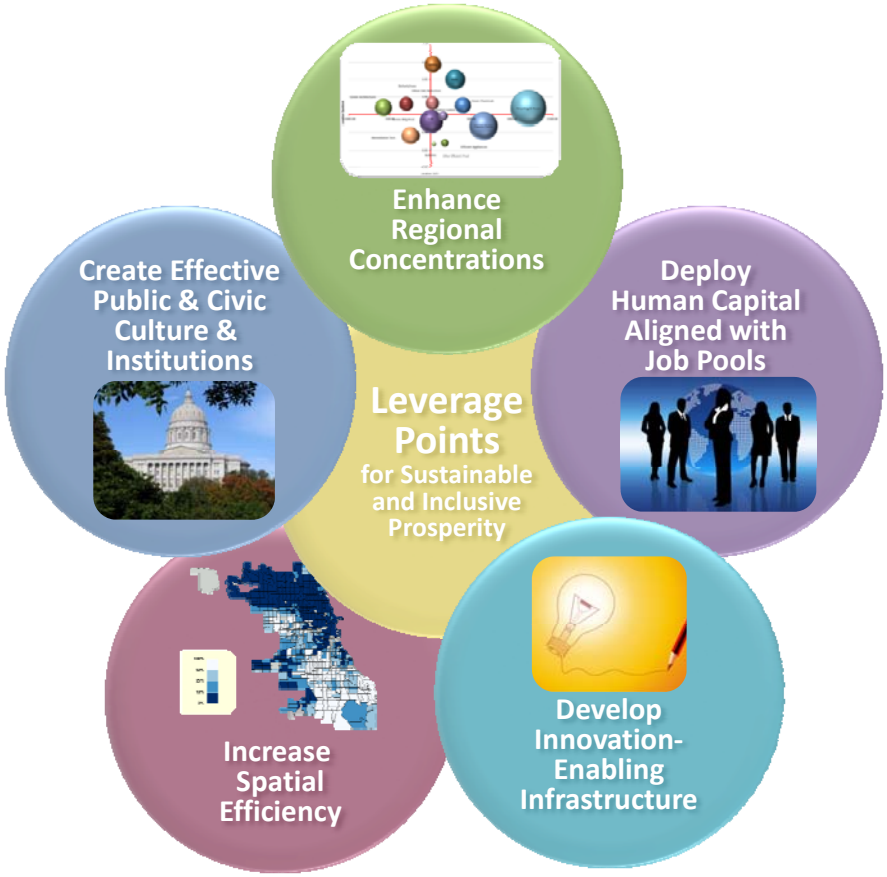
Implementing Regionalism:

Connecting Emerging Theory and Practice to Inform Economic Development



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Preface and Acknowledgements

The "Implementing Regionalism" project sought to begin bridging the gap between the theory and practice of regional economic development by reviewing existing research and convening experts, in order to both suggest initial lessons for practice, and identify key areas where further applied research and product development would be most productive. We hope that the papers which follow advance the practice of economic development.

We are grateful to the Surdna Foundation for its leadership in the community and economic development fields generally, and its support for this project in particular. Special thanks go to Phillip Henderson, Shawn Escoffery, Kim Burnett, Jasmine Thomas and Kim Musler for their support and critical insights throughout the course of the project.

This project also benefitted greatly from coordinated work with several companion projects. Very substantial parts of the framework and analysis about regional economies included in this report – including particularly the identification and analysis of the five key leverage points for regional economic growth – were and continue to be developed jointly with our colleagues at the Brookings Institution's Metropolitan Policy Program in the context of the Metropolitan Business Planning initiative. We are particularly grateful to Bruce Katz, Amy Liu, Mark Muro and Sarah Rahman – all extraordinarily committed and talented contributors to the field of regional economic development.

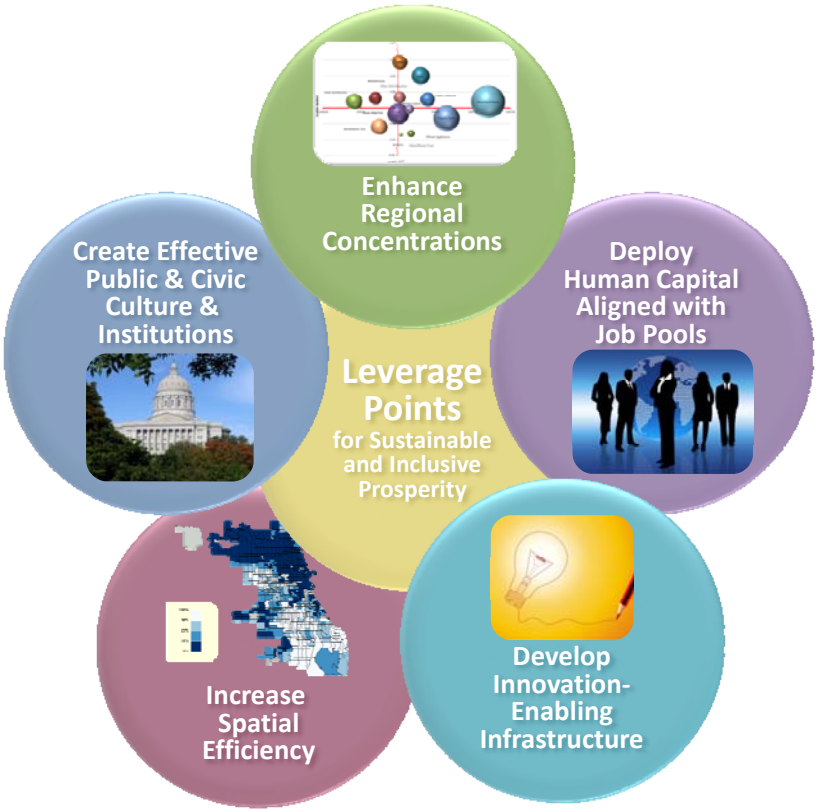
Two projects specific to the Chicago region have also contributed to – and benefited from – our work on this project. They include a paper reviewing the economic impacts of the Chicago Metropolitan Agency for Planning's (CMAP) GO TO 2040 comprehensive plan for metropolitan Chicago (supported by the Chicago Community Trust); and work being led by Metropolis Strategies on regional economic development opportunities and practices in the Chicago region. Much of the framework developed here was simultaneously informed by, and informed, those projects, and appears in similar form in those projects as well. Special thanks to Terry Mazany and Ngoan Le of the Chicago Community Trust; Randy Blankenhorn, Bob Dean and Brett Baden of CMAP; and Frank Beal, Emily Harris and Tim Quayle of Metropolis Strategies.

A host of researchers assisted with literature reviews and otherwise provided drafting, input and comments for portions of this project. We are grateful to Joseph Grant, Rebecca Solomon, Emily Metz, Michael Ford, Sophie Cohen and Sohair Omar.

Finally, our sincere thanks to the many esteemed colleagues who graciously participated in a workshop on November 12, 2010. These expert researchers and practitioners provided invaluable insights and feedback on our many and varied working papers, contributing in a very meaningful way to this final product. A full list of participants is included as an appendix to Chapter I (Executive Summary).

CHAPTER I

Executive Summary



***Note**: This is one of eight papers – an executive summary, six papers on specific aspects of regional economies and an appendix – generated by the "Implementing Regionalism" project, funded by the Surdna Foundation and undertaken by the George Washington University Institute of Public Policy and RW Ventures, LLC. Please see [insert web link] for the complete set of materials developed by the project.*

CHAPTER I: EXECUTIVE SUMMARY

I. Introduction

Researchers and practitioners alike agree that metropolitan regions are critical units of economic activity. Metropolitan areas disproportionately house the nation's economic assets and produce its economic outputs. The concentration of assets in metropolitan areas reduces transportation costs, creates economies of scale and generates other synergies and multiplier effects. Some argue that regions – and not nations – are the primary competitors in the global economy, as they are big enough to compete internationally, but still small enough to benefit from network and agglomeration economies.

While these observations justify a regional focus, they do not yet offer significant guidance for practitioners: how do we improve the performance of regional economies, including all of their component parts?[1] This entails focusing on the systems and interactions which account for regional economic performance. The key point for economic development practice is that regions are the scale at which many of the mechanisms operate which determine how efficiently and productively assets are deployed to create wealth. The primary systems that convert economic assets to wealth in our economy are markets, and a primary geography of markets – real estate, labor, business – is regional. This means that, whether you care about the neighborhood, the city or the suburb; about human capital or business growth; one has to understand how the assets and markets intersect and relate across – and combine to constitute – the regional economy.

Regional economies are complex, dynamic systems arising from the interactions of housing, labor, business and other market systems with characteristics of place, all enabled and shaped by government and civic-sector activity. System performance is a function of the interactions of millions of people and firms in this market and institutional context, with the actions of each affecting the behavior of the others in an ongoing, iterative cycle. If we want to improve the deployment of assets – to create jobs, income and wealth – then we have to understand how these systems work, in order to understand how we can influence their performance. For particular interventions, this may entail working at sub-regional geographies specific to the system of interest, but in any event it entails thinking and acting within a regional framework.

This is no small task. Supported by a large body of research, the message of regions' importance as a unit of economic geography is increasingly accepted, and policymakers and practitioners around the country are ready to begin thinking and acting regionally. However, much of the research aims only to provide formal analytic evidence of the fact that regions are important, of the importance of certain factors to regional performance, or of the broad, formal mechanisms at play. In many instances, this research does not yet generate actionable implications for

[1] We sometimes refer to this below as "inclusive regional economic development." This is meant to emphasize that our focus on regional economic development is *not instead of* a focus on neighborhood or subject-area development (such as human development or small business development), but rather views regional economic development, properly conceived, as necessarily *including* the sub-areas and subjects. Similarly, we use the phrase "thinking and acting regionally" to refer to applying this regional framework to economic development activities in sub-regions and subjects as well as across the regional economy, rather than to the geographic scope of the particular activity.

economic development strategies, policies and practice. Knowing, for example, that human capital levels are a statistically significant driver of economic growth does not necessarily mean that simply having more human capital will cause growth, let alone begin to explain the precise mechanisms through which it affects growth, or how best to develop and deploy the "right" human capital within a particular region. Fortunately, this research sets us off in the right direction, and a great deal of emerging research – and practice – is shedding further light on how to do regional economic development.

Given the importance of inclusive regional economic development, and that policymakers and practitioners are looking for guidance on what to do, the time seemed right to begin summarizing and extracting from existing work in order to help bridge the gap between theory and practice, suggest initial lessons for practice, and identify key areas where further applied research and product development would be most productive. This project was thus conceived with a fairly simple logic: we aspire to better understand the systems which drive regional economic growth; then explore the factors and mechanisms which influence their performance; in order to identify what interventions will be most effective (or what further research and practice tools are necessary to create effective interventions). To do so is clearly an extremely ambitious undertaking; indeed, not fully achievable. We intend only to make progress – to advance the discussion and practice of economic development.

To that end, the project was structured to create a series of discussion papers, which then served as basis for a one-day workshop of expert researchers and practitioners. Based on that rich discussion, the papers have been converted into this compilation. The following chapters and, by extension, this overview chapter, convey the insights – and challenges – arising from the project. Inclusive and sustainable regional economic development is a rapidly emerging and exciting field of practice, with enormous potential and opportunity, but also with a lot to learn. We hope this material will contribute to further conversations, research, policy and product development to advance the practice and the field.

Chapter II of this document begins by laying out a simple framework for understanding the system interactions that make up regional economies. Based on this framework and related research and practice, it then identifies five key "leverage points" that influence economic growth and are subject to intervention by economic development practitioners. In actionable terms, these are:

- *Develop and deploy human capital*
- *Enhance performance of clusters*
- *Foster an innovation- and entrepreneurship-enabling environment*
- *Improve spatial efficiency*
- *Create effective public and civic institutions*

Chapters III through VII address each of these leverage points, offering observations on: (a) the definition and significance of the leverage point; (b) the mechanisms through which it influences economic growth and itself can be influenced; (c) given those mechanisms, how practitioners can

influence the leverage point to improve economic performance; and (d) unresolved issues and challenges particularly warranting further research and product development.

The remaining sections of this Summary (Chapter I) provide a distillation of the key points from Chapters II through VII.

II. Regional Economic Framework

Having observed that assets and outputs concentrate in regions, and that this is a function of regional systems interacting in complex ways to deploy assets for economic growth, we need to understand how these systems operate, interact and can be influenced by interventions. To move in that direction, for discussion purposes, we first offer some observations about how regional economies grow, and then a framework for understanding the dynamics that drive growth.

A. How Regional Economies Grow

Within a regional economy, we can increase prosperity (i.e., generate more outputs or wealth) in two ways:

- First, we can grow the economy through increasing inputs – either by attracting new resources from outside the region (such as human capital, businesses and investments) or by more fully deploying existing resources (underemployed labor, underdeveloped real estate, etc.).
- Second, we can increase the productivity and efficiency of the regional economy (increase outputs per unit of input) – by improving efficiency of market operations and governance; enhancing the interactions and synergies between different kinds of economic activity; and improving how the assets of the economy are organized and deployed spatially.[2]

A broader context is also important here: overall regional economic growth requires increases in demand for what the economy produces. In other words, increasing existing outputs or expanding into new types of outputs through adding assets, or becoming more efficient and productive, will not create growth if there is no demand for the goods and services. That is, the goal is not to get better at producing typewriters.

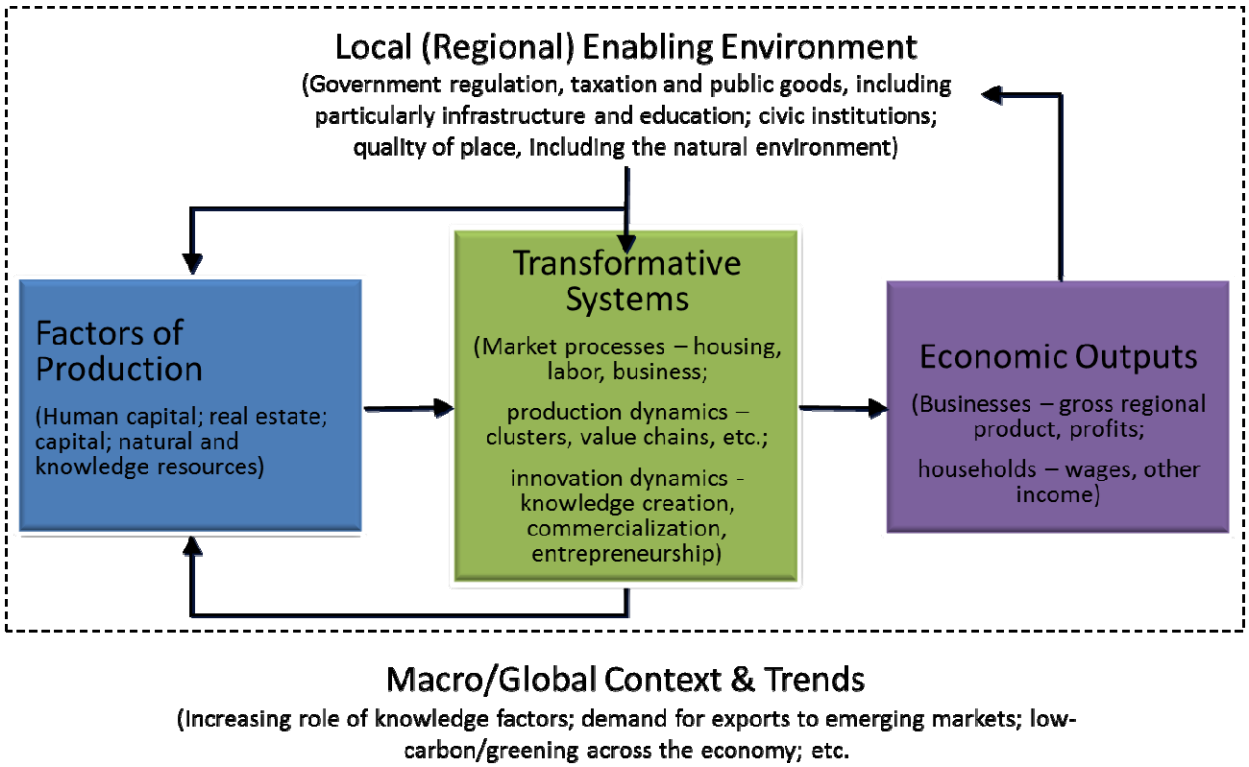
From a micro-economic point of view, increasing outputs inherently flows from business-sector growth – increasing the number, size and productivity of firms in the region. Business-sector growth, in turn, occurs through firm creation, growth, retention and attraction. Firms grow and choose to locate where they can be most efficient (including with regard to costs of production, such as transportation) and productive – and so profitable. This is a function of both firm- and system-level (particularly market system) operations. We are thus ultimately concerned with what attributes of the region and its component systems lead to increased creation, efficiency and productivity of firms.

[2] These two avenues for growth intersect and overlap. For example, increasing market efficiency often also increases deployment of underutilized assets.

Overall, as a sort of "first approximation:" in order to increase regional prosperity, we can seek to better develop and deploy local assets; attract new assets; improve the efficiency and productivity of the regional systems which deploy assets to convert them to economic outputs; and increase the efficiency and productivity of firms. These things, of course, are intimately related.

B. The Dynamics of Regional Economies: Framework and Leverage Points

A regional economy is a complex and dynamic system operating in an equally complex environment and global marketplace. Analyzing how any given change will impact its performance entails first understanding the context and key components, and the systems which interact to deploy assets efficiently and productively (or not). A simple framework is offered below.



The ***outputs*** of the regional economy – the total value of goods and services produced (gross regional product) – result from the individual interactions and transactions of myriad individuals and businesses. These interactions take place through a set of overlapping and interrelated **transformative systems** – primarily market systems – that combine and transform inputs such as human capital (**factors of production**) into tangible economic results. The input factors and the quality of these interactions – particularly the efficiency and productivity of these systems – depends in part on **the enabling environment** (such as infrastructure), which in turn is determined by local governmental and civic institutions, as well as the natural and built environment. Finally, the regional economy operates in the context of a changing global and

macroeconomic environment, which influences how the systems operate to affect productivity and growth, and where demand is emerging for economic outputs.

Examining the research (particularly in the burgeoning field of economic geography) and practice with respect to these dynamic interactions of the components of a regional economy enables identification of the main mechanisms that increase efficiency and productivity. Dense networks of suppliers, service providers and customers within close proximity of firms reduce transportation and transaction costs. The benefits of concentration provide additional "agglomeration economies" through shared inputs to production, deep labor pools and knowledge spillovers. The opportunity for face-to-face interaction across firms and between individuals, as well as the movement of employees between firms, facilitates the sharing of ideas that generates increasing returns to knowledge and spurs innovative activity. As a result, how industries, functions and occupations "cluster," the institutional environment that facilitates transactions, and the spatial efficiency of their organization, are all key determinants of economic productivity.

The rise of the knowledge economy (part of the macroeconomic environment), in particular, also infuses much of the discussion that follows. The increasing role of knowledge embedded in people and technologies in driving economic growth has enormous implications for the relative importance of inputs (e.g., high human capital); drivers and how they operate (e.g., knowledge spillovers, functional concentrations, institutional and innovation economics); and even the spatial arrangement of assets (e.g., benefits of density facilitating face-to-face interaction).

Viewed at a micro or firm level, the productivity and efficiency of firms is driven by their concentration and interaction with other firms (hence, clusters); having the right human capital; rates of innovation; the government and institutional environment; and access to workers, customers and suppliers (spatial efficiency).

Focusing on these key aspects of how a regional economy functions, informed by the research and practice, enables identification of five key leverage points through which practitioners can influence performance of the regional economy.

- ***Develop and deploy human capital.*** Human capital is the single most important input to economic growth, but it must be deployed, requiring attention not only to human capital production, but to job creation, job-skills matching and labor market efficiency.
- ***Enhance performance of clusters.*** Concentrated economic activity benefits the production of goods and services by reducing transportation and transaction costs, enabling shared labor and other inputs, facilitating spillovers and exchange and enhancing innovation.
- ***Foster an innovation- and entrepreneurship-enabling environment.*** Innovation drives productivity gains and, in the context of a knowledge-based economy, the field is getting more sophisticated about how to catalyze and support innovation activities.
- ***Improve the region's spatial efficiency.*** The location of firms, workers, producers and consumers within a region – and the infrastructure connecting them – determines the transaction costs for people, businesses and government, and influences agglomeration benefits such as shared inputs to production and knowledge spillovers.

- ***Create effective public and civic institutions.*** Government shapes and enables market activity and provides critical public goods from roads to education. Along with civic, business and cross-sector institutions, it also creates the institutional environment and culture that increasingly influences the dynamism and innovativeness of regional economies.

It bears emphasis that the "whole" of a regional economy is greater than the sum of its parts. The leverage points help focus on the interactions between the "parts," and particularly the dynamics which make them efficient and productive (or not). Similarly, the leverage points are themselves closely inter-related, as the discussion which follows often highlights.

The accompanying Appendix to this document (essentially a distinct eighth chapter) explores the regional systems in much more detail than this chapter, in order to further derive and understand these leverage points.

C. Implications, Observations, Issues

Before turning to each of the leverage points, even this high-level framework raises several implications and issues:

- "High-Road/Low-Road" Strategies. Practitioners recently have been advocating moving away from "smokestack chasing" (competing to attract firms, especially by reducing tax burdens) toward "high-road" strategies that build more from existing assets and compete on value-added (attracting firms because they can be more productive in a particular regional context). The framing here (better deploying local assets and increasing productivity and efficiency of local firms and systems) tends to favor "high-road" approaches. It also highlights that the relationship between local development and firm attraction strategies is more complex. The issue is not whether firm attraction is important, but on what basis and how: in particular, what targets and strategies for business attraction best build from the strengths of particular local economies?
- Neighborhood Development and Equity. This framework sees neighborhoods and their assets as integral parts of regional economies, each dependent on the other for its success. It similarly sees addressing equity (through fully deploying assets) as aligned with long-term regional growth. We have deliberately resisted including a separate leverage point(s) on neighborhoods and equity to avoid, yet again, treating these issues as an aside from economics. Neighborhood and equity opportunities are instead woven throughout the leverage point discussions. How to better connect neighborhood and regional development is emerging as a key focus in both fields, and one of the areas we highlight throughout as deserving more research and product development.
- Market Efficiency. Markets can be more or less efficient, depending on the efficiency of the firms that operate in those markets; the structure of the market (monopoly, oligopoly, perfect competition, etc.); and on the degree to which market imperfections (such as information asymmetries and externalities) affect their operations. When we say economies are not using all of their available assets, we are often referring to market imperfections or barriers that prevent markets from reaching or including otherwise viable assets (people, places, opportunities). Many of the leverage point discussions address aspects of market efficiency, and we believe there are additional development opportunities that would result from a more

direct focus on identifying and ameliorating market imperfections toward enabling markets to be more inclusive.

- Framework, Logic, Other Leverage Points. While this framework and set of leverage points is proving useful in discussions and initial application in practice, it is surely incomplete. Quality of life, amenities and housing markets are deliberately treated in the context of other leverage points, but not yet adequately. Translating from leverage points to strategies to particular products or tactics requires much more attention. (For example, many economic development activities – such as branding and marketing – are considered tactics to implement particular strategies, and so not fully examined here.)

III. Develop and Deploy Human Capital

A. What is it, why do we care and how does it work?

(What is this leverage point and why is it important? What are the mechanisms through which it influences economic growth and itself can be influenced?)

Human capital refers to *the stock of knowledge, skills, expertise and capacities embedded in the labor force.* Human capital is the single biggest "driver" of economic growth in metropolitan areas, and continues to increase in importance in the knowledge economy. Regions with higher levels of human capital experience greater increases in outputs, productivity, wages and employment.

Human capital contributes to economic growth as an input to production. Increasing amounts and levels of human capital drive growth by increasing the productivity of firms and, consequently, their output. The key point here is so obvious that it is often overlooked: the *mechanism* through which human capital influences production is by working – by being *deployed* in jobs. For example, college towns are frequently statistical outliers in human capital research exactly because their unusually high levels of human capital generally are not deployed to maximize economic value (but for other important purposes).

If the mechanism through which human capital causes growth is through deployment, what are the mechanisms that influence levels of deployed human capital?

- Several mechanisms are at work here, since this entails two factors: the amount of human capital, and how well it is deployed.
- The amount of human capital in a region is a function of its production, attraction and retention. The mechanisms for human capital production (largely beyond the scope of this project) are the formal educational system, as well as adult training, on-the-job training, work experience and other forms of knowledge and skill acquisition.
- Attraction and retention of human capital are achieved primarily by having the right jobs (though amenities can also be significant). High-human-capital workers look to locate in places offering rich job pools in which they have a range of opportunities to deploy their talents, and in which they can benefit from the knowledge spillovers and enhanced productivity accompanying concentrations of knowledge workers. Firms and knowledge workers attract each other in an iterative and mutually reinforcing process – knowledge workers are attracted to rich pools of knowledge jobs, and firms in turn are attracted to rich

pools of knowledge workers. The primary mechanisms for attraction and retention are thus those which influence the demand side of the labor market, such as cluster approaches (discussed in Chapter IV).

- As mentioned, we are concerned not just with amounts of human capital, but its deployment. The mechanism for deployment is labor markets. Productive deployment entails having the right jobs (again taking us to demand-side strategies) and strategies which enable the labor market to more efficiently deploy workers into those jobs.
- The focus on deployment also reveals the importance of some related labor market issues. It is increasingly being argued that "opportunity rich" economies perform better, which we take to refer to those offering jobs at all skill levels, particularly including middle-skill and middle-wage jobs; and facilitating mobility through career ladders and market–driven, continual incremental human capital development and deployment.

From an economic development standpoint, therefore, regional human capital strategies need to focus not only on increasing levels of human capital, but also on effectively *deploying* human capital into jobs that maximize its economic impact. This means that, in order to maximize development and deployment of human capital for economic growth, practitioners have to focus on the complex relationships between (1) production, attraction and retention of human capital; (2) job creation through firm growth, attraction and retention; and (3) the structure and efficiency of labor markets.

B. Practical Implications

Regional economic development strategies to influence the development and deployment of human capital can be organized into three categories.

(i) Increase levels of human capital through production, attraction and retention of skilled workers

- Human Capital Production.
  - The first key implication is that human capital strategies have to move well beyond production of skilled workers. The prevalent and compelling statistical research linking high levels of human capital, generally measured by formal educational attainment, to high levels of metropolitan economic performance has often led practitioners to conclude that if a region simply produces more human capital, it will lead to economic growth. Production of human capital does not create the jobs and firms through which the economy grows (though it may help, in the iterative process discussed). By and large, the human capital will leave the region if the right jobs are not there.
  - While not sufficient, human capital production of course remains critical (though largely beyond the scope of this paper). A second key implication is that strategies to increase the production of human capital should both address the need to raise formal educational attainment levels and ensure that workers of all skill levels have continued access to education and training programs that develop the "right" human capital to meet regional labor demands (discussed in more detail in (ii) and (iii) below).

- Finally, to improve deployment and labor market efficiency (particularly matching workers to jobs, discussed below), many aspects of human capital production must become more demand-driven: informed by the current and emerging needs of employers.

- Attraction and Retention. In light of these dynamics, attracting and retaining skilled workers primarily depends on identifying, creating and enhancing the job pools necessary to effectively deploy their talents (discussed in more detail in Chapter IV, regarding Clusters), and secondarily on certain quality-of-life amenities.
  Retention can also be enhanced by making sure the human capital produced in the region is well matched to existing jobs, and through programs, such as internships and mentoring, which connect college students and other trainees to local jobs.

The key umbrella point here is that human capital strategies should be more carefully aligned with and informed by the demand side of the market in general, and cluster strategies in particular.

(ii) Improve labor market efficiency

Firms and workers face transaction costs related to search and evaluation in order to create matches which maximize deployment of human capital. When information is limited or costly to acquire, both firms and workers over-rely on personal networks and formal degrees. The frequent lack of connection between human capital production and demand also makes it harder for employers to know whether the skills developed in formal education and training are the ones they need. Spatial mismatch of jobs and workers may also increase the costs of transportation and employee turnover. Several strategies surfaced as promising steps toward reducing transaction costs or otherwise improving job-worker matching. (Strategies to address spatial mismatch are discussed in Chapter VI, regarding spatial efficiency.)

- Third-party labor market intermediaries: Labor market intermediaries (LMIs) targeting a particular sector can frequently achieve economies of scale in information collection and use their detailed knowledge to help firms and workers navigate the labor market to form productive matches. Some LMIs also create training programs by directly soliciting the help of firms in designing curricula to reflect their needs. These types of demand-driven training programs lower search costs to firms, since employers have access to a pool of candidates trained for their specific industry, as well as assessment costs, since firms feel more confident evaluating workers who completed training that they helped design. Conversely, workers reduce their transaction costs by training for identified local jobs and acquiring a means to signal their skills to employers.

- Certification. Certification also helps to address the challenge of signaling relevant skills to employers. Starting with foundational skills, there has been progress in developing standardized, affordable and accessible tools to assess basic academic and "job-readiness" skills. In addition, some industries are seeking ways to create hierarchical certification programs that begin by establishing foundational skills and then move on to certifying industry-specific skills. This structure signals the range of human capital necessary for a specific job, enabling education and training programs to coordinate services for workers at different starting skill levels to create a pipeline of qualified workers aligned with industry standards, and enhancing mobility in the labor market.

- Labor market information and analysis. Accurate and timely information on both the demand and supply sides of the labor market is critical to success, but challenging to obtain. Policymakers and practitioners need to know what skills are required for available jobs and what skills exist in the workforce in order to coordinate and design programs intended to train and match workers to jobs. Interesting experiments to increase access to up-to-date labor market information include, for example, a "spidering" technology that "crawls" through Internet job postings and résumé banks to gather real-time statistics on jobs-skills gaps; as well as "skillshed" analyses that survey workers and employers within a given commuting area.

(iii) Promote an "opportunity-rich" economy

Evidence also suggests that economies perform better when workers of all skill levels have opportunities for both employment and upward mobility (in part due to improved development and deployment of human capital).

- Mobility through career pathways. "Career pathway" programs define clear steps for incumbent workers and jobseekers to undertake additional education and training directly linked with higher-skilled and better-paying jobs in a targeted industry. A few innovative "career pathway" programs partner with employers and educational institutions to integrate coursework into the daily routines of entry-level jobs, allowing workers to earn academic credit and industry-recognized credentials while also working full-time. These work-based learning programs represent a "mutual gains" model, in which workers benefit from increased skills and wages, and employers have access to qualified workers for high-demand jobs.
- Intra-firm career ladders. Some LMIs also attempt to increase labor mobility by working with employers to alter hiring and advancement practices to better create "career ladders." This kind of structural change in firm practice promotes mobility that lasts beyond the lifespan of a particular training program.

C. Key Opportunities for Applied Research and Product Development

(i) Applied Research[3]

- Much more nuanced work would be helpful on the iterative processes through which firms and human capital attract each other, and (similarly and interconnected) through which firms and human capital create demand for amenities which in turn help attract more firms and workers. Research (and analytic products) are needed which would help practitioners better understand the staging or sequencing of these factors in the particular circumstances of their regions, including of specific clusters, in order to determine the relative importance at any given moment, and in a particular place, of focusing on expansion of firms, specific human capital production and development of amenities.

[3] Note that we have considered the basic human capital production systems – pre-K through 12, colleges, training programs, etc. – largely beyond the scope of this project, and so are not including here the very necessary research on issues like charter schools or drop-out rates.

- Better data and research is needed for practitioners to evaluate the extent to which human capital in a region is under-deployed – by which we mean qualified labor which is not employed to maximize its value in existing jobs. (If a trained engineer is working as a cashier because no engineering jobs are available, that presents a different, labor force demand-side, issue.) To the extent qualified labor is not being well matched to employers seeking their skills, it points to the need to focus on the strategies which improve labor market efficiency.
- Creating an "opportunity rich" economy entails preserving middle-skill and middle-wage jobs. Further research is needed to better understand the relationship between middle-skill jobs and middle-wage jobs (e.g., whether middle-skill jobs are remaining and it is just that the wages are dropping, or the nature of the "middle skills" is changing, or the jobs are just disappearing); what accounts for the drop in either or both (e.g., off-shoring? shifts in employer-employee negotiating power?); and what can be done about it.
- Similarly, career ladders are disappearing (perhaps due to mergers, cost-cutting, restructuring, out-sourcing, etc.): further research is needed to understand why and what can be done to increase vertical mobility in the labor force (entailing also, product development, such as tax credits which incent employers to invest in retention and training).

(ii) Product Development

- Understanding the region's present and anticipated human capital needs presents a fundamental challenge for human capital production practitioners wishing to become more demand driven. This entails working more closely with employers and cluster strategies, but also might benefit from better data and analytic products for assessing current and emerging demand. This might include new services and technologies (such as the "spider" example discussed above) for continually evaluating job postings and their associated skill levels.
- Promising certification and credentialing programs need to be expanded to other areas and coordinated. This includes certification programs to better measure "soft" skills; certification programs tailored to the skills (often not learned in or reflected in degrees from formal educational institutions) needed in specific high-demand industries, especially creating credentials that are portable among employers within the same industry; and coordinating certification programs to create skill-level hierarchies that enhance mobility along career ladders.
- Support is needed to further design standardized curricula and materials that enhance and promote use of work-based learning programs, particularly to broaden adoption for entire industry segments rather than just individual firms. Similarly, support is needed for organizations that work with industries on a larger scale to implement training programs that achieve economies of scale, allowing a group of employers to fund training that individual firms would not be able to afford alone.
- With increasing mobility of workers and firms, less established "career ladders" and more frequent need for skills upgrading and retraining, the exchange functions in labor markets become particularly important and challenged. New workforce intermediaries that better serve both employers and employees, reduce finding and measurement costs in qualifying and connecting the workforce to jobs and create an entry and delivery point for related

services (including perhaps even portable pension accounts and continuing education vouchers) should be explored.

- The field needs to find ways to enable more investment in human capital and more portable, continuing benefits for that investment. Possibilities include creating a more equity-like financial instrument to invest in human capital, one that is more subsidized and longer-term than current student loans; developing Adult Learning Accounts; and universal voucher systems.
- Human capital lives, and initially is primarily produced, in neighborhoods. Most of these R&D strategies to improve the preparation, access and mobility of human capital – to increase development and deployment of underutilized human capital assets – need to be designed to build upon and inform the many neighborhood-based human capital development activities.

IV. Enhance Performance of Existing and Emerging Clusters

A. What is it, why do we care and how does it work?

Clusters consist of inter-related firms in a common geographic region producing similar or related products, utilizing similar processes, or engaging in similar functions (e.g., headquarters or R&D); the regional suppliers and customers of these firms; and institutions (e.g., universities, community colleges, industry and trade associations, public and private sector organizations) which provide services or inputs to the firms. Clusters also generally are defined by and benefit from shared labor pools, infrastructure and markets.

The concentration of shared activities, inputs and markets provides "agglomeration economies," including lower input costs (particularly for labor and transportation), as well as facilitating knowledge spillovers that increase innovation and productivity. Consequently, firms in clusters that generate these benefits will be more competitive, and regions with effective clusters experience greater growth.

The mechanisms through which the benefits of clustering may occur include:

- Labor market pooling. Firm and labor agglomerations provide a variety of different skills and occupational specialties. Firms with needs for specialized skills are more likely to find them, and people with those skills are more likely to be attracted to an area where they know these specialized skills are in demand. Further, the ability to replace an inferior worker with another more productive one available in the area also enhances firm productivity.
- Input sharing/supplier specialization. Suppliers of physical inputs into the production process choose to agglomerate because the benefits of a large customer pool compensate for any increased costs of locating there (higher land costs, higher labor costs, greater congestion, etc.), and because they may benefit from other agglomeration benefits amongst themselves. As a result, cluster firms purchasing these inputs obtain lower transportation costs for inputs, as well as higher quality.
- Knowledge spillovers. Knowledge spillovers result from the concentration of many people working on problems across a similar or related set of industries, skill sets or processes that

produce a widely shared understanding of the problem and its workings. The result is greater innovation, enhancing efficiency and productivity and contributing to greater economic growth in the region.

B. Practical Implications

An economic development policy informed by cluster theory would proceed by first identifying clusters in the region that:

- Produce goods and services for export (or import substitution);
- Are in sectors with growing demand;
- Have a local competitive advantage; and
- Have some existing concentration in the region – i.e., the region already has assets in the cluster that it can build upon.

Practitioners can then identify the cluster components, the cluster drivers and the interaction between the drivers and other components in order to hone in on specific strategies that will improve the performance of a given cluster. The purpose of the analysis is to search for gaps, inefficiencies and market failures among the relationships of these components that might be improved through direct intervention and then to fashion interventions addressed to these. In aggregate, work by academic and practitioner cluster experts suggests a set of key policies, strategies and lessons for cluster-based economic development practice:

- Learn how specific local businesses and clusters interact and function – this may entail quantitative analysis of sectoral interaction, input-output analysis and/or qualitative "anthropological mapping" through engaging the businesses and institutions in the cluster to deeply understand who they buy from, sell to and partner with, and their particular opportunities and barriers. Often, regional cluster identification efforts rely heavily upon high-level data analysis based on national models of clusters that may or may not reflect the true dynamics of firm interactions within a particular region. For example, some of the most commonly used cluster definitions (i.e., groups of related NAICS codes) are derived from analysis of aggregated national data that describes which types of firms interact and how. Practitioners tend to apply these definitions to their regions without fully understanding in what ways their region's firms may conform to or deviate from these national "averages" in terms of supply chain, market and institutional relationships. Without additional "anthropological" analysis to understand the local context more deeply, the interventions described below cannot be properly selected and tailored to local clusters.
- Support clusters based on their economic dominance, strategic importance, leadership and potential.
- Design and deliver, with cluster leadership, tailored technical support services.
- Undertake targeted firm recruitment based on identified gaps in cluster development (such as particular parts of the supply chain).
- Develop and organize supply chain associations.

- Support entrepreneurs enhancing targeted clusters through assistance for start-ups and spin-offs, including services such as financial advice, marketing and design.
- Encourage labor market quality and pooling through providing labor market information and specialized training.
- Encourage knowledge spillovers and networking through public-sector research and development support, building cluster networks and otherwise strengthening industry-institutional ties.
- Facilitate market development through joint market assessment, marketing and brand-building.
- Represent cluster interests before external organizations such as regional development partnerships, national trade associations, and local, state and federal governments.

The most important implication for practice is that clusters provide a conceptual framework through which the production side of a regional economy can be analyzed and understood. A cluster framework suggests that economic development policymakers and practitioners should focus not primarily on single firms or narrowly defined sectors, but on the wider set of firms, actors and institutions that form a cluster and help determine the cluster's competitiveness.

C. Key Questions for Future Research and Product Development

While cluster theory provides an enormously useful economic framework, numerous challenges remain in translating it into practice.

- How have cluster-based economic development policies, activities and practices actually performed? While there are many case studies of specific cluster-based initiatives – most of which focus on the processes through which cluster policy is applied or operates – there are very few existing systematic evaluations of outcomes, or particularly of what interventions matter most.
- How can clusters best be characterized (i.e., sorted into relevant classifications through typologies) so that they provide relevant information to economic development practitioners such as:
  - What kinds of clusters work best for different types of regional economies?
  - What are the kinds of interventions most appropriate for different kinds of clusters?
- How do knowledge spillovers really work, and to what extent and how can they be deliberately facilitated? Perhaps social network analysis studies can be used as a means of exploring this question.
- What are the economic development effects of using "cluster brokers?" Can this kind of intervention be brought to scale?
- What are the best methods for identifying clusters? In particular, how can the initial identification of clusters through quantitative analysis be improved, especially through using measures that more closely capture the conceptual meaning of "cluster?" Once potential clusters are identified through quantitative analysis, how can the methods such as

"anthropological mapping" be systematized and improved to better identify the actual clusters and better understand their operations, gaps and opportunities?

- As particular clusters are deeply analyzed, it turns out that many of the assets and factors needed to strengthen their performance are housed in neighborhoods – such as human capital, customer markets, suppliers and available real estate. More work is needed on how to link cluster and neighborhood development strategies, to better deploy neighborhood assets to strengthen both.
- What are the implications of the substantial literature on organizational and institutional learning and learning networks for how cluster-based networks can be developed and strengthened to improve regional economies?
- Regions need to be cautious about trying to "pick winners" or build clusters without a sufficient pre-existing core, but it would be important to know whether they can create the conditions in which new clusters are more likely to materialize, and in which existing clusters thrive. More work is needed on whether such emerging clusters can in fact be identified successfully in advance, and on what roles practitioners can play to enhance their emergence and performance.

V. Foster an Innovation- and Entrepreneurship-Enabling Environment

A. What is it, why do we care and how does it work?

Innovation is the development of new ideas, products, services, technologies, processes, systems, organizational structures and business models. Practically speaking, it proves useful to tease out some of the dimensions of and distinctions within this broad scope:

- Types – product (or service), process and business model innovations. Further distinctions can be made based on the degree (radical/disruptive vs. incremental) and source (e.g., science-, creativity- or design-based) of the innovation.
- Stages – Innovation is not a strictly linear process; however, in both theory and practice, there are a number of stages that provide a useful framework for understanding how a region's innovation environment is performing. One way of portraying those stages is provided here:

> Basic research → Discovery/idea generation → Applied research/development → Invention → Product (prototype/proof-of-concept) → Commercialization (investment + further product/process development) → Market introduction (including entrepreneurship)→ Market adoption/diffusion → Business growth/expansion

- Levels – Innovation can be viewed from the firm level or the market/system level – the micro or the macro. Given our focus on regional economic development practice, we primarily focus on system-level interventions.

Innovation is critical for economic growth because it:

- Is the only *long-term* way to grow the economy overall – the only path to increasing the quantity and quality of the goods produced from the finite resources of the global economy.

- *Causes* economic growth through increasing the productivity and efficiency of firms and markets, and by enabling the emergence of new markets.
- Has become increasingly important to local economic competitiveness in the context of the knowledge economy, in which information technologies and high human capital combine to enable faster, more flexible, continual redeployment of assets into new, more customized, products and services. Increasing, rather than diminishing, returns to knowledge cause ongoing, mutually reinforcing concentration of and interactions between these knowledge factors generating local capacity for sustained innovation and economic growth.

An emerging body of research and practice suggests five primary categories of factors and mechanisms that make some regions more "innovation-prone" and entrepreneurial than others:

- Labor market characteristics – the attributes of the workforce and its deployment into industries and occupations. Factors that increase innovative capacity include higher levels of education, including STEM degrees; concentrations of knowledge-intensive occupations and the presence of potential entrepreneurs (resilient, risk-taking individuals).
- Business ecology – the characteristics of local firms and their interactions. Factors that contribute to greater innovation include the existence of strong clusters; the presence of firms that are (a) in knowledge- and technology-intensive industries; (b) small and nimble (in contrast to a large-firm-dominated environment); and (c) not vertically integrated (i.e., interact with other firms through buyer/supplier relationships).
- Networks and information exchange – the extent and nature of connections that enable interaction, spillover of ideas and generation of deals among economic actors. Connectivity facilitates innovation through high rates of labor mobility among related firms and organizations; intra-regional, face-to-face and strong ties, particularly in early stages of problem solving, idea development and testing; and inter-regional and weaker/intermittent ties for sharing of codified knowledge and exposure to outside-the-box ideas.
- Institutional environment and culture – the fluidity, dynamism and coordination among components of the public, private and civic infrastructure. Innovation-enabling features include supportive regulation and tax policies, including R&D incentives; local governance style that encourages participation and is open, adaptive and flexible; the presence of intermediary institutions linking actors across public, industry and other boundaries; engagement of universities and research labs in commercialization activities; and an overall business culture that is collaborative, risk-taking, open, flexible and adaptable.
- Investment capital– the availability of public and private financing across all stages of the innovation process. This includes the existence of sufficient R&D funding to prime the pipeline of early-stage ideas, as well as access to seed and venture capital to support pre-market start-up ventures and navigate the funding "valley of death."

B. Practical Implications

To enhance its innovation rate, a region must gain a deep understanding of its innovation environment – the infrastructure, stakeholders and their interactions – and of the particular opportunities and barriers either in the overall ecosystem, at specific stages of innovation or in the context of particular clusters. This enables much more strategic interventions targeted to

particular opportunities or challenges. Following are a broad range of potential interventions which can then be selected based on this analysis.

- Foundational – inputs and ecosystem. The basic inputs and infrastructure for building broad regional innovation capacity are virtually identical to the leverage points discussed in depth in other chapters of this document (plus including appropriate finance). Examples include human capital production, retention and attraction targeted to innovative occupations, functions and clusters; fostering interdisciplinary networking opportunities; and creating an open, flexible, responsive and adaptive government, institutional and business environment.
- Stage-specific
  - Basic and applied research – A host of strategies and practices focus on enhancing early-stage innovation (idea generation to invention), including production, attraction and retention of STEM-degree holders; creation of research centers; incentives for private-sector R&D; and better linkages between R&D institutions and local industry.
  - Commercialization of knowledge – Strategies to improve conversion of ideas into economic activity include altering tech transfer relationships to create the networks, incentives and expertise to move ideas from the lab to the marketplace; and otherwise strengthening and streamlining interaction between research institutions and private firms.
  - Entrepreneurship and firm growth – The leading programs for supporting entrepreneurship and firm growth effectively combine the right technical assistance and finance, and deliver them through customer, peer and market-driven networks that include experienced mentors, investors and institutional partners – often acting at the intersection of the public and private realms. "Innovation ecosystems" are often in fact focused on and build from this stage. Additionally, incorporating entrepreneurship and business-themed content into secondary and post-secondary curricula can aid in producing human capital to foster a more entrepreneurial business environment.
- Industry- and cluster-specific – In practice, many of what would otherwise be considered the "foundational" or stage specific interventions turn out to be better organized and delivered by cluster. Once high-potential clusters are identified, the most effective strategies for targeted human capital development, building networks, creating specialized finance and supporting R&D, commercialization or entrepreneurship are all often best tailored to and delivered within the context of a given cluster.

C. Key Questions for Future Research and Product Development

To be strategic in implementing innovation-related interventions, practitioners need better information and tools in three broad areas: (a) the extent to which each of the many varieties of innovation impact regional economic activity, and in what ways; (b) at a more nuanced level, what characteristics of certain elements of the innovation ecosystem are most likely to lead to growth-enhancing innovation; (c) how to effectively measure innovation activity; and (d) how to evaluate the performance of innovation infrastructure and processes in a particular region.

- Innovation's impact on economic growth. Do different types (product, service, process, business model, radical vs. incremental, etc.) or stages (R&D, product testing, commercialization, small business growth, etc.) have varying impacts on regional economic

growth? What about their potential for generating positive externalities for the region? How can we identify which industries or clusters are more prone to innovation? Does innovation through entrepreneurship or through existing firms have different growth implications? Practitioners need better research and tools to understand what particular types and stages of innovation, in what clusters, will be most productive given the specific circumstances of their regional economy.

- Priority mechanisms to drive innovation. What we can learn from studying regions that have *not* succeeded in becoming more innovative? How do networks and knowledge spillovers vary across industries/clusters or over the course of a cluster's lifecycle? What aspects or characteristics of a region's business mix contribute to greater innovative capacity? When is emphasis on the overall ecosystem, or on particular stage barriers, most productive?
- Measuring innovation. The current metrics are inadequate for measuring inputs, processes and outputs of innovation. (For example, a leading metric, patenting activity, is problematic because so much innovation does not result in patents, and so many patents do not move to market.)
- Tools. Practitioners need better tools and methodologies for analyzing the innovation dynamics of their regional economies: by sector/cluster, by stage of the innovation process and so on. Further efforts are needed to develop a framework and create tools for understanding in depth how a region is doing with respect to all of the factors and systems which drive innovation, and for identifying the best opportunities for intervention.

VI. Improve Spatial Efficiency

A. What is it, why do we care and how does it work?

An important and dynamic intermediate outcome from the interaction of various regional systems is the spatial organization of economic assets within a particular region, also known as the urban spatial structure, urban form or built environment. W*e define spatial efficiency as the geographic arrangement of businesses and residences, the physical infrastructure that connects the region (i.e., transportation, communication, green space) and the orientation of each toward the other that determines the effort required to conduct economic activities within the region.*

There are at least two primary pathways through which regional spatial outcomes may feed back into economic development.[4] First, the spatial arrangement of regional resources affects economic growth through its impact on travel and transaction costs for both physical and human capital. Locating new activity near existing activity – known as co-location – can minimize

[4] Note that, for the most part, scholars have not directly investigated the impact of spatial efficiency (or related concepts) on regional economic outcomes. There is instead a rich literature on the relationships between spatial arrangements and transportation outcomes (especially costs for workers from commuting and spatial mismatch) and public service costs; relationships which then impact regional economic growth.
Regarding transportation costs, existing research generally finds that residents of denser regions drive less and incur lower personal transportation costs. In particularly spatially inefficient regions, transportation costs may be so high that they produce a spatial mismatch in which low-income, uneducated (predominately minority) city residents are unable to reach places of employment without transportation costs exceeding wages. The under-employment that results from spatial mismatches further reduces economic competitiveness.

transportation or communication costs for various interactions and facilitate innovation, knowledge transfer and the formation of clusters (as discussed in Chapters IV and V).

Second, and related, the spatial arrangement of economic assets may reduce economic growth if human capital is located too distant from available job locations, known as a "spatial mismatch," a problem particularly endemic to poor and minority urban communities. Generally, spatial efficiency is a critical factor in improving market efficiency and deployment of a region's underutilized assets.

Other pathways may connect spatial efficiency with economic growth but are not covered in detail for the purposes of this project. These include housing affordability, energy and environmental costs and public service costs. For instance, the spatial arrangement of housing of different types and qualities will strongly influence housing prices and affordability in a region, which will affect labor supply, demand and wages; consumer demand for goods and services; human capital and educational attainment; property taxes and demand for government services; etc.

A spatially efficient arrangement should therefore result in minimal costs for businesses, governments and households to conduct their daily activities as compared to alternative arrangements, consequently producing stronger economic growth and providing a competitive advantage relative to less efficient spatial arrangements.

B. Practical Implications

Three primary factors interact to produce the land use pattern observed within a region, and so are key levers for influencing its spatial efficiency: business location decisions, residential location decisions and the physical infrastructure that knits them together, structuring their interactions. The land use pattern structures the economic activities of businesses and residents within a region, which include business-to-business interactions (addressed in Chapter IV on clusters), business-to-worker interactions, business to resident (as consumer) interactions and other resident interactions (such as for education and recreation, which impact their human capital and quality of life). All interactions are constrained to some degree by regional climate, topography, culture and history, as well as by previous location and investment decisions that may "lock-in" land use and activity patterns for years to come.

Strategies that can improve regional spatial efficiency include:

- Encourage co-location of businesses and residents. Individual business location decisions (as opposed to residential location decisions) may have a broader impact on the efficiency of the regional economy, especially for large employers, as many economic activities are oriented around each business location.
- Organize economic activity around existing infrastructure, especially at fixed points such as transit stations, highway interchanges and existing activity centers, so as to make the best use of current capacity and prior investments. Coordinating activity around existing infrastructure may reduce transaction costs for businesses, workers or residents more broadly. It should also reduce public service costs for government, which lowers costs for conducting business or for residing in these areas.

- Invest in regional infrastructure to reduce the time and effort required for residents and businesses to conduct daily activities. The focus might be on roadways, transit, communications networks, green space or some combination thereof. Infrastructure investments may improve the desirability of particular locations and will influence future location decisions and economic activity for decades.
- Reorient activity away from the most severely congested areas to less-congested activity centers, which themselves could be organized around existing or planned infrastructure. This strategy would be most appropriate in regions that suffer from severe congestion externalities that might be relieved by a degree of de-concentration.
- Take a long-term view in choosing strategies to increase spatial efficiency. Both businesses and residents face high costs for relocating, and location adjustments tend to occur slowly over time. Therefore, regions may be more able to influence new development than existing development. Similarly, large-scale infrastructure investments may be expensive and time-consuming to implement and require some certainty about future travel demand, which may be difficult to obtain in rapidly changing regions.

C. Key Questions for Future Research and Product Development

Key areas for future exploration include:

(i) Measurement of spatial efficiency

Researchers need a high-quality, long-term, comparative dataset with which to evaluate spatial efficiency in a large number of regions. Urban scholars frequently debate how best to measure spatial outcomes, with some researchers falling back on existing measures of urban sprawl. Yet, it is not clear whether these measures are the most appropriate to use when conducting research on economic outcomes. Most sprawl research focuses on personal travel outcomes rather than on the conduct of other business activity or on public service costs, which are also likely to influence economic outcomes. In addition, most existing research has focused only on large metropolitan areas in the U.S., providing much less information about smaller regions. Smaller regions may stand to benefit the most from new metrics as they typically have less capacity to collect their own data and conduct their own analysis.

(ii) Rigorous case study analyses and typology development

There is currently a dearth of academic evidence directly connecting existing spatial structures with regional economic outcomes. Most of the research to date has involved cross-sectional or simulation studies regarding spatial patterns, transportation or public service costs – many of which have examined only a few regions in any detail. More rigorous, comparative research is needed to evaluate the extent to which changing spatial organization within regions directly or indirectly impacts economic outcomes. Further research could also delve more deeply into the specific conditions required to achieve positive returns in varied circumstances, such as through careful comparative case-study analyses, and develop typologies of spatial structure in the context of economic development.

(iii) Identifying promising interventions

Regions need reliable evidence regarding which strategies and interventions are most likely to change spatial structure and to bring economic benefits to their region, as well as at what cost. Increasing invention and experimentation are occurring with respect to transit-oriented development, regional affordable housing, better coordination of land use and transportation planning and other strategies. It would be useful to compile an open, online learning space where practitioners, academics and others could submit information regarding local and regional strategies and their impacts as they are being implemented. Researchers and practitioners should be encouraged to focus on regional economic outcomes when evaluating any sub-regional or local interventions (e.g., tax increment financing, transit-oriented development, brownfield redevelopment, enterprise zones).

(iv) Improving available tools for practitioners

Researchers should work with regional leaders and practitioners to develop better tools that can be used to understand regional dynamics and for identifying what would be optimal policy interventions given their unique economy and characteristics of place. At the regional level, tools are needed to better evaluate the potential for improving regional competitiveness through strategic investments in infrastructure (communications and transportation), including ways to enhance connectivity of urban regions with adjacent rural or "frontier communities." At the sub-regional level, more tools are needed to understand and promote sub-regional specializations and clustering of activity to highlight ways in which these sub-economies fit into larger regional, national and international networks (e.g., maps of sub-economies and hierarchies of transportation nodes). Practitioners also need easy-to-use metrics for assessing the impact of current and proposed development plans. Finally, the field would benefit from more systematic identification and assessment of interventions aimed at enhancing spatial efficiency and development of sophisticated and comprehensive materials to guide practitioners in determining which ones are best suited to their regional circumstances and how to successfully design and implement them.

VII. The Institutional Environment: Government and Governance

A. What is it, why do we care and how does it work?

In addition to local governments that shape and enable economic activity within a region, regions are home to a broad range of institutions – civic, non-profit, private-sector associations, and so on – that also play an important role. Within this enormous subject, this chapter focuses on three critical issues that arise in the context of thinking and acting regionally: (a) the tax/value proposition – balancing levels of taxation with the provision of economy-enhancing public goods; (b) fragmentation and coordination of local governments; and (c) the changing institutional environment, business climate and culture that may be best suited to the dynamism of the "next economy."

(i) Definition

The collection of institutions and the culture they foster shape the economic activity that occurs in a region. While *government* is the predominant part of this institutional environment, it is only one piece of the puzzle of regional *governance* as carried out by a broader range of regional institutions. To clarify, *government* is a territorially based body that makes authoritative decisions (for which it has constitutional or legislative authority) that are binding on residents and businesses within its boundaries. *Governance,* although a somewhat contested concept, has two widely accepted, but somewhat different meanings. First, *governance* is the process of governing. The second conception is broader, and aligned with our conception of what the "institutional environment" does: *governance* is the process of making decisions intended to affect economic, social and environmental outcomes.

In either conception of governance, government (the public sector) must be involved, but other sectors play roles as well. Non-governmental participants in governance include non-profit organizations, foundations, civic elite organizations, business leadership organizations, labor unions, social service organizations and the inter-organizational partnerships among these groups. It is this collection of governmental and non-governmental organizations, their interactions, policies and other actions that affect economic activity that we refer to here as the region's *public and civic institutions and culture* or simply the *institutional environment*.

Regional governance is explicitly meant to affect economic, social and environmental outcomes throughout an entire region – or at least in parts of the region that encompass more than a single governmental jurisdiction. Regional governance thus explicitly *excludes* decisions of a private firm pursuing its own interests, even if those actions have an impact on societal outcomes throughout the region. Given the current lack of formal regional governing bodies in the U.S. (other than regional special districts and regional or multi-jurisdictional planning entities), regional governance usually requires cooperation among local governments and other institutions with like-minded interests or missions.[5]

Government plays a fundamental role in shaping the regional economy: while economic activity is largely a product of market forces, public goods, market rules and operating procedures that shape and enable market activity are established and enforced by government. At the local level, government's economic role includes the provision of public goods that are collective in nature (e.g., roads, transit, public safety services), as well as efforts to counter market imperfections such as negative externalities or poor information. State and local governments impose

[5]Despite the various regional systems that interact to produce economic growth, there are virtually no multi-purpose governments at the regional level. In other words, the formal government system within a region operates at a different geographic scale than does the regional economic system. Labor markets, housing markets, land markets and the transportation network are all regional in nature, while the formal political system is emphatically not regional in nature. Instead it is highly fragmented both horizontally (multiple governments of the same type within a metropolitan area) and vertically (overlap of different kinds of governments, e.g., concurrent taxation by a municipality, a school district, and a county). *Governance*, the process by which decisions intended to affect economic, social and environmental outcomes at a level beyond a single jurisdiction may occur through bi-lateral or multi-lateral agreements among local governments within a region or through formal or informal collaboration activities involving government and non-governmental participants. The geographic scope of these efforts may vary from one such effort to another.

regulations (e.g., licensing, zoning) that affect economic activity and impose taxes to finance public services. Regulation, taxation and the level and quality of public goods all vary from one jurisdiction to another, affecting business and household location decisions, and consequently, economic growth.

(ii) Balancing taxation and public goods

Within the local institutional environment, several aspects of the governmental environment enable (or hinder) economic activity. Among these is local governments' authority to impose taxes to finance local public services. Since local government taxes are an element of firm operating costs, public debate often focuses on how the level of local taxes affects economic growth, both relative to other regions and in terms of its distribution among the region's multiple jurisdictions. In particular, it is argued that lower local taxes promote growth by attracting firms and higher local taxes hinder it.

While taxes are indeed an operating cost to firms, if they result in public services of equal or greater value to firms, then taxes are a *promoter* of growth rather than a deterrent. Local taxes provide infrastructure construction and maintenance, police and fire protection, water, sewer and waste disposal, all of which are services that most business establishments make use of. Taxes also provide support for labor force skill development through funding the elementary and secondary education system, and in some places, community college and other post-secondary training. The value of these services will vary among different kinds of firms, but the calculation is still the same: if the value of the services produced equals or exceeds the taxes paid, then the taxes are not a deterrent to growth.

Understanding and creating the best tax-value proposition for a particular local economy is a critical issue for regional growth strategies.

(iii) Local government fragmentation

The systems that constitute the regional economy – including housing and labor markets, transportation infrastructure and others – operate across jurisdictional boundaries. It follows that system characteristics in one place (neighborhood, municipality, county, etc.) affect performance throughout the entire region, contributing to or detracting from firms' ability to operate efficiently and productively. The result of a fragmented government environment is inter-governmental competition that results in an inefficient allocation of public resources and often additional costs for business.

Taxation provides a clear illustration of the challenge posed by governmental fragmentation. Taxes constitute a relatively small percentage of business operating costs for firms, and thus are not likely to be a high-priority consideration in a decision to locate in one region relative to another. Indeed, empirical research shows that the importance of taxes pales relative to labor (both quality and cost) and transportation concerns in *inter-regional* location decisions. However, the regional nature of labor markets and the transportation system tends to render these costs relatively similar throughout the region. Thus differences in local taxes, while small relative to other operating costs, may affect decisions on where firms will locate *within* the

region. Thus, given the property tax returns for locating within a jurisdiction, local governments engage in competition to attract businesses. This competition, which passes for local economic development policy in many local governments, mostly redistributes economic activity within the region and does nothing to promote regional economic growth.

(iv) Institutional Environment/Business Culture

The structure and culture of the institutional environment can also have a strong influence on regional economic activity. At a fundamental level, the competence of local government – its ability to provide services and manage its resources efficiently, to administer its regulatory and permitting systems fairly and without delays and to operate transparently and without corruption – affects the willingness of businesses to locate within the jurisdiction and their capacity to operate efficiently within it. Recent changes in the economy, however, suggest that additional characteristics of the institutional environment may be increasingly important in supporting sustained economic growth going forward.

The modern economy is dynamic, fast-paced and information-driven. Today's challenges demand quick detection and solution, as well as the willingness to start from scratch when the first solution fails or the next problem arises. Many firms recognized the significance of the changes in the economy at least a decade ago and modified their organizational cultures and structures to better innovate, adapt and compete. Flatter business organizations, more open systems, within- and across-sector partnerships and other strategies have been used to create more flexible, adaptive and innovative firms.

It seems increasingly likely that similar changes in institutional cultures and structures are necessary for regions, too, to be more innovative, adaptive and competitive. In the industrial economy (and even in the early years of the knowledge economy), centralized top-down organizations in business and government could get things done quickly and effectively, and strong executives in government drove change by building on existing assets, recruiting big businesses and making the most of their connections. But now, cities known for their "old-boy networks" are falling behind those regions with a reputation for having more open, flexible, innovative and dynamic environments (e.g., Austin, Silicon Valley and Atlanta). The welcoming business culture of the latter metros attracts the knowledge workers, entrepreneurs and firms that a region needs to thrive.

Although government is not the only institution whose culture impacts the economy, it is uniquely positioned to extend its influence to other sectors. By being more open and transparent, governments can provide businesses, citizens and institutions with the key data and information that reduces market entry and transaction costs. Greater willingness to collaborate across sectors – creating public-civic-private partnerships – creates more access for firms. Flexibility and adaptability allow governments to address arising problems (in the economy or otherwise) more quickly and effectively.

B. Practical Implications

(i) Balancing taxation and public goods

What are the implications of the level of taxes and public services for regional economic growth?

- Economic policy needs to consist of more than tax reduction or subsidization. Low taxes are not always good if they produce inadequate levels of the public services required by businesses. High taxes are not always bad if they produce high-quality public services.
- User fees/taxes should better align costs and benefits. The financing of regional activities is a constant concern in nearly every region where such activities take place. The most direct means of financing regional activities (and the one most consistent with economic theory) would be through a tax imposed upon residents and businesses in the area that benefit from the activity. Indeed, there are many examples of such regional taxes for specific purposes such as regional transportation systems, airports, regional parks and recreation, etc.

(ii) Local government fragmentation

Why does government fragmentation matter? What problems does the horizontal and vertical governmental fragmentation of metropolitan regions pose for regional economic growth?

- Incentive structure biases against regional decision-making – Elected officials necessarily respond to the concerns of their electors. Thus, to the extent that "acting regionally" or in the region's interest is perceived by residents of a local government as counter to local interests, local elected officials will be loath to act regionally.
- Intra-regional tax structure encourages competition between jurisdictions – While from a regional perspective it may matter little where within the region economic activity locates (although there are both equity and spatial efficiency concerns), it matters deeply to individual local governments, since they receive no property tax yield unless the activity locates within their boundaries. Jurisdictions, therefore, have an incentive to compete with one another via low tax rates, breaks and/or subsidies to be the "winner" in the location decisions of new development projects.
- Horizontal fragmentation and local land use regulation reinforce inter-jurisdictional competition – Local governments control land use policy, zoning land to produce their desired environment and to encourage positive fiscal outcomes, a process known as "fiscal zoning." As a result, jurisdictions may engage in zoning practices that have a serious adverse effect on regional spatial efficiency, such as effectively prohibiting low- and moderate-income households from living within the jurisdiction (e.g., through large-lot zoning); zoning out commercial and industrial uses; and/or zoning for retail development at the expense of other uses.

Partly as a result of the belief that horizontal fragmentation can generate beneficial competition among local governments, but more because of the seeming political impossibility of creating general purpose regional governments, over the past two decades "regional *governance*" has superseded regional government as the preferred solution for problems affecting regions. The

focus of regional governance is not on creating a single regional government, but on inducing cooperation and collaboration among local governments and other sectors and actors, with formal government being only one player. The expectation is that metropolitan areas with strong regional governance (i.e., with multiple organizations and actors interacting to address regional problems) will be more successful in addressing problems and bringing about regional economic growth than those regions engaged in lower levels of collaborative activity.

Given the above-described influences to the contrary, how can coordinated action among local governments within a metropolitan region for the purpose of economic development be encouraged?

- Create, support or facilitate networks that convene key regional actors and create collaborations – Encourage greater regional activity by creating, supporting or facilitating networks that bring together the potential actors in the region concerned with economic growth, including local governments, voluntary organizations such as COGs, foundations, non-profits and civic organizations to discuss regional problems and how they might be addressed. While strategies to "regionalize" a broad range of activities, either through formal institutions or collaborative networks, have generally proven very difficult, collaborations around one or a small number of functions (such as specific shared services) have proven more successful. Norms of trust and cooperation – critical to regional coordination – arise after repeated interactions among individuals and groups, suggesting that even efforts to create a venue or network for discussions of regional economic needs and concerns may have later payoffs.
- Engage in regional visioning and community planning – More elaborate efforts such as regional visioning and community planning efforts may flow from (or possibly stimulate) collaborative regional economic growth activity. Though these kinds of activities rarely result in direct implementation, they can set up constituencies and interest groups that continually press local governments to engage in cooperative activity to accomplish at least some of the recommendations.
- Directly encourage or require regional collaboration – Local governments can also be directly encouraged (or even required) to engage in cooperative activity. State governments could provide incentive funding for localities in regions that develop and implement regional economic development plans. State governments (or the federal government) could also provide funding for regional visioning exercises with citizen input that result in regional plans with recommendations for implementation. Or, states could require intergovernmental collaboration within metropolitan regions as a condition for applying for federal grant programs. At a minimum, state governments could make sure that their laws do not hinder or prevent regional collaboration from occurring among local governments, or inadvertently incent destructive competition.
- Mitigate intra-regional fiscal disparities – The most direct way of dealing with fiscal disparities resulting from fragmentation (apart from instituting a region-wide multi-purpose government with taxing authority, which is unlikely to happen), is to implement metropolitan tax-base sharing such as exists in the Minneapolis-St. Paul region. This solution mitigates the localization incentives inherent in the fiscal structure of U.S. regions. Realistically, visible redistribution of tax resources is a hard sell politically for local governments and

makes voluntary tax-base sharing schemes unlikely. A more effective way of meeting these needs is through state taxing and spending decisions that, in aggregate, provide greater resources to fiscally strapped local governments. The most direct means of accomplishing this is through a state equalization grant that provides money to local governments based primarily on their tax capacity and which can be used by the recipient for any purpose. A less visible approach is to redistribute through individual state programs for specific purposes such as state highway grants, housing and community development grants or police and fire grants to local governments.

(iii) Institutional Environment/Business Climate

The institutional environment of a region (including governments, universities, corporations and organizations) may support or hinder the pursuit of a flexible, open, innovative and entrepreneurial region. In addition to the explicit policies, rules and regulations that make up the institutional environment, cultural values also contribute to the creation of productive places. These difficult-to-quantify characteristics include the celebration (in the press and by public officials) of entrepreneurial and innovative successes; cooperative networks and coordination within and between sectors; openness to new people and ideas; flexibility and adaptability; tolerance of failure; and enthusiasm for taking risks.

Although government is not the only institution whose culture impacts the economy, it is uniquely positioned to extend its influence to other sectors. Potential actions might include:

- Streamline processes and diminish bureaucracy by using technology to remove barriers to entrepreneurship and innovation
- Provide higher-quality and more timely data to businesses, citizens and institutions, in an effort to be more open and transparent and empower them to make better decisions
- Increase collaboration across sectors to catalyze beneficial public-private partnerships
- Engage firms, citizens and civic sector institutions more readily in the work of government (from community health to public safety)
- Champion flexibility and adaptability to enable emerging problems to be addressed more quickly and effectively
- Take calculated risks in considering new solutions for long-standing inadequacies in education, health care and transportation

Each of these cultural and structural changes has its own intrinsic value for a successful region, but their primary importance is the effect they have on economic actors and the regional economy.

C. Key Questions for Future Research and Product Development

Regional governance is complex and varies considerably across metropolitan areas. However, very little is known about how much regional activity truly exists by region, of what kind, through what kinds of structures, involving which sectors as participants and with what results.

Foundational questions that need to be answered to guide policy recommendations and policymaking include:

- What is the array of financing mechanisms for regional activity? How well does each work? Which are more likely to be successful, under what circumstances, and why? What are their impacts on regional economic growth?
- Why are regional taxes successfully imposed in some regions and for some purposes, while rejected in others?
- What kinds of circumstances, framing and political campaigns are more likely to result in successful regional governance?

A multi-stage research program, such as detailed below, may help practitioners to more formally address the above questions:

a. Develop and gather data on measures of the key attributes of regions. To identify the circumstances under which desired regional economic development outcomes are most likely to be achieved, such a program would begin by defining the independent variables. The next step would be to collect data on these attributes, largely through survey research.

b. Develop a typology of regions. Using the data collected from the previous step, it would then be possible to create a typology that groups regions into different categories with respect to their capacity for and action at a regional level.

c. Develop measures of important regional economic development outcomes. Serious conceptual work needs to be done in terms of the dependent variable as well: what constitutes regional economic development and how to measure it, particularly with respect to equity, sustainability and spatial efficiency. Traditional measures need to be updated to incorporate inclusiveness and sustainability goals so we know the results and what accounts for them.

d. Model the effects of regionalism on economic development and related outcomes. With the previous foundational work, we can then analyze what "types" of regions and what specific regional attributes and activities are most effective for achieving which economic development goals.

In addition, further work on the concept of dynamic institutional environments could be envisioned as follows:

- Undertake foundational research on the evolving institutional environment. One could extend this project's review of literature and practice to more deeply examine the hypothesis laid out above and its potential implications for regional economic development practice, in order to identify actionable insights for practitioners and a more nuanced agenda for future research and product development.
- Develop measures of dynamism. To test the hypothesis that more dynamic regions fare better in today's economy, one could operationalize dynamism by looking at a range of objective and subjective variables (e.g., rate of firm creation and "churn," levels of high-speed internet access, degree of access to information (openness)).

- Analyze the effect of dynamism measures on economic outcomes. Further research should compare variables of dynamism with regional employment, GRP growth, wages and real personal income and wealth distribution to determine whether places that are further along the "new economy" spectrum are, in fact, achieving more positive economic outcomes.

Finally, policymakers and practitioners would benefit from systematic identification and assessment of more dynamic and adaptive governance practices (e.g., cross-sector networks and partnerships, increased availability of more data and mapping tools, web-based applications to enable reporting problems or getting services to) and development of materials to guide them in successfully designing and implementing them.

VIII. Conclusion

In the context of dramatic changes in the global economy, metropolitan regions are emerging as key drivers of prosperity. They are the locus where assets combine through complex, interacting market mechanisms, shaped by governance institutions, to determine the efficiency and productivity of economic activity. To influence these dynamics – to successfully undertake economic development – we need to intentionally enable coordinated human capital, business, infrastructure, innovation and related activity tailored to the assets and circumstances of particular places. We need to "think and act regionally," whether focusing on particular sub-geographies (e.g., a neighborhood) or development sub-areas (e.g., job training).

In effect, we need to develop a new "metro-economics," complementing macro- and micro-economics and building on the emerging work in economic geography. However, it needs to be a "clinical economics" – in the sense of clinical medicine – both informed by and informing practice.

This project takes a first step in that direction. It set out to begin reviewing the state of the research on metropolitan economies, to make it more accessible and actionable for economic development practitioners. The process has proven invigorating, frustrating, unexpectedly productive – and especially humbling.

Invigorating because the project clearly struck a chord in the field. Researchers and practitioners are increasingly focused on these issues and hungering for more. Even while in process, the work has been in great demand. Weekly, we are surfacing new requests, finding new applications, identifying new issues and opportunities. Writing up the project cannot keep up with the continuous learning and application. We see an exciting moment of engagement and innovation among regional economic development leaders.

Frustrating because much of the research is not designed to inform practice, and is easily misinterpreted and misapplied. Correlations are often confused with causality. Indications of causality are often extended beyond the research itself to implications about the underlying mechanisms and how they can be influenced. When the best research does shed light on causality and the operations of underlying systems, it often still stops short of addressing interventions. Developing products, services and institutions to influence dynamic regional systems is generally not the job of researchers. The research and practice do not sufficiently – or

often accurately – inform each other, leaving a genuine, and frustrating, gap. The project surfaced a great deal of need to close this gap, but could, at best, make only modest strides with respect to identifying or clarifying particular interventions.

Productive because practitioners, governments, funders and researchers are already applying, building upon and improving the project work. It is informing federal, state and local government programming. Eight regions are currently engaged in creating comprehensive, integrated metropolitan business plans organized around the five leverage points (and their analysis) articulated here. Many more are interested, and a new community of practice is beginning to emerge.

Humbling because the work reveals how little we know about the practice of inclusive and sustainable regional economic development. It is a rapidly emerging and exciting field of practice, with enormous potential and opportunity, but also with a lot to learn. The following chapters explore in much more detail what is known – and not – and identify opportunities for needed further work. They repeatedly surface the need for practice and product development, and for objective evaluation of existing activities. We hope this material will contribute to further conversations, research, policy and product development to advance the practice and the field.

More broadly, what emerges is the need to create a different kind of connection between academics and practitioners. Just as university-industry partnerships are leading to more applied research and commercialization of technology in the business world, academic-practitioner partnerships are needed in the economic development world. Institutionalizing clinical metro-economics, as part of the emerging community of practice, could improve both research and practice as they lead to new understandings, initiatives, products and institutions to drive regional prosperity in the next economy.

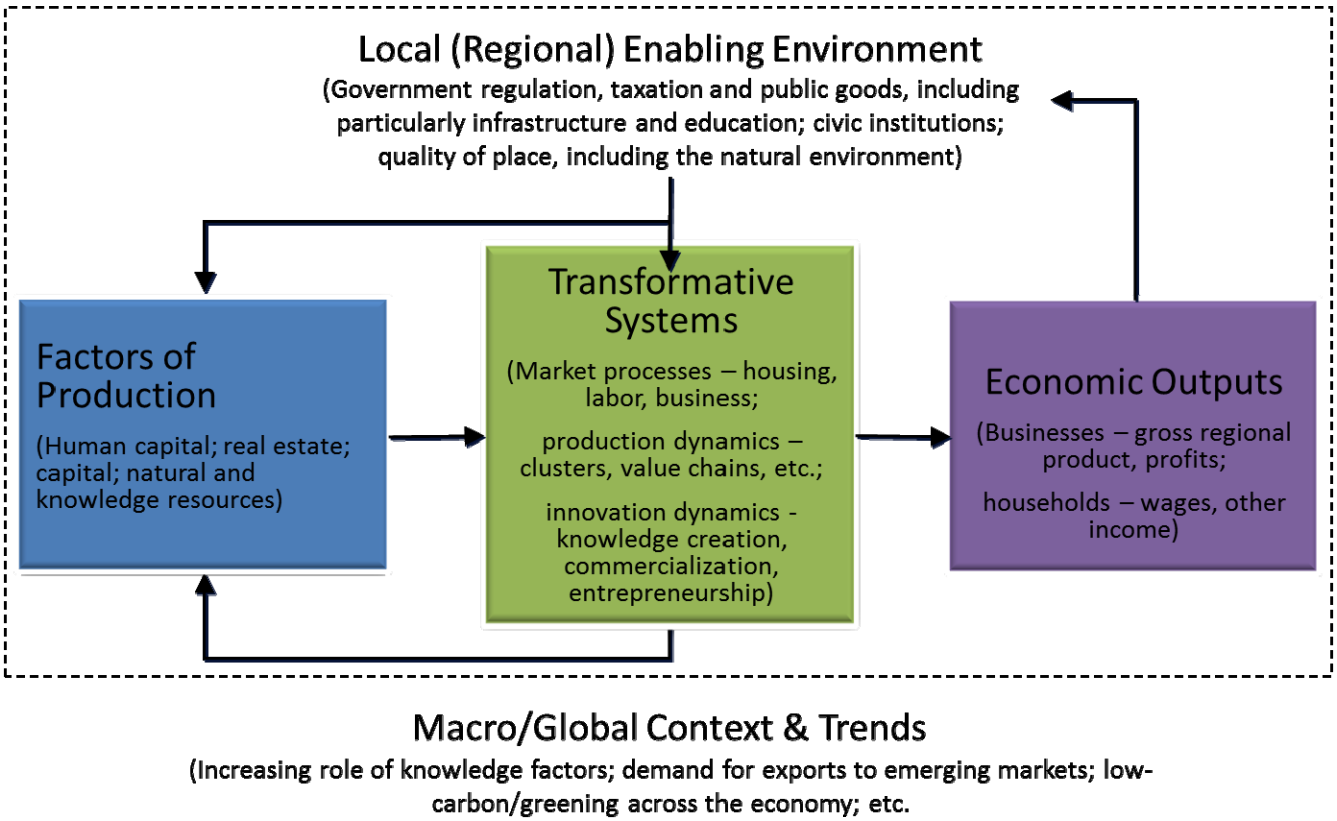
Appendix: Executive Summary – Workshop Participants

Participant	Professional Affiliation
Bill Barnes	National League of Cities
Frank Beal	Chicago Metropolis 2020
Scott Bernstein	Center for Neighborhood Technology
Paul Brophy	Brophy & Reilly, LLC
Pete Carlson	Carlson & Associates
Maggie Cowell	Virginia Institute of Technology
Derek Douglas	The White House, Domestic Policy Council
Randall Eberts	Upjohn Institute
Maryann Feldman	University of North Carolina-Chapel Hill
Jeff Finkle	International Economic Development Council
Kate Foster	University of Buffalo
Phillip Henderson	Surdna Foundation
Edward (Ned) Hill	Cleveland State University
Diana Hincapie*	George Washington University Institute of Public Policy
Marie Howland	University of Maryland
Gerrit Knapp	University of Maryland
Gretchen Kosarko*	RW Ventures, LLC
Ray Leach	JumpStart Inc.
Alice Levy*	George Washington University Institute of Public Policy
Samuel Leiken	Council on Competitiveness
Teresa Lynch	Initiative for a Competitive Inner City
Mark Muro	Brookings Institution, Metropolitan Policy Program
Rolf Pendall	Urban Institute
Ken Poole	The Council for Community and Economic Research (C2ER)
Andrew Reamer	George Washington University Institute of Public Policy
Brian Reilly	Municipal Land Use Center, The College of New Jersey
Jasmine Thomas	Surdna Foundation
Richard Voith	Econsult Corporation
Ken Voytek	Manufacturing Extension Partnership/NIST
Bob Weissbourd*	RW Ventures, LLC
Howard Wial	Brookings Institution
Hal Wolman*	George Washington University Institute of Public Policy
David Zipper	Office of the Deputy Mayor for Planning & Economic Development

* indicates members of the Implementing Regionalism project team

CHAPTER II

Regional Economies



***Note**: This is one of eight papers – an executive summary, six papers on specific aspects of regional economies and an appendix – generated by the "Implementing Regionalism" project, funded by the Surdna Foundation and undertaken by the George Washington University Institute of Public Policy and RW Ventures, LLC. Please see [insert web link] for the complete set of materials developed by the project.*

CHAPTER II: REGIONAL ECONOMIES[1]

This chapter provides the rationale for focusing on regions as a critical unit of geography in today's economy. In short, regions not only house the assets and disproportionately produce the wealth in the economy but, more importantly for practitioners, the systems and interactions which account for this also are often regional in scope. In order to better deploy assets and create wealth – whether for a particular sub-geography like the neighborhood, or for a particular sub-system like labor markets – it is critical to understand how these regional systems and dynamics operate, and how to influence their performance.

A simple framework is offered to describe the way a regional economy operates, in terms of its basic components and mechanisms, in the context of global trends in the economy. This framework begins to surface implications for economic development practice, and particularly allows identification of five "leverage points" that are currently key drivers of regional economic growth. With this context, subsequent chapters then examine in detail, for each leverage point, how it operates, implications for development practice, and key applied research and product development opportunities to enhance practice.

A. The Importance of Regional Economies

1. Regions overwhelmingly house the assets, and far disproportionately produce the outputs, that drive prosperity.

Population has become increasingly concentrated in the past 50 years, both within the United States and globally. As of 2009, the proportion of the world population living in urban areas had passed the 50% mark, and is expected to reach 69%, or 6.3 billion people, by 2050.[2] Population concentration has made the United States, in particular, a "metro nation," with 84% of the population living in metropolitan areas.[3] Infrastructure and institutions are also highly concentrated, with the largest 100 U.S. metropolitan areas boasting 66% of the nation's research universities, 92% of air passenger traffic and 95% of public transit passenger miles.[4] This trend

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[1] The lead authors of this chapter are Robert Weissbourd and Gretchen Kosarko. As described in the acknowledgements, many of the ideas in this chapter were co-developed in this and companion projects, including particularly the Metropolitan Business Planning project with Brookings Institution and a review paper for the Chicago Community Trust on CMAP's Go To 2040 Plan. This chapter includes excerpts from the review paper (Kosarko, Gretchen and Robert Weissbourd, *Economic Impacts of GO TO 2040*, August, 2010), as well as from the business plans and a policy brief created as part of the Brookings project (http://www.brookings.edu/~/media/Files/events/2010/1208_metro_summit/1208_metro_summit_business_framing_paper.pdf).

[2] The urbanized population of the world in 2050 is projected to be equivalent to the total population of the world as of 2004. *World Urbanization Prospects: The 2009 Revision Highlights* (New York and Geneva: UN Division of Economic and Social Affairs Population Division, March 2010), 4.

[3] *TheState of Metropolitan America: On the Front Lines of Demographic Transformation* (Washington, DC: The Brookings Institution Metropolitan Policy Program, 2010), 16. Figure reflects Brookings analysis of Census Bureau Population Estimates Program data for 2009.

[4] Research universities figure was provided via an email message to the author, May 17, 2010, citing unpublished analysis of 2008 data from the Carnegie Foundation for the Advancement of Teaching by The Brookings Institution Metropolitan Policy Program. Figures for air passengers and public transit passenger miles are for 2005, as cited in Alan Berube, *Metro Nation: How U.S. Metropolitan Areas Fuel American Prosperity* (Washington, DC: The Brookings Institution Metropolitan Policy Program, 2007), 32.

toward concentration in metropolitan areas is expected to continue, as growth in these areas is outpacing non-metro areas.[5]

The extent to which people and other economic assets are concentrated in regions is striking, but more significant is the disproportionate degree to which metropolitan areas contribute to the national economy. While the 100 largest U.S. metropolitan areas are home to about two thirds of the nation's population,[6] they generate 73% of the nation's economic output (gross product).[7] Further, they produce a disproportionate share of jobs, knowledge workers, patents, research and venture capital investments.[8] Metropolitan areas not only aggregate the assets that matter most, but also amplify them through geographic agglomeration and multiplier effects that connect and boost inputs and outputs to generate regional – and thus national – prosperity.[9] *In short, metropolitan areas are where the nation's assets agglomerate to disproportionately create economic value.*

As a result, increasingly, it is regions – and not nations – that are primarily competing in the global economy.[10] Regions may offer a minimum size at which markets and business networks achieve the economies of scale necessary to compete in international markets, yet still be small enough to provide the geographic proximity of firms which fosters the benefits of agglomeration economies. It thus makes sense to be focused on the region as the key geographic unit for facilitating economic growth.

2. The Key Systems that Make These Assets Productive are Regional

That regions concentrate assets, or even that they disproportionately produce economic outputs, does not yet prove that they should be the geographic focus of interventions. The critical question is whether the systems and dynamics that produce these outputs operate, and are best understood and influenced, at a regional scale. Why do regions disproportionately create wealth?

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[5] See, Brookings, *TheState of Metropolitan America*, 38 and UN Population Division, *World Urbanization Prospects: The 2009 Revision Highlights.*

[6] Brookings, *TheState of Metropolitan America*, 17.

[7] Email message to author, May 17, 2010, citing unpublished analysis of 2008 data from the Bureau of Economic Analysis by The Brookings Institution Metropolitan Policy Program.

[8] These areas are home to 68% of jobs, 74% of both 4-year and graduate degree holders, 79% of knowledge jobs, 78% of patents, 80% of NIH/NSF funding and 94% of venture capital investments. Figures are for 2008 with the exception of patents, NIH/NSF funding and venture capital investment, and are based on analysis by The Brookings Institution Metropolitan Policy Program (via email to the author, May 17, 2010) and Berube, *Metro Nation*, 32.

[9] Mark Muro, Bruce Katz, Sarah Rahman and David Warren, *MetroPolicy: Shaping a New Federal Partnership for a Metropolitan Nation* (Washington, DC: The Brookings Institution Metropolitan Policy Program, 2008).

[10] See, e.g., Annalee Saxenian, *Regional Advantage: Culture and Competition in Silicon Valley and Route 128* (Cambridge, MA: Harvard University Press, 1994); Manuel Pastor Jr. et al., *Regions That Work: How Cities and Suburbs Can Grow Together* (Minneapolis, MN: University of Minnesota Press, 2000); Pierre-Paul Proulx, "Cities, Regions, and Economic Integration in North America," in *North American Linkages: Opportunities and Challenges for Canada*, ed. Richard Harris (Calgary: University of Calgary Press, 2003); Peter Calthorpe and William Fulton, *The Regional City* (Washington, DC: Island Press, 2001), 17-21.

Economic growth flows from market activity: markets convert assets to value.[11] The outputs with which economic development is fundamentally concerned – jobs, income, wealth, gross product – are primarily a function of the complex interaction of housing, labor, business and other market systems, enabled and shaped by government and civic-sector activity. System performance is a function of the interactions of millions of people and firms in this market and institutional context.

Does place matter? As research in the burgeoning field of economic geography is demonstrating almost daily, the geographic proximity of key assets and actors in the economy enhances their individual and collective performance.[12] Indeed, this appears to be truer than ever in the knowledge economy, where increasing returns to knowledge factors and path dependency may be leading to specialization and divergence.[13] Dense networks of suppliers, service providers and customers within close proximity of firms reduce transportation costs. The benefits of concentration provide additional "agglomeration economies" through shared inputs to production, deep labor pools and knowledge spillovers.[14] Large, diverse labor pools enable firms to more efficiently find and hire the particular types of workers that they need to be most productive. The opportunity for face-to-face interaction across firms and between individuals, as well as the movement of employees between firms, facilitates the sharing of ideas that generates increasing returns to knowledge and spurs innovative activity.[15]

Place does matter – and a key geography of many of these systems and interactions is the metropolitan region. In fact, it is no coincidence that regions disproportionately attract assets and produce economic outputs. From an economist's point of view, the reason for the very existence of cities – and their attendant economic regions – is to reduce the transportation costs of goods, people and ideas.[16] The major systems that determine how productively assets are deployed are often regional in scope. These include market systems such as business, housing and labor markets, as well as non-market factors such as transportation and infrastructure. Many cultural and recreational amenities affecting the location decisions of firms and workers are also regional. Indeed, the intersection of all of these systems with each other and with institutional

[11] Paul Krugman, *Development, Geography and Economic Theory* (Cambridge, MA: MIT Press, 1997), 53; Robert Weissbourd and Riccardo Bodini, "Market-Based Community Economic Development," (Brookings Institution 2005).

[12] See, generally, Clark, Feldman and Gertler, Eds., *The Oxford Handbook of Economic Geography* (Oxford: Oxford University Press, 2000).

[13] In the knowledge economy, knowledge embedded in the labor force (human capital) and in new technologies increasingly drives productivity gains, and so economic success (see, e.g., Boston Consulting Group analysis that finds an increasing share of productivity growth is due to innovation, as compared to growth in capital or labor inputs). *The Innovation Driven Economic Development Model: A Practical Guide for the Regional Innovation Broker* (San Mateo, CA: Collaborative Economics, September 2008), 10). New growth theory, in particular, holds that concentrations of knowledge factors – such as high human capital, information technologies andinformation sector firms – build upon themselves. This results in increasing rather than diminishing returns, so that the places that get ahead tend to keep getting further ahead.See generally, Robert Weissbourd and Christopher Berry, *TheChanging Dynamics of Urban America* (Chicago: CEOs for Cities, 2004); and Joseph Cortright, "New Growth Theory, Technology and Learning: A Practitioner's Guide, *Reviews of Economic Development Literature and Practice* 4 (2001), esp. 10-12.

[14] Alfred Marshall, *Principles of Economics* (London: Macmillan and Co, 1890).

[15] See, generally, Edward Glaeser, ed., *Agglomeration Economies (National Bureau of Economic Research Conference Report)* (Chicago: University of Chicago Press, 2010).

[16] Edward L. Glaeser, "Are Cities Dying?" *The Journal of Economic Perspectives* 12(2) (Spring 1998): 140.

and physical characteristics of a particular place constitutes and determines the performance of the regional economy. At a basic level, if we want to be a prosperous, equitable and sustainable nation, we need prosperous, equitable and sustainable regions.

Note that the logic here does not mean that all interventions should necessarily be regional in scale. Rather, it means that, whether the goal is development of a neighborhood, city or suburb, business productivity or human capital, one has to be cognizant of the larger system dynamics, and design interventions at the geography of the particular systems that determine how the targeted assets are deployed to generate the desired economic outcomes. To "think and act regionally," in this context, means understanding and influencing the dynamic systems at their appropriate geography.

B. What Drives Regional Economic Growth

Here's where it gets complicated. It's one thing to observe that assets and outputs concentrate in regions, or even that this is a function of regional systems interacting in complex ways to deploy assets for economic growth. It's quite another to understand how they operate, interact and can be influenced. To move in that direction, for discussion purposes, we first offer some observations about how regional economies grow, and then a framework for understanding the dynamics that drive growth. From these, we derive five leverage points that appear to be particularly important areas for practical interventions. The subsequent chapters are then devoted to detailed analysis of each of these leverage points. (Further exploration of regional systems is provided in Appendix B.)

1. How Regional Economies Grow

Given a regional economy, we can increase prosperity (i.e., generate more outputs or wealth) in two ways:

- First, we can grow the economy through increasing inputs – this means fully deploying the resources in the region (e.g., underemployed labor, underdeveloped real estate); and attracting new human capital, businesses and investments from outside the region.
- Second, we can increase the productivity and efficiency of the regional economy. Increasing productivity and efficiency means increasing outputs per unit of input. This is a function of the efficiency of market operations and government action;[17] of the interactions and synergies

[17] Markets can be more or less efficient, depending on the efficiency of the firms that operate in those markets, the structure of the market (monopoly, oligopoly, perfect competition, etc.) and on the degree to which market imperfections (such as, for instance, information asymmetries) affect their operations. When we say economies are not using all of their available assets, we are often referring to market imperfections or barriers that prevent markets from reaching or including otherwise viable assets (people, places, opportunities). Government action can also be more or less effective in contributing to economic efficiency, depending on the organizational structure of local government agencies (duplication of services, inter-agency cooperation, e-government), on the regulation and taxation of economic activity (including incentives and sometimes mis-incentives) and on government provision of public goods (such as infrastructure or schools).

between different kinds of economic activity;[18] and of how the assets of the economy are deployed and organized spatially.[19] [20]

A broader context is also important here: overall regional economic growth requires increases in demand for what the economy produces. In other words, expanding existing or new outputs through adding assets, or becoming more efficient and productive, will not create growth if there is no demand for the goods and services. The goal is not to get better at producing typewriters.

From a micro-economic point of view, increasing outputs inherently flows from business-sector growth – increasing the number, size and productivity of firms in the region. Business sector growth, in turn, occurs through firm creation and growth, retention and attraction. Firms grow and choose to locate where they can be most efficient and productive (a function of both firm and system, particularly market system, operations). We are thus ultimately concerned with what attributes of the region lead to increasing creation, efficiency and productivity of firms.

Overall, as a sort of "first approximation:" in order to increase regional prosperity, we can seek to better develop and deploy local assets, attract new assets, improve the efficiency and productivity of the regional systems which deploy assets to convert them to economic outputs, and increase the efficiency and productivity of firms. These things, of course, are intimately related (and the firm level and system level, in particular, are in large part two sides of the same coin).

How is any of this accomplished? We need a framework for understanding how the systems interact, and attract and convert assets to wealth, in order to consider how practitioners might best enhance efficiency and productivity. In other words, we need to move toward an understanding of how this works in practice.

2. The Dynamics of Regional Economies: Framework and Leverage Points

A regional economy is a complex and dynamic system operating in an equally complex environment and global marketplace. Analyzing how any given change will impact its performance entails first understanding the context and key components, and the systems which interact to deploy assets efficiently and productively (or not). A simple framework is offered below.

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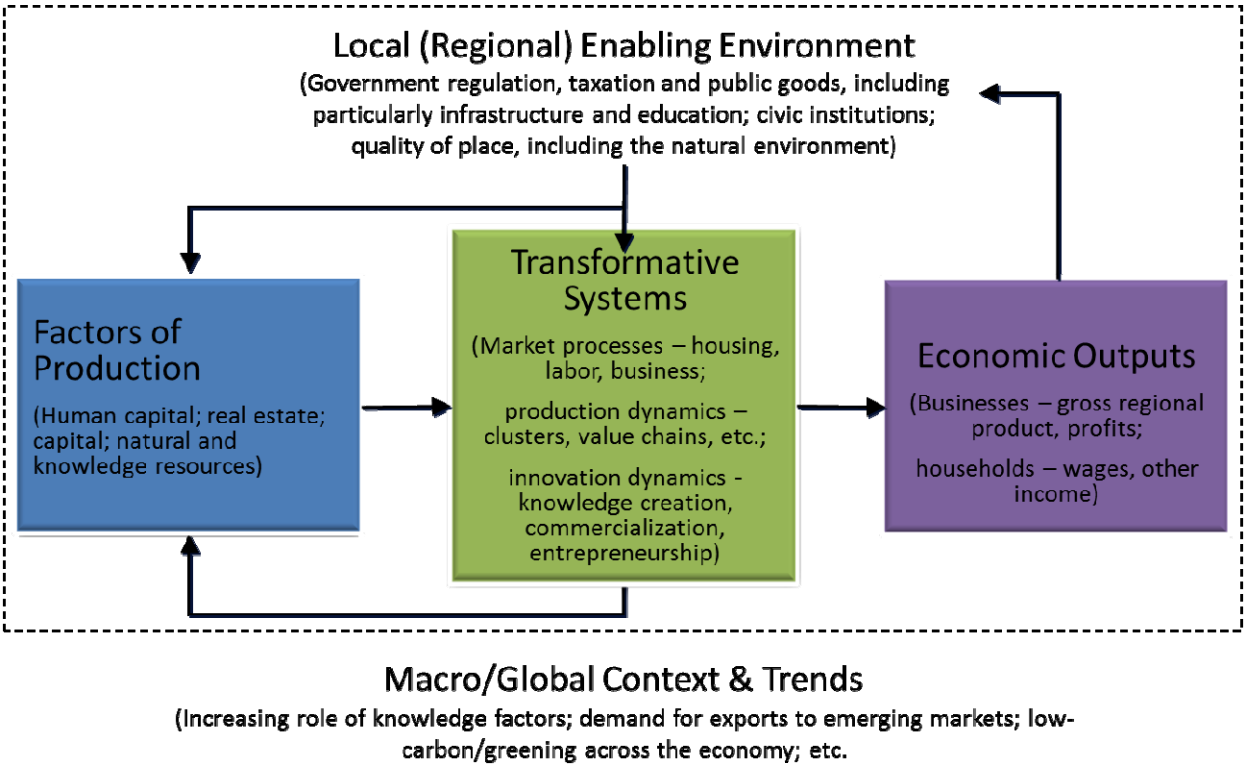
[18] This area is probably the least understood. In addition to innovation dynamics, which are discussed extensively in Chapter V, this area encompasses questions such as whether there is an optimal economic mix for different regions. Is it possible, for example, that regions with high concentrations of auto manufacturing and transportation industries would be more efficient if they were also home to warehousing rather than consulting services? The idea of seeking an optimal mix of occupations, functions and industries gets at this kind of economic efficiency. Also, the scale of the economic activity in a place might affect the efficiency of the system: is there an optimal size for a regional economy depending on what its concentrations are? Is there a critical mass that makes a region more or less efficient? It's likely that different regions have different optimal compositions based on their economic activities, such that these are important issues to consider case by case.

[19] As discussed extensively in Chapter VI, the location of firms and workers, producers, suppliers and consumers within the region affects efficiency in two major ways: it determines transportation costs for people and businesses, and it affects productivity by determining levels of congestion and agglomeration benefits (such as shared inputs and knowledge spillovers).

[20] These two avenues for growth intersect and overlap. For example, increasing market efficiency often also increases deployment of underutilized assets.



The ***outputs*** of the regional economy – the total value of goods and services produced (gross regional product) – result from the complex interactions of millions of individuals and businesses. These interactions take place through a set of overlapping and interrelated systems – primarily **market systems –** that combine and transform inputs such as human capital (**factors of production**) into tangible economic results. The quality of these interactions – specifically the efficiency and productivity of these systems – depends in part on **the enabling environment** (such as infrastructure), which in turn is determined by local governmental and civic institutions, as well as natural qualities of place.

Finally, the regional economy operates in the context of a changing global and **macroeconomic environment**, which influences how the systems operate to affect productivity and growth, and whether they are directed toward viable long-term growth trajectories. The rise of the knowledge economy,[21] in particular, infuses much of the discussion that follows. The increasing role of knowledge embedded in people and technologies in driving economic growth has had – and can be expected to continue to have – enormous implications for the relative importance of inputs (e.g., high human capital); drivers and how they operate (e.g., knowledge spillovers, functional concentrations, institutional and innovation economics); and even the spatial

[21]"Knowledge economy" refers here to the increasing importance of information and knowledge resources (a) as inputs to production, (b) in the production and market process and (c) as products and services. See discussion in Robert Weissbourd and Christopher Berry, *TheChanging Dynamics of Urban America* (Chicago: CEOs for Cities, 2004), 24-27; Matthew Drennan, *The Information Economy and American Cities* (Baltimore: Johns Hopkins University Press, 2002); and J. Houghton and P. Sheehan, *A Primer on the Knowledge Economy* (Melbourne City, Australia: Center for Strategic Economic Studies, Victoria University, 2000).

arrangement of assets (e.g., benefits of density in facilitating face-to-face interaction and idea exchange).[22]

Examining the research (particularly in the field of economic geography) and practice with respect to these dynamic interactions of the components of a regional economy enables identification of the main mechanisms for increasing efficiency and productivity. Dense networks of suppliers, service providers and customers within close proximity of firms reduce transportation and transaction costs. The benefits of concentration provide additional "agglomeration economies" through shared inputs to production, access to deep labor pools and knowledge spillovers. The opportunity for face-to-face interaction across firms and between individuals, as well as the movement of employees between firms, facilitates the sharing of ideas that generates increasing returns to knowledge and spurs innovative activity. As a result, how industries, functions and occupations "cluster," the institutional environment that facilitates transactions, and the spatial efficiency of their organization, all are key determinants of economic productivity.

As discussed extensively in the chapters which follow:

- The balance of taxation and public goods; the quality of particular public goods, especially infrastructure and education; and the public, private and civic culture are all critical factors in the ***enabling environment*** for economic activity;
- Knowledge embedded in the labor force (human capital) and in information resources and technologies is an increasingly important ***factor of production***; and
- The dynamics of "clusters" of firms and related institutions; the innovation "ecosystem"; and, as always, the efficiency of market operations are the critical processes (***transformative systems***) determining the efficiency and productivity of economic production.

Focusing on these key aspects of how a regional economy functions, informed by research and practice, enables identification of five key leverage points through which practitioners can influence performance of the regional economy.

- *Concentrations of industries, functions and occupations.* Concentrated economic activity benefits the production of goods and services by reducing transportation costs, enabling shared labor and other inputs, facilitating spillovers and exchange and enhancing innovation.[23]
- *Human capital deployed for economic growth.* Human capital is the single most important input to economic growth, but it must be *deployed*, requiring attention not just to production,

[22] Weissbourd and Berry, *The Changing Dynamics of Urban America*, 24-36, 79-82.

[23] Marshall, *Principles of Economics;* J. Vernon Henderson, "Marshall's Scale Economies," *Journal of Urban Economics* 53(1) (2003): 1-28; Gilles Duranton and Diego Puga, "From Sectoral to Functional Urban Specialization" (NBER Working Paper 9112, 2002); Michael Porter, *Competitive Advantage: Creating and Sustaining Superior Performance* (New York: Free Press, 1998). For a general review, see Joseph Cortright, *Making Sense of Clusters: Regional Competitiveness and Economic Development* (Washington, DC: The Brookings Institution, March 2006). On agglomeration economies, see Edward Glaeser, ed., *Agglomeration Economies*.

but to job creation, matching and labor market efficiency.[24]

- *Innovation- and entrepreneurship-enabling resources and institutions.* The ability to innovate has been a longstanding driver of productivity gains, and is a growing priority in economic development policy and practice.[25]
- *Spatial efficiency.* The location of businesses, suppliers, workers and consumers within a region – and the infrastructure connecting them – determines the transportation costs between them, and also influences the economic benefits of agglomeration, such as shared labor pools and knowledge spillovers.[26]
- *Effective public and civic institutions and culture.* Government shapes and enables market activity, and provides critical public goods from roads to education. Along with civic, business and cross-sector institutions, it also creates the institutional environment and culture that increasingly influences regional economies.[27]

Viewed at a micro or firm level: the productivity and efficiency of firms is driven by their concentration and interaction with other firms (hence, clusters); having the right human capital; rates of innovation; access to workers, customers and suppliers (spatial efficiency); and the government and institutional environment.

Subsequent chapters explore in depth the operations and implications for practice of each of

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[24] Christopher Berry, Riccardo Bodini and Robert Weissbourd, *Grads and Fads: The Dynamics of Human Capital Location*, (Chicago: CEOs for Cities, August 2005). For a review of the literature, see Paul D. Gottlieb and Michael Fogarty, "Educational Attainment and Metropolitan Growth," *Economic Development Quarterly* 17(4) (2003): 325-336. See, also, Edward Denison, *Trends in American Economic Growth, 1929-82* (Washington, DC: The Brookings Institution, 1985); Paul Romer, "Endogenous Technological Change," *The Journal of Political Economy* 98(5) (October 1990): S71-S102; Vijay Mathur, "Human Capital-Based Strategy for Regional Economic Development," *Economic Development Quarterly* 13(3) (August, 1999): 203-216; Edward Glaeser and Janet Kohlhase, "Cities, Regions and the Decline of Transport Costs," Discussion Paper 2014, Harvard Institute of Economic Research, July 2003.

[25] G.M. Grossman, and E. Helpman, *Innovation and Growth in the Global Economy* (Cambridge: MIT Press, 1991); Joseph Schumpeter, *Capitalism, Socialism, and Democracy*(New York: Harper Brothers, 1947); Paul M. Romer, "Increasing Returns and Long Run Growth," *Journal of Political Economy* 94(5) (1986); Robert Atkinson and D. Audretsch, "Economic Doctrines and Policy Differences: has the Washington Policy Debate Been Asking the Wrong Questions?" (Washington: Information Technology and Innovation Foundation, 2008).

[26] See, for example, Jackie Cutsinger, George Galster, Royce Hanson and Doug Towns, "Verifying the Multi-Dimensional Nature of Metropolitan Land Use: Advancing the Understanding and Measurement of Sprawl," *Journal of Urban Affairs* 27 (3):235-259;William T. Bogart, *Don't Call it Sprawl*(Cambridge: Cambridge University Press, 2006); and Keith R. Ihlanfeldt, "The Geography of Economic and Social Opportunity in Metropolitan Areas" in A. Altshuler, W. Morrill, H. Wolman, and F. Mitchell Eds., *Governance and Opportunity in Metropolitan America*(Washington, DC: National Academy Press, 1999)..

[27]See among others, Christopher Berry, *Imperfect Union: Representation and Taxation in Multilevel Governments*(Cambridge: Cambridge University Press, 2009); Douglas North, *Institutions, Institutional Change, and Economic Performance*(Cambridge: Cambridge University Press, 1990.); Richard Nelson, ed., *The Limits of Market Organization* (New York: Russell Sage Foundation, 2005); Robert Weissbourd, "Into the Economic Mainstream: A Discussion Paper on Bipartisan Policies for Inclusive Economic Growth," prepared for Opportunity Finance Network and CFED (August 2006), available at http://rw-ventures.com/publications/downloads/Distribution%20Draft%20IEM%20Paper%208-6-06%20rw.pdf;Remy Prud'homme, "Dangers of Decentralization," *The World Bank Research Observer* (Washington: The World Bank, 1995); and Vincent Ostrom, Charles Tiebout and Richard Warren, "The Organization of Government in Metropolitan Areas: A Theoretical Inquiry," *The American Political Science Review* (1961).

these key leverage points for driving regional economic growth.

CHAPTER III

Developing and Deploying Human Capital

***Note**: This is one of eight papers – an executive summary, six papers on specific aspects of regional economies and an appendix – generated by the "Implementing Regionalism" project, funded by the Surdna Foundation and undertaken by the George Washington University Institute of Public Policy and RW Ventures, LLC. Please see [insert web link] for the complete set of materials developed by the project.*

Chapter III: DEVELOPING AND DEPLOYING HUMAN CAPITAL[1]

A. Definition and Significance

1. What is human capital, and how important is it?

Labor is one of the main inputs to economic production. Extensive work has documented the primary importance of the quality of labor, or human capital, for economic growth.[2] Human capital refers to *the stock of knowledge, skills, expertise and capacities embedded in the labor force*, defined in Nobel laureate Gary Becker's pioneering work on the subject as "the embedding of resources into people."[3] Workers acquire human capital through formal education and training, on-the-job training, work experience and other forms of learning, which when deployed in a job, leads to increased levels of labor productivity. As a result, economies with larger total stocks of deployed human capital experience more and faster gains in productivity and, by extension, greater economic growth.[4]

In the context of technology development, globalization and other facets of the "knowledge economy,"[5] economic productivity has become even *more* reliant on human capital. While higher levels of human capital lead directly to productivity gains, as well as to increased levels of innovation and entrepreneurship,[6] the *interaction* of human capital and technology further amplifies productivity, as skilled workers take better advantage of new technologies. This interaction generates additional technological change, further compounding the productivity of the labor force. Reflecting these dynamics, the value of output per U.S. worker has increased more than ten-fold over the last century.[7]

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[1] The lead authors of this chapter are Robert Weissbourd, Gretchen Kosarko and Emily Metz.

[2] For a review of the literature on education and economic growth at the nation, state, and metropolitan area levels see: Gottlieb and Fogarty, "Educational Attainment and Metropolitan Growth," *Economic Development Quarterly* (17) (2003): 325-336. See also Andrew Gunder Frank, "Human Capital and Economic Growth," *Economic Development and Cultural Change* 8 (1960): 170-173 for a discussion of the role of education and training in 19th century US productivity gains.

[3] Gary S. Becker, "Investment in Human Capital: A Theoretical Analysis," *The Journal of Political Economy* 70(5) (1962): 9.

[4] Gottlieb and Fogarty, "Educational Attainment and Metropolitan Growth," *Economic Development Quarterly* (17) (2003): 325-336. See also Pamela Blumenthal, Harold Wolman, and Edward Hill, "Understanding the Economic Performance of Metropolitan Areas in the United States," *Urban Studies* 46 (3): (2007) 605-627. From 1990 to 2000, initial-year human capital (share of population with bachelor degrees or higher) is positively and significantly related to GMP and employment growth.

[5] "Knowledge economy" refers here to the increasing importance of information and knowledge resources (a) as inputs to production, (b) in the production and market process and (c) as products and services in and of themselves. See discussions in Robert Weissbourd and Christopher Berry, *The Changing Dynamics of Urban America* (Chicago: CEOs for Cities, 2004), 24-27; Matthew Drennan, *The Information Economy and American Cities* (Baltimore: Johns Hopkins University Press, 2002); and J. Houghton and P. Sheehan, *A Primer on the Knowledge Economy* (Melbourne City, Australia: Center for Strategic Economic Studies, Victoria University, 2000).

[6] To realize the economic potential of inventions and/or innovations within a regional economy, entrepreneurs have to emerge to implement and diffuse them for productive use. Both innovation and entrepreneurship are closely tied to human capital stock, because people with knowledge, ideas and skills provide the pool from which innovators and entrepreneurs emerge. See Vijay Mathur, "Human Capital-Based Strategy for Regional Economic Development," *Economic Development Quarterly* 13(3) (August 1999): 203-216.

[7] Christopher Berry, Riccardo Bodini and Robert Weissbourd, *Grads and Fads: The Dynamics of Human Capital Location* (Chicago: CEOs for Cities, August 2005), 4.

In the knowledge economy, the benefits of concentrating economic activity in metropolitan areas apply particularly to the concentration of human capital. Skilled workers deployed in dense, urban areas generate more economic output than similarly skilled workers in less dense areas.[8] This advantage is derived from two principal effects. "Knowledge spillover" effects arise as smart, experienced workers interact with each other and move between firms, exchanging and generating new knowledge.[9] In addition, thick labor markets enable more efficient sorting of workers into jobs, resulting in more productive firm-worker matches.[10]

For all of these reasons, human capital was the single biggest factor in economic growth in metropolitan areas across the 1990s.[11] Regions with higher levels of human capital experience greater increases in worker productivity,[12] wages[13] and employment growth.[14]

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[8] Due to these productivity benefits of density, skilled workers in metropolitan economies command higher wages than similarly skilled workers in less dense economies, an effect known as the urban wage premium. Wheeler, for example, finds that a one-standard-deviation increase in log population or density of a metropolitan area is accompanied by an approximately 0.2% increase in the annual rate of within-job wage growth. Reflecting the extent to which dense, urban economies facilitate more productive firm-worker matches, Wheeler also finds that the same increase in log population or density results in an average 1% increase in wages when workers move between jobs. Wheeler, "Cities and the Growth of Wages Among Young Workers: Evidence from the NLSY." Working Paper 2005-055A, Federal Reserve Bank of St. Louis, 2005.

[9] See Gottlieb and Fogarty, "Educational Attainment and Metropolitan Growth," 326; and Glaeser and Gottlieb, "The Wealth of Cities: Agglomeration Economies and Spatial Equilibrium in the United States," 983, 1012.

[10] See Christopher H. Wheeler, "Cities and the Growth of Wages Among Young Workers: Evidence from the NLSY," Working Paper 2005-055A, The Federal Reserve Bank of St. Louis, 2005; and Christopher Wheeler, "Search, Sorting, and Urban Agglomeration," *Journal of Labor Economics* 19 (4) (2001): 879-99.

[11] Weissbourd and Berry, *The Changing Dynamics of Urban America*, 32. In a statistical analysis examining the impact of myriad characteristics of Metropolitan Statistical Areas (MSAs) on economic growth through the 1990s, the effect of the educational attainment variables (a conventional proxy for human capital more broadly) was larger than for all other independent variables. Roughly, for each 2% increase in the proportion of adults with college degrees in a MSA in 1990, income growth from 1990-2000 increased by about 1%. See also Randall Eberts, George Erickcek and Jack Kleinhenz, "Dashboard Indicators for the Northeast Ohio Economy: Prepared for the Fund for Our Economic Future," Federal Reserve Bank of Cleveland, Upjohn Institute for Employment Research, and Kleinhenz and Associates, 2006. In an analysis of 118 metropolitan areas similar in size to those in Northeast Ohio, having a skilled workforce was found to be the primary driver of economic growth between 1994 and 2004, correlated most highly with output, per capita income, and productivity.

[12] A one-year increase in average educational attainment in a metropolitan area increases total factor productivity by about 3%, productivity in manufacturing jobs by 8.5%, and productivity in non-manufacturing jobs by 12.5%. See both R. Lucas, "On the Mechanics of Economic Development," *Journal of Monetary Economics* 22 (July 1988): 3-42 and J. Rauch, "Productivity Gains from Geographic Concentration of Human Capital: Evidence from Cities," *Journal of Urban Economics* 34 (1993): 380-400.

[13] Moretti finds that a one percentage point increase in college share in a Metropolitan Statistical Area (MSA) raises average wages by 0.6%-1.2% above and beyond the private return to education, generally agreed to be an 8-12% increase in earnings per each additional year of schooling (all else equal). This finding indicates that there are positive externalities associated with human capital accumulation. See: Enrico Moretti, "Human Capital Externalities in Cities," Working Paper 9641, National Bureau of Economic Research, 2003. See also J. Mincer, *Schooling, Experience, and Earnings* (New York: Columbia University Press, 1974). One of the first economists to formally study the relationship between human capital and wages, Jacob Mincer calculated that workers' individual annual earnings rose by 7% across the 1950s and 1960s for every year of additional schooling.

[14] Between 1940 and 1990, a 10% increase in a metropolitan area's concentration of college-educated residents was associated with a 0.8% increase in employment growth, two thirds of which is accounted for by productivity enhancements based on skill. The remaining third was attributable to quality of life improvements due to social

2. How does human capital lead to regional economic growth?

The prevalent and compelling statistical research linking high levels of human capital to high levels of metropolitan economic performance has often led practitioners to conclude that if we just produce more human capital, it will lead to economic growth. However, it is not simply increasing levels of human capital which *causes* economic growth. To move beyond research to the practice of economic development, we need to understand the operational relationship between human capital and growth.

Human capital contributes to economic growth as an input to production. Increasing amounts and levels of human capital drive growth by increasing the productivity of firms and, consequently, their outputs. The key point here, to which we return immediately below, is so obvious that it is often overlooked: human capital contributes to growth through working – by being deployed in jobs. For similar reasons – because workers go to places where their skills can be well-deployed – jobs are also critical to retaining and attracting human capital.

From an economic development point of view, simply having lots of human capital is not sufficient: the goal is high levels of well-deployed human capital. This means that, in order to maximize development and deployment of human capital, practitioners have to focus on the complex relationships between (1) production, attraction and retention of human capital; (2) job creation through firm births, growth, attraction and retention; and (3) the structure and efficiency of labor markets.

While most of the discussion below is not explicitly about regions, the multiple systems which interact to determine human capital development and deployment – particularly with respect to job creation and the operation of labor markets – are primarily regional in scope. As a result, the strategies which emerge below inherently entail regional perspective and action.

B. Mechanisms and Intervention Strategies

1. What Mechanisms Influence the Development and Deployment of Human Capital?

In exploring how best to maximize deployment of human capital, we begin by addressing several common misconceptions. In short, the mechanisms for developing human capital (production, attraction and retention), and particularly for deploying it well, are at least as much a function of creating the right job pools and of labor market dynamics, than just of the educational systems which produce human capital or the quality-of-life amenities which contribute to its retention and attraction.

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externalities. Jesse Shapiro, "Smart Cities: Quality of Life, Productivity, and the Growth Effects of Human Capital," Working Paper No. 11615, National Bureau of Economic Research, September 2005.

Misconception #1: Producing more and higher levels of human capital is itself the primary cause of economic growth.

As discussed, regions with higher levels of human capital generally experience greater economic growth. However, the necessary mechanism through which human capital realizes its economic value is by increasing the productivity of workers employed in jobs, through better use of technology, increased levels of innovation, and so on. Deployment in occupations that effectively leverage workers' skills is the mechanism through which capability is converted into increased productivity and, consequently, economic growth.

As a result, two metropolitan economies may have the same amount and quality of human capital, but the economy that offers rich job pools and more productively deploys workers' skills will experience greater economic growth. For example, consider the case of "college towns," which, not incidentally, are frequently statistical outliers in human capital research. While college towns have unusually high levels of human capital, they generally do not have the largest, most productive or highest-growth economies.[15] Were human capital in itself sufficient to create economic growth, we would expect these nodes of concentrated human capital to serve as the nation's economic production centers. However, the very high levels of human capital embedded in professors are deployed for other, critically important purposes (e.g., production of human capital in students), not for maximizing their value in local economic growth; and the human capital produced in students often moves elsewhere to find jobs.

Focusing on *deploying* human capital is not to diminish the importance of strategies that strive to increase the production of human capital. As discussed below (see "Misconception #2"), firms and knowledge workers attract each other in an iterative and mutually reinforcing process — knowledge workers are attracted to rich pools of knowledge jobs, and firms in turn are attracted to rich pools of knowledge workers. For this reason alone (as well as many non-economic reasons), increasing production of human capital is never a mistake. The point, though, is that it is not enough.

That deployment is what counts for economic growth raises several other issues for practitioners. In order to maximize impact on regional economic growth, it is not just that the skilled workers must have jobs, but that they must be engaged in occupations that most productively deploy their human capital. For example, if a newly minted PhD scientist works at the checkout counter of a grocery store, this represents underemployment for that individual, and the regional economy fails to maximize his potential economic value-added. Underemployment may occur because of labor market inefficiencies, if for example high transaction costs[16] prevent efficient matching of workers and jobs (including under conditions of spatial mismatch, discussed further in the Spatial Efficiency chapter).

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[15] Paul D. Gottlieb and George Joseph, "College-to-Work Migration of Technology Graduates and Holders of Doctorates within the United States," *Journal of Regional Science* 46(4) (2006): 627-659; see also Berry, Bodini and Weissbourd, *Grads and Fads: The Dynamics of Human Capital Location* (Chicago: CEOs for Cities, August 2005).

[16] As further discussed below, transaction costs include finding and measurement costs for employers and job seekers to make a match. In order to form productive matches, firms and workers must be able to easily and effectively find and evaluate each other. Market barriers range from the jobs-housing mismatch discussed in the spatial efficiency chapter to skills evaluation and credentialing problems discussed below.

Underemployment may also occur because the jobs simply are not there. More broadly, the point here is that the jobs are the key mechanism for economic growth in this context (and, as discussed below, for attracting and retaining human capital). Improving production of human capital and enabling more efficient matching are hardly relevant if demand for workers does not exist. If practitioners are to maximize deployment of human capital for economic growth, production of human capital must be supplemented with strategies that focus on the demand side of labor markets (discussed in much more detail in Chapter IV, on clusters), and on their efficiency.

Misconception #2: Retaining and attracting high-skilled human capital is primarily achieved through improving quality-of-life and consumption amenities.

Retaining and attracting human capital is a critical component of any comprehensive regional human capital strategy: if a region produces large quantities of high-skilled human capital that then move elsewhere, it of course will not be deployed locally and contribute to growth of the regional economy. Similarly, if a region does not attract human capital, it cannot be deployed for local economic growth.

A well-known body of research emphasizes the role of quality-of-life factors – such as access to quality performance venues and restaurants, tolerant attitudes and safety – in determining where high-skilled workers[17] choose to locate, and so suggests that the primary strategy for retaining and attracting them should be to improve amenities.[18] While amenities do contribute to the location decisions of knowledge workers, the magnitude of the impact is significantly smaller than the impact of the availability of high-skilled jobs.[19] Knowledge workers have spent considerable resources and time acquiring skills and qualifications, so they seek to locate in metropolitan economies where they can effectively deploy their human capital in order to receive

[17]The attraction and retention literature focuses primarily on knowledge workers, particularly college graduates, for several reasons. As discussed, higher human capital workers contribute more to productivity, and college degree attainment is the most readily available data to proxy knowledge workers. Also, better educated individuals are significantly more likely to migrate between regions than low-skilled workers. Current Population Survey (CPS) data from 1981-2000 indicates that individuals with a college degree are 82% more likely to migrate in any given year than high-school dropouts. See EmekBasker, "Education, Job Search and Migration," (2002) University of Missouri-Columbia Working Paper No. 02-16.
Available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=371120.

[18] For the most popular articulation of this view, see, Richard Florida, *The Rise of the Creative Class and How It's Transforming Work, Leisure, Community, and Everyday Life, Basic Books* (New York: Basic Books, 2002).

[19]Christopher Berry, Riccardo Bodini and Robert Weissbourd, *Grads and Fads: The Dynamics of Human Capital Location* (Chicago: CEOs for Cities, August 2005). See also Michael Storper and Allen Scott, "Rethinking Human Capital, Creativity and Urban Growth," *Journal of Economic Geography* 9 (2009): 147-167; Gottlieb and Joseph, "College-to-Work Migration of Technology Graduates and Holders of Doctorates within the United States," *Journal of Regional Science* 46(4) (2006): 627-659; Randall Eberts, George Erickcek and Jack Kleinhenz, "Dashboard Indicators for the Northeast Ohio Economy: Prepared for the Fund for Our Economic Future," Federal Reserve Bank of Cleveland, Upjohn Institute for Employment Research and Kleinhenz and Associates, 2006; Paul Gottlieb, "Economy Versus Lifestyle in the Inter-Metropolitan Migration of the Young," *International Journal of Economic Development* 5(3) (June 2003); Steven Malanga, "The Creative Clash," *Governing Magazine* (June 2004); Louis G. Tornatzky et al., *Where Have All the Students Gone? Interstate Migration of Recent Science and Engineering Graduates* (Research Triangle Park, NC: Southern Growth Policies Board, Southern Technology Council, February 1998); and *Graduate Migration from Indiana's Post-Secondary Institutions* (Indianapolis: Indiana's Human Capital Retention Project, Indiana Fiscal Policy Institute (March 1999).

a high return on their skills in the form of wages.[20] More broadly, they look to locate in places that offer rich job pools in which they have a range of opportunities to deploy their talents, and accompanying rich pools of knowledge workers, benefiting from the ensuing knowledge spillovers and enhanced productivity.[21] Amenities and other factors[22] are important, but jobs are much more important.

In light of these dynamics, attracting and retaining skilled workers primarily depends on identifying, creating and enhancing the job pools necessary to effectively deploy their talents.[23] As workers are attracted to job pools that provide a strong return on their skills, firms are attracted to deep pools of high-quality human capital that can be productively deployed to increase firm performance. Firms and skilled workers thus attract one another in a mutually reinforcing, iterative process.[24] Human capital strategies accordingly must also encompass, or at least be closely linked to, strategies addressing the demand side of the market. (These are discussed in other chapters, particularly Chapter IV on clusters).[25]

[20] Gottlieb and Joseph, "College-to-Work Migration of Technology Graduates and Holders of Doctorates within the United States," *Journal of Regional Science* 46(4) (2006): 627-659.

[21] This ordering of priorities reflects the basic neoclassical economic principle that individuals seek to maximize utility given certain constraints. For the vast majority of working-age adults, the need to earn a living is a primary constraint, and is therefore the most significant factor in their location decisions. See Michael Storper and Allen Scott, "Rethinking Human Capital, Creativity and Urban Growth," *Journal of Economic Geography* 9 (2009): 147-167.

[22] Other factors that influence the location decisions of high-skilled workers on the margins include the education of the incumbent population (i.e., the presence of other knowledge workers), city size (i.e., migration increases with city size), and proximity to where one was born or received the most recent degree. Gottlieb and Joseph, "College-to-Work Migration of Technology Graduates and Holders of Doctorates within the United States," *Journal of Regional Science* 46(4) (2006): 627-659.

[23] "Furthermore, it is now obvious that any reasoned discussion of the role of human capital and skills in urban growth must take directly into account their specific substantive content in relation to local productive activities. In other words, we typically do not observe in empirical reality agglomerations of arbitrarily assorted workers (whether members of the creative class or not), but rather clearly selected types of workers and skills, associated with definite sectors or activities, in particular places. This sorting is primarily an outcome of local productive specialization." Michael Storper and Allen Scott, "Rethinking Human Capital, Creativity and Urban Growth," *Journal of Economic Geography* 9 (2009), 158.

[24] See Berry, Bodini and Weissbourd, *Grads and Fads*, 12, 16; and Krugman, *Geography and Trade*, as cited in Cortright, "New Growth Theory, Technology and Learning: A Practitioners Guide," 19-20. As a result of this iterative dynamic, metropolitan areas with higher levels of deployed human capital have an advantage that continues to build on itself. A pattern of divergence is occurring between high- and low-performing regions, both with respect to economic growth and growth in educational attainment. Weissbourd and Berry, *The Changing Dynamics of Urban America*, 22-23. For a review of the economic literature on these topics see, e.g., Edward Glaeser and Albert Saiz, "The Rise of the Skilled City," discussion paper 2025, Harvard Institute of Economic Research, December 2003; and Christopher R. Berry and Edward L. Glaeser, "The Divergence of Human Capital Levels across Cities," discussion paper 2091, Harvard Institute of Economic Research, September 2005.

[25] Finally, this shift in emphasis from just human capital production and amenities to the dynamic and iterative deployment process again highlights the importance of employer driven training and enhancing labor market "matching" efficiency, as discussed below.

Misconception #3: Formal educational attainment levels adequately reflect the human capital attributes that are most relevant to employers, and should be the primary focus of human capital economic development strategies.

Since educational attainment data sets are readily available, and educational attainment often serves as a sufficient proxy for human capital in aggregate statistical analyses, formal educational attainment (e.g., receipt of high school diploma, college or advanced degree) is a primary focus of the quantitative research on human capital. As these findings are translated to practice, they often result in human capital development strategies that focus primarily on increasing formal educational attainment. Practically speaking, however, not all degrees are created equal due to the high variability in the quality of education received from different schools in the education system, and employers increasingly feel that workers with the same degrees may not possess equivalent levels of human capital.[26] Additionally, while formal education is an integral component of human capital development, it does not represent the sole – or perhaps even most significant – source of knowledge and skills contributing to labor productivity.

Workers also acquire and build skills through work experience, on-the-job training, mentoring, relationships with family and peers, and so on. This rich combination of formal and informal learning experiences endows them with expertise and skills not produced by formal educational institutions, nor captured by educational attainment measures. This is particularly true, of course, for workers who have not gone through traditional educational institutions. As workers settle into a particular occupation, they acquire unique industry-specific skills, which ultimately contribute to greater worker productivity over time.[27] In additional, "noncognitive" skills such as self-control, discipline and perseverance have been found to increase productivity as much as, and sometimes more than, cognitive skills measured by traditional educational attainment.[28]Employers understand the value of these other types of human capital and frequently rank "attitude" (i.e., noncognitive skills), previous work experience and industry-based credentials as more important than years of schooling when hiring new employees.[29] These

[26] For example, 60 percent of employers surveyed by Deloitte Consulting in their 2005 Skill Gaps report stated that high school graduates were not adequately prepared for an entry-level job in their company. See "2005 Skills Gap Report-A Survey of the American Manufacturing Workforce," report produced by Deloitte Consulting, National Association of Manufacturers, and the Manufacturing Institute, p. 19. Note that strategies on how to improve the quality of the education system and increase educational attainment levels are beyond the scope of this paper.

[27] As proxied for by increased wages. See Gueorgui Kambourov and Iourii Manovskii, "Occupational Mobility and Wage Inequality,"*Review of Economic Studies* 76(2) (2009): 731-759. Kambourov and Manovskii find that 5 years of tenure in the same occupation increases wages by 12% holding other variables constant.

[28] As proxied for by increased wages. See James Heckman, Jora Stixrud and Sergio Urzua, "The Effects of Cognitive and Noncognitive Abilities on Labor Market Outcomes and Social Behavior," *Journal of Labor Economics* 24(3) (2006): 411-482. Heckman et al. find that except for male 4-year college graduates, the labor market values noncognitive skills (as measured by increased wages) as much as or more than cognitive skills. The magnitude of the effect depends on the specific population of workers in question (i.e., high school graduates, drop outs, some college, female, male, etc.). See also Marigee Bacolod, Bernardo Blum and William Strange, "Skills in the City," *Journal of Urban Economics* 65(2) (2009): 136-153; and Robert Lerman, *Are Skills the Problem? Reforming the Education and Training System in the United States* (Kalamazoo, MI: Upjohn Institute for Employment Research at the Urban Institute, 2008).

[29] The 1997 National Employer Survey revealed that employers ranked attitude, communication skills, previous work experience, employer recommendations and industry-based credentials above years of schooling, grades and

dynamics help explain why workers with the same amount of formal education exhibit almost as much variance in wages as individuals across the entire workforce.[30] Formal education is an important component of, but not the sole contributor to, the complex mix of skills developed throughout a worker's life and career that impact overall levels of productivity.

Without a doubt, formal education provides the foundational knowledge and skills that shape later skill attainment in the workforce[31] and significantly impact individual labor market outcomes.[32] For particular jobs – especially highly technical ones – the skills and abilities conveyed by formal educational attainment are primary drivers of worker productivity. For these and many other reasons, promoting the highest possible levels of formal educational attainment and improving the quality of the formal education system are always valuable.[33]However, equally important human capital is attained in many other ways. As the knowledge-based economy advances a culture of lifelong learning, and job requirements increasingly call for constant up-skilling of workers' abilities, industry-specific and "noncognitive" skills comprise an important part of continued skill development for both incumbent and emerging workers.

Therefore, strategies to develop human capital need to address not only the foundational skills acquired as part of formal education, but also the other skills that enable workers to be deployed in jobs that the region has and can grow. For purposes of maximizing development and deployment of human capital for regional economic growth, the over-emphasis on formal degrees in both human capital production and hiring has two implications: (1) we may be undervaluing and under-producing the industry-specific and noncognitive human capital not obtained through degrees; and (2) to the extent that labor markets cannot as readily find and evaluate this non-degree based human capital, it is being less efficiently deployed. The discussions below concerning employer-driven training and enhancing labor market "matching" efficiency are both addressed to these issues.

The theme underlying each of these three misconceptions is that human capital cannot contribute to regional economic growth unless it is effectively deployed. Understanding the mechanisms through which human capital is developed and deployed requires broadening the focus well beyond production of college graduates and enhanced amenities, to encompass strategies which foster and link skilled workers to rich and diverse pools of jobs.

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test scores administered as part of the interview when hiring new employees. The survey included responses from more than 3,300 businesses.

[30] See Robert Lerman, "Are Skills the Problem? Reforming the Education and Training System in the United States," Upjohn Institute for Employment Research at the Urban Institute, 2008; and Gueorgui Kambourov and Iourii Manovskii, "Occupational Mobility and Wage Inequality," *Review of Economic Studies* 76(2) (2009): 731-759.

[31] See Eric Knudsen, James Heckman, Judy Cameron, and Jack Shonkoff, "Economic, neurobiological, and behavioral perspectives on building America's future workforce," *Proceedings of the National Academy of Sciences* 103(27) (2006): 10155-10162.

[32] Each additional year of schooling is associated with an 8 to 12 percent increase in individual earnings. See Enrico Moretti, "Human Capital Externalities in Cities," Working Paper 9641, National Bureau of Economic Research, 2003. The individual returns to schooling increased by as much as 35 to 50 percent between 1985 and 2000. See David Card, "The causal effect of education on earnings," *Handbook of Labor Economics* 3(1) (1999): 1801-1863.

[33] Strategies on how to improve the quality of the education system and increase educational attainment levels are outside the scope of this paper.

2. What strategies enhance development and deployment of human capital?

Clarifying the misconceptions above to better understand the mechanisms through which human capital translates to economic growth suggests three areas of strategies that practitioners can employ to more effectively develop and *deploy* human capital: (a) increase levels of human capital through production, attraction and retention of skilled workers; (b) improve the efficiency of labor markets; and (c) foster an "opportunity-rich" economy in which workers of all backgrounds can gain entry into the labor market and have opportunities to increase skill levels and experience upward mobility.

a. Increase levels of human capital through production, attraction and retention

Production – from pre-school through worker re-training and lifelong learning – of course remains critically important. To increase regional levels of human capital in a way that maximizes economic impact, production strategies should be (1) targeted to the particular needs and characteristics of different segments of the population; and (2) targeted to the current and anticipated needs of employers. Therefore, strategies to increase the production of human capital should not only address the critical need to raise formal educational attainment levels, but also provide workers with continued access to education and training programs that produce the "right" human capital to meet the demands of local industries and employers. This demand-driven emphasis increases the likelihood that workers' skills will be effectively deployed to increase labor productivity in the regional economy, and enables better integrating human capital and other economic development strategies.

With the sometimes intense emphasis placed on attracting knowledge workers, strategies to upgrade and better utilize the skills of the existing and emerging workforce may get less attention than they deserve: these strategies also contribute to increased productivity in the economy.[34] Addressing human capital development of the emerging and existing workforce with a focus on improved labor market outcomes increasingly requires policies and programs that span from birth through the arc of a career. While strategies or reforms to improve the production of human capital within the formal educational system are well beyond the scope of this paper, a few observations follow.

The production of human capital begins with investments in early childhood, primary and secondary education, which form the foundation for all later skill attainment.[35] Research indicates that early-childhood enrichment improves later school achievement and job

[34] Competitiveness in a globalized economy depends in part on a region's ability to consistently increase the productive use of its own resources, for which upgrading and better leveraging the skills of its workforce (i.e., increasing output per worker) is a critical component. See Michael Kitson, Ron Martin and Peter Tyler, "Regional Competitiveness: An Elusive yet Key Concept?" *Regional Studies* 38(9) (2004): 993.

[35] Research indicates that "learning begets learning." The skills established in early childhood and primary education are the foundation on which later, more complex capacities are developed, rendering later investments in skill attainment more efficient and effective. See Eric Knudsen, James Heckman, Judy Cameron and Jack Shonkoff, "Economic, neurobiological, and behavioral perspectives on building America's future workforce," *Proceedings of the National Academy of Sciences* 103(27)(2006): 10155-10162.

performance, particularly among children at risk of school failure.[36] Improving the quality of the formal education system and raising educational attainment at all levels (while, as discussed, not the only or necessarily most important source of human capital) is critical in promoting positive labor market outcomes.[37] A high school diploma is no longer sufficient to meet the skill requirements of today's job market,[38] and the lifelong learning culture of the knowledge-based economy frequently calls for workers to receive additional postsecondary education and training throughout their careers.

Comprehensive human capital development strategies must therefore promote postsecondary education and training programs that are accessible to workers no matter the skill or income level. This focus on increased accessibility might require programs that have flexible scheduling or provide additional supports to low-income individuals. Above all, programs must be responsive to the human capital needs of regional employers, including industry-specific, "noncognitive" and foundational skills, in order to help ensure that individuals are effectively deployed into the regional economy. In many states, as much as two thirds of the labor force is projected to still be working in 2020,[39]meaning that these investments in incumbent workers and job seekers will continue to yield returns in the form of increased productivity for years to come.[40] In addition to attracting and retaining knowledge workers, strategies to enable and encourage workers of all skill levels to pursue additional education and training will contribute to greater output per worker and ultimately regional economic growth.

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[36] See Clive Belfield, Milagros Nores, Steve Barnett, and L.J. Schweinhart, "The High/Scope Perry Preschool Program: Cost-Benefit Analysis Using Data from the Age-40 Followup," *Journal of Human Resources* 41(1) (2006):162-190; A. Reynolds, J. Temple, S. Ou, D. Robertson and J. Merksy, "Effects of a School-Based, Early-Childhood Intervention on Adult Health and Well-being: A 19-Year Follow-up of Low-Income Families," *Archives of Pediatric Adolescent Medicine* 161(8) (2007): 730-739; and F.A. Campbell, C.T. Ramey, E. Pungello, J. Sparling and S. Miller-Johnson, "Early Childhood Education: Young Adult Outcomes from the Abecedarian Project," *Applied Developmental Science* 6(1) (2002): 42-57.

[37] Each additional year of schooling is associated with an 8 to 12 percent increase in individual earnings. See Enrico Moretti, "Human Capital Externalities in Cities," Working Paper 9641, National Bureau of Economic Research, 2003. The individual returns to schooling increased by as much as 35 to 50 percent between 1985 and 2000. See David Card, "The causal effect of education on earnings," *Handbook of Labor Economics*, 3(1) (1999): 1801-1863.

[38] In 2006, almost six in ten jobs nationally were held by workers with at least some college or postsecondary training, compared to two in ten in 1959. Between 2006 and 2016, jobs that require either an associate's degree or a post-secondary vocational award are projected to grow faster than jobs that require no postsecondary training and slightly faster than occupations requiring a bachelor's degree or more. See *Preparing the Workers of Today for the Jobs of Tomorrow* (Washington, DC: Executive Office of the President, Council of Economic Advisers, 2009). Link found at http://www.whitehouse.gov/assets/documents/Jobs_of_the_Future.pdf. See also Anthony Carnevale and Donna Desrochers, "The Missing Middle: Aligning Education and the Knowledge Economy," paper prepared by the Educational Testing Service for the Office of Vocational Education, U.S. Department of Education, 2002; and Thomas L. Hungerford and Robert W. Wassmer, *K-12 Education in the U.S. Economy: Its Impact on Economic Development, Earnings, and Housing Values* (Washington, DC: National Education Association, September 2003).

[39] See the "Forgotten Middle-Skill Jobs: Meeting the Demands of a 21st-Century Economy" report series (produced between 2008-10) conducted in partnership by Skills2Compete and The Workforce Alliance for eleven individual states: Washington, Illinois, Wisconsin, Rhode Island, Oregon, Michigan, Connecticut, California, Maryland, New Mexico, and Massachusetts. Projections for the percentage of the incumbent workforce that will still be working in 2020 are approximately two-thirds (or within a few percentage points) for all states except for California, which is the outlier at fifty-eight percent. Reports found at the following link: http://www.nationalskillscoalition.org/resources/reports/state-reports/.

[40] Demand-driven training programs, career pathways and work-based learning programs, all of which are innovative responses to help meet the lifelong learning demands of a knowledge-based economy, are discussed in more detail in the sections below.

For increasingly mobile knowledge workers, strategies particularly need to focus on attraction and retention, which means creating knowledge jobs and attraction and retention strategies tied to those jobs, in addition to providing attractive amenities and quality-of-life factors (significant at the margin, as discussed in Misconception #2, above). Access to high-skilled jobs, particularly in cutting-edge technology sectors or knowledge-intensive industries like finance, insurance, business services and real estate,[41]is even more influential in the location decisions of the young and single cohort of college graduates.[42] Strategies to actively identify and enhance concentrations of high-skilled industries, occupations and functions are discussed in more detail in Chapter IV (clusters). Aspects of innovation and governance, particularly the institutional and business climate (see Chapters V and VII), similarly address creation of the right jobs to attract and retain high-skilled workers. In particular, integrating regional cluster and human capital strategies has the potential to increase the success of both initiatives: emerging clusters often focus on common human capital needs, creating the opportunity to better target human capital production, retention and attraction around particular emerging job opportunities. Finally, with respect to attraction and retention, amenities may also play a supplementary role in human capital strategies, particularly if a regional economy already has the high-skilled jobs available that predominantly influence location decisions.[43]

b. Improve labor market efficiency

Effectively deploying human capital into jobs is a function of labor markets. Focusing on labor markets highlights two challenges: (1) transaction costs which may result in under-deployment of certain segments of human capital; and (2) poor information "signaling" of current and emerging job demand, resulting in inefficient production (e.g., training for the wrong jobs) and matching.[44] These two challenges are related, particularly in their solution: better tying production of and demand for human capital both reduces transaction costs and improves signaling.

An efficient labor market enables firms and workers to easily find and evaluate each other to form productive matches. A critical component of firms' transaction costs in hiring is finding and evaluating workers with the "right" skills to productively contribute to firm output. Workers' transaction costs are driven by the search for jobs that leverage their skills and the need to effectively signal relevant skills to employers.[45] Transaction costs are becoming more

[41] See Gottlieb and Joseph, "College-to-Work Migration of Technology Graduates and Holders of Doctorates within the United States," *Journal of Regional Science* 46(4) (2006): 627-659; Enrico Moretti, "Human Capital Externalities in Cities," Working Paper 9641, National Bureau of Economic Research, 2003; and Berry, Bodini and Weissbourd, *Grads and Fads: The Dynamics of Human Capital Location*, 12.

[42] Berry, Bodini and Weissbourd, *Grads and Fads: The Dynamics of Human Capital Location*, 12.

[43]Examination of which amenities most attract and retain specific types of workers is outside the scope of this paper. For further discussion, see, e.g., Edward Glaeser, Jed Kolko and Albert Saiz (2001), "Consumer City," *Journal of Economic Geography* 1 (1): 27-50; Berry, Bodini and Weissbourd, *Grads and Fads: The Dynamics of Human Capital Location*, 14.

[44] As mentioned earlier, effective deployment is also integrally linked to having the job pools necessary to employ skilled workers. Particularly in the current economic climate, fostering job and firm creation and expansion and reducing unemployment levels is of the utmost importance to any of the other strategies.

[45] For a review of labor market search theory, see Dale Mortensen, "Job Search and Labor Market Analysis," in *Handbook of Labor Economics*, ed. O.C. Ashenfelter and R. Layard (Amsterdam: North-Holland, 1986).

important in an increasingly knowledge-based and globalized economy, where the complexity and frequency of labor market transactions have increased.[46]

Historically, many firms recruited workers for entry-level jobs and invested in internal training programs that formed career ladders leading to advancement, thus internalizing some of the search and evaluation transaction costs of sorting by promoting within the organization.[47] However, the increasingly mobile nature of human capital has led employers to invest less in training in recent years,[48] and to the extent that they do provide training, it is disproportionately offered to higher-skilled workers.[49] These and other evolving characteristics of the labor market increasingly place the responsibility for developing industry-specific skills and effectively signaling those skills to employers on the job seeker – a trend that also increases the transaction costs for employers in evaluating potential employees. At the same time, the rapid pace of change in industry and increasing technological skill requirements makes attaining and signaling in-demand skills more difficult, as a more sophisticated understanding of industry trends and

[46] In the late 1970s, Americans were estimated to have an average of seven employers in their working lifetimes. By 2005, U.S. Bureau of Labor Statistics data indicated that the average American worker born in the later years of the baby boom had 10.5 employers by age 40. See Gina Dokko, Steffanie Wil and Nancy Rothbard, "Unpacking Prior Experience: How Career History Affects Job Performance," *Organization Science*, 20(1) (2009):51-68. For a discussion of the increasing transaction costs in the labor market more broadly, see Chris Benner, "Labour Flexibility and Regional Development: The Role of Labor Market Intermediaries," *Regional Studies* 37(6&7) (2003): 621-633.

[47] For a discussion of the impact of changing trends job security and tenure, mobility, wages, and career advancement, see Paul Osterman, "Labor Market Intermediaries in the Modern Labor Market," in *Workforce Intermediaries for the 21st Century*, edited by Robert P. Giloth (Philadelphia: Temple University Press, 2003); and Thomas DiPrete, Dominique Goux and Eric Maurin, "Internal Labor Markets and Earnings Trajectories in the Post-Fordist Economy: An Analysis of Recent Trends." *Social Science Research* 31 (2002):175-196. See also Peter Capelli, "Career Jobs are Dead," *California Management Review*, 42(1) (1999): 146- 167, 147, 155-156. Capelli notes a 10 percent increase in the rate of job changes for younger workers in the 1990s than in earlier decades. Of men approaching retirement age (58 to 63), only 29 percent had been with the same employer for 10 years or more compared to a figure of 47 percent in 1969.

[48] Corporate expenditures on workforce training as a share of GDP have fallen by almost half in the last fifteen years. "Training Magazine's 2007 Industry Report." Available at: http://www.trainingmag.com/msg/content_display/publications/e3ib4fbcf3a3d03c749c530aa54043278f5. This trend reflects a general disincentive that firms face to invest in the skills of mobile workers. If a firm invests in a worker who then chooses to go elsewhere, the firm does not receive the returns on its investment in the form of increased productivity. Since firms cannot "own" the skills in which they invested, on an aggregate level they will invest less than the societally optimal level of training – i.e., the level that would result in the most efficient production of goods and services – creating a negative market externality. There's even some indication that individuals who have recently received internal job training are the most likely to leave a company, making employers less likely to sponsor paid, internal training. See, Peter Capelli, "Talent Management for the Twenty-First Century," *Harvard Business Review* (March 2008), 4.

[49] To the extent that employers do provide formal skills development, availability of training is disproportionately provided to workers with higher educational levels, meaning that workers with a high school diploma or less receive the lowest amounts of employer-provided training. See Robert Lerman, Signe-Mary McKernan and Stephanie Riegg, *Employer-Provided Training and Public Policy* (Washington, DC: The Urban Institute, 1999); Maureen Conway, *Investigating Demand Side Outcomes: Literature Review and Implications* (Washington, DC: The Aspen Institute, 2003); and Paul Osterman, "Employment and Training Policies: New Directions for Less Skilled Adults" (2007) in *Reshaping the American Workforce in a Changing Economy*, Washington D.C., The Urban Institute Press.

dynamics is needed to guide effective skill development, and the complexity of skill sets that need to be matched to jobs and signaled to employers increases.[50]

Reflecting these emerging trends, practitioners are developing multiple approaches to help reduce the transaction costs of forming productive matches, including: (1) labor market intermediaries (LMIs), (2) certification and (3) access to timely and accurate labor market information.[51]

(i) Labor Market Intermediaries

Third-party labor market intermediaries (LMIs) such as employment agencies, membership-based professional associations or even community colleges, to name a few, are playing a more important role in helping workers and firms navigate the labor market and manage the higher volume of transactions.[52] It has become increasingly challenging for workers to navigate the disjointed array of existing educational and training programs in order to identify those that will be most effective in helping them obtain employment and advance in their careers.[53] At the same time, employers seeking to engage a growing number of highly skilled workers – including those with industry-specific capabilities – struggle to identify and assess potential candidates. By focusing on a particular industry or sector, LMIs are frequently able to achieve economies of scale related to information collection, acquiring an expertise that would be costly and difficult for individual workers or firms to develop on their own. As "middlemen," LMIs look to the needs of both workers and employers, helping them find each other and form productive matches in the face of rapidly changing market conditions, increasingly complex skill sets, imperfect information and poor supply-demand feedback loops. In the case of workers, LMIs might advise on types of jobs available, the skill sets necessary for specific jobs, how to acquire those skills (if necessary) and signal them to employers.[54] For firms, LMIs may reduce costs in human resource

[50] See Chris Benner, "Labour Flexibility and Regional Development: The Role of Labor Market Intermediaries," *Regional Studies*, 37 (6&7) (2003): 621-633.

[51] These elements (along with a few others) are described by the Council for Adult and Experiential Learning as those necessary to provide the "connective tissue" between the many disparate components of the existing workforce development system. See "Innovation Strategies for a New System of Workforce Development and Lifelong Learning: The Challenges of Today and the Vision for Tomorrow," Council for Adult and Experiential Learning for Innovation Network for Communities, November 2008.

[52] Broadly speaking, labor market intermediaries look both ways in the labor market, attending to the needs and interests of both workers and businesses in facilitating labor market transactions. LMIs consist of a wide variety of organizations, including private-sector employment agencies, recruiters and labor contractors; membership-based professional associations, guilds and unions; and public-sector programs or educational institutions such as workforce development programs, community colleges or other postsecondary educational institutions, and community or non-profit organizations. See Chris Benner, "Labour Flexibility and Regional Development: The Role of Labor Market Intermediaries," *Regional Studies* 37(6&7) (2003): 621-633; and Paul Osterman, "Labor Market Intermediaries in the Modern Labor Market," in *Workforce Intermediaries for the 21st Century*, edited by Robert P. Giloth (Philadelphia: Temple University Press, 2003).

[53] The Council for Adult and Experiential Learning (CAEL) attributes this fragmentation to market failures in information asymmetry, poor supply-demand feedback loops and high transaction costs arising from "siloed" education and training funding streams. "Innovation Strategies for a New System of Workforce Development and Lifelong Learning: The Challenges of Today and the Vision for Tomorrow," Council for Adult and Experiential Learning for Innovation Network for Communities, November 2008: 4.

[54] Barcelona Activa offers a particularly innovative web-based platform for job seekers to identify skills needed for particular jobs, assess their skills and find matching jobs. See www.bcn.cat/treball.

departments and shorten the employee search and hiring process by presenting a pool of qualified candidates. In sum, labor market intermediaries can help minimize the transaction costs to both firms and workers of forming productive matches.

One differentiating characteristic among LMIs is the extent to which they simply help firms and workers find and evaluate each other or actually attempt to improve the skills of the available workforce to meet rapidly changing skill requirements and labor demands.[55] When interacting with workers that need to acquire or upgrade skills for a specific job, LMIs may refer workers to external postsecondary education (e.g., community colleges that may provide customized training) or training programs that confer the relevant skills. Alternatively, some LMIs develop their own training programs particular to a specific occupation. In the latter case, best-practice LMIs frequently engage firms directly in formal partnerships and solicit their input to help design curricula reflecting their specific needs.[56] These demand-driven training programs can reduce firms' finding costs since employers can access a pool of workers that are training specifically for their industry (and sometimes specifically for their firm). The other component of firms' transaction costs, assessment costs, are also reduced since firms are better able to evaluate the skill levels of workers who completed training programs that they themselves were partners in creating.[57] Likewise, workers reduce their transaction costs by participating in training that is directly linked to the skill requirements of available local jobs and acts as a signal of ability to employers. Participating in well-implemented, demand-driven training programs has been shown to improve labor market outcomes for participants.[58]

For segments of the labor force in which transaction costs are especially high, LMIs are particularly important in promoting an efficient labor market. Employers often rely heavily on formal degrees and personal networks to find and assess potential employees. This tendency is partly due to a lack of standardized and reliable measurement tools for many industry-specific and "noncognitive" skills, but also decreases the transaction costs to employers of conducting lengthy searches. As a result, if otherwise qualified workers do not acquire their knowledge and skills through formal institutions or are not as "plugged in" to employers' personal networks,

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[55] Since firms view training as an investment, they are less likely to provide training in an environment in which human capital is highly mobile because they may not see the returns in the form of increased productivity. Additionally, a firm that makes substantial investments in workers' human capital risks another firm hiring the employee away. The tendency to underinvest in training creates a role for third-party providers to increase their role in the labor market. See Paul Osterman, "Labor Market Intermediaries in the Modern Labor Market," in *Workforce Intermediaries for the 21st Century*, edited by Robert P. Giloth (Philadelphia: Temple University Press, 2003).

[56] See Amy Blair, *Measuring Up and Weighing In: Industry-Based Workforce Development Training Results in Strong Employment Outcomes* (Washington, DC: The Aspen Institute, 2002); and Maureen Conway, Linda Dworak-Munoz, and Amy Blair, *Sectoral Workforce Development: Research Review and Future Direction* (Washington, DC: The Aspen Institute, Workforce Strategies Initiative, 2004).

[57] Robert Weissbourd and Riccardo Bodini, *Using Information Resources to Enhance Urban Markets* (Washington, DC: The Brookings Institution, 2005), 9-11.

[58] A two-year randomized study of three well-implemented demand-driven training programs found that in the second year of the study, participants earned an average of $4,000 – or 29% – more per year and worked an average of 20 hours more per month than members of the control group. See Sheila Maguire, Joshua Freely, Carol Clymer, Maureen Conway, and Deena Schwartz, "Tuning In to Local Labor Markets: Findings from the Sectoral Employment Impact Study," *Public/Private Ventures*, July 2010.
Available at http://www.ppv.org/ppv/publications/assets/325_publication.pdf. See also Amy Blair, *Measuring UP and Weighing In: Industry-Based Workforce Development Training Results in Strong Employment Outcomes* (Washington D.C.: The Aspen Institute, 2002).

they may be under-deployed, creating a labor market inefficiency and wasted economic assets.[59]Successful LMIs can help provide a substitute for poor social networks by vetting and training workers for a specific job or industry and directly presenting and "certifying" job-ready applicants to employers.

(ii) Certification

The challenge of reducing assessment costs is more broadly being met by new certification programs. While mandated certifications have in some instances been used as a tool for excluding particular groups (especially minority and immigrant populations) from particular professions, appropriate certification acts as a clear signal to employers of workers' abilities, and allows job seekers to assess and signal their skills to firms, which is particularly important in an economy where a high school diploma no longer consistently signals basic literacy and numeracy skills[60]or "job-readiness" workplace skills.[61] There has been some progress in the development of standardized, affordable and accessible tools to assess basic academic and workplace skills. One prominent example is the ACT National Career Readiness Certificate (NCRC), which was designed to reflect research indicating that basic skills in reading, math and locating information[62] are highly important to the majority of jobs. Test takers are awarded levels of proficiency at a bronze, silver, gold or platinum level based on the combination of scores across tests, which are then matched against the skill requirements for 16,000 different jobs to identify appropriate matches.[63] In theory, if an employer were familiar with the system, he would know that a specific job in his firm requires a silver level of proficiency, for example, and could use an applicant's NCRC level as a signal of adequate basic skills. While a promising new tool, implementation rates and familiarity with the standards have progressed further in some states and regions than others.

[59] See Robert Weissbourd, "Into the Economic Mainstream," paper prepared for the Opportunity Finance Network and CFED, 2006.

[60] In 2003, the OECD surveyed adults in several OECD nations to directly measure literacy and numeracy skills. The survey in the United States questioned a random representative sample of 3,400 adults. Five levels were identified, with a level one score signifying very low-level skills. In the United States, 20 percent of adults scored at level one in both prose and document skills, and 26 percent scored at level one in numeracy skills. For comparison, in Canada the fractions at these levels were 14 percent and 19 percent. In Norway they were 7 percent and 10 percent. See "Learning a Living: First Results of the Adult Literacy and Life Skills Survey," *Organization for Economic Co-operation and Development*, 2005, 50. Available at: http://www.oecd.org/dataoecd/44/7/34867438.pdf.

[61] In the *2005 Skills Gap Survey* conducted by Deloitte Consulting and the National Association of Manufacturers, nearly half of responding employers reported that current employees have inadequate basic employability skills such as attendance, timeliness, and work ethic, and 36 percent indicated insufficient reading, writing and communication skills. See "2005 Skills Gap Report-A Survey of the American Manufacturing Workforce," report produced by Deloitte Consulting, National Association of Manufacturers, and the Manufacturing Institute.

[62] The "locating information" portion tests the skills people use when locating, synthesizing, and using information from workplace graphics such as charts, graphs, tables, forms, etc. For more information, see http://www.act.org/workkeys/assess/locate/.

[63] Each of the three NCRC tests cost participants $5 to take. For more information on the National Career Readiness Certificate, seehttp://www.act.org/certificate/.

Certification of industry-specific skills is increasingly being used for a variety of occupations.[64] However, the standards and tools to assess and signal abilities in industry-specific skills vary significantly between different industries and regions. Standards for industry-specific skills and qualifications range from very well-defined (e.g., requiring a license to practice) to those that are significantly less structured, without portable or comparable certifications or credentialing.[65] In addition to more efficiently signaling skills to employers, industry skill standards can help guide education and training institutions in efforts to align and coordinate programs among themselves and with the market, ultimately helping to increase the number of job seekers that possess relevant qualifications. To the extent that industry-specific skill standards are aligned with foundational skill standards, clear linkages can be formed between remedial, academic and occupational programs, providing a pipeline of qualified workers to participating industries.

Given the benefits of standardizing skill requirements, certain industries have already implemented certification programs at either the state or, more rarely, national level. For example, the National Association of Manufacturing is in the process of establishing and promoting a national skills certification system that uses the ACT National Career Readiness Certificate to certify basic academic and workplace skills, and builds on that foundation to certify skill sets aligned with the job requirements for hard-to-fill manufacturing jobs.[66] The goal of this effort is to create comparable and portable qualifications to decrease the transaction costs to workers and firms of developing, signaling and assessing required skill sets.

To the extent that certification is available for specific jobs or industries, it has been shown to improve labor market outcomes, particularly for those lacking a four-year college degree. Among students that do not attend four-year colleges, workers that receive industry certification earn significantly higher subsequent wages than peers with general associate's degrees or those who took courses in the humanities, especially if certified in high-growth industries.[67] Making

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[64] Nearly 1.5 million certificates or credentials were awarded in 2007, up more than 28 percent since 2002. In 2008, nearly one out of two (47 percent) of all undergraduates were enrolled in certificates or associates degree programs. See U.S. Department of Education, "Changes in Postsecondary Awards Below the Bachelor's Degree: 1997 to 2007," NCES 2010-167, November 2009.

[65] Certification and licensing may artificially restrict labor supply by increasing the barriers to entry in a profession, thereby raising wages. The concerns regarding artificial increases in wages are generally greater for licensing, for which it is illegal for any individual without a license to practice the profession, than for certification, in which individuals may choose to be certified and consumers or employers decide whether to hire a certified worker. For a review of the literature on these concerns, see Morris M. Kleiner (2000). "Occupational Licensing." *The Journal of Economic Perspectives*, 14 (4): 189-202.

[66] For more information, visit the National Association of Manufacturers website http://institute.nam.org/page/edu_workforce_skills_cert.

[67] Research using data from Florida indicates that for two-year college students that do not later transfer to four-year colleges, concentrating in health-related fields increases subsequent earnings by over 40 percent relative to students who take courses in the humanities, professional and voc-tech fields by more than 20 percent, and quantitative courses (STEM) by 13 percent, even after controlling for background characteristics. For four-year college graduates, degrees in STEM concentrations are the most lucrative. See Louis Jacobson and Christine Mokher, "Pathways to Boosting the Earnings of Low-Income students by Increasing Their Educational Attainment," prepared for the Bill & Melinda Gates Foundation by the Hudson Institute for Employment Policy and CNA Analysis and Solutions, 2009. Additionally, research using data from Washington State found that among older workers who returned to community college, male workers who took quantitative or industry-focused courses experienced a 10% increase in subsequent earnings, versus only 3 to 5 percent subsequent increased earnings for workers who took all other courses. See Louis Jacobson, Robert LaLonde and Daniel Sullivan, "The Impact of Community College

students and incumbent workers aware of the financial benefits of attaining qualifications can improve both individual outcomes in the form of increased wages, and regional outcomes in the form of improved labor productivity and decreased jobs-skills gaps.

(iii) Timely and accurate labor market information

A related, broader challenge underlying the efforts of all stakeholders interested in decreasing the transaction costs of matching is having access to accurate and timely labor market information to assess imbalances in regional labor supply and demand. Specific demand-driven training programs overcome this information challenge by directly consulting with local employers or industry associations about the skills needed for specific positions. At a regional level, however, a lack of access to labor market data makes it difficult for practitioners, policymakers and researchers to diagnose larger trends in jobs-skills gaps.[68] Additionally, to the extent that labor market information is available, it is often very difficult to analyze and interpret; statistics provided by the federal government span several different agencies and may include varying methods of coding data.[69] Without tools to facilitate access to and analysis of accurate and timely labor market information, practitioners and policymakers are challenged to determine which programs will be most effective at addressing jobs-skills gaps.

However, several innovative tools are being explored to improve access to real-time labor market data. For example, private and public providers of labor market information are employing a new "spidering" technology that "crawls" through Internet job postings and résumé banks for a region or metropolitan area, aggregating tailored real-time statistics on jobs-skills gaps in a particular area.[70] This technique has the advantage of providing information on "soft" or "noncognitive" skills mentioned in the ads, in addition to occupation- and geographic-specific skills data. Another emerging technique being employed by regional research organizations is "skillshed" analysis, for which researchers survey workers and employers within a given "laborshed" (or commuting area) to find out what qualifications employers really want and what skills workers currently possess or are willing to obtain.[71] Despite these promising early

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Retraining on Older Displaced Workers: Should We Teach Old Dogs New Tricks?" *Industrial & Labor Relations Review* 58(3) (2005), Article 5.

[68] Illustrative of persisting skills gaps, in a 2005 survey conducted by Deloitte Consulting, 90 percent of responding manufacturers reported a shortage of qualified workers for positions of varying skill levels, and 53 percent indicated that at least 10 percent of their total jobs were currently unfilled for this reason. In addition, nearly half of manufacturing firms surveyed reported having current employees with inadequate basic employability skills, such as attendance, timeliness and work ethic, and 46 percent reported inadequate problem-solving skills. See Phyllis Eisen, Jerry Jasinowski and Richard Kleinert, "2005 Skills Gap Report - A Survey of the American Manufacturing Workforce,"Deloitte Consulting, 2005.

[69] For a review of the role of the federal government in providing access to labor market information and the shortcomings of the current system, see Andrew Reamer, "Putting America to Work: The Essential Role of Federal Labor Market Statistics." *The Metropolitan Policy Program at Brookings*. October 2010. Available at http://www.brookings.edu/~/media/Files/rc/papers/2010/1029_labor_reamer/1029_labor_reamer.pdf.

[70] One example is the Help Wanted OnLine data series (HWOL) sponsored by the Conference Board, which was first developed in 2005. An important drawback to this technology is that a higher percentage of high-skilled job listings are posted online than low-skilled jobs, and this tool does not access data on jobs filled through unions. See: Robert Holm, Terri Lee Bergman and Heath Prince, "Innovations in Labor Market Intelligence: Meeting the New Requirements of Regional Workforce and Economic Development," Jobs for the Future, August 2010.

[71] For example, a collaboration of state research organizations in Iowa, Missouri, Indiana and Nebraska are conducting a skillshed analysis funded by the U.S. Department of Labor, intended in part to develop and refine a

innovations, access to this type of data varies significantly among practitioners, as does having the appropriate resources to effectively analyze it.

c. Promote an opportunity-rich economy

Recent political and policy discussions have suggested that "opportunity-rich" economies – those that enable upward mobility[72] and support a strong middle class – will be the ones that grow and prosper the most in the post-recession U.S. economy.[73] While still a new topic that has yet to be fully explored, there are several lines of economic and political reasoning that underscore the importance of promoting these characteristics in regional economies.

At the most basic level, a labor market that allows for meritocratic economic mobility – either upward or downward – will best match workers to jobs that fully leverage their skills, helping to maximize labor productivity.[74] Barriers to full deployment of workers' human capital through employment and subsequent upward mobility, on the other hand, may result in wasted economic assets by underutilizing human capital. Opportunities for professional and economic advancement also help alleviate concentrated poverty, which research indicates negatively impact long-term regional economic outcomes.[75]

In addition to these direct economic implications, mobility also plays a critical role in helping create and foster a strong middle class. A vibrant middle class positively impacts long-term

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methodology and framework for analyzing the skills present and needed in particular regional economies. Iowa Workforce Development press release from February 24, 2010 found at the following link: http://www.iowaworkforce.org/news/2010/02242010.pdf.

[72] Recent research suggests that contrary to popular perception, the United States exhibits less intergenerational income mobility than other OECD countries such as Denmark, Norway, Finland, Canada, Sweden, and Germany, to name a few, as measured by how predictive a parents' income levels are of their child's income levels. About half of the difference in income between families in one generation persists into the next. In the U.S., 42 percent of children born to parents in the bottom fifth of the income distribution remain in the bottom, while 39 percent born to parents in the top fifth remain at the top. See Isabel Sawhill and John E. Morton, "Economic Mobility: Is the American Dream Alive and Well?" Report from the Economic Mobility Project of the Brookings Institution, 2008; and Julia Isaacs, Isabel Sawhill and Ron Haskins, "Getting Ahead or Losing Ground: Economic Mobility in America," report for the Economic Mobility Project of the Brookings Institution, 2007.

[73] See Summers, "Rescuing and Rebuilding the U.S. Economy: A Progress Report;" "Remarks by the President in the State of the Union Address;" Katz, "The Next Economy: Transforming Energy and Infrastructure Investment"; and "Strengthening the American Labor Force" in *The Economic Report of the President*.

[74] See Ben Bernanke "The Level and Distribution of Economic Well-Being," speech given on February 6, 2007 before the Greater Omaha Chamber of Commerce, Omaha, Nebraska. Available at: http://www.federalreserve.gov/newsevents/speech/bernanke20070206a.htm.

[75] SauravDevBhatta, "Are Inequality and Poverty Harmful for Economic Growth: Evidence from the Metropolitan Areas of the United States," *Journal of Urban Affairs* 23(3-4) (2001): 335-359 (initial poverty rate in 1980 has a statistically significant negative effect on economic growth in U.S. MSAs between 1980 and 1990); Ramaprasad Rajaram, "Poverty, Income Inequality and Economic Growth in U.S. Counties: A Spatial Analysis," Department of Economics at the University of Georgia, 2009 (counties with a higher initial level of poverty in 1979 experienced slower economic growth between 1979 and 1999). See also findings and discussion in Weissbourd, *The Changing Dynamics of Urban America* (CEOs for Cities 2004).

regional economic growth,[76] in part by generating demand for consumption of goods and services.[77]

To increase opportunities for labor mobility,[78] some regions have begun implementing innovative "career pathway" programs that seek to provide incumbent workers and jobseekers with the necessary training and credentials to secure higher-skilled and better-paying jobs in regional industry or occupational clusters.[79] "Career pathways" align existing resources across education, workforce development and social service sectors—adding new services where gaps may emerge—to form a clearly defined series of steps for workers to advance from basic or remedial education to entry-level positions and beyond. Education and training requirements are coordinated with industry standards, including any necessary certification, credentials or licensing, so that each step leads to successively higher levels of employment in the targeted sector. By providing workers with detailed information on how to attain the skills necessary for higher paying jobs, while simultaneously offering financial and other supports during participation, "career pathways" enable workers to gradually advance in the labor market over time.

For many low-income workers, undergoing extensive training presents both financial and scheduling challenges. It is likely in these cases that workers do not have the financial means necessary to stop working while furthering their education, especially in the case of sole wage earners or caregivers of families. As a result, many "career pathway" programs offer additional supports for enrollees, including child care, financial aid and career assessment and counseling. Additionally, courses are intentionally scheduled at convenient times and locations for working adults, even at the workplace itself.

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[76] Using 1960-2000 state-level data, Partridge (2005) finds that having a vibrant middle class (i.e., middle-class income share) in 1960 increased states' economic growth in the long run. Mark Partridge, "Does Income Distribution Affect U.S. State Economic Growth?" *Journal of Regional Science* 45(2) (2005): 363-394.

[77] See Homi Kharas and Geoffrey Gertz, *The New Global Middle Class: A Cross-Over from West to East* (Washington, DC: Wolfensen Center for Development at the Brookings Institution, *Brookings Institution Press*, 2010). It has also been argued that the middle class is good for economic growth because it is a political voting block that favors pro-growth reforms, improved infrastructure and investment in the education system. See William Easterly, "The Middle Class Consensus and Economic Development," *Journal of Economic Growth* 6(4) (2001): 317-335; and Alberto Alesina and DaniRodrick, "Distributive Politics and Economic Growth," *The Quarterly Journal of Economics* 109(2)(1994): 465-490.

[78] There is some debate among practitioners, researchers, and policymakers about whether workforce development training and other policies or programs intended to increase labor mobility should focus on individuals that are the hardest to employ (e.g. high school dropouts) or incumbent and emerging workers that already possess basic foundational "job-readiness" skills or even work experience but simply need retraining on the margin to meet industry-specific labor demands. Both strategies align with the economic priority of increasing the skills of the workforce, though it is important to distinguish strategies whose primary purpose to assist particularly challenged workers from those whose primary purpose is economic growth through generating and deploying the highest skilled workers. This section includes recommendations that address both types of strategies (for example, career pathways typically begin with offerings for remedial courses and include steps all the way through industry licensing or certification).

[79] See Davis Jenkins, *Career Pathways: Aligning Public Resources to Support Individual and Regional Economic Advancement in the Knowledge Economy* (New York: Workforce Strategy Center, 2006); and Davis Jenkins and Christopher Spence, *The Career Pathways How-To Guide* (New York: Workforce Strategy Center, 2006).

In the case of a few innovative "career pathway" programs, practitioners partner with employers and educational institutions to integrate coursework leading to academic credit and industry-recognized credentials directly into the work setting.[80] In work-based learning programs, academic and occupational training is incorporated into the incumbent worker's daily job tasks and responsibilities. Partnering educational institutions appoint workplace supervisors or job coaches as adjunct faculty to help direct work-based learning curricula, assess student-worker competencies and provide evaluation and feedback.[81] Programs are designed by each institution and tailored to its unique needs, so depending on the program, completion may lead to certification, eligibility for wage increases, promotions based on competency assessments or a combination of these. This arrangement allows a student to gain skills and credentials while maintaining their full-time job, and saves valuable time that would have been spent commuting to a college campus.

Work-based learning to date has seen particularly widespread implementation in the health industry,[82] in which frontline workers frequently earn low wages despite persisting vacancies in higher-skilled positions within the same hospital or clinic. For example, as part of the *Jobs to Careers* program, which partners with 17 health institutions across the country, entry-level healthcare workers such as nurse assistants, receptionists and medical records staff are trained for a host of different positions depending on the institution's particular needs, ranging from auxiliary medical interpreters to certified addiction counselors to registered nurses.[83] This arrangement represents a "mutual gains" model, in which workers benefit from increased skills and wages and employers have access to a supply of qualified candidates to fill high-demand jobs.

Necessarily, LMIs or practitioners that design "career pathway" programs typically form close relationships with specific firms or industries. In order to implement effective programs, LMIs frequently need to leverage those relationships to convince employers to change hiring and advancement practices, to better reflect "career ladders." These attempts to change job structures and definitions within organizations represent a demand-side approach to improving worker mobility, and are at least equally based on benefits to the employers.[84] LMIs contend that

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[80] See Randall Wilson, Kristina Cowan, Ed Phippen and Rebecca Star, *A Primer for Work-Based Learning: How to Make a Job the Basis for a College Education* (Boston: Robert Wood Johnson Foundation, The Hitachi Foundation, and Jobs for the Future, 2008). See also Jeff Landis, "Work-Based Learning Model Helps Community Health Centers 'Grow their Own Workforce': Training Frontline Workers is Focus of the National Jobs to Careers Initiative," press release, August 11, 2010. Available at: http://jobs2careers.org/press_release.php?id=82.

[81] O. Quimby and Kimberly Rogers, *Community Colleges Get to Work Adopting Work-Based Learning in Partnership with Health Care Employers* (Boston: Robert Wood Johnson Foundation, The Hitachi Foundation, and Jobs for the Future, 2010).

[82] Formal internship and apprenticeship programs for new hires are also gaining ground in the health care industry. "Innovation Strategies for a New System of Workforce Development and Lifelong Learning: The Challenges of Today and the Vision for Tomorrow," Council for Adult and Experiential Learning for Innovation Network for Communities, November 2008: 5-6.

[83] See O. Quimby and Kimberly Rogers, *Community Colleges Get to Work Adopting Work-Based Learning in Partnership with Health Care Employers* (Boston: Robert Wood Johnson Foundation, The Hitachi Foundation, and Jobs for the Future, 2010); and Nancy Paul, "Cultivating our own resources," *The Herald News*, August 6, 2010. Available at: http://www.heraldnews.com/opinions/letters_to_the_editor/x588239074/GUEST-OPINION-Cultivating-our-own-resources.

[84] See Paul Osterman, "Improving Job Quality: Policies Aimed at the Demand Side of the Low-Wage Labor Market," in *A Future of Good Jobs? America's Challenge in the Global Economy*, T.J. Bartik and S. Houseman,

partnering with them to alter hiring and advancement practices will reduce turnover rates, which decreases employers' costs of recruiting, and provide a sustained flow of skilled incoming workers for persistently hard-to-fill positions. In some cases, LMIs organize several employers to collectively fund training solutions, achieving economies of scale for programs that individual firms could not afford to design or fund alone.[85] The resulting improvements in industry practices can help promote long-term options for worker mobility and advancement in regional industries and firms.[86]

Mobility and a strong middle class require that there be a "middle." As a result, the goal of an "opportunity-rich" economy equally entails preservation and creation of more middle-skill and middle-wage jobs,[87] reflecting concerns that many of these jobs, such as in manufacturing, have been "off-shoring." Job creation strategies, such as through clusters and innovation, are addressed in other chapters.

The notion that becoming "opportunity-rich" is important to economic growth deserves attention, but a great deal more work is necessary to understand how to get there, and perhaps even what it precisely means. It seems an area in which practitioners are often ahead of policy and research, and that offers key opportunities for further research and product development, and ultimately for new strategies to strengthen regional economies.

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eds. (Kalamazoo: W.E. Upjohn Institute for Employment Research, 2008), 203-244; Annette Bernhardt, Manuel Pastor, Eric Hatton and Sarah Zimmerman, "Moving the Demand Side: Intermediaries in a Changing Labor Market," in *Proceedings of the 53rd Annual Meeting of the Industrial Relations Research Association*, ed. Voos P. (Champaign, IL: Industrial Relations Research Association: 2001); Whitney Smith, *Investing, Improving, and Measuring Workplace Skills* (Chicago: Chicago Jobs Council, 2003, commissioned for the Workplace Learning Conference hosted by the Institute for Work and the Economy).

[85] See Annette Bernhardt, Laura Dresser and Joel Rogers, "Taking the High Road in Milwaukee: The Wisconsin Regional Training Partnership," *Working USA* 5(3) (2004): 109-130.

[86] For example, The Boston SkillWorks program convinced hospitals to change the entry-level position of "Patient Care Technician" to a three-tiered job ladder of increasing responsibility and wages. Prior to this change, workers would have needed to obtain an associate's degree in order to advance into a higher-skilled position within the hospital. Recognizing that having to return to school to obtain a formal degree functioned as a barrier for many entry-level workers to advance within the organization, Boston SkillWorks collaborated with hospitals to form Patient Care I, II and III positions of increasing responsibility. In some cases, they also convinced employers to provide tuition assistance to enable workers to undergo additional training as they moved up the ladder. This kind of structural change within organizations can promote career mobility for workers on a larger scale than just for those enrolled in a specific program and lasts beyond the lifespan of a particular LMI or training program. See Paul Osterman, "Improving Job Quality: Policies Aimed at the Demand Side of the Low-Wage Labor Market," in *A Future of Good Jobs? America's Challenge in the Global Economy,* T.J. Bartik and S. Houseman, eds. (Kalamazoo: W.E. Upjohn Institute for Employment Research, 2008).

[87] Note that "middle wage" (or middle class) and "middle-skill" jobs no longer equate, raising complex issues beyond the scope of this paper. While middle-skill jobs (i.e., those requiring some postsecondary training but not necessarily a four-year college degree) continue to comprise a greater portion of all jobs in the national economy, wages in the middle of the income distribution (i.e., middle-wage jobs) have stagnated over the last 30 years, posing a question as to whether supporting a "middle class" means ensuring access to middle-skill jobs (on the rise) or middle-wage jobs (on the fall) – or whether efforts need to be focused on assuring that middle skill jobs once again are paid middle wages. See Harry J. Holzer and Robert I. Lerman, "The Future of Middle-Skill Jobs," CCF Brief #41, Brookings Institution Center on Children and Families, 2009; "Preparing the Workers of Today for the Jobs of Tomorrow," Executive Office of the President, Council of Economic Advisers, 2009, available at http://www.whitehouse.gov/assets/documents/Jobs_of_the_Future.pdf; and David Autor, "The Polarization of Job Opportunities in the U.S. Labor Market: Implications for Employment and Earnings," Center for American Progress and The Hamilton Project, 2010.

C. Recommendations for Future Applied Research and Product Development

Effectively developing and deploying human capital into the regional economy is a complex process that goes well beyond simply increasing the number of individuals with formal degrees. Deployment entails enabling human capital production to be more demand driven; increasing mobility, opportunity and efficiency within labor markets; and creating the jobs and amenities which will result in human capital attraction and retention. Practitioners and policymakers within the education, workforce development and economic development fields require tools that systematically identify, develop, assess and help signal the wide-ranging kinds of human capital relevant to employers on a regional scale. Some potential avenues for further applied research and product development are outlined below.

1. Applied Research[88]

- Much more nuanced work would be helpful on the iterative processes through which firms and human capital attract each other, and (similarly and interconnected) through which firms and human capital create demand for amenities which in turn help attract more firms and workers. Research (and analytic products) are needed which would help practitioners better understand the staging or sequencing of these factors in the particular circumstances of their regions, including relative to specific clusters, in order to determine the relative importance at any given moment and place of focusing on expansion of firms, specific human capital production and development of amenities.
- Better data and research is needed for practitioners to evaluate the extent to which human capital in a region is under-deployed – by which we mean qualified labor which is not employed to maximize its value in existing jobs. (If a trained engineer is working as a cashier because no engineering jobs are available, that presents a different, labor force demand-side, issue.) Of particular interest, from an equity perspective, is the extent to which the human capital of lower-income and minority workers is not being recognized by employers, resulting in particularly acute under-deployment among certain populations. To the extent qualified labor is not being well matched to employers seeking their skills, it points to the need to focus on the strategies which improve labor market efficiency.
- Creating an "opportunity-rich" economy entails preserving middle-skill and middle-wage jobs. Further research is needed to better understand the relationship between middle-skill jobs and middle-wage jobs (e.g., whether middle-skill jobs are remaining and it is just that the wages are dropping, or the nature of the "middle skills" is changing, or the jobs are just disappearing); what accounts for the drop in either or both (e.g., off-shoring? shifts in employer-employee negotiating power?); and what can be done about it.
- Similarly, career ladders are disappearing (perhaps due to mergers, cost-cutting, restructuring, out-sourcing, etc.): further research is needed to understand why and what can be done to increase vertical mobility in the labor force (also entailing product development, such as tax credits which incent employers to invest in retention and training).

[88] Note that we have considered the basic human capital production systems – pre-K through 12, colleges, training programs, etc. – largely beyond the scope of this project, and so are not including here the very necessary research on issues like charter schools or drop-out rates.

2. Product Development[89]

- Understanding the region's present and anticipated human capital needs presents a fundamental challenge for human capital production practitioners wishing to become more demand driven. This entails working more closely with employers and cluster strategies, but also might benefit from better data and analytic products for assessing current and emerging demand. This might include new services and technologies (such as the "spider" example discussed above) for continually evaluating job postings and their associated skill levels; standardization and streamlining of methodologies across currently disparate data sets; and/or increased user-friendliness of analytic tools, improving the intuitiveness of the format in which results are displayed and ease of use by practitioners.
- The very promising certification and credentialing programs need to be expanded to other areas and coordinated. This includes certification programs to better measure "soft" skills; certification programs tailored to the skills (often not learned in or reflected in degrees from formal educational institutions) needed in specific high-demand industries, especially creating credentials that are portable among employers within the same industry; and coordinating certification programs to create skill level hierarchies (e.g., ranging from basic employability skills, social and "job readiness" skills to industry-specific or technical skills) that enhance mobility along career ladders.
- Support is needed to further design standardized curricula and materials that enhance and promote use of demand-driven, work-based learning programs, particularly to broaden adoption for entire industry segments rather than just individual firms. Similarly, support is needed for organizations that work with industries on a larger scale to implement training programs that achieve economies of scale, allowing a group of employers to fund training that individual firms would not be able to afford alone.
- With increasing mobility of workers and firms, less established "career ladders" and more frequent need for skills upgrading and retraining, the exchange functions in labor markets become particularly important and challenged. New workforce intermediaries that better serve both employers and employees, reduce finding and measurement costs in qualifying and connecting the workforce to jobs and create an entry and delivery point for related services (including perhaps even portable pension accounts and continuing education vouchers) should be explored.
- The field needs to find ways to enable more investment in human capital and more portable, continuing benefits for that investment.[90] Possibilities include creating a more equity-like financial instrument to invest in human capital, one that is more subsidized and longer term than current student loans; developing Adult Learning Accounts; and universal voucher systems.

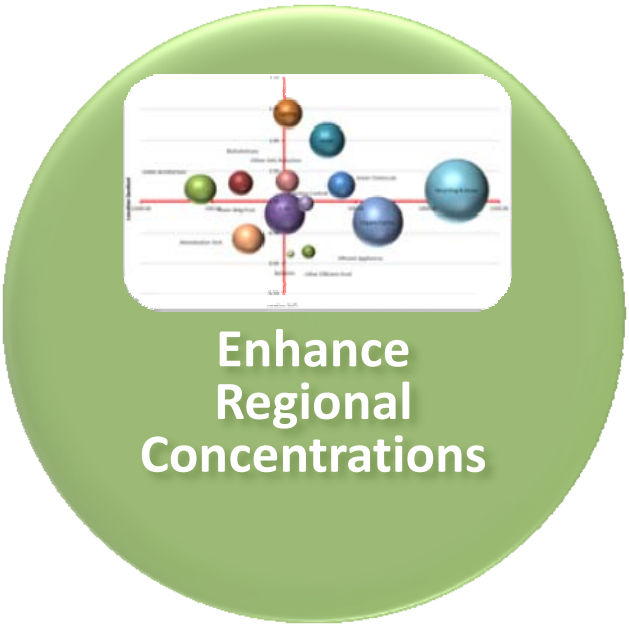
[89] Note that we have considered the basic human capital production systems – pre-K through 12, colleges, training programs, etc. – largely beyond the scope of this project, and so are not including here the very necessary research on issues like charter schools or drop-out rates.

[90] Human capital production markets offer special challenges. The producer (educator, trainer, employer providing on the job training) does not own the product (the higher-skilled employee), who can walk out the door any time. As a result of these externalities and barriers, it is likely that individuals and firms underinvest in human capital.

- Human capital lives, and initially is primarily produced, in neighborhoods. Most of these R&D strategies to improve the preparation, access and mobility of human capital – to increase development and deployment of underutilized human capital assets – need to be designed to build upon and inform the many neighborhood-based human capital development activities.

CHAPTER IV

Clusters and Cluster-Based Development



***Note**: This is one of eight papers – an executive summary, six papers on specific aspects of regional economies and an appendix – generated by the "Implementing Regionalism" project, funded by the Surdna Foundation and undertaken by the George Washington University Institute of Public Policy and RW Ventures, LLC. Please see [insert web link] for the complete set of materials developed by the project.*

CHAPTER IV: CLUSTERS AND CLUSTER-BASED DEVELOPMENT[1]

A. Definition and Significance

1. Definition

Porter (1998), who is the most frequently cited advocate and analyst of cluster policy, defines clusters as "geographic concentrations of interconnected companies and institutions in a particular field, linked by commonalities and complementarities." However, Porter's definition is only one of many in the literature. The meaning of "cluster" is somewhat ambiguous, and the term is often used in different ways by different authors. Despite the widespread use of cluster analysis and strategies, the actual meaning of the term is somewhat imprecise and ambiguous. Indeed, Martin and Sunley (2003, p. 16), in a highly critical article argue that the cluster concept "has acquired such a variety of uses, connotations and meanings that it has, in many respects, become a 'chaotic concept'." Indeed, they list ten different definitions of cluster that they found in their review of the literature (p. 12).

In our review of the literature, we found a wide variety of conceptualizations of clusters, some of which focused entirely on inter-firm relationships and some of which included much broader links:

- Krugman (1991): New economic geography; clusters as co-location decisions of firms due to increasing returns to scale, lower costs of moving goods across space, etc.
- Rosenfeld (2005): clusters "are simply geographic concentrations of interrelated companies and institutions of sufficient scale to generate externalities."
- Cortright (2006): "An industry cluster is a group of firms and related economic actors and institutions, that are located near one another and that draw productive advantage from their mutual proximity and connections."
- Glaeser and Gottlieb (2009): "People cluster in cities to be close to something. At their heart, agglomeration economies are simply reductions in transport costs for goods, people and ideas" (p. 1005).
- Marshall (1890): Clusters as external economies created by labor market pooling and the benefits of moving people across firms, supplier specialization, knowledge spillovers.
- Porter (1998): "Geographic concentrations of interconnected companies and institutions in a particular field, linked by commonalities and complementarities." Clusters include: linked industries and other entities (suppliers), distribution channels and customers (demand) and related institutions (research organization, universities, training entities, etc.) (see also Porter (2000), p. 254 for definition).

[1] The lead authors of this chapter are Hal Wolman and Diana Hincapie.

- Saxenian (1994): Clusters as social and institutional phenomena: technological change, organizations, social networks and other non-market relationship in which markets are embedded; organization within and between businesses, relationship among firms.
- Hill and Brennan (2000, p. 67-8): "We define a competitive industrial cluster as a geographic concentration of competitive firms or establishments in the same industry that either have close buy-sell relationships with other industries in the region, or share a specialized labor pool that provides firms with a competitive advantage over the same industry in other places."

Nonetheless, there is a common core to the concept. In an attempt to capture the broad meaning of the term (at the expense of brevity) and drawing upon definitions of Michael Porter, Joseph Cortright and others, we define clusters to

> consist of firms in a geographic region producing similar or related products, utilizing similar processes, or engaging in similar functions (headquarters; R&D), the regional suppliers and customers of these firms, workers with specialized labor skills (occupations) whom firms in the region wish to employ (and customized training, e.g., by community colleges, that provides such skills), and institutions (e.g., universities, community colleges, industry and trade associations, public- and private-sector organizations) which provide services to cluster members whose presence or *interaction*, to the extent it exists (i.e., the extent of interaction is an empirical question), results in cost-savings to firms and/or knowledge spillovers that produce cost savings and/or product or process innovations.[2]

2. Implications of Definition

What are the implications of our definition? An obvious first question is whether clusters are simply a new and somewhat more accessible term for agglomerations and whether the benefits of clusters are what urban and regional economists have long termed "agglomeration economies." Cumber and MacKinnon (2004, p. 960) ask, for example, "What is the added value of the cluster approach to existing theories of agglomeration?" It seems clear that our definition – and that of most, but not all, others – incorporates traditional agglomeration economies. But are clusters more than that? Drawing upon Gordon and McCann (2000, p. 515ff), there are really two different forms of clustering, each coming from different traditions and operating in somewhat different ways.

The first is what they term "pure economies of agglomeration." Agglomeration economies result from firms locating in geographic proximity to each other. The cost savings that result from lower input costs and increased productivity are external benefits to firms that come about through their proximity to one another. Gordon and McCann (2000) note agglomeration economies neither presume nor require any cooperation among actors. "The fundamental point here," they argue (p. 517), "is that a variety of mechanisms by which the external economies are achieved…operate simultaneously, often indirectly, and cumulatively."

[2] Note: the extent of cost-savings and product or process innovations is an empirical question.

The second is the "social network model" of clustering. While Gordon and McCann (2000) assert that this model arises primarily from the sociological literature on institutions, the concept, captured in the term "knowledge spillover" or MAR externalities, named after the three economists most responsible for contributing to the concept (Marshall-Arrow-Romer), is also clearly present in the agglomeration economy literature. In this model informal networks of individuals *across* firms (and also across other related institutions such as trade associations, universities, research institutes, and labor organizations) result in the transmission of tacit knowledge that leads to innovation, adoption of advanced and improved techniques related to production processes, marketing, research, etc. These networks are based on interpersonal relations and trust and are said to embody social capital that is embedded in them.[3] Gordon and McCann note:

> There is nothing inherently spatial about the social-network model although it has explicit spatial applications. This is because social networks are a form of durable social capital, created (and maintained) through a combination of social history and ongoing collective action. In this sense, their strength is inherently problematic, depending upon a prior accumulation of trust, circumstances which facilitate monitoring of others' behavior, a source of leadership and/or a sense of common interest…Many of these pre-conditions are made possible by propinquity, particularly where economic relations have historically been more localized and/or there is a distinctive local economic base and cultural or personal links among key actors (p. 520).

Given the overlap between social networks and MAR externalities the difference between "clusters" and what are traditionally thought of as agglomeration economies appears rather small. In light of the above discussion, we conclude that neither the concept of clusters nor our definition is "new." Nonetheless, as this chapter argues, we believe clusters provide a useful framework for thinking about the production side of the economy and how to grow it.

A second implication is that all regions have clusters, but not all clusters produce high growth. Indeed, if a region has a cluster consisting of industries the demand for whose products is low and/or declining or whose production processes emphasize low-skilled labor, the contribution to regional economic growth is likely to be small, no matter what other institutions are connected to it.

A third implication is that even within a cluster consisting of the same components (industries, research facilities, educational and training institutes, etc.), a cluster in one region may be more effective than the same cluster in another area at producing economic growth. "The benefits realized from geographical clustering appear to be specific to certain industries at certain stages of development in certain places, and are only realized under particular conditions" (Glasmeir, 2000, as cited in Martin and Sunley, 2003, p. 22). Some of the differences may, of course, be due to inherent differences in the economies of the different regions. Some may be due to clusters that are in different stages of the product cycle for output that is at the core of the cluster.

[3] It should also be noted that the existence of networks does not necessarily enhance the performance of clusters. For example, certain kinds of highly embedded social networks may actually retard innovation and growth. Porter notes (2000, p. 252**)** that "when a cluster shares a uniform approach to competing, a sort of groupthink often reinforces old behaviors, suppresses new ideas, and creates rigidities that prevent the adoption of improvements."

But some may be due to the quality of the clusters: the interaction of cluster members, the way in which clusters are organized or embedded in institution and area cultures.

As Porter notes (2000), "the mere presence of firms, suppliers, and institutions in a location creates the potential for economic value, but it does not necessarily ensure the realization of this potential...Many of the competitive advantage of clusters depend on the free flow of information, the discovery of value-adding exchanges or transactions, the willingness to align agendas and to work across organizations, and strong motivations for improvement"(p. 264).
For example, certain kinds of highly embedded social networks may actually retard innovation and growth. Porter notes (p. 252) that "when a cluster shares a uniform approach to competing, a sort of groupthink often reinforces old behaviors, suppresses new ideas and creates rigidities that prevent the adoption of improvements." Gordon and McCann (2000, p. 521) cite Granovetter (1973) whose research showed that networks with weak ties, "characterized by pluralistic and open-ended network building strategies in which actors cultivate more extensive sets of links" are more likely to produce innovation than strong and tight ties among a smaller number of like-minded people.

The obvious question is the implication for policy and practice: whether and how clusters can be shaped through public policy to be more effective? We return to this question in Section F.
A fourth implication relates to scale: what is meant by geographic proximity or co-location. Do some types of clusters require only clustering at the regional level? Do some types require closer clustering at a sub-regional level, and, if so, must they be centralized in a downtown location or can they also be effective if at a suburban node? (In this chapter on clusters, we will consider only business-business related clusters in terms of whether and where sub-regional locations might be relevant. Other types of spatial relationships (e.g., business to worker) are discussed in Chapter VI on spatial efficiency.) The forms of clusters that require face-to-face contact and personal interaction have historically implied geographic proximity at a relatively circumscribed sub-regional level, e.g., the downtown core city area. One question is the extent to which the telecommunications revolution has eroded the need for proximity at a sub-regional level in favor of clusters more widely dispersed across the region. Other forms of clusters, such as the agglomeration economies resulting from the pooling of labor with a wide variety of skills and experience clearly accrue at the labor market (regional) level.

3. Significance for Economic Growth

Cluster theory and its application and cluster-based economic development policy have been in the forefront of regional economic development theory and practice during the past decade. Cluster theory suggests that firms that are part of a geographically defined cluster benefit from being a part of that cluster and that these benefits result in growth in economic output for the region. These benefits accrue as a result of co-location or geographic proximity that, in turn, creates lower input costs for firms through agglomeration economies and facilitates knowledge spillovers that produce innovation and increased productivity. Consequently, firms in clusters

that generate these benefits will be more competitive,[4] and regions with effective clusters will experience greater growth.

While cluster theory and application are widely accepted, to what extent has empirical research supported the positive effect of clusters on economic growth that the theoretical propositions discussed above suggest? Relatively little literature is directed at testing the effects of clusters in terms of the broad, cross-cutting way that we (along with Porter, Cortright and others) define them. There has been a very substantial research literature directed at agglomeration economies, which are, as we have noted, at the core of the cluster concept. Most of this literature is directed at whether cities/regions that are larger or more dense have better economic performance, which would imply that firms operating in these areas are taking advantage of the agglomerations provided in these areas (though it is sometimes pointed out that may also be possible that more productive and profitable firms choose to locate in large urban regions). Some literature is focused on why agglomerations occur, i.e., why do cities grow.

The empirical literature consists of two quite different strands: econometric studies where growth = a + b (measure of clusters) + c (other control variables) and intensive case studies of clusters in one or two locations.

The former literature consists mainly of studies that attempt to explain the growth in aggregate regional output, personal income, wages or employment by using variables that theory and the empirical literature have identified as determinants of growth. Examples of possible explanatory variables employed include measures of physical capital, human capital, labor market performance or labor force characteristics and geographical characteristics. These serve as control variables to which an independent variable is added as a measure for the extent of clustering or of agglomeration economies. The variable added to measure cluster or agglomeration differs substantially depending on the particular aspect of clustering or agglomeration economies that each paper wants to test, and in many cases these variables bear little relationship to the concept of clustering as we have defined it. (See Appendix 1 to this chapter for a discussion of the kinds of measures that have been used.)

Many of the studies use some measure of industrial concentration (e.g., location quotients[5] or a Herfindahl index[6]). However, as Porter observes, if parts of a cluster fall within a different traditional industrial or service category (as his own conceptual definition suggests is likely to be the case), then a real cluster may be obscured or even go unrecognized. Cluster boundaries rarely conform to standard industrial classifications systems, which fail to capture many important actors in competition as well as linkages across industries. Indeed, as Cortright notes clusters conceptually are likely to *cut across* industrial classifications. The binary classifications of industries (for example, and industry is either high technology or it isn't) implies that there is great homogeneity among these firms "Classifications are imperfect means of describing the

[4] However, causality may not be clear. Clusters might make firms more productive and thus more competitive, but more productive and competitive firms might come together to form a cluster. See, for example, Duranton (2009, p. 32).
[5] Location quotient is the ratio of the percentage employment in a particular sector in the regional economy to the percentage of employment in that sector in the national economy.
[6] A Herfindahl index is an index of diversity (or concentration).

activities of diverse and quickly changing enterprises" (Cortright & Mayer, 2001, p. 3). Porter, as noted above, responds to this problem by trying to identify industrial sectors that are highly correlated with one another as constituting clusters.

Thus, the empirical evidence is difficult to interpret, both because researchers do not always use the same conceptual definition of clusters and because the operational definitions – i.e., the way in which clusters are measured – vary enormously. As a result findings may differ substantially because researchers are examining different things but calling them all clusters.

There are several literature reviews of the econometric literature, and there is broad agreement that the agglomeration component of the cluster concept has positive effects on various measures of regional economic performance.[7] For example, after reviewing the literature, Glaeser and Gottlieb (2009) conclude that:

> There is abundant evidence that manufacturing firms choose location to reduce transport costs, but this does not seem to be an important part of urban comparative advantage today…Numerous researchers have argued that dense agglomerations provide labor market pooling so that workers can move from less productive to more productive firms, yet the empirical evidence supporting this claim is still modest…The largest body of evidence supports the view that cities succeed by spurring the transfer of information. Skilled industries are more likely to locate in urban areas and skills predict urban success. Workers have steeper age-earning profiles in cities and city-level human capital strongly predicts income (p. 1023).

At the international level, the OECD (2008) analyzed the determinants of economic growth in the OECD economies. In their model, agglomerations economies were captured by a specialization index for each of the sectors (proportion of employment in the sector weighted by the relative size of the sector). They found that agglomeration economies are partly responsible for regional growth.

Duranton (2009, p. 31ff) cite Rosenthal and Strange to summarize the findings from the empirical literature: "The range of estimates for the mean elasticity for labor productivity to local industry employment is between 2 and 10% with a midpoint around 4 or 5%" (p. 31). In other words, doubling specialization in an activity and area is associated with an increase in productivity of approximately 4%, although the numbers can be lower or higher depending on the industry. He concludes that there are positive effects of clustering, but the literature also strongly suggest that it takes extremely large increase in specialization to get more than marginal effects on local productivity and wages.

Duranton (2009, p. 31-32) argues that the effects estimated in the literature are very modest, and that even these modest effects may exaggerate the true causal benefits of clustering on productivity. First, many studies do not estimate a "pure" effect of clustering (i.e., where clustering is defined as an increase in specialization keeping total employment constant), but the effect of an increase in the size of the industry of employment on total employment, keeping employment in all other industries constant. This procedure conflates the effect of increased

[7] Behrens et al. (2010), however, note that income inequality also rises with regional size.

clustering with the effect of being in an area with more employment overall (since increasing the size of one industry keeping all other industries equal means an overall increase in employment). Second, most studies fail to control for possible reverse causation or simultaneity, e.g., the possibility that clustering may not lead to high local productivity and wages, but instead that high local productivity and wages may lead to clustering. If causation in the latter direction, then most results from the literature would be biased, exaggerating the magnitude of clustering effects. Finally, the authors are concerned that the skills of workers need to be properly controlled for in the estimation of localization effects: if better workers in the industry work in a larger cluster, then the estimates in the literature might be biased upwards again.

Another type of studies tries to tests whether localization economies of agglomeration or urbanization economies of agglomeration will produce greater growth. These studies provide support for the existence of agglomeration economies in general, since they nearly all find some effects of agglomeration, whether through localization (which is closer to our own conception of clustering) or urbanization economies or both, on economic outcomes.

A closely related research literature examines whether diverse urban environments or more concentrated ones, usually measured by the degree of industry concentration, are more likely to lead to economic growth and innovation. A high degree of industry concentration indicates strong clusters and the presence of localization economies, while industrial diversity is seen as evidence of broader urbanization economies and, is less consistent with clusters as a driver of growth. Thus some researchers argue that a positive relationship between industrial concentration and growth is evidence of the importance of clusters, while evidence of a relationship between diversification and growth indicates clusters are less important. Jacobs (1969) argues, for example, that more diverse cities will grow faster than concentrated cities. New ideas are formed by combining older ideas. Cities allow for the mixing of many different industries and occupations; ideas from different areas get combined and growth occurs. So, more diverse cities will tend to grow faster than concentrated cities (as referenced by Glaeser, 2000).

Rosenthal and Strange (2004, p. 2132-36), Feldman (2000, p. 303) and Cortright (2006, p. 39-42) review these studies and find mixed results. Rosenthal and Strange, (2004, p. 2135-2136) observe that in many of the studies specialization (measured through some measure of industry concentration) is not related to employment growth, births, etc. while diversification is. But in a large region an industry could have a large enough presence even though it represented only a small percentage of total employment, to still garner localization economies in a diversified economy. In other words, it may be absolute size of a sector rather than the relative degree of concentration of the sector in the economy that matters.

The above studies are mostly concerned with the agglomeration economy component of the cluster concept, although in some cases this also incorporates the knowledge spillover (MAR) concept. However, the knowledge spillover, networking component of the concept is not directly tested in these studies.

Baptista and Swann (1998) analyzed the relationship between industrial clusters or regions and innovation in the UK. In this study, the authors regress the number of innovations introduced by

each company in each time period (INNOVit) on regional employment in the firm's own industry, regional employment in other industries, the firms' market shares, industry concentration and industry fixed effects. The different models show a significant and moderately positive effect of own sector employment on the probability that a firm would innovate. Therefore firms located in clusters that are strong in their own industry are considerably more likely to innovate. In general, the results of this paper suggest that innovation, entry and growth tend to be stronger in clusters. One way in which clusters can affect economic growth is precisely through innovation: knowledge workers are attracted to knowledge firms, and knowledge firms are attracted to knowledge workers, and that concentration of occupation and functions (i.e. clusters) fosters innovation in that cluster of knowledge, generating growth.[8] Hanson (2000) revises the literature on the topic, noting the impacts of spillovers of clustered firms on innovation. For example, Barkley, Henry and Nair (2006) examine concentrations of innovative activity and find that regions with higher concentrations of high-tech occupations are more innovative.

The studies that attempt to focus more directly on "knowledge spillovers" are mostly intensive case studies of specific areas. For example, Saxenian's (1994) study on Silicon Valley and Route 128, Hippel's (1988) study on the U.S. steel industry, and Dahl and Pederson's (2004) study among wireless engineers in Scandinavia, all of them based on interviews and surveys, confirmed that ideas flow freely in each of these clusters (Cortright, 2006, p. 21). Saxenian's intensive case study compared Silicon Valley and Route 128 in the Boston region and asked, "Why has Silicon Valley adapted successfully to changing patterns of international competition while Route 128 appears to be losing its competitive advantage?"

She concluded that:

> Silicon Valley has a regional network-based industrial system that promotes collective learning and flexible adjustment among specialist producers of a complex of related technologies. The region's dense social networks and open labor markets encourage experimentation and entrepreneurship. Companies compete intensely while at the same time learning from one another about changing markets and technologies through informal communications and collaborative practices…The Route 128 region, in contrast, is dominated by a small number of relatively integrated corporations. Its industrial system is based on independent firms that internalize a wide range of productive activities. Practices of secrecy and corporate loyalty govern relations between firms and their customers, suppliers, and competitors. (p. 2-3)

Newlands (2003) reviews several case studies of flexible specialization in central and northern Italy and comes to much the same conclusion: "The sources of flexibility lay in collaborative networks…[that] permitted the establishment of trust between actors, a crucial argument within most contemporary approaches to clusters" (p. 523).

Others studies have analyzed these issue quantitatively. For example, Jaffe, Trajtenberg and Henderson (1993) (as cited in Cortright, 2006, p. 21) "found that new patents were more likely to

[8] See Chapter V on innovation.

cite previous patents in the same metropolitan area or state than to cite more distant patents," concluding that knowledge is relatively localized.

Black & Henderson (1999) utilize econometric methods to test whether city growth rates (in population size) are closely tied to growth rates in educational attainment and inferred human capital spillovers. They found that cities grew with human capital accumulation and knowledge spillovers and concluded, "Overall, the evidence supports strongly the theoretical result than individual city size growth rates are related to individual local human capital growth rates" (p. 271).

The most directly relevant research consists of studies that focus directly on the concept of clusters rather than on proxies for agglomeration. O'Huallachain (1992) identified 18 geographic clusters consisting of related 2-digit industries and examined the relationship between the strength of each of these clusters and regional employment and income growth for the 150 largest metropolitan areas in the U.S. He found that five of the 18 clusters studied had a positive effect on both employment and per capita income growth. The five clusters were: high-order services, high-tech manufacturing, state and local government, textiles and construction, and insurance. The retail trade and recreation service clusters were notable among the clusters that were positively related to metro employment growth but did not have any relationship with income growth.

Feser, Renski and Goldstein (2008) attempted to assess the effect of clusters by analyzing technology clusters in the Appalachian Regional Commission region from 1998-2002. They identified several different technology clusters and their locations in each of the 406 counties in the region. They then divided the counties into high employment growth and low employment growth counties over the 1998-2002 period and analyzed whether the high growth ones had a greater presence of technology-based clusters in 1998 than did the low-growth ones. They concluded that "We found little evidence that technology industries in spatial clusters in Appalachia created more jobs than the same industries in noncluster locations" (p. 343). They are extremely cautious in placing the findings as being specific to a particular place over a particular time period.

To what extent does the empirical literature separate out the effects on regional economic outcomes of the very diverse processes that lie behind agglomeration economies and which we discussed above? Rosenthal and Strange (2004, p. 2146) ask what do studies on productivity have to say about the various micro foundations of agglomeration economies and answer "not much." Hanson (2000) echoes this: "We have relatively little understanding of the precise type of externalities that contribute to agglomeration…Individual studies find evidence consistent with human capital spillovers across workers, localized knowledge spillovers in the innovation process, and regional cost and demand linkages between firms" (p. 489). There is little work that attempts to estimate the relative impact of these different effects.

The problem, Rosenthal and Strange observe (2004), is that "agglomeration economies whose sources are knowledge spillovers, labor market pooling, or input sharing all manifest themselves in pretty much the same way"(p. 2146). As Gordon and McCann note "a variety of mechanisms by which the external economies are achieved… operate simultaneously, often indirectly and

cumulatively, so that individual sources of the agglomeration process cannot be isolated or individually identified…The only observable manifestation of their existence may thus be the realized efforts on productivity, growth and local factor prices" (p. 517). Finding reasonable measures of each of these as a means of sorting out the effects while controlling for the others is very difficult.

After reviewing the research literature, Glaeser and Gottlieb (2009) conclude:

> We focused on three different types of agglomeration economies. There is abundant evidence that manufacturing firms choose location to reduce transport costs, but this does not seem to be an important part of urban competitive advantage today. Today, the urban role in reducing transport costs seems to be more important for service firms. Numerous researchers have argued that dense agglomerations provide labor market pooling so that workers can move from less productive to more productive firms, yet the empirical evidence supporting this claim is still modest. The largest body of evidence supports the view that cities succeed by spurring the transfer of information. Skilled industries are more likely to locate in urban areas and skills predict urban success. Workers have steeper age-earnings profiles in cities and city-level human capital strongly predicts income. It is possible that these effects will be reduced by ongoing improvements in information technology, but that is not certain and has not happened yet (p. 1023).

However, their conclusion that information transfer or knowledge spillover is the "process" behind the findings they review is indirect evidence of their effects at best. Indeed, as Cumber and MacKinnon (2004) write, "The importance of locally specific forms of knowledge circulating through the labour market has been identified as a key feature of successful agglomerations such as Silicon Valley (Saxenian, 1994). Yet few detailed studies have sought to test this proposition empirically" (p. 964).

In sum, clusters are important for understanding and improving regional economic growth. It is important for policy makers and practitioners to understand how and in what ways they do so and what actions they can take to enhance economic growth through generating additional cluster benefits. In particular, since analysis of and policies based on clusters have become a feature of much modern regional economic development policy, it is critical for practitioners to understand the dynamics of clusters and the limitations as well as advantages of employing cluster strategies.

B. How Do Clusters Drive Regional Economic Growth?

What are the processes through which we would expect clusters to generate economic growth? We focus on the first and third of Gordon and McCann's (2000) three forms of clusters – pure agglomeration economies and social networks (although the latter is closely related to the concept of "knowledge spillovers" in the agglomeration economy literature) since these are the models that produce benefits external to an individual firm as opposed to arrangements initiated and organized by an individual firm.

Agglomeration economies are external benefits that accrue to firms as a result of co-location. That is, they are real benefits to firms in the form of input cost reductions or productivity gains that result from other firms and large numbers of people located in the same area.[9] As Phelps notes (2004, p. 972-973) clustering through external economies of agglomeration fosters economic growth through one or both of two processes:

- By lowering the cost of inputs to production (pecuniary economies) of a firm benefitting from the external economies and/or by
- By increasing the firms' productivity so that it is able to produce more output per unit input (technological economies).

The literature identifies many different kinds of agglomeration economies. An initial distinction is between agglomeration economies that result from the co-location of firms that are similar in nature in terms of goods produced, processes, skills required and/or functions (called "localization economies") and those that result from the co-location of a large number of firms, even if they are diverse (called "urbanization economies," or, if the focus is on their diversity, "Jacobs economies" after writings of Jane Jacobs). While the most common conceptual definitions of clusters focus attention more on localization economies, many of the processes incorporate both and consequently, we will examine both.

There are many different processes through which these benefits may occur. These include labor market pooling, worker-matching (more workers mean better matching), input-sharing, supplier specialization through the growth of supplier and subsidiary industries, development of a common infrastructure, reduction in transportation costs (Glaeser), niche consumer markets, knowledge spillovers (which may result more from social network interaction), competition (see Rosenthal and Strange, 2004, p. 20-21), culture and modeling behavior (Saxenian (1994), Rosenthal & Strange, p. 21-23). Bergman and Feser (1999) provide additional examples of proximity based agglomeration economies such as "increased market power through brokered buying and selling, the better availability and use of specialized repair facilities, shared infrastructure, reduced risk and uncertainty for aspiring entrepreneurs, and better information" (p. 8).

Many of the processes produce increasing returns to scale that are external to an individual firm and result from the location of the existence of large numbers of firms located near to each other. Krugman (1991) and others cite these increasing external returns to scale as the core economic process through which agglomeration economies occur.

Below we discuss the various processes, the links through which they presumably affect firm growth and thus regional economic output (empirical evidence on the extent to which they actually do so is presented later in Section D), the extent to which they do so through input cost-reduction and/or through productivity increases (many do so through both), and the extent to which these effects are naturally created through size or density or can be enhanced through interventions.

[9] Duranton (2009) notes, however, that at some point size diseconomies of agglomeration (e.g., congestion) begin to set in and impose external costs on firms in the area.

1. Labor market pooling

Large agglomerations provide a large supply of labor with a variety of different skills and occupational specialties. What are the external economies that result from this?

First, the availability of large numbers of potential employees suggests that, ceteris paribus, wages will be lower than otherwise would be the case, resulting in cost savings to all firms regardless of the industry they are in (i.e., an urbanization economy)[10].

Second, the ability to replace an inferior worker with another more productive one available in the area is a productivity gain that results to a firm through agglomeration. As Duranton and Puga (2004, p. 2086, 2092) note, a large labor pool improves both the probability of a match and the expected quality of the match.

Third, since a large area will have a labor force with many diverse and specialized skills, firms in industries or engaged in processes with needs for specific specialized skills are more likely to find them in a large area, and people with those skills are more likely to be attracted to an area where they know these specialized skills are in demand. These are agglomeration economies that result from both input cost-reduction and productivity gains from firms (input cost reductions because a larger supply of specialized workers will lower wages of these workers; productivity gains because workers with these specialized skills will provide greater output per input than would less specialized workers.).[11] The geographic scope of this, like many of the benefits resulting from labor market pooling, should occur throughout the entire labor market area (the metropolitan area).

2. Input sharing/supplier specialization

The presence of a large number of firms producing the same types of goods or services or requiring the same types of inputs provides external benefits to these firms if specialized suppliers locate within the region to provide that input. Although the process is broadly similar, input sharing agglomeration economies can be categorized as either physical inputs into the production process or producer services related to firm operations. These may be urbanization economies if the specialized services (e.g., accounting, legal, advertising services) apply to a wide range of industries or sectors or they may be localization economies if they are specialized to a particular industry or related set of industries. The latter may be input supplies necessary for the production process or they may be professional services tailored to individual industries.

Suppliers of physical inputs into the production process decide to locate in an agglomeration if there are enough customers in the region so that the reduced cost of transporting supplies to their customers will make up for the increased costs of locating there (higher land costs, higher labor costs, greater congestion, etc.). As a consequence of the clustering of these specialized suppliers

[10] Although tight labor markets may obviously occur, thus limiting labor supply, during times of economic expansion in any labor market.

[11] Note that while input cost reductions through greater supply of specialized labor will reduce wages, higher productivity of a worker will increase worker wages, and the result may well be higher wages per worker.

in the region, firms purchasing these inputs will pay lower transportation costs for inputs than they otherwise would have. These are cost-reducing economies that ought to accrue through location of these supplier firms anywhere in the region (and even beyond), although the closer these firms are located to their customers in terms of transportation time and costs, the greater the savings should be. This also suggests that if the firms purchasing the inputs are themselves clustered geographically within a sub-regional area, the more likely supplier firms will be able to locate close to all of them, again reducing transportation costs for all. Supplier firms locating close to their customers will also benefit from increased physical accessibility to their customers, who will in turn receive more customized service (a productivity enhancing external benefit).

Suppliers of producer services to firms may also decide to locate in close proximity of their customers in order to reduce the accessibility costs of personal contact and to increase their understanding of customer needs, that is, co-location will reduce transaction costs. These may be urbanization economies if they apply to a wide range of firms in diverse industries within the region (accounting, legal, advertising or architectural services) or localization economies if they are tailored only to firms in a particular sector (e.g., precision engineering, professional consulting, testing labs).

3. Market aggregation

The cost of distribution and selling goods or services to consumers may be reduced substantially in large agglomerations. Goods or services for which there is sufficient final demand in the area to justify producers to locate there will increase regional economic growth through import substitution (i.e., rather than importing these goods from outside of the region, consumers will purchase them within the region), with resulting positive economic multiplier effects as local employees of these firms spend money throughout the regional economy. For goods or services whose demand is confined to a relatively small percentage of the population (niche goods) and whose purchase requires physical presence (a smaller number now, perhaps, as a result of internet sales), location in a large agglomeration may be necessary in order to aggregate enough purchasers to make a profit or to be close to the few buyers. Expensive and personalized goods that require personal inspection are examples. To reduce transaction costs to consumers, these specialist shops are likely to be located in a very small and easily accessible geographic area (traditionally in or close to the central business district).

Note that all three of the processes described above occur largely or completely through market processes; they do not require human intervention in order for the external benefit to be achieved, although it is possible to envision policies that would enhance these processes. For example, providing land or transportation infrastructure may encourage suppliers to locate in greater proximity to each other; workforce development programs focused on cluster-specific skills may increase the skill levels needed for the cluster; labor force intermediary institutions may help to provide more efficient worker-job matching processes, and other supporting institutions could provide specific support to the industry at the core of the cluster through research and development, innovations and technology transfer.

4. Knowledge spillovers

Knowledge spillovers or MAR externalities, named after the three economists most responsible for contributing to the concept (Marshall-Arrow-Romer), are frequently discussed in the literature on agglomeration economies. However, the processes through which they occur are perhaps better understood through the social network model that Gordon and McCann (2000) posit. "MAR" externalities result from the concentration of many people working on problems in a similar or related set of industries, skill sets, processes, etc. that produces a widely shared understanding of the problem and it workings. The result is greater innovation with respect to product/process/marketing etc. that lowers costs and/or generates greater productivity for firms in the region. This in turn provides a competitive advantage for firms in the region and consequently greater regional economic growth and greater innovation as a result of knowledge spillovers through interaction and face-to-face communication that facilitates learning.

The logic of these knowledge spillovers is straightforward, but how they actually occur is less so. Marshall, in his original exposition on agglomeration economies, writes, with respect to knowledge spillovers:

> When an industry has thus chosen a locality for itself, it is likely to stay there…The mysteries of the trade become no mysteries; but are as it were in the air, and children learn many of them unconsciously. Good work is rightly appreciated; inventions and improvements in machinery, in processes and the general organization of the business have their merits promptly discussed: if one man starts a new idea, it is taken up by others and combined with suggestions of their own; and thus it becomes the source of further ideas. (Quoted in Rosenthal and Strange, 2004, p. 11)

Duranton and Puga (2004, p. 2098) observe that:

> A fundamental feature of learning is that in many (if not most) cases, it is not a solitary activity taking place in a void. Instead, it involves interactions with others and many of these interactions have a 'face-to-face' nature. *Cities, by bringing together a large number of people, may thus facilitate learning.*…Moreover, the advantages of cities for learning regard not only cutting-edge technologies, but also the acquisition of skills and 'everyday' incremental knowledge creation, diffusion, and accumulation.

Cumbers and MacKinnon (2004, p. 962) extend this directly to firms and argue that "Spatial proximity between specialist firms facilitates the creation and exchange of tacit knowledge, viewed as a crucial form of competitive advantage in a work in which codified knowledge is easily replicated and rendered ubiquitous."

But what are the processes through which these knowledge spillovers occur. Do they require personal interaction and face to face communication? Do they occur through informal networks and of what sort? Can they be encouraged through creation of more formal networks? Are they part of a region's culture or of the culture of an industry or skilled workers in a region? Those who approach knowledge spillovers through social network analysis emphasize culture and embeddedness: the social relationships among economic actors, many of which are

geographically localized. Economic systems are embedded in social systems, not separate from them (social connections, culture of particular places, institutions). Presumably certain kinds of cultures (work ethos?) are more likely to produce economic growth. It is also hypothesized that certain kinds of networks and network relationships are more likely to produce sustained economic growth (see Putnam's study of Italy (1993), Granovetter's findings on the strength of weak ties (1973), and Safford's (2009) study comparing Allentown and Youngstown).

Porter (2000), for example, argues that "Social glue binds clusters together, contributing to the realization of this potential…Relationships, networks, and a sense of common interest undergird these circumstances. The social structure of clusters thus takes a central importance (p. 264)."[12]

However, despite these claims by Porter and others, Martin and Sunley (2003) contend that, "the social dimensions of cluster formation and cluster dynamics remain something of a black box in Porter's work…[and] the problem of conceptualizing and empirically analyzing knowledge networks and other 'soft' socio-cultural-institutional features of clusters and spatial economic agglomerations is not, of course, confined to Porter's work" (p. 16).

Malmberg and Maskell (2006) respond to these critiques by setting forth three processes through which learning occurs as a result of knowledge spillovers that arise through agglomeration. They term the first, learning by interaction, "the vertical dimension of spatial proximity" (p. 4-7). The vertical dimension refers to firms that interact with each other in a production chain relationship which requires some kind of coordination through interaction. They note that, "Studies of industrial innovation quite consistently show that new products are developed in response to signals from, and often in interaction with, customer firms. The most sophisticated and demanding customer firms are of particular importance here, especially if their demand is in some way anticipatory, i.e., help producer firms understand what the global market will request tomorrow, or the day after tomorrow"(p. 5). The horizontal dimension of spatial proximity relates to firms in the same industry located close enough to each other that they can observe, compare, and monitor the behavior of each other. Malmberg and Maskell (2006) observe that, "Spatial proximity helps firms identify and imitate superior solutions while combining them with ideas of their own" (p. 7).

Finally, there are knowledge spillovers that occur as a result of what Malmberg and Maskell (2006) term "neighborhood effects." They refer to these as "local buzz." Buzz refers to "the information and communication ecology created by numerous face-to-face contacts as people and firms within the same industry collocate…This buzz consists of specific information and continuous updates of this information, intended and unanticipated learning processes in organized and accidental meetings; the application of the same interpretative schemes and mutual understanding of new knowledge and technologies; as well as shared cultural traditions and habits, which taken together make interaction and learning less costly"(p. 7). This appears to be an elaboration of Marshall's famous "in the air" statement and, unfortunately, provides little more understanding of the processes through which this kind of knowledge spillover occurs.

[12] However, despite these claims by Porter, Martin and Sunley (2003) contend that, "the social dimensions of cluster formation and cluster dynamics remain something of a black box in Porter's work…[and] the problem of conceptualizing and empirically analyzing knowledge networks and other 'soft' socio-cultural-institutional features of clusters and spatial economic agglomerations is not, of course, confined to Porter's work"(p. 16).

Borrowing from the organizational learning/networking literature, we know that learning occurs primarily through interaction in informal networks of near-peers, but it also may occur through leadership replacement and/or new hires who bring their experience from other organizations. All of these processes are arguably more likely to occur when similar firms and similar occupational clusters are geographically proximate to each other.

C. What Systems Are Important for Generating Clusters?

Porter argues that industry clusters are the product of four factors: "the diamond of competitive advantage": factor conditions (factors of production like labor force, specialized infrastructure, educational institutions or demand for services and products); demand conditions (presence of sophisticate and demanding local customers); related and supporting industries (suppliers and competitive related industries); and firm strategy, structure and rivalry (competition between firms drives competitiveness). Unfortunately, these are a listing of categories; they yield little or nothing about the causes of cluster formation or the processes driving it.

Most of what we know about cluster formation results from research on agglomeration economies. With respect to agglomerations, Krugman (2000, p. 53) argues (see also Duranton and Puga (2004)) increasing returns to scale are the rationale for agglomerations; industries locate in proximity to each other in order to take advantage of the reduced marginal costs that occur as production increases in the area as a whole. Co-location occurs naturally and without coordination through independent decisions of firms operating in their own interests.

Some of the literature on cluster formation is concerned with why clusters of a particular kind locate and thrive in particular places. While natural features may account for the location of, for example, natural resource clusters, many argue that initial location is a matter of idiosyncratic circumstances or simply luck, followed by processes of "path dependence" and "lock-in." Economic development is to some degree path –dependent: the set of opportunities for any particular place will be shaped by the economic activities is has already established, so chance events are important, and there is a propensity for the market to "lock-in" in certain patterns of activities. Product and profit cycle theories (see Markusen, 1985) suggests, however, that lock-in does not last forever, and when a product reaches mass production stage it may move to lower cost production sites.
Returning to our earlier discussion of cluster/agglomeration processes, clusters form through the following systems:

- Production process: activities for which the area has a competitive advantage will form clusters (localization economies) and produce scale economies that result in lower costs for firms' inputs, more productive firms producing their output.
- Labor market: labor market pooling; firms benefits from larger pool of workers with the required skills, workers benefit from a great variety/quantity of possible employers. In addition clusters will form around skills that are present in the regional labor market. This in turn interacts with the production process: regions specializing in the production of products requiring specific types of skills will attract labor with those types of skills and regions that have specialized skills will attract firms (or expansion of existing firms) that require those types of skills).

- "Market for goods": customers demand certain products, press for innovation, and firms benefit from larger market for their products.
- Social/institutional/cultural: clusters form through historical accidents, spin-offs from existing clusters, individual entrepreneurs and are then expand in place as a result of lock-in, path dependence, and cultures that are conducive to shared trust through social interactions, face-to-face communication, social networks, etc.

These processes and their results occur naturally as a result of individual firms operating in their own interests through markets and/or as a result of human social interactions. To what extent can they be encouraged, affected or made more effective through conscious and explicit effort?

D. What Can Be Done? Cluster-Based Strategies and Interventions.

1. What Is Cluster-Based Economic Development Policy?

Cluster initiatives have become the leading edge of regional economic development policy over the past decade. The Global Cluster Initiative survey (GCIS) identified over 500 cluster initiatives in North America, Europe, Australia and New Zealand as of 2003 (Mills, Reynolds, Reamer, 2008). Cumbers and MacKinnon (2004, p. 959) state that "Cluster-based policies have been adopted by a range of organizations operating at different geographical scales, including regional development agencies within a number of European and North American states…Such policies require the identification of specialist clusters which can then be targeted for support, typically in the form of R&D assistance, bespoke training, venture capital initiatives which attempt to inculcate a culture of innovation and learning, and efforts to build and reinforce a sense of cluster identity among constituent firms and organizations."

The rationale for cluster-based economic development policies is provided by Michael Porter, who has been the most persistent and effective proponent of such policies:

> Since clusters involve powerful externalities across firms in a location, and associated public goods, there is a strong rationale for public policies. In the presence of positive externalities market failure will lead to underinvestment in specialized skills, scientific knowledge and specialized infrastructure that benefits the entire cluster and increases competition by lowering the barriers to entry of new firms. Public policy that provides rules, mechanisms and incentives for capturing external economies will improve productivity and, with it, job, wage, and innovation growth.

However, what does "cluster theory" suggest in terms of actual economic development strategies and policies that might be applied? Motoyama (2008) notes:

> A limitation of the theory is its feasibility and whether and how government can effectively fill-in the missing components of the cluster. For example, if a specific element in a cluster is missing, such as the suppliers, a logical policy consequence would be for the government to provide grants to attract or nurture them. However, in reality, there is hardly such a case unless the government plans to form a cluster from scratch. The private sector is not blind and has usually looked for business

> opportunities. Even if there is a gap, how and how well government can promote the missing components is questionable. The more difficult part is to promote the interconnectedness of a cluster. If firms in a cluster do not have sufficient spillover or synergistic effects, what can government do: the current cluster theory may point out that government should do something about it but does not explain how (p. 360).

Bartik (2008) is skeptical as well, particularly with respect to cluster-targeting strategies:

> If clustering boosts productivity in a knowable and predictable way, this has extremely strong implications for policy. If we know that some firms expanding in the cluster would boost productivity at other firms, we should provide subsidies to help those firms expand…However, the problem is that no one knows how large such agglomeration economies are, and at what scale of industry or urban activity these agglomeration economies are most important…Therefore, it is difficult to use such cluster findings as a strong rationale for subsidizing one set of industries rather than another. (p. 15)

Duranton (2009, p. 38) argues that research clearly shows that cluster benefits are real, but they are also quite small. Instead he urges economic development policy makers to focus on "the cost curve" attempting to reduce costs associated with place through more traditional public sector policies related to land use planning, urban transport and provision of local public goods. He also notes that the various mechanisms that produce clustering benefits (e.g., labor pooling, knowledge transfer through networks) are difficult to identify empirically and call for very different policy approaches.

Despite what some see as the lack of straightforward implications of "cluster theory" or the cluster framework for public policy, others have suggested clear policy implications. Martin and Sunley (2003, p. 23-24), write that the cluster framework suggests a focus on strengthening existing clusters by helping to promote the supply of local and regional public goods that are absent due to market failure. These include 1) creating cooperative networks and encouraging dialogue between firms and other agencies, 2) collective marketing of a region's cluster specialties, 3) provision of local services to firms such as financial advice, marketing and design services, and 4) identification of weaknesses in existing cluster value chains and attracting investors and businesses to fill those gaps.

Porter (2007) argues that:

> Public policy at the cluster level should begin with the collection of information that identifies the existence of clusters…Government has an important role in assembling information about cluster composition, membership, employment and performance…. Another potential role for government in cluster development is to *convene* cluster participants if private sector institutions have not already arisen to do so. Once clusters are organized through trade associations or other means, government agencies need to become active participants in dialogs with cluster participants to understand local constraints to productivity and identify gaps and weaknesses in public policy. Another dimension of cluster policy is *incentives* to spur collective investment by cluster participants in assets that benefit many cluster participants, such as university research

> centers, community colleges curricula or testing facilities. In some cases, public investment in assets involving cluster externalities is also justified (p. 5).

Waits (2000, p. 39) suggests that the implications of cluster theory as popularized by Porter and others, are that it directs economic development practitioners to focus on clusters as an analytical tool to better understand the economy, as an organizational tool "to engage industry leaders in a regional strategy and to foster communication, networking, and improvement among the companies within and across clusters," and as a service delivery tool to direct services to key industries in high-value clusters.

What kinds of public policy have actually been adopted as part of the cluster-based approach for which Porter provides the above rationale? We begin by first examining some economic development *strategies* that have resulted from use of the cluster framework. Many of these are at the state level.

Hill, Samuel and Stewart (2008) analyzed Ohio's advanced manufacturing sector, which is based on the Central Ohio automotive cluster. This sector has been particularly resilient and has managed to do better with global competition. After analyzing elements that characterize the advanced manufacturing sector, they recommended policies to increase its value added: improving the business environment, supporting incumbent manufacturers, improving the workforce and developing thought leadership in global integrated manufacturing production.

Felbinger and Robey (2001) suggest a new strategy for economic development based on regional clusters that flows from a case-study of Cleveland made for the Northeast Ohio Regional Economic Development Strategies Series (NORESDI). The main purpose was to propose proactive policies that allow state and local governments to participate in the global economy and offer opportunities and venues for effective development, mainly based on a case study of Cleveland's economic development experience. The NORESDI first identified six industry clusters that were relatively competitive or had competitive advantage in the region and then aimed to promote those clusters in the region. After the stage of cluster identification, "this initiative sought to generate a bottom-up, private sector program in which interrelated private firms within an identifiable "cluster" could work together to identify and resolve common needs and concerns" (p. 70). Therefore, a series of cluster forums took place that resulted in the identification of six main barriers to retaining regional competitive advantages: workforce/education, technology/R&D, entrepreneurship, regulatory/tax policy, quality of life, and infrastructure. The authors concluded that to be economically competitive, regions have to operate in a global environment, and to do it is very important to implement strategies of regional cluster-based development to maintain or develop competitiveness and prosperity.

Pennsylvania is another state that has implemented cluster-based economic development strategies. A study conducted by Deloitte for the Industrial Resources Center (IRC) of Pennsylvania and the Department of Community and Economic Development of the Commonwealth of Pennsylvania (2004), proposes a regional strategy that builds from current strengths and addresses competitive challenges, particularly in the manufacturing sector. This study analyzes the importance of manufacturing in the Pennsylvania's economy, studies the forces that will shape its possible futures and identifies actions to help achieve a dynamic and

prosperous future for that sector. The findings highlight the importance and the new challenges of the manufacturing sector and identify sixteen driver industries that produce nearly half of the state's product and that have grown and concentrated in the state in the last decade. These industries together with their associated cluster of in-state suppliers provide a substantial part of the export earnings of manufacturing, and therefore contribute significantly to the wealth of the Pennsylvania area. Even though these industries are considered as a portfolio, they have different needs so they required different strategies from economic developers. Some of the main recommendations of the study are:

> Pennsylvania's economic development strategy must address the distinct needs of firms at all level of growth and competitiveness in the portfolio of driver industries in Pennsylvania's manufacturing base. State and local intermediaries should support public policies and private investments that can have a positive impact on the cash statement of firms and tailor and create incentives that have a significant impact on the growth of existing firms.

Another example of cluster-based development strategy is detailed in a study of Missouri by Peters (2004). According to Peters, by correctly identifying competitive clusters, economic development strategies can direct public resources towards the most viable parts of the economy, in other words, they can implement policies to develop industry clusters. To that end, Peters utilizes hierarchical cluster analysis, discriminant function analysis, and factor analysis to identify six competitive clusters based on economic specialization relative to the national economy. In terms of economic development planning, this analysis was used to provide a basis for understanding industry clusters centered on supply chains and its linkages within the economy. In terms of economic development policy, it was used by the Missouri Department of Economic Development to provide a conceptual and empirical basis for linking particular public and private entities in Missouri based on supply chain relationships so that policy could be directed towards strengthening those relationships. The analysis is also being used to support the Missouri Automotive Partnership (MAP). MAP uses it "to identify similar competitive industries is the motorized products cluster, to identify the top suppliers of this cluster and to determine the economic impact of this cluster in the state" (p. 18). It also uses it to guide efforts at creating a motorized products supply-chain forum, which would link state agencies, motorized products firms and their supplier firms.

In many cases the brief description of "strategies" described reflect more exhortation and aspiration than strategy. To have an impact, the strategies have to be implemented through specific policies and practices. What are cluster-based development policies?

Rosenfeld (1997) provides the following list of policy lessons that economic development practitioners should derive from the cluster literature:

- Learn how businesses interact and clusters work
- Support clusters based on their economic dominance, strategic importance, or leadership and potential.
- Improve technical support services.

- Invest in social capital and social infrastructure
- Empower and listen to cluster leaders
- Encourage cross-fertilization of ideas across clusters.
- Recruit companies that fill gaps in cluster development
- Develop and organize supply chain associations
- Support employee entrepreneurs.

In another setting, Rosenfeld (2010) argues that there are essentially three types of economic development policies that flow from cluster theory: associational encouragement (i.e., efforts to encourage information exchange and knowledge spillovers); provision of specialized services to identified clusters; and targeted investments, including research and development and recruitment.

Cortright (2006, p. 48) lists the types of policies or approaches that can "work to create or enhance each of the micro-foundations of industry clustering:

- Labor market pooling: labor market information, specialized training
- Supplier specialization: brokering, recruiting, entrepreneurship, credit
- Knowledge-spillovers: networking, public sector research and development support.
- Entrepreneurship: assistance for start-ups, spin-offs.
- Lock-in: work to extend, refine and recombine existing distinctive specializations.
- Culture: acknowledge and support cluster organization.
- Aggregate and strengthen local demand.

Mills et al. (2008) provide a more specific list of cluster-based activities:

- Facilitating market development through joint market assessment, marketing and brand-building
- Encouraging relationship-building (networking) within the cluster, within the region, and with clusters in other locations
- Promoting collaborative innovation – research, product and process development, and commercialization
- Aiding… innovation diffusion, the adoption of innovative products, processes, and processes
- Supporting the cluster expansion through attracting firms to the area and supporting new business development
- Sponsoring education and training activities
- Representing cluster interests before external organizations such as regional development partnerships, national trade associations, and local, state and federal governments.

Feser (2008, p. 189-190) provides a longer list of common cluster-building interventions for increasing innovations from technology-related activity, including interventions on the demand side as well as on the supply side. These include:

Supply Side

- Creation of cluster industry association to serve as catalyst for cluster interests
- Location incentives for and recruitment of firms that would fill important gaps in the cluster supply chain.
- Establishment of business networks to encourage information sharing and joint problem-solving.
- Investment in university research competencies related to the cluster.
- Provision of business incubators to provide services to cluster members.
- Regulatory assistance that would provide guidance to firms on regulatory compliance
- Provision of technical and business development advice and services to smaller firms through an industrial extension service analogous to the agricultural extension service.
- Skill upgrading of workers in identified cluster firms.
- Making available risk-based financing through creation of venture capital pools.

Demand Side

- Targeting of public sector procurement to local firms in the cluster.
- Foster purchasing links among members of the cluster in product or value chains through supplier fairs and assistance to suppliers.

What do we know about how well these cluster-based policies work? To what extent have they been evaluated? In some ways, this is a tricky question, since most of the individual policies described above have existed long before there were intentional and explicit "cluster-based" economic development policies. The difference, to the extent a difference exists, is the target of the policy(ies) – i.e., an identified cluster rather than a single industry sector or sectors or individual firms – and the way the policies are combined. They also differ in what they *do not* attempt to do. As Porter (2009) notes, "Cluster-based policies, unlike sectoral or industrial policies should be neutral with regard to industry or type of economic activity…Cluster policy is thus fundamentally different from sectoral or industrial policy, the fatal flaw of which is a tendency to favor particular types of economic activity, pick winners, and tilt the playing field" (however, as Martin and Sunley (2003) observe, in practice this neutrality is frequently violated with practitioners engaging in an effort to identify clusters that are more likely to produce growth on which to focus, a strategy unlike the picking winner strategy common in industry-based economic development policy.).

There are many case studies of specific cluster-based initiatives, most of which focus on the processes through which cluster-based policy is applied or operates. Very few actually undertake systematic evaluation of outcomes. As noted above, Feser et al. (2008) attempted to assess the effect of clusters (not cluster-based policies, although the creation of clusters is

presumably the object of such policy) by analyzing technology clusters in the Appalachian Regional Commission region from 1998-2002. They concluded that "We found little evidence that technology industries in spatial clusters in Appalachia created more jobs than the same industries in noncluster locations" (p. 343).

Instead, several authors point to benefits not related to specific policies but more to processes. For example, Cumbers and MacKinnon (2004) observe "In a regional context in particular, a clusters approach seems to provide development agencies with a new and compelling rationale for both identifying a limited number of sectors to support – generally those that are deemed to have the highest growth potential – and defending and justifying this to those interests that are consequently excluded" (p. 962). Observing Arizona's cluster strategy, Waits (2000) concluded that best practice is the use of cluster working groups to help policy makers better understand an industry, the challenges it faces, and the most valuable assistance government can provide"(p. 39).

Bacheller (2000) in his commentary on state-level economic development using a cluster strategy in New York, concludes that using this strategy "allowed a better understanding of the state's economy, strengthening the ESD position as a leader in key industry clusters and enhancing competitiveness of industries through the use of inter-firm approaches.

2. The implications of cluster-based policy for regional economic development activity

Clusters provide a conceptual framework through which a regional economy can be analyzed and understood. Conceptual frameworks are not necessarily correct or incorrect; they are ways of looking at the world and their utility lies in the understanding and insights that looking at the world through that framework provides. Indeed, as evidenced by its widespread adoption, the cluster framework has proven to be a very useful framework, one that is clearly superior to seeing the world solely through the frame of industrial sectors, the previous dominant framework.

A cluster framework thus suggests that economic development policy makers and practitioners should focus not solely on individual export sectors, but on the wider set of firms, actors and institutions that form a cluster and help determine the cluster's competitiveness. Surely this provides a better understanding of how regional economic processes work to lead to regional economic performance than does a focus solely on economic sectors. As one example, Cortright (2006) notes that "cluster theory" suggests that regional economic development practitioners should work with groups of firms rather than with individual firms. He also argues that use of a cluster framework "will shift analysis from firm-level rent-seeking (subsidies, tax breaks) to more widely shared competitive problems. So our first recommendation is that is extremely useful for local and regional economic development practitioners to think about economic development through a cluster framework.

What does this suggest for economic development policy and practice? Here the world begins to look a bit murkier. Use of a cluster framework does not directly lead to answers to the difficult

questions for regional economic development.[13] There is widespread agreement that it is not possible to create clusters where there is not an initial base for the cluster to grow on. There is less agreement on whether it is possible to identify "emerging clusters" or whether clusters can only be identified "in the rearview mirror," i.e., after they already exist. Should policy be directed at specific clusters or at concerns that are the foundation of virtually every cluster (e.g., human capital, public infrastructure)? If a cluster-based policy makes sense, should the policy be targeted at specific clusters or, as Porter argues, all sectors? If targeted, toward what kinds of sectors and how selected? And what kinds of specific policies make sense? To none of these does utilizing a clusters framework provide definitive answers.

Cortright writes that most researchers agree that, "No set policy prescription emerges from the cluster literature." In particular, the silver bullet of creating new clusters seems unattainable. As he notes (2006), "the tantalizing paradox of clustering is that it implies that the location of economic activity is not preordained and that, therefore, public policy…can make a difference. Yet at the same time it is virtually impossible to say what it takes to successfully create a new industry cluster in a particular place" (p. 48). Summarizing his review of the literature, Cortright (2006, p. 47-48) writes:

> There is general agreement that it is difficult or nearly impossible for public policy intentionally to create industry clusters where they do not already exist… Most successful clusters have evolved serendipitously. Although public policies have occasionally been a catalyst to cluster growth, their effects are as likely to be inadvertent as intentional (Rosenfeld, 2002b).

Cumber and MacKinnon (2004, p. 965), summarizing the conclusions of Wolfe and Gertler (same issue) observe that their results "do not provide easy answers for policy-makers as they conclude that cluster development is often due to a set of unique and path-dependent circumstances which are not easily replicable elsewhere and in any case can take several decades to nurture."

And Newlands (2003), when analyzing theoretical approaches used in cluster theory, concludes that "cluster theories do not necessarily provide much detailed or specific guidance in the construction of economic development strategies" (p. 528). But while it may be the case that clusters not be created where they previously have not existed (or were very weak), can *existing or emerging* clusters be built on and made more effective? Given that the literature we have reviewed indicates that clusters develop naturally through market processes and individual actions of firms, workers, and residents (consumers), is it possible for direct and intentional human intervention to improve cluster operations, and, if so, through what kinds of policies or practices?

At a broad level, the question of which clusters to focus on reduces to the same kinds of questions economic development policy makers have developed answers to through more traditional frameworks and the policy implications are also similar.

[13] Indeed, Duranton (2009) asks whether cluster-based strategies in the face of limited resources make sense given the small payoff relative to more traditional local policies.

- Focus on clusters for which the region has existing assets, as evidence by some existing concentration.
- Focus on clusters for which the region has a competitive advantage relative to other regions. Focus on clusters that are growing nationally.
- Focus on clusters for which an intervention strategy is possible and for which intervention will make a difference in terms of affecting economic development objectives.
- Focus on cluster whose impacts or externalities particularly serve public purposes (e.g. employ more entry level labor or promote energy efficiency).

As Duranton (2009) and others have noted, appropriate cluster policies are likely to vary depending on the specific mechanisms and processes that produce cluster benefits. Thus, to consider specific policy and practice interventions we return to the individual processes through which clusters (agglomeration economies and networks) operate that we reviewed in Section B.

a. Labor market pooling

Labor market pooling results from a large supply of labor with a variety of different skills and occupational specialties, resulting in agglomeration economies through more efficient matching, better quality of the match and the ready availability of specialist skills. While all of these occur naturally through agglomerations, it is certainly possible to think of interventions that might make a difference. The efficiency of the matching process, for example could be improved through labor market intermediaries at the regional and sub-regional level that help match employers and potential employees. The quality of the match and specialist skills could be improved through customized training provided by community colleges and workforce development institutions and programs. While labor markets are region-wide, travel across space is not frictionless, and the ability to provide efficient and higher quality matches could be improved through improvements in a region's transportation system that would allow easier access of worker to job throughout the region. More generally the presence of specific kinds of area amenities, including publicly provided ones, might serve to attract worker in-migrants of skill levels in demand (although presumably higher wages offered by employers for workers in skill-demanded occupations would serve as the primary attraction). According to Duranton and Puga (2009), local industry agglomeration clusters speed "sharing, matching and learning" when it comes to workers, business relationships and knowledge transmission.

The cautionary note here, however, is *could.* The existence of a regional labor market exchange process seems a reasonable idea, but it does not *guarantee* that the job matching process will become more efficient. Workforce development programs abound, but most of the evaluation research literature suggests that they have little effect. The real question is how can these rather traditional economic and workforce development programs, programs that are consistent with a cluster approach, be structured and operated so that they are effective. A cluster framework as an organizing lens suggests that these institutions and programs be developed along cluster rather than industrial lines.

b. Input sharing/supplier specialization

Input sharing/supplier specialization is another process that provides agglomeration economies through the co-location of suppliers and producers throughout the value-chain. To the extent that agglomeration economies produced through these processes increase with greater proximity (e.g., through reduced transportation costs) land use and zoning policy, including possibly the provision of industrial parks or districts might play a role.

c. Knowledge spillovers

Knowledge spillovers result from the concentration of many people working on problems in a similar or related set of industries, occupations, production processes, etc. that produces a widely shared understanding and the transmission of information. As we noted earlier, the propensity for knowledge spillovers may be a function of history and culture as well as simply agglomeration. However, the literature indicates that much knowledge sharing occurs through informal and quasi-formal networks of relationships. Can such networks be strengthened through intervention or through creation of formal networks? This is a particularly important question from a cluster perspective, since cluster members do not necessarily perceive themselves as being joint participants in a common endeavor. Trade associations are a private sector response to formalization of knowledge-spillover networks. A cluster-oriented public sector response would focus on creating networks that connect the various cluster members across institutions. Indeed, this is a common feature of cluster-based development strategies. Indeed, some interventions feature designated "cluster brokers" to serve as facilitators of interaction and information exchange.

However, creating a formal network doesn't necessarily result in substantial knowledge spillovers. First, as Saxenian emphasizes in her comparative case study of Silicon Valley and Route 128, regional history and culture differ, leaving firms in some regions interested in collaboration and networked learning, while firms in other regions suspicious and concerned about local competitors gaining an advantage over them. Second, a substantial amount of research suggests that most learning takes place in informal peer networks, and particularly so when trust is embedded in the local history and culture. In these cases formal networks may be a *result* of effective informal networks. There is a substantial literature on organizational and institutional learning and learning networks that needs to be explored for implications on how cluster-based networks can be strengthened and/or developed to improve regional economies.
Many of the possible interventions that flow from the above discussion of cluster operations – as well as the various lists described in the previous section – are activities and programs that have long been a part of the local and regional economic development arsenal. The argument is that they will be more effectively applied if they are focused on clusters rather than on industrial sectors.

d. Implications for strategies

This brings us back to what cluster-based strategies should look like on a broader scale. As noted above, it is widely agreed that it is difficult if not impossible to consciously *create* a new cluster or to strengthen a very weak one. But what about existing clusters? Porter suggests

(2003, p. 564) that public policy should be concerned with upgrading all clusters that exist in a region. Others argue that economic development policy should focus resources on a small number of most promising clusters (although Martin and Sunley, 2003, p. 24, argue that if policy is too focused "it starts to look like old industrial policy and too close to the discredited notion of 'picking winners.'").

While all regions have clusters, it makes little sense, despite Porter's injunction, for regional economic development policy to focus on clusters for which export demand is declining or clusters that produce primarily low-skill, low-wage jobs. Moreover, regional economic development policy should take into account that regions exist in a competitive environment and the same cluster specialty cannot be competitive everywhere. Despite the fact that a very high proportion of regional cluster-based development plans focus on a bio-technology cluster, life sciences and/or information technology clusters, it is just not possible for every region to have such a cluster. Some regions are simply better positioned to be competitive in a cluster than are other regions.

An economic development policy informed by cluster theory would proceed by first identifying clusters in the region that produce goods and services for export, are competitive or have a competitive advantage in doing so, and have some existing concentration in the region – i.e., the region already has assets in the cluster that it can build upon. It would then further focus on those clusters for which external demand is increasing or expected to increase. In many cases the broad clusters are readily apparent. The next step is to identify the cluster components, the cluster driver(s), and the interaction between the driver(s) and other components. Not all cluster components are created equal. The cluster driver in the Detroit region, for example, is the automobile industry. The cluster includes the headquarters function, engineering, research and development, and production plants, although these have a diminishing presence. Efficient supply chains in the region make the industry and the region more competitive; however, the supply chains without the industry are unlikely to be able to sustain a cluster.

The purpose of the above exercises is to search for gaps, inefficiencies and market failures among the relationships of these components to one another that might be improved through direct intervention and then to fashion interventions (programs, structures, activities) addressed to these. In this regard cluster-based economic development places particular emphasis on determining whether and how information exchange among cluster members, beyond that which already occurs through knowledge spillovers, can be improved.

Muro and Katz (2010) review what they call "general principles for productive pro-cluster activity (p. 18):

- Don't try to create clusters. Clusters initiative should only be attempted where clusters already exist. Clusters cannot be created out of nothing.
- Clusters strategies or policy interventions should use data and analysis to target interventions, drive design and track performance.
- Focus clusters initiatives on clusters where there is objectively measured evidence of under-capacity.

- Maximize impact by leveraging cluster-relevant preexisting approaches, programs and initiatives.
- Align efforts "vertically" (coordination up and down the different levels of government) as well as horizontally (coordination between policy offerings of any one level of government).
- Let the private sector lead on cluster strategy.
- It is important to note some cautions about clusters and cluster policy as well, in many cases reiterating points that have already been made. It is very difficult, if not impossible, to create clusters from scratch, i.e., where some existing base does not already exist.
- Even when a cluster is in the process of emerging and an existing base exists, it may take a substantial amount of time for an effective cluster to develop; North Carolina's Research Triangle took more than 15 years to take off as a viable cluster.
- All clusters are not necessarily good clusters in terms of a cluster promotion strategy. For example, promoting existing clusters in sectors that are declining nationally may not be an effective long-term economic development strategy.
- There are real limits to how many areas can develop the same cluster, even if some elements of the cluster are present in all. Regions compete against each other in terms of the particular goods and services they produce and external demand for a particular output is finite; only the most competitive areas with respect to a particular cluster will flourish.

The most important caution simply moves us back to the beginning of this section: cluster-based policy is more a framework for viewing and analyzing regional economies then a "silver bullet" for generating economic growth. Adopting a cluster-based economic development strategy does not guarantee economic growth; rather it depends on *which* clusters are pursued and how effectively.

E. Agenda for Future Applied Research and Development.

Our review of the cluster concept and cluster-based economic development suggests a variety of avenues both for future research to improve our understanding of how clusters work and for future product development to assist policy makers and practitioners in designing and implementing regional economic development policy.

As our review suggests, we know a good deal about how clusters operate, but much less about how they are formed and, in particular, the extent to which they can be assisted either in their formation or in operation through public policy. This, of course is the critical question for public policy makers. There is widespread agreement that it is unlikely that completely new clusters can be created where some foundation and elements of the cluster do not already exist. But can "emerging clusters" be identified and encouraged to develop through public policy? Since efforts to identify emerging sectors are occurring increasing frequently in economic development plans, one obvious research project would involve a simple assessment of their effectiveness: to what extent have clusters that have been identified as "emerging" actually emerged? Can public policies be identified which, when used, were more likely to lead to the successful emergence of clusters?

This leads to an even broader question: how can clusters be identified? Identifying clusters, describing them in terms of their components and assessing their effects on regional economic performance are obvious concerns for policy makers and practitioners as well as researchers. Our conceptual definition of clusters – and our discussion of other definitions – suggests that clusters can be composed of very different components. As Porter (2003) observes, "A major constraint to the analysis of clusters has been the lack of a systematic approach to defining the industries that should be included in each cluster and the absence of consistent empirical data on cluster composition across a large sample of regional economies" (p. 562).

Given this, what are different kinds of clusters? Are there typologies of clusters, either explicit or implied, in the literature? How can clusters be characterized, i.e., what are the different dimensions on which a typology might be constructed? Can we construct our own cluster typology?

Our ultimate objective is to provide policy makers and practitioners with a means of intervening through strategies and policies that will produce higher regional economic growth. As indicated by the above discussion, clusters are a complex and elusive concept. One way of trying to come to grips with them is to attempt to classify different kinds of clusters according to their characteristics with the expectation that different kinds of clusters will be susceptible to different kinds of interventions (and that some kinds of clusters will be much more susceptible to interventions than will others).

As outlined in Appendix 2 to this chapter, existing methods for identifying and describing clusters, particularly the quantitative ones, have conceptual shortcomings, while the more qualitative ones are time consuming and sometimes yield self-interested results. How, can the identification of clusters through initial quantitative analysis be improved, in particular through using measures that more closely capture the conceptual meaning of "cluster?" What analytical methods can be developed to identify emerging clusters and for evaluating which clusters have the most potential, are most amenable to interventions, will have particular desired development impacts and externalities, and so forth (as further discussed below). What tools can be developed, for example, that would improve our ability to analyze the potential for some portions of a cluster in a declining industry to be redeployed to more viable existing or emerging clusters in growing industries?

Clearly there is a need for more granular data at the regional level, including more accurate and readily accessible input/output tables, that allow sectoral interactions among industrial (and occupational) sectors to be identified. Absent that tall order, can clusters that cut across NAICS codes be identified through means other than input-output analysis, a technique that is powerful but largely unavailable to economic development policy makers in most regions? How can networks that signal the existence of clusters be identified? Is social network analysis a realistic possibility?

There are a range of research and development questions that relate directly to public policy. Since clusters result from natural processes – private sector, organic, market driven activity – can public policy improve the functioning of clusters and through what means? Cluster-based economic development policy has many advocates, but even they acknowledge that there is a

dearth of evidence about how cluster-based economic development policies, activities, practices have actually performed. Systematic objective evaluation research on cluster-based economic development policy outcomes is badly needed.

It is possible, indeed likely, that clusters differ by type, by place and by stage of development and that these differences have important implications for policy and practice. Some types may be more susceptible to successful policy intervention than others and different types may require different kinds of interventions. While, as we have noted in this chapter, there are some efforts to develop cluster "typologies," none of the existing ones are very helpful to policy makers. This suggests another important area for research and development: how can clusters be best characterized (i.e., sorted into relevant classifications through typologies) so that they provide relevant information to economic development practitioners such as:

- What kinds of clusters work best for different types of regional economies?
- What are the kinds of interventions most appropriate for different kinds of clusters?

In addition, the types are shifting towards functions (e.g., headquarters, production facilities specializations) from industry groupings. Understanding how to identify functional clusters and design appropriate interventions to support them is particularly critical.

Knowledge spillovers through informal networks are a critical benefit of the existence of clusters, leading to increases in regional productivity and output. While the processes through which knowledge spillovers occur are not well understood, such spillovers provide scope for policy intervention through assisting network formation and operations. Reid et al.'s (2008) suggestion that social network analysis be employed as a research technique to better understand the many different types of networks and how each operates is a very promising approach. In addition, there is a substantial literature on organizational and institutional learning and learning networks that needs to be explored for implications on how cluster-based networks can be strengthened and/or developed to improve regional economies.
The key for economic development policymakers is whether and how knowledge spillovers can be encouraged through efforts to make networks more effective. Research is needed on what kinds of policy efforts can accomplish this. Can, for example, "cluster brokers" bring about more effective network operations? Is providing government financial assistance for network operations, organizing more formal networks, or providing venues such as conferences around issues relevant to a network encourage knowledge spillover.

Clusters: Appendix 1 – Measures of clustering/spatial agglomeration

- Regional population or regional employment (in total or in a specific sector) with larger sizes implying greater agglomerations.

  Glaeser and Goettlieb (2009) regress income on city size (population). Agglomeration economies happen when productivity rises with population, so this regression can capture the presence of agglomeration economies. They also use historical population as an instrument for current population. The authors use a standard spatial equilibrium model to understand the connection between density and income in the US: according to urban economists, the large concentrations of people in high-income areas with no exogenous sources of productivity heterogeneity, suggests there are important agglomeration economies.

- Regional population density or regional employment density (in total or in a specific sector) Density is population or employment divided by area, e.g., square miles.

- Concentration indices

  - Glaeser et al. (1992): share of city employment in industry / share of U.S. employment in industry.
  - Henderson et al. (1995): Herfindahl index across industries. Industry concentration measure (total city employment in 5 largest industries).
  - O'Huallachain (1992): employment shares in each industry across metro areas.
  - Waldhorn, Egan and Park (1998): relative employment concentration or location quotients.

- Localization economies

  - Barkley and Henry (1999). Base industry size (to capture the presence of static localization economies). Regional specialization in industry (MAR localization economies). Industry activity in nearby urbanized counties.
  - Henry, Barkley and Zhang (1997).Level of income in an industry in the initial base year.

- Other measures of spatial agglomeration

  Hanson (2005) analyzes the spatial correlation between regional wages and consumer purchasing power to see whether demand linkages contribute to spatial agglomeration. The findings in this paper are consistent with the hypothesis that geographic concentration of economic activity is caused by product demand linkages between regions: regional variation in wages is associated with proximity to large markets, which suggest strong demand linkages between regions.

- Are there measures of occupational clustering? Presumably there are, utilizing the standard occupational classification. Have we found any yet?

- Hill and Brennan (2000): They use agglomerative hierarchical cluster analysis to group similar industries in terms of their economic characteristics, such as measures of competitiveness, inter-industry linkages and export measures.

Note: most of the empirical literature focuses on agglomeration rather than clusters as a concept.

Clusters: Appendix 2 – Identifying and Describing Clusters

1. Cluster Typologies

One way of classifying clusters is according to the *process(es)* through which cluster benefits are produced. Gordon and McCann posit three basic models of cluster processes: agglomeration economies, industrial complex, and social networks (see also Iammarino and McCann, 2006). Each of these models produces cluster benefits in very different ways (and, in turn, the agglomeration model has several different forms of benefits that result from quite different processes). As Gordon and McCann suggest, one particular form of distinction is whether the clusters produce benefits automatically or as a result of interaction. So:

- *Cluster typology 1: Type of cluster by process*
  - Pure agglomeration economies
  - Industrial complex
  - Social networks
- *Cluster Typology 2: Type of cluster by presence of human interaction*
  - Cluster benefits occur automatically through market processes
  - Cluster benefits occur as a result of human interaction

Another way of classifying clusters would be by their members. As Porter notes (2000, p.254):

> "Most clusters include: end-product or service companies; suppliers of specialized inputs, components, machinery and services; financial institutions; and firms in related industries. Clusters also often include firms in downstream industries (channels or customers); producers of complementary products; and specialized infrastructure providers. Clusters also include a number of institutions, governmental or otherwise, that provide specialized training, education, information, research, and technical support (universities, think tanks, vocational training providers); and standards setting agencies. Government departments and regulatory agencies….can be considered part of it. Finally many clusters include trade associations and other collective sector bodies that support cluster members."

Which of these potential members are actively involved in a cluster and to what extent does membership affect cluster performance?

- *Cluster Typology 3: Type of cluster by category of membership.* Cluster types can include relationships involving some combination of the following:
  - A goods- or service-producing industry
  - Suppliers or consumers of the industry
  - Business or professional services related to these industries
  - Other industries producing similar products or utilizing similar processes
  - Trade associations consisting of firms in an industry or related industries (e.g., high technology)
  - Workers with specialized skills or occupations utilized by these industries.

- Workforce development institutions that provide training for workers in these skills (e.g., training programs, community colleges).
- Research institutions tied to products, processes, marketing, etc. related to the cluster (R&D facilities, research universities)
- Government as regulator, facilitator, organizer, provider of incentives, investments, subsidies, etc.

- *Cluster typology 3A: Type of cluster by breadth of category membership*
  - Narrow: includes only one or two of the above categories
  - Medium: includes several of the above categories
  - Comprehensive: includes many or all of the categories.

Another set of cluster differences may have to do with the extent to which clusters are consciously organized at the regional level through creation of cluster organizations or whether they occur naturally.

- *Cluster typology 4: Cluster creation method*
  - Through natural processes
  - Through human intervention to create, build upon, or improve a cluster.

Clusters may also be characterized by the cluster member(s) that serves as the cluster core and driver. At the broad level the question is whether the cluster is organized around a particular set of goods and services produced (an industry or set of industries), a particular set of occupational skills and knowledge that may cut across many industries (e.g., optics and photonics in the Rochester region), particular kinds of production processes or functions (e.g., research and development; headquarters). Within each of these there are obvious sub-classifications (which industrial sectors: automobile manufacturing, furniture, pharmaceuticals, finance, advertising, etc.).

- *Cluster Typology 5: Type of cluster classified by cluster core:*
  - Industry, and if so, specific industry (e.g., vehicle manufacturing, software, finance, etc.)
  - Occupation/skills/knowledge, and if so, what kind?

Note that Duranton and Puga (2005) present evidence indicating that urban regions have begun to specialize by function (e.g., headquarters, research and development, advertising, finance)much more so than previously, with headquarters clustering more in larger urban regions to take advantage of business services co-located there, while production facilities are increasingly located in smaller urban regions.[14]

[14] Duranton and Puga (2004) explain this transformation to functional specialization with respect to headquarters by developing a model in which the choice of organizational form by firms as well as the urban structure depends on how much higher is the cost of providing headquarters services to a plant in a different city as compared to a plant in the same city. When the additional costs associated with managing production from a remote headquarter are high, firms remain integrated (with headquarters and production plant in same city), and because localization economies in production and urban congestion costs increasing in size, this in turn lead cities to specialize by sector. However, when the additional costs associated with managing production remotely fall below certain level, firms become multi-unit organizations (with headquarters and production plant in different cities), and since similar choices are made by a larger number of firms, this affects employment patterns in the cities, which shift from sector specialization to functional specialization. This model explains the urban transformation in the US and suggests that

Clusters can be characterized by whether the goods and services that they produce are in fast or slow growing sectors nationally or by the nature of the labor force skills at their core.

- *Cluster typology 6a: Type of cluster by national growth of cluster core*
  - Slow-growing
  - Average
  - Fast-growing
- *Cluster typology 6b: Type of cluster by required workforce skill level for cluster core*
  - Low-skilled
  - Average
  - High-skilled
- *Cluster typology 6c: Type of cluster by cluster wages*
  - Low wage
  - Average wage
  - High wage

There are other typologies in the literature that are relevant to the research purposes of the authors. For example, Markusen (1996) creates a typology of a certain kind of cluster - industrial districts - based on the size of the firms that are part of it, their linkages and networks within and across the district, and the distribution of power among firms. Feldman and Audretsch (1999) classify clusters according to their ranking of the importance of different academic disciplines for the cluster and the level of innovation of the industries related to the cluster. Rosenfeld (1997) (as cited in Martin and Sunley, 2003) describes cluster typologies based on the evolution of the clustering process: working or overachieving clusters; latent or underachieving clusters; and potential clusters.

Enright (2003) characterizes clusters along various dimensions: geographic scope, density, breadth (range of horizontally related industries), depth (range of vertically related industries),

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it is closely interrelated with changes in the firms' organization, and especially to the separation of the management and production facilities of individual firms.

Kahn and Vives (2006) found evidence that headquarters are concentrated, increasingly so in medium-size service-oriented metropolitan areas, and the rate of relocation is significant (5%) a year.They find that the larger (in terms of sales) and younger headquarters tend to relocate more often, as well as larger (in terms of number of headquarters) and foreign firms, and firms that are the outcome of a merger. Also, headquarters relocate to metropolitan areas with good airport facilities -with a dramatic impact, low corporate taxes, low average wages, high level of business services, same industry specialization and agglomeration of headquarters in the same sector of activity, with all agglomeration variables having and important and significant impact.

Davis and Henderson (2004), analyzing the determinants of headquarter agglomerations, found that separation of the white collar activities from production plants benefits headquarters in two ways: the availability of differentiated local service input suppliers and the scale of other headquarter activity nearby. A wide diversity of local service options allows the headquarters to better match their various needs with specific experts producing service inputs from whom they learn, which improves their productivity. A 10% increase in the number of local intermediate business service providers increases the expected headquarters birth in a county by 3.6%. Headquarters also benefit from other headquarter neighbors, because this allows them to exchange information and acquire information about market conditions, although such marginal scale benefits seem to diminish as local scale rises.

activity base, geographic span of sales, strength of competitive position, stage of development, nature of the technological activities, innovative capacity, and ownership structure. He also uses several categories to characterize the state of development of clusters: working clusters, latent clusters, potential clusters, policy driven clusters (chosen by government to support, but that lack a critical mass of firms), and "wishful thinking clusters" (lacking a mass of firms and any source of advantage).

The key question is whether typologies can be developed that classify clusters according to important characteristics that allow policy makers to address different kinds of interventions to different kinds of clusters.

2. Other Approaches to Identifying and Describing Clusters

The various typologies suggested above provide a possible approach, but one that has been rarely applied. Instead, the most common approach by researchers is to engage in intensive individual qualitative case studies of a specific cluster or clusters in a specific place or places (for examples of such work, see Saxenian, 1994; Bacheller, 2000; Waits, 2000; Rosenfeld, 2000). As a result of such a case study, an attempt can be made to identify the individual components of the cluster that are involved (the extent to which various industries, suppliers, trade associations, research institutes, etc. are involved in the cluster). Saxenian, for example, describes her methodology as (1994), 'ethnographic in nature, with the empirical material accumulated over the course of nearly a decade living in and observing the two regional economies. The core of the argument is built from more than 160 in-depth interviews with entrepreneurs, industry leaders, corporate executives, and representatives of local business associations, governmental organizations, and universities in Silicon Valley and Route 128"(p. 209).

Practitioners, often assisted by local researchers or consultants apply much the same approach; in some cases these case studies follow initial quantitative analyses that identify possible clusters. Reid, Smith and Carroll (2008) note that these qualitative case studies usually rely upon "expert opinions or key informants to isolate clusters" (p. 346). An example of the typical case study methodology is provided by Allen and Potiowski (2008) in their study of Portland's "green" building cluster. They relied upon, "a combination of surveys and interviews targeted at "key informants" to develop an understanding of the industry cluster… Fifteen individuals or firms were interviewed or responded to a questionnaire for this study. Respondents included developers, green building consultants, and representatives of architecture firms, landscape architecture firms, engineering firms, wood products companies, certifying organizations, and nonprofits"(p. 303).

In addition to interviews with cluster leaders, many of the qualitative case studies present "cluster maps," identifying the cluster components and relating them to each other through arrow diagrams or through placing them in the relevant part of the value chain. Austrian (2000) reviews several of these studies, usually done on a consultant basis for economic development professionals in a specific region, and concludes (p. 109), "case studies and cluster maps… bring forward institutional detail and qualitative richness that are absent from the quantitative portion of cluster analysis, which identifies the regional clusters. The case studies analyze the clusters'

special characteristics in terms of structure, growth opportunities, and common issues on which cluster participants could collaborate."

There are several difficulties with this approach, not the least of which are the expense, the difficulties in generalizing beyond individual cases studies, and the problems of selection on the dependent variable (researchers tend to focus only on presumed successful clusters which make it difficult to determine in what ways they are different from unsuccessful ones). However, the more serious problem is in actually identifying cluster participants and processes if they do not engage in interactions that are visible to the researcher. This is particularly problematic with respect to agglomeration components of clusters. In addition, cluster maps with arrows, as they are usually presented, are a summary tool rather than an analytical one; they show that there is a relationship of various parts of the cluster to each other, but provide little or no information on the extent, importance or nature of the relationship.

There have also been quantitative efforts to identify cluster components and to measure the effects of clusters across clusters and regions. However, most of these employ measures of clusters (operationalizations) that do a very poor job of capturing what is meant conceptually by the term "cluster" as we and others have defined it. The most commonly used measure is based on the sectoral composition of the regional economy, including location quotients (the share of a regions employment in a particular industry relative to the share of the nation's employment in that industry – see, for example, Glaeser, Kallal, Scheinkman and Shleifer, 1992;Ohuallachain, 1992) in each industry across metro areas (Cortright & Mayer, 2001, and Hill & Brennan, 2000), sectoral specialization weighted by sector size (OECD, 2008), and a Herfindahl index (Henderson, Kuncoro and Turner, 1995), which is a measure sectoral diversity for a region's industries).

Hill and Brennan (2000) employ a particularly sophisticated set of techniques to identify clusters. Starting with individual industrial sectors, they characterize each sector by a set of variables related to the sector's competitiveness, exports, centrality and employment specialization (p.72). They then make use of a mathematical technique called "hierarchical cluster analysis" to sort the various industrial sectors into groups of sectors that are most like each other and different from other groups. They next use "discriminant function analysis" to identify the important dimensions along which the various cluster groups differ. They applied these techniques to the Cleveland-Akron CMSA and used a region specific input-output model and focus groups to identify the "driver" industries at the core of the industry clusters in the region.

All of these measures have serious problems either of conceptualization or of difficulty of applying or both. Industrial sectors measure the type of goods and services produced, but they do not include other features that conceptually might be associated with clusters (e.g., trade associations, government programs, occupational specialties, etc.). In addition clusters are likely to cut across industrial classifications since these are essentially artificial constructs. Suppliers, for example, may be in a different industrial classification than the industry that is core to the cluster. Clusters based on area occupational specialties may be captured in many different industrial classifications.

An obvious way of tracing these relationships across sectors would be through an input-output table that detailed for each industry the various inputs used from other sectors within the region and to which it sold what it produced, as Hill and Brennan did. Such tables do not usually exist at the regional level.

Porter (2003, 2010) addresses this problem by identifying geographic clusters through correlation analysis across states (2003) and regions (2010, Cluster Mapping Project). His methodology is somewhat fuzzy, but, as best as can be reconstructed, he first selects a prominent "core" industry and then, with the state or region as unit as the unit of analysis, correlates industry employment at the four-digit level of that industry with that of all other industries. In a second approach, he estimates locational correlations between pairs of industries, and defines the cluster as those set of industries with significant intercorrelations. He then uses national input-output tables to eliminate "spurious correlations." However, the *assumption* is that industrial sectors with high correlations among states or regions constitute a cluster. Using states or economic areas (EAs, which are essentially regions) as his unit, Porter (2003) identifies 41 traded clusters in the US economy, with an average of 29 industries in each cluster. The next step is to examine each unit (state or EA) to determine which of the clusters identified through the above method the unit has a strong presence in. Note, however, that not only does he assume that sectoral correlations are necessarily evidence of a cluster, but also that clusters are defined completely by industrial classification employment measures.

Other efforts to measure clusters systematically are even more remote. Measures of agglomeration economies are frequently employed in the research literature, but they do not identify cluster components, nor do they usually distinguish which of the various processes that lead to economies of agglomeration are employed. Urbanization economies are sometimes proxied through use of population size or population or employment densities with the expectation (largely validated through empirical research) that economic growth and productivity are directly related to density (and the assumption that this relationship results from external economies of agglomeration).

Identifying clusters based on knowledge spillovers and communications networks is even more problematic. Efforts have either proceeded through inference (i.e., the importance of human capital in economic growth increases with agglomeration thereby suggesting the existence of knowledge spillover[15]) or case studies of individual regions that strongly suggest (suggest, because knowledge spillovers are not visible) communication linkages and networks. Presumably formal network analysis approaches would be possible to apply, but they are difficult, complex and expensive. Reid et al. (2008) argue for such an approach and illustrate its utility by conducting a social network analysis of collaboration among greenhouse firms in the Northwest Ohio region.

[15] See Glaeser (2000, p. 90-91) and Hanson (2000, p. 483-484) for reviews of literature utilizing this approach.

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CHAPTER V

Enhancing Regional Innovation and Entrepreneurship

***Note**: This is one of eight papers – an executive summary, six papers on specific aspects of regional economies and an appendix – generated by the "Implementing Regionalism" project, funded by the Surdna Foundation and undertaken by the George Washington University Institute of Public Policy and RW Ventures, LLC. Please see [insert web link] for the complete set of materials developed by the project.*

CHAPTER V: ENHANCING REGIONAL INNOVATION AND ENTREPRENEURSHIP[1]

A. Definition and Significance

Innovation is currently an enormously popular subject, perhaps the hottest fad in economic development.[2] It is the only sustainable way to increase output in the context of the global economy's finite resources, and so is fundamental to long-term economic growth. The current economic environment – including rigorous global competition and rapid technological change – has made enhancing innovation a particularly high priority among both researchers and practitioners.

Considering the voluminous literature on the topic, our purpose here is primarily to identify what's most relevant to the regional economic development practitioner, and to help separate the wheat from the chaff. In attempting to extract fairly high-level, strategic and practical guidance for practitioners approaching innovation for purposes of regional economic development, we can do little more than acknowledge many other important aspects of the subject. The whole point, though, may be that regional practice requires a much more nuanced approach to innovation, better tailored to characteristics of place, than much of the current research and practice yet enables.

Section A defines the term, and provides very brief background economics on the significance and role of innovation in driving regional growth. Section B describes key factors and mechanisms that influence a region's levels of innovation. Section C then outlines a framework for how regional economic development practitioners might approach intervening to affect those factors and mechanisms, and identifies particular strategies and interventions to increase regional innovation. Finally, Section D identifies gaps in contemporary research and practice, and suggests promising avenues of applied research and product development.

1. Definition

Innovation may be broadly defined as *the development of new ideas, products, services, technologies, processes, systems, organizational structures and business models*.[3] This

[1] The lead authors of this chapter are Gretchen Kosarko and Robert Weissbourd.

[2] See, e.g., Michael Lord, Donald deBethizy and Jeffrey Wager, *Innovation that Fits: Moving Beyond the Fads to Choose the RIGHT Innovation Strategy for Your Business* (Upper Saddle River, NJ: Pearson Prentice Hall, 2005), chapter 1, "Making Sense of Innovation Fads and Fashions," available at http://www.ftpress.com/articles/article.aspx?p=366895.

[3] Note that innovation is often defined as new ideas, etc. which have positive impacts: for reasons discussed below, we have separated the innovation from its effect. This definition and the example linear model that follows are broadly derived from: "Innovation Measurement: Tracking the State of Innovation in the American Economy," Report to the Secretary of Commerce by the Advisory Committee on Measuring Innovation in the 21st Century Economy; "Crossing the Next Regional Frontier: Information and Analytics Linking Regional Competitiveness to Investment in a Knowledge-Based Economy," research conducted for the Economic Development Administration, October 2009; NIST, *Between Invention and Innovation: An Analysis of Funding for Early-Stage Technology Development* (Gaithersburg, MD: Economic Assessment Office, Advanced Technology Program, National Institute of Standards and Technology, November 2002); "Metro Nation: How U.S. Metropolitan Areas Fuel American Prosperity," Metropolitan Policy Program at The Brookings Institution, Blueprint for American Prosperity, 2007;

definition, while useful in its breadth, potentially encompasses nearly every potential change to economic production. For practical purposes, it proves important to tease out some of the dimensions of and distinctions within innovation, particularly between types, stages and levels.

It should be noted that our definition's use of the qualifier "new" indicates that we do *not* include adoption and diffusion activities in our working definition – for example, instances in which Region A adopts a product or service that is already present in Region B. The capacity of a region's firms to disseminate their own innovations, as well as access and absorb others', is of course vital to remaining competitive.[4] However, we have limited our scope to the topic of *generating* innovations and introducing them to the marketplace. A distinct – and vast – literature addresses the importance of adoption and diffusion, and is not covered here.

Types – The key distinctions here are between product (or service), process and business model innovations.[5] The automobile was a new product; the production line a new process; outsourcing combined with new supply chain management a new business model. Within each of these, distinctions are made based on the degree and source of the innovation, such as between incremental and radical (or disruptive), science- or creativity-based, technology- or design-based and so forth.

Stages – As discussed in further detail below, innovation is not a strictly linear process. However, in both theory and practice, it is useful to identify a number of stages along a continuum that provide a framework for understanding which aspects of a region's innovation environment are performing better or worse and identifying opportunities for intervention. The stages of innovation are portrayed below:[6]

Christine Greenhalgh and Mark Rogers, *Innovation, Intellectual Property, and Economic Growth* (Princeton: Princeton University Press, 2010).

[4] Particularly in the case of process innovation, if firms refuse or are unable to adopt new technologies devised elsewhere, they may quickly find themselves losing competitive edge; if regions are full of such firms, the region overall will find itself less competitive.

[5] Some consider business model innovations a subset of process. See Greenhalgh and Rogers, *Innovation, Intellectual Property, and Economic Growth*, 4.

[6] The example linear model is derived from: "Innovation Measurement: Tracking the State of Innovation in the American Economy," Report to the Secretary of Commerce by the Advisory Committee on Measuring Innovation in the 21st Century Economy; "Crossing the Next Regional Frontier: Information and Analytics Linking Regional Competitiveness to Investment in a Knowledge-Based Economy," research conducted for the Economic Development Administration, October 2009; NIST, *Between Invention and Innovation: An Analysis of Funding for Early-Stage Technology Development* (Gaithersburg, MD: Economic Assessment Office, Advanced Technology Program, National Institute of Standards and Technology, November 2002); "Metro Nation: How U.S. Metropolitan Areas Fuel American Prosperity," Metropolitan Policy Program at The Brookings Institution Metropolitan Policy , Blueprint for American Prosperity, 2007; Greenhalgh and Rogers, *Innovation, Intellectual Property, and Economic Growth*.

Basic research → Discovery/idea generation → Applied research/development → Invention → Product/Process (prototype/proof-of-concept) → Commercialization (investment + further product/process development) → Market introduction(including entrepreneurship) → Market adoption/diffusion → Business growth/expansion

Defining and examining innovation this broadly – to go well beyond invention to firm and market creation and growth – makes particular sense from an economic development point of view. A new idea must ultimately be deployed into the marketplace for its economic value to be realized and so to impact the regional economy.[7] Entrepreneurship is often a focus of innovation practice because it is a primary vehicle for translating new ideas and products into businesses.[8] However, not all innovations require entrepreneurship (companies, for example, can introduce their own inventions to market), and not all entrepreneurs are innovators (opening a new outlet of a franchise, for example).

The differentiation of, and focus on, stages proves useful to understanding where along the path local economies may be productive or lagging. Knowing, for example, that a region is producing new ideas and patents, but not commercializing them, helps identify that R&D incentives may not be needed, but instead venture capital or entrepreneurship support might be most fruitful.

However, despite the conceptual clarity of a linear model, it cannot be over-emphasized that innovation is a heterogeneous and highly context-specific process, unfolding in various ways depending on its type and the context in which it occurs.[9] In reality innovation tends to follow an iterative and open process, in which "particular innovative activities can both be cause and result, consequence and prerequisite."[10] That is, innovative activities often do not pass through the stages identified above in a strictly sequential order, nor does the process always include every stage.[11]For example, manufacturing process improvements are not generally derived from basic research, nor is an existing business's new product launch dependent on entrepreneurship; multiple new product and/or process ideas might be generated during the invention stage, leading to separate innovation paths for each; unsuccessful proof-of-concept testing may send innovators

[7] As mentioned earlier, theories of market adoption and diffusion, however, constitute an entire field unto themselves, and are beyond the scope of this paper. For an overview, see Everett M. Rogers, *Diffusion of Innovations (Fifth Edition)* (New York: Free Press, 2003); Bronwyn H. Hall, "Innovation and Diffusion," in *The Oxford Handbook of Innovation*, ed. Fagerberg, Mowery and Nelson (Oxford: Oxford University Press, 2005), 459-484; Greenhalgh and Rogers, *Innovation, Intellectual Property, and Economic Growth*, 177-209.

[8] Schumpeter, for example, pointed out long ago that the most drastic innovations are often brought to market by new firms, noting that the firms that built the first railroads were not the same ones that had previously operated the stagecoaches. Joseph Schumpeter, *The Theory of Economic Development* (Oxford: Oxford University Press, 1934), as cited inJoseph Cortright, "New Growth Theory, Technology and Learning: A Practitioners Guide," U.S. Economic Development Administration Reviews of Economic Development Literature and Practice, No. 4, 2001, 14.

[9] Keith Pavitt, "Innovation Processes," in *The Oxford Handbook of Innovation*, ed. Fagerberg, Mowery and Nelson, 86-89.

[10] Philip Cook and Olga Memedovic, "Strategies for Regional Innovation Systems: Learning Transfer and Applications," Policy Paper for the United Nations Industrial Development Organization, 2003, 4.

[11] See, e.g., the interview findings highlighted in NIST, *Between Invention and Innovation: An Analysis of Funding for Early-Stage Technology Development* (Gaithersburg, MD: Economic Assessment Office, Advanced Technology Program, National Institute of Standards and Technology, November 2002), 34.

back to the idea generation stage; or market introduction might bring to light a shortcoming of the technology that returns innovators back to the applied R&D stage for additional development. This reinforces that, at a "system" level (see below), certain foundational resources and a broader infrastructure for enabling and connecting all of the stages always remain important.

Note that while significant emphasis is often placed on the entrepreneurship stage of the innovation process, innovation, of course, also takes place in existing firms of various sizes. Many of the same factors and conditions affect innovative capacity in both entrepreneurial and existing-firm contexts;[12] differences between the two arise at particular stages, based on differences in capital and institutional structures, risk profiles, investor motivations/mindset and other characteristics.

Levels – Finally, like many other subjects in economic development, innovation can be approached at both the firm (micro) level and the market or system (macro) level. A vast business literature targeted at firms highlights very specific firm innovation practices and disciplines, as well as broader issues such as firm "culture."[13] While innovation overwhelmingly occurs within individual firms – either already existing or newly created – in the aggregate, firms constitute and are part of larger market systems and institutional (including government) environments which determine firm inputs (e.g. human capital), market demand and adoption, and an overall "innovation ecosystem,"[14] all of which in turn influence firm innovation. Given our focus on regional economic development practice, we will be primarily focused on system-level interventions here.

2. Significance for Economic Growth

From a global perspective, innovation is the source of all long-term economic growth, since it is the only path to increasing the quantity and quality of the goods produced from the finite resources of the global economy.[15] In this sense, having a strategy to grow the economy through

[12] E.g., the government and regulatory environment, extent of networks linking the private sector to institutional researchers, overall business environment and innovation culture of the region and many others.

[13] See, for example, Tom Kelley, *The Art of Innovation: Lesson in Creativity from IDEO, America's Leading Design Firm* (New York: Doubleday, 2001); Andrew Hargadon, *How Breakthroughs Happen: The Surprising Truth About How Companies Innovate* (Boston: Harvard Business School Publishing, 2003); Peter F. Drucker, *Innovation and Entrepreneurship* (New York: Harper & Row, 1985); and Kim S. Cameron and Robert E. Quinn, *Diagnosing and Changing Organizational Culture: Based on the Competing values Framework* (San Francisco, CA: Jossey-Bass, 2006).

[14] "The regional innovation system can be thought of as the institutional infrastructure supporting innovation within the production structure of a region." Bjørn T. Asheim and Meric S. Gertler, "The Geography of Innovation: Regional Innovation Systems," in *The Oxford Handbook of Innovation*, Fagerberg, Mowery and Nelson, Eds., 299; see also, Acs, *Innovation and the Growth of Cities*, 183; Beat Hotz-Hart, "Innovation Networks, Regions, and Globalization," in *The Oxford Handbook of Economic Geography*, ed. Clark, Feldman and Gertler (Oxford: Oxford University Press, 2000), 432-450.

[15] Remember Thomas Malthus, who predicted massive starvation would flow from population growth unsupportable by limited resources – famously missing the effects of innovation? See, discussion in Dimitri Zenghelis, "The Economics of Network-Powered Growth, Cisco White Paper, August 2010, 3. For the broader point, see discussion below, and particularly Romer's work. E.g., "No amount of savings and investment, no policy of macroeconomic fine-tuning, no set of tax and spending incentives can generate sustained economic growth unless it is accompanied by the countless large and small discoveries that are required to create more value from a fixed set of natural

innovation is largely tautological, reinforcing the need for more nuanced approaches to innovation.

As discussed in Chapter II, from a regional and perhaps less long-term perspective, there are two broad ways to increase economic output in a given place: (a) increase economic inputs[16] – either in quantity or quality – such as labor and capital to generate a proportional increase in output; or (b) deploy inputs more productively and efficiently. Innovation accomplishes the latter.[17] Innovation provides the only prospect for *sustainably* deriving an increasing quantity of economic outputs from a limited (even declining, in the case of natural resource depletion) resource base over which countless regions are in fierce competition.

Innovation *causes* economic growth[18] through increasing the productivity and efficiency of firms and markets,[19] and by enabling the creation and emergence of new markets.[20] For example, the computer vastly increases productivity of workers and firms compared to the typewriter. "Just in time" inventory controls increase firm efficiency. Securitization enabled new financial markets.

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resources." Paul M. Romer, "Implementing a National Technology Strategy with Self-Organizing Industry Boards," *Brookings papers on Economic Activity, Macroeconomics* 2 (1993): 345.

[16] As used here (unlike in the diagramed framework in Chapter II), inputs include production capacity – so the attraction of new firms.

[17] Note that, in the context of a particular place, economic growth can also come from imitation, by applying the innovative practices developed elsewhere. As noted in "Definition and Significance," adoption and diffusion are not, however, within the scope of this paper. See Paul Romer, "Two Strategies for Economic Development: Using Ideas and Producing Ideas," Proceedings of the World Bank Annual Conference on Development Economics, 1992. See, generally, Romer, "Endogenous Technological Change"; Grossman and Helpman, *Innovation and Growth in the Global Economy*; and Schumpeter, *Capitalism, Socialism, and Democracy*. For a review of empirical studies confirming the relationship between innovation and regional economic growth, see, Jeremy Howells, "Innovation and Regional Economic Development: A Matter of Perspective?" *Research Policy* 34(8) (2005): 1222-1223.

[18] The most common measure of innovative output, patent applications, has been shown to have a positive influence on economic growth, including in a set of OECD countries over both five- and ten-year periods. This relationship has also been demonstrated at the regional level in Europe, where a link has been found between innovation (as measured by an index) and per capita GDP. Measuring innovation through production of research papers in a set of 28 scientific fields, a link was identified with GDP for Italian regions specifically, and was later confirmed to hold true for European Union member states as well. Within the U.S., at least 50% of growth in gross product between 1950 and 1993 has been attributed to increases in the "stock of ideas" – the seeds of innovation – produced by researchers. Enrique Garcilazo, "The Sources of Economic Growth in OECD Regions: A Parametric Analysis," prepared for the 17th Session of the Working Party on Territorial Indicators, Organization for Economic Cooperation and Development, December 2008, 24; Jeremy Howells, "Innovation and Regional Economic Development: A Matter of Perspective?" *Research Policy*34 (2005): 1222, citing Commission of the European Communities 2002; G. Lewison, "The Scientific Output of the EC's Less Favoured Regions," *Scientometrics* 21(3) (1991): 383-402; Charles Jones, "Sources of U.S. Economic Growth in a World of Ideas," *American Economic Review* 92(1) (2002): 220-239.

[19] Innovation results in economic growth through increasing the efficiency of business operations, as productivity growth "lets workers produce more for the same amount of work." Robert Atkinson and Howard Wial, *Boosting Productivity, Innovation, and Growth Through a National Innovation Foundation* (Washington, DC: The Brookings Institution, April 2008), 6-7. Available at www.itif.org/files/NIF.pdf.

[20] Bruland and Mowery argue that innovation – in the form of institutional change and creation of new markets – is how societies have been able to shift away from economic growth that relied strictly on increased labor input. Kristine Bruland and David Mowery, "Innovation Through Time," in *The Oxford Handbook of Innovation*, ed. Fagerberg, Mowery and Nelson (Oxford: Oxford University Press, 2005), 349-379 (especially 349-52). See also, generally, Gene Grossman and Elhanan Helpman, "Endogenous Innovation in the Theory of Growth," Journal of Economic Perspectives 8(1) (1994): 32 for a short review of literature on how the creation of new markets for innovative products translates to economic growth.

In fact, innovation is generally *defined* as new products, processes and models *that increase the efficiency or productivity of business operations or spur the emergence of new markets.* We have resisted including the effect within the definition to highlight the importance for practitioners of distinguishing the question of *how* to increase innovation from the question of *what* innovations to increase (i.e., which will make the most difference in a particular local economy). From this perspective, not all innovations are equally good, or even good at all: making a more efficient horse and buggy may not be the most promising economic development strategy. Most mutations fail: the darling of the innovation world for a decade was Enron.[21]

While innovation's importance for economic growth has long been recognized, with the emergence of the knowledge economy, in recent decades economists have focused more directly on innovation, giving rise to the related fields of "new growth theory" and "innovation economics."[22] Generally, in the knowledge economy, knowledge embedded in the labor force (human capital) and in new technologies[23] increasingly drives productivity gains, and so economic success.[24] Furthermore, concentrations of knowledge factors – such as high human capital, information technologies and information sector firms – build upon themselves. This results in increasing rather than diminishing returns, so that the places that get ahead tend to keep getting further ahead.[25] In other words, the continuing and mutually reinforcing concentration of and interactions between knowledge factors, broadly defined, leads to continuing innovation and economic growth. It is no coincidence (as discussed in Chapter II) that this concentration is happening in metropolitan regions, and making them disproportionately productive.[26]

With this focus on knowledge economy growth dynamics, rather than adhering to classical and neoclassical models' treatment of technological change as *externally* determined (exogenous), new growth theory explicitly incorporates innovation as an *internal* component (endogenous factor) of economic growth models, and in fact *the* primary driving factor.[27] This shift in

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[21] Lord et al, "Making Sense of Innovation Fads and Fashions."

[22] For an overview, see, generally, Verspagen, "Innovation and Economic Growth," *The Oxford Handbook of Innovation*, ed. Jan Fagerberg, David C. Mowery and Richard R. Nelson (Oxford: Oxford University Press, 2005), 487-513; Joseph Cortright, "New Growth Theory, Technology and Learning: A Practitioners Guide," U.S. Economic Development Administration Reviews of Economic Development Literature and Practice, No. 4, 2001; Robert Atkinson and David Audretsch, "Economic Doctrines and Policy Differences: has the Washington Policy Debate Been Asking the Wrong Questions?" (Washington, DC: Information Technology and Innovation Foundation, 2008).

[23] In economics, "technology" is often used as the core of, if not synonymous with, innovation.

[24] See, e.g., Boston Consulting Group analysis that finds an increasing share of productivity growth is due to innovation, as compared to growth in capital or labor inputs. *The Innovation Driven Economic Development Model: A Practical Guide for the Regional Innovation Broker* (San Mateo, CA: Collaborative Economics, September 2008), 10.

[25] For discussions of path dependence and non-convergence of regional economic performance, see, e.g., Weissbourd, *The Changing Dynamics of Urban America* (CEOs for Cities, 2004), http://www.rw-ventures.com/publications/r_economies.php; Joseph Cortright, *New Growth Theory, Technology and Learning: A Practitioner's Guide*, Reviews of Economic Development Literature and Practice, No. 4, U.S Economic Development Administration, 2001, 10-12.

[26] See, Asheim and Gertler, "The Geography of Innovation," *The Oxford Handbook of Innovation*, 291.

[27] Paul M. Romer, "Endogenous Technological Change," *The Journal of Political Economy* 98(5) (2) (October 1990): S71-S102; see discussion in Robert Atkinson and David Audretsch, "Economic Doctrines and Policy Differences: has the Washington Policy Debate Been Asking the Wrong Questions?" (Washington, DC:

thinking pointed to innovation as the object of intentional efforts. Innovation economics further highlights this approach at a policy level, focusing on ways to directly generate innovation (e.g. R&D tax credits), rather than more conventional indirect demand or supply side strategies.[28]

In this context, finding ways to more deliberately foster innovation has become a high priority for regional economic development policy and practice.[29]Indeed, arguably, in the "next economy,"[30] the speed of economic change has accelerated – with shortened product

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Information Technology and Innovation Foundation, 2008), 16 (In neoclassical economics, innovation is seen as "falling like 'manna from heaven,' not something that can be induced by proactive economic policies."). Many earlier schools of economic thought considered innovation (technological change) to be important to economic growth, dating at least as far back as Smith and Marx. However, this aspect of their work wasn't widely adopted, and attention to innovation declined in the late 19th and early 20th centuries. Interest returned in the 1950s -1970s, and innovation was treated as an endogenous growth factor in several economists' models (e.g., Kaldor, Arrow, Uzawa, Shell and Dixon and Thirwall, Griliches). Contemporary with the rapid rise of endogenous growth models beginning in the 1980s, evolutionary economics has also gained traction with some economists. This group of theories includes an emphasis on the diffusion of knowledge from more-developed to less-developed nations as a mechanism for explaining technological change and views the economy as in a constant state of change rather than converging toward an equilibrium state, largely based on modeling of historical empirical data. Combining elements of both new growth theory and evolutionary economics, Eaton and Kortum (1998) have proposed a sort of hybrid, "semi-endogenous" model, in which innovation and technological diffusion are both drivers of growth. For a thoughtful review of the history of the role of innovation in economic theory, see Bart Versapgen, "Innovation and Economic Growth" in *The Oxford Handbook of Innovation*, ed. Jan Fagerberg, David C. Mowery and Richard R. Nelson (Oxford: Oxford University Press, 2005), 487-513. See also Jan Fagerberg, "Innovation: A guide to the Literature" in the same volume (1-26).

[28] Stanford economist Paul Romer asserts that indirect save-more and spend-more economic approaches are not adequate to generate innovation, arguing that neither adjustments to monetary or fiscal policy, nor increases in the rate of savings and capital accumulation can by themselves generate persistent increases in the standard of living. In other words, these traditional tools are not enough for governments to grow economies; rather, governments should sustain a policy stance that fosters technological progress and innovation in order to discover and distribute new ideas. "[Traditional] policy prescriptions miss the crux of the matter…the most important job for economic policy is to create an institutional environment that supports technological change." Paul Romer,"Beyond Classical and Keynesian Macroeconomic Policy," *Policy Options*(July-August 1994): 16. Robert Atkinson suggests that among such strategies are: boosting federal support for R&D, creating a national innovation foundation, financially incentivizing the private sector to invest more in R&D, targeting the technology and software industries for further investment, digitizing the economy and better preparing the nation's workforce for highly skilled jobs (e.g., those that require math, science and/or engineering training). See, e.g., Robert Atkinson, *Supply-Side Follies*(New York: Rowman & Littlefield Publishers, Inc., 2006): 231-239.

[29] This emphasis particularly appears in the context of global competition placing a premium on gaining and maintaining a competitive edge in creating the next generation of products, services, processes and business models. See, Paul M. Romer, "Implementing A National Technology Strategy with Self-Organizing Industry Boards," in Martin Neil Baily, Peter C. Reiss, and Clifford Winston, eds., Brookings Papers on Economic Activity, *Microeconomics* 1993:2; Charles Jones, "Sources of U.S. Economic Growth in a World of Ideas," *American Economic Review* 92(1) (2002): 220-239; and Executive Office of the President, "A Strategy For American Innovation: Driving Towards Sustainable Growth And Quality Jobs" (Washington, DC, 2009).Pressure from international competition is evidenced in other nations' challenges to long-standing U.S. leadership on key indicators like worldwide shares of domestic R&D spending, new patents and science and engineering degree holders and publications. On global innovation competition, see Council on Competitiveness, *Competitiveness Index: Where America Stands* (Washington, DC, 2007). See also, "The Atlantic Century" (Washington, DC: Information Technology and Innovation Foundation, 2009).

[30] Several knowledgeable observers have suggested that the "next economy," emerging in the wake of the Great Recession, will be more export-led, lower carbon and *innovation-fueled*. See, e.g., Lawrence H. Summers, "Rescuing and Rebuilding the U.S. Economy: A Progress Report," remarks at the Peterson Institute for International Economics. July 17, 2009; "Remarks by the President in the State of the Union Address," Washington, DC, January

development cycles; increased business "churn" (Schumpeter's "creative destruction"[31]); nearly instantaneous global exchange of information; lower costs and faster transportation of goods; the advent of internet based "open" innovation-development processes; and the emergence of large-scale markets in developing nations.[32] As a result, understanding the inputs and mechanisms that cause innovation, and how to influence them to address the challenges and opportunities in specific regional economies, becomes particularly important.

B. Factors that Contribute to Regional Innovation

If innovation causes growth, what causes innovation? Innovation arises (or not) through a complex set of interactions among a diverse set of actors that includes private-sector firms, universities, entrepreneurs, investors, government, and many others. These interactions occur through market systems and private, public and civic networks that define the institutional infrastructure and environment for economic activity, including particularly innovation. The particular set of actors will vary, as will the nature of their interactions, based on characteristics of the place in which they occur. Though distinct, these dimensions – actors, mechanisms and environment – are certainly related, and iteratively influence one another to determine the extent and nature of innovative activities in a place. Not coincidentally, some of the key theoretical framework for understanding how these interactions occur across space and in varying contexts is reflected in two fields of study which have gained a lot of traction lately: economic geography and institutional economics.

As initially described in Chapter II, economic geography[33] focuses on the role of place as a key determinant of economic activity, recognizing that economic assets – human and financial capital, firms, physical infrastructure, research centers – concentrate in particular places to take advantage of the benefits they all gain by being in close proximity to one another (and amenities of the particular place).[34] These dynamics particularly influence innovation: the geographic

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27, 2010; Bruce Katz, "The Next Economy: Transforming Energy and Infrastructure Investment," conference presentation, East Palo Alto California, February 2-3, 2010; and "Strengthening the American Labor Force" in *The Economic Report of the President* (Washington, DC: U.S. Government Printing Office, February 2010).

[31] The process of replacing existing goods, services, processes and business models with new, especially revolutionary, ones is what drives economic growth over the long term. New methods, enterprises and markets are created, causing others to become obsolete and cease to be made, used or engaged in. See Joseph Schumpeter, *Capitalism, Socialism, and Democracy* (New York: Harper Brothers, 1947), 82-85.

[32] See, e.g., See, Abbie Griffin, "Product Development Cycle Time for Business-to-Business Products," *Industrial Marketing Management* 31(4) (2002): 291-304; Manyika, Lund and Auguste, "From the Ashes: The Most Dynamic Economies Rely on Creative Destruction to Grow," *Newsweek* (August 16, 2010); Jean-Paul Rodrigue, Claude Comtois and Brian Slack, *The Geography of Transport Systems* (New York: Routledge, 2009); Henry Chesbrough, *Open Business Models: How to Thrive in the New Innovation Landscape* (Boston: Harvard Business School Press, 2006); and Sawers, Schydlowsky and Nickerson, Eds., *Emerging Financial Markets in the Global Economy* (River Edge, NJ: World Scientific Publishing, 2000).

[33] See, generally, Masahita Fujita, Paul Krugman and Anthony J. Venables, *The Spatial Economy* (Cambridge, MA: The MIT Press, 1999); Clark, Feldman and Gertler, Eds., *The Oxford Handbook of Economic Geography* (Oxford: Oxford University Press, 2000).

[34] In particular, the geographic proximity of key assets and actors in the economy enhances their individual and collective performance by reducing transportation costs of goods, people and ideas. Edward L. Glaeser, "Are Cities Dying?" *The Journal of Economic Perspectives* 12(2) (Spring 1998): 140.See also, generally, Clark, Feldman and Gertler, Eds., *The Oxford Handbook of Economic Geography* (Oxford: Oxford University Press, 2000). The benefits of concentration provide additional "agglomeration economies" through shared inputs to production, deep

concentration of knowledge-intensive activities has become even more pronounced in recent years.[35] Proximity of economic actors – including firms, research organizations, universities and individual workers – provides the opportunity for face-to-face interaction and sharing of ideas, generating increasing returns to knowledge and catalyzing innovative activity.[36]

Institutional economics[37] emphasizes the significant role that the institutional environment plays in enabling and shaping interactions among economic actors. Government of course influences innovation, such as through intellectual property protection or tax incentives for R&D investment. As importantly, a host of less direct institutional factors appear to determine a place's tendency to be innovative, including the density and nature of professional and learning networks; the nature of civic, business and cross-sector (e.g., public-private partnerships) organizations; and the business climate which flows from this institutional environment.[38] As mentioned, it appears that as the economy continues to become more dynamic, places that are more open, adaptive, flexible, networked and dynamic are also more innovative and entrepreneurial (see Chapter VII for further discussion of this topic).

Complementing this theoretical backdrop, which is largely focused on the systems level, practical understanding of how to increase firm-level innovation has also been increasing: case studies and "how to" advice proliferate in the business-management literature. Combining the two, a more nuanced picture is beginning to emerge of the types, stages and drivers of innovation as they translate to economic growth, and of the factors influencing success at various points within the process.[39] This allows policy makers and practitioners to identify and focus on these factors, and intervene accordingly.[40]

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labor pools and knowledge spillovers. Alfred Marshall, *Principles of Economics* (London: Macmillan and Co, 1890). See also, e.g., Cortright, "New Growth Theory, Technology and Learning," *Reviews of Economic Development Literature and Practice* 4 (2001): 19-20; Edward Glaeser and Joshua D. Gottlieb, "The Wealth of Cities: Agglomeration Economies and Spatial Equilibrium in the United States," *Journal of Economic Literature* 47(4)(2009): 999-1001; and Diego Puga, "The Magnitude and Causes of Agglomeration Economies," *Journal of Regional Science* 50(1) (February 2010): 204-205.

[35] Bjørn T. Asheim and Meric S. Gertler, "The Geography of Innovation: Regional Innovation Systems," in *The Oxford Handbook of Innovation*, Jan Fagerberg, David C. Mowery and Richard R. Nelson, Eds., (New York: Oxford University Press, 2005): 291-317.

[36] See, generally, Edward Glaeser, ed., *Agglomeration Economies (National Bureau of Economic Research Conference Report)* (Chicago: University of Chicago Press, 2010).

[37] See, generally, Brousseau and Glachant, Eds., *New Institutional Economics: A Guidebook* (New York: Cambridge University Press, 2008).

[38] See Roxas, Lindsay, Ashill and Victorio, "An Institutional View of Local Entrepreneurial Climate," in *Asia-Pacific Social Science Review* 7(1) (2007): 27-44; Van Looy, Debackere and Andries, "Policies to Stimulate Regional Innovation Via University-Industry Collaboration: An Analysis and an Assessment," *R&D Management* 33(2) (2003): 209-229; Annalee Saxenian, *Regional Advantage: Culture and Competition in Silicon Valley and Route 128* (Boston, MA: Harvard University Press, 1996); and Christie Baxter and Peter Tyler, "Facilitating Enterprising Places: the Role of Intermediaries in the United States and United Kingdom," *The Economic Geography of Innovation*, ed. Karen R. Polenske (Cambridge: Cambridge University Press, 2007), 261-288.

[39] See, e.g., Greg Tassey, *Rationales and Mechanisms for Revitalizing U.S. Manufacturing R&D Strategies*, (Washington, DC: National Institute of Standards and Technology, 2009); *A Strategy for American Innovation: Driving Towards Sustainable Growth and Quality Jobs* (Washington, DC: Office of Science and Technology Policy, September 2009).

[40] See, e.g., Joseph Cortright and Heike Mayer, "Signs of Life: The Growth of Biotechnology Centers in the U.S.," The Brookings Institution Center on Urban and Metropolitan Policy (January, 2001). For a particularly successful

The emerging body of research and practice suggests five primary categories of factors[41] that make some regions more "innovation-prone" and entrepreneurial than others:[42]

- **Labor market characteristics** – attributes of the workforce and its deployment;
- **Business ecology** – characteristics of firms and their interactions;
- **Networks and information exchange**– extent and nature of connections that enable interaction among workers and across firms and other organizations, particularly that enable spillover of ideas and reduce transaction costs for forming partnerships and doing deals;
- **Institutional environment and culture** – public, private and civic infrastructure that supports innovative capacities and activities; and
- **Investment capital** – availability of public and private financing across the stages of innovation, from R&D to new and growing businesses.

In the discussion that follows, key insights are highlighted in each category regarding the factors that contribute to regional innovation.[43] Coverage of each category is not intended to be comprehensive, but rather to highlight and organize the extensive literature in the context of what matters to and can be influenced by regional practitioners. This relatively high-level scan of the range of specialized research on subjects related to causes of innovation lays the groundwork for suggesting (in Section C) a framework for regional practice, and potential policy and programmatic interventions for improving regional performance.

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and prominent example of practice, see JumpStart, http://www.jumpstartinc.org/, which bundles an array of products and services to support innovation related entrepreneurship.

[41] Devising appropriate measures of innovation is an ongoing issue for both researchers and practitioners, resulting in use of metrics that tend to be indirect or incomplete at best. The research studies referenced throughout the balance of this section necessarily utilize such metrics, and their findings, as a result, can be challenging to evaluate. Measuring innovation is included as an area warranting future applied research and product development, in Section D.

[42] Note that while articulated here as distinct categories of influential factors, these areas interact and overlap greatly, particularly in their implications for real-world interventions. It should also be noted that the interactions of these factors with one another and in particular places are highly complex, with policy and program implications that are not "spatially blind" – that is, what works in one region (e.g., Silicon Valley) will not be wholly replicable in other regions. Interventions will therefore need to be tailored to a particular context. Indeed, "the mix of innovation factors is likely large, and the interplay and synergy among these factors is just beginning to be understood: The policy implications are many." See, e.g., Charles Edquist, "Systems of Innovation: Perspectives and Challenges" in Jan Fagerberg, David C. Mowery and Richard R. Nelson, Eds., *The Oxford Handbook of Innovation* (Oxford: Oxford University Press, 2005), 190-191; Bjorn T. Asheim and Meric S. Gertler, "The Geography of Innovation: Regional Innovation Systems" in the same volume, 294; Hamilton Galloway and Henry Robison, *Identification of Knowledge and Innovation Clusters: A GIS Application of Concentration, Co-Existence, and Correlation* (Moscow, ID: Economic Modeling Specialists, Inc., 2008), 1.

[43] Note, again, that we are primarily focused here on system-level factors that can be influenced by regional economic development practitioners. As a result, this list of factors does not include the internal firm-level activities that can foster innovation in specific firms.

1. Labor Market Characteristics: Human Capital and Knowledge Occupations[44]

The general and critical importance of human capital to regional economic growth is discussed in Chapter III. The importance of occupational and functional concentrations, including in knowledge intensive fields, is referenced in Chapter IV, addressing clusters. Both emphasize the iterative relationship of knowledge workers being attracted to rich knowledge job pools, and knowledge firms (with the jobs) being attracted to concentrations of knowledge workers. One of the key ways in which the level of human capital embodied in a region's labor force and deployed in its job pools influences economic grow this through its impact on innovation.

Education/Skill Levels. In general, higher levels of education[45] – particularly in science, technology, engineering and mathematics (STEM) fields[46] – tend to be associated with higher levels of innovation. Practical, experiential and technical skills can also be particularly important to certain types of innovation,[47] such as manufacturing workers' inside knowledge of the workings of the production line, in order to identify potential process improvements, or sales representatives' insights into unmet customer needs in order to propose new products and services. Developing the strongest possible human capital base, particularly well-matched to innovation-prone occupations, improves a region's chances at spurring innovation in private firms.

Knowledge Occupations. It is important for this human capital to be well deployed into knowledge and technology-based occupations. Having the cutting-edge firms, functions and clusters with these occupations is a critical part of any innovation strategy. These jobs tend to

[44] In addition to the human capital mechanisms discussed in this section, there is some evidence that regional demographics – the population's age profile, in particular – may affect innovative capacity. A recent study by the U.S. Small Business Administration found that, on average, as the population ages, it becomes more "risk averse." The authors used the Global Entrepreneur Development Index – a mechanism that captures the contextual features of entrepreneurship – to rank 71 countries, including the U.S., on indicators related to innovation and knowledge creation. When ranked across five pillars of the GEDIs "attitude toward entrepreneurship" sub-index, U.S. entrepreneurs were found to exhibit an increased fear that their investments and/or start-up firms will fail. The authors conclude that this increasing fear is a result of the U.S.'s changing population demographics, stating that older American citizens are more risk averse than their younger counterparts. Zoltan J. Acs and Laszlo Szerb, *Global Entrepreneurship and the United States* (Washington, DC: U.S. Small Business Administration, September 2010), 20, 29.

[45] See, e.g., Randall Eberts, George Erickcek and Jack Kleinhenz, "Dashboard Indicators for the Northeast Ohio Economy: Prepared for the Fund for Our Economic Future," Working Paper #06-05 (Cleveland: Federal Reserve Bank of Cleveland, 2006), 12; *Regions Matter: Economic Recovery, Innovation and Sustainable Growth* (Paris: OECD, 2009), 44-45; and US EDA October 2009, 208.

[46] Joshua L. Rosenbloom, "The Geography of Innovation Commercialization in the United States During the 1990s," The University of Kansas Working Papers Series in Theoretical and Applied Economics, Working Paper Number 200502, 2004 (subsequently published under the same title in *Economic Development Quarterly* 21(1) (2007): 3-16) (among the 50 largest U.S. metropolitan areas, the number of science and engineering PhDs granted has a positive and significant effect on levels of innovation commercialization, as defined by Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) grants, venture capital investments or initial public offerings (IPOs).

[47] While data limitations often cause researchers to measure human capital by levels of educational degree attainment, human capital encompasses all of the skills embedded in the labor force, including particularly the many and often more important skills learned through experience and on the job. These might include job-specific technical knowledge or skills, insights into customer needs/behavior, as well as management techniques or communication and other "soft" skills.

have a higher probability of leading to innovative ideas, products and processes.[48] (This subject is of course closely related to business ecology, discussed below.)

Presence of Entrepreneurs. While knowledge levels are particularly important to invention, the presence of entrepreneurs is critical during the later stages of the innovation process – commercialization of ideas into products, markets and companies. These individuals tend to be less risk-averse and more resilient.[49]

2. Business Ecology

The characteristics of firms that comprise a regional economy – including industry, size and structure – have an impact on the magnitude and type of innovative activity that occurs there. Further, the nature of interactions among firms, as well as with public-sector and civic actors, also influences the region's capacity to innovate. Four aspects warrant particular attention:

- *Clusters.* The presence of clusters (covered in much greater detail in Chapter IV) has been shown to increase firms' rates of innovation, leading to productivity gains and growth.[50]
- *Industries.* Studies suggest that knowledge-intensive industries in both manufacturing and service fields are more prone to innovate than others.[51] In addition, the process of innovation

[48] Barkley et al., for example, examine geographic concentrations of innovative activity in 107 metro across 13 Southern U.S. states, and find that regions with higher concentrations of high-tech occupations (e.g., computer engineers and natural, biological, and social scientists) are more innovative than those without such an occupational make-up. David L. Barkley, Mark S. Henry and Santosh Nair, "Regional Innovation Systems: Implications for Nonmetropolitan Areas and Workers in the South," *Growth and Change* 37(2) (2006): 281, 296-300. Feser, examining data from the Occupational Information Network, a database containing 1122 American occupations, finds that knowledge-based occupations (e.g., engineers, medical scientists, educators and financial personnel) produce and disseminate more knowledge and new ideas in an economy when compared to less knowledge-intensive occupations. Edward Feser, "What Regions Do Rather than Make: A Proposed Set of Knowledge-Based Occupation Clusters," *Urban Studies* 40(10): 1937-1958. Similarly, Drennan argues that occupations that attract a high proportion of college graduates, such as jobs in the information sector, tend to be more innovative, producing more output and a higher GDP of traded goods and services than jobs in the goods production and distribution sectors. Matthew Drennan, *The Information Economy and American Cities* (Baltimore and London: Johns Hopkins University Press, 2002): 24-26, 35.

[49] See, Zoltan Acs, *Innovation and the Growth of Cities* (Cheltenham, UK: Edward Elgar Publishing Limited, 2002), 13 ("[W]hat triggers the search for and exploitation of opportunities by some individuals but not others" is a set of "skills, aptitudes, insight and circumstances that is not either uniformly or widely distributed in the population," including their perceptions of risk and their ability to deal with and manage that risk.)

[50] See, e.g., a literature review by Hanson which notes the impact of spillovers on the innovation process of cluster firms. G. Hanson, "Firms, Workers, and the Geographic Concentration of Economic Activity," in Clark, Feldman and Gertler, Eds.,*The Oxford Handbook of Economic Geography*(Oxford: Oxford University Press, 2000), 477-494.

[51] A Study by the OECD, for example, finds that the presence of knowledge-intensive services and high-tech manufacturing is related to a region's level of innovative activity (as measured by patenting). Work by the US EDA suggests that high-tech employment (derived from a NAICS-based definition by Moody's, aggregating employment in key sectors such as pharmaceuticals, electronics, software, telecom and scientific R&D) has a consistent, significant and positive effect on economic performance measures including GDP per worker, per capita personal income and compensation per worker. See, e.g., Enrique Garcilazo, "The Sources of Economic Growth in OECD Regions: A Parametric Analysis," Submitted to OECD's Territorial Development Policy committee, December 1, 2008; US EDA, *Crossing the Next Regional Frontier: Information and Analytics Linking Regional Competitiveness to Investment in a Knowledge-Based Economy*, October 2009, 208.

itself is likely to vary from one industry to another,[52] as well as throughout the lifecycle of any given cluster,[53] potentially translating into differing information sharing, human capital, financial and other needs throughout the stages of innovation, as well as making different types of innovation important for specific industries. Identifying and building on local strengths in knowledge-intensive industries and shaping the innovation environment to account for the specific needs of key industries is key to being strategic in regional innovation development (as discussed in Section C).

- *Firm size.* Large firms have been found to hold certain competitive advantages when it comes to bringing innovations to market, generally, as well as in particular industries.[54] These include their capacity to (a) shoulder the often large fixed costs involved in R&D, through economies of scale; (b) gain temporary market power to maximize returns on their innovations; (c) diversify their innovation "portfolios" and thereby manage risk; (d) achieve better market penetration for new products/services through economies of scale in production, distribution and marketing; and (e) realize higher profit margins as a result of cost-saving process improvements.[55] At the same time, this dynamic may be changing as large firms face pressure for short-term profits, become more risk averse and find new models to acquire innovative firms. Research suggests that small firms also play a key in

[52] For an overview of how innovation differs in terms of knowledge base, sources of knowledge, actors and their relationships, geographic boundaries, relevant institutions and their roles, see the following chapters in Fagerberg, Mowery and Nelson, ed., *The Oxford Handbook of* Innovation (Oxford: Oxford University Press, 2005): Franco Malerba, "Sectoral Systems: How and Why Innovation Differs Across Sectors," 380-406; Nick Von Tunzelmann and Virginia Acha, "Innovation in 'Low-Tech' Industries," 407-432; and Ian Miles, "Innovation in Services," 433-458. See also, e.g., the discussion regarding the varying importance of within-industry and across-industry interactions in capital-intensive versus high-tech industries in Riccardo Crescenzi, Andres Rodriguez-Pose, and Michael Storper, "The Geographical Processes behind Innovation: A Europe-United States Comparative Analysis," *Journal of Economic Geography* 7(6) (November 2007): 10-11.

[53] Research suggests that the nature of networks and knowledge spillovers that contribute to innovation may vary throughout the lifecycle of industry clusters, shaping the innovation process and consequently the types of interventions most appropriate and effective at various stages. Audretsch and Feldman, for example, find that the transmission of tacit knowledge playsa particularly important role during early stages of the lifecycle, leading the authors to suggest that the positive agglomeration effects during the early stages of the industry lifecycle become replaced by congestion effects during the latter stages. Similarly, Eisingerich et al find that inter-organizational relationship strength and "intrapreneurship" (internal entrepreneurship) have varying effects on firm innovativeness depending on cluster maturity. In adolescent clusters, firms are open to a diverse set of exchange partners, such as research institutions and universities, and these interactions have a significantly positive impact on a firm's innovativeness during the early stage of the industry lifecycle. Mature clusters, on the other hand, were found to be more streamlined, and the *strength* (versus the number) of their network ties increasingly important to innovative capacity. See, e.g., David B. Audretsch and Maryann P. Feldman, "Innovative Clusters and the Industry Life Cycle," *Review of Industrial Organization* 11(1996): 253, 267-270; and Andreas Eisingerich, Oliver Falck, Stephan Heblich and Tobias Kretschmer, "Cluster Innovation Along the Industry Lifecycle," Jena Economic Research Paper #2008-070, Friedrich Schiller University/Max Planck Institute of Economics, 2008: 18-20.

[54] In studies comparing the innovation performance of small and large firms, Acs and Audretsch, for example, found that while large firms (those with over 500 employees) tend to have the relative innovative advantage in industries which are capital-intensive, smaller firms tend to exhibit a relative advantage in industries which are highly innovative and utilize a large component of skilled labor. In a second study, they found that small firms were more innovative in producing items such as electronic computer equipment, process control instruments, plastics products, surgical and medical instruments and measuring/controlling devices. See Zoltan J. Acs and David B. Audretsch, "Innovation, Market Structure, and Firm Size," *The Review of Economics and Statistics*, 69(4) (1987): 567, 570, 572-574; and Zoltan J. Acs and David B. Audretsch, "Innovation in Firms," *American Economic Review* 78(4) (1988): 680-681.

[55] For additional discussion, see Acs, *Innovation and the Growth of Cities*, 35-36.

innovation, as their size seems to convey to them some important advantages relative to larger firms, due to their (typically) more flexible organizational structures and the tendency for R&D activities to play a central role in their business strategies.[56]

- *Organizational structure.* Firms that are vertically integrated tend to lock in a static supply chain for production of their goods and/or services. While there are benefits to this structure (cost reductions, quality control, etc.), evidence suggests that it may impede innovation by limiting the interaction that components of the firm's internal supply chain have with external sources of knowledge and by making competitors, potential suppliers and partners wary of sharing information with the integrated firm.[57]

3. Networks and Information Exchange

The rate at which firms can develop and introduce innovations is increasingly influenced by their capacity to interact and cooperate with other firms and institutions.[58] The exchange of ideas, and particularly their combination in varied and novel ways, is a key factor for driving the pre-commercialization stages of the innovation process, enhancing the innovative capacity of human capital beyond what would be achievable in isolation.[59]These "knowledge spillovers" can occur as the result of informal social ties, worker mobility among firms and institutions[60] or through more formal networks and events that bring researchers, entrepreneurs and other actors together.

Labor mobility. Movement of workers between firms, within firms (across departments, functions or geographic locations) and across industry categories contributes to increased innovative activity. Labor mobility affects innovation by establishing links between previously unconnected firms, people and places, enabling tacit knowledge[61] transmission across firm

[56] The Advisory Committee on Measuring Innovation in the 21st Century Economy (2008) references evidence that "much innovation occurs in the smallest firms, where high exit and entry rates are common." The authors go on to note that while "entering firms are, on average, more productive than exiting firms…the role played by innovation is not known" (19). Acs (citing Acs and Audretsch, 1993b) cites the following reasons: (1) fewer layers of management structure and less inertia to encounter in approval processes; (2)Relative freedom from bureaucratic constraints (many successful new ventures resulting from departure of researchers frustrated by constraints); and (3)innovative activity's central role in firm. Acs, *Innovation and the Growth of Cities*, 24 and 18.

[57] Bengt-Åke Lundvall et al, "National Systems of Production, Innovation, and Competence Building," in *The Economic Geography of Innovation*, ed. Karen R. Polenske (Cambridge: Cambridge University Press, 2007), 219.

[58] Bengt-Åke Lundvall et al, "National Systems of Production, Innovation, and Competence Building," in *The Economic Geography of Innovation*, ed. Karen R. Polenske (Cambridge: Cambridge University Press, 2007), 214. For a discussion of the increasing level and duration of interactions among public- and private-sector organizations over the last 20 years, see Powell and Grodal 2005 (in *The Oxford Handbook of Innovation*, 56-58).

[59] See, Paul D. Gottlieb and Michael Fogarty, "Educational Attainment and Metropolitan Growth," *Economic Development Quarterly* 17(4) (2003): 326; Edward Glaeser, ed., *Agglomeration Economies (National Bureau of Economic Research Conference Report),* (Chicago: University of Chicago Press, 2010), 9.

[60] Dominic Power and Mats Lundmark, "Working through Knowledge Pools: Labour Market Dynamics, the Transference of Knowledge and Ideas, and Industrial Clusters," *Urban Studies* 41 (May 2004): 1025-1044.

[61] Explicit or codified knowledge is "objective and rational knowledge and can be expressed in such forms as data, scientific formulas, specific actions and manuals." Tacit knowledge, in contrast, is "subjective and experiential and hard to formalize." Examples include "belief, perspective, mental models, ideas and ideals." Ikujiro Nonaka, Ryoko Toyama and Akiya Nagata, "A Firm as a Knowledge-Creating Entity: a New Perspective on the Theory of the Firm" *Industrial and Corporate Change* 9(1) (2000): 5.

boundaries; new combinations of knowledge and ideas as workers interact with one another; and creation of new social ties via informal "alumni networks" of past and current firm employees.[62]

Several characteristics influence the level of labor mobility within a region. Larger labor markets increase mobility by pooling more employment opportunities.[63]Younger and single workers are more likely to be professionally mobile.[64] Networks and the institutional environment can also facilitate mobility, by providing workers with access to information about potential employment opportunities through former colleagues, partners, customers, suppliers, alumni networks or professional organizations.

Types of Networks. Networks can be structured in a number of ways, generally distinguished by the actors involved and the degree of formality. Networks take the form of trade associations, formal cluster collaboratives, peer research organizations, public-private partnerships linking institutions with entrepreneurs and large corporations or cross-functional institutions connecting entrepreneurs and small businesses with supportive resources and technical assistance. They may be formal, such as industry- or occupation-specific professional organizations that provide individuals and firms the opportunity to interact and cross-fertilize around problems or topics of mutual interest.[65]Alternatively, informal connections such as those maintained by "alumni" of particular firms and educational institutions, through one-on-one exchanges between firms or institutions, social networks or "communities of practice"[66] can provide more casual and intermittent ties to ideas and resources in related fields that might not otherwise occur through formally structured professional networks.

As discussed in Chapter IV, clusters play a prominent and important role in network formation and dynamics, as the inherent synergies among the activities of cluster members – as one another's competitors, customers, suppliers and partners – facilitate the type of interactions that often lead to innovation. In well-developed clusters, the group of actors involved is often relatively broad, and their structure can be something of a hybrid, capable of exhibiting both formal and informal network characteristics.

Geography of Spillovers and Networks. Geographic proximity provides the opportunity for face-to-face interaction among economic actors, facilitating exchange of information that may not be

[62] Power and Lundmark 2004, 1026-7

[63] Power and Lundmark 2004, 1028-1029

[64]According to a report from the 2000 Census, people aged 25 to 39 years old were highly mobile, accounting for nearly 34% of all movers between 1995 and 2000. Those in the next younger age group – 15 to 24 years old, some of the older of whom are presumably living independently – were also more likely than the total population to have moved during this time period. The study also indicated that young, single workers who were college educated were even more likely to move and to move farther (i.e., crossing state boundaries) when they did move. Rachel S. Franklin, "Migration of the Young, Single, and College Educated: 1995-2000," Census 2000 Special Report, U.S. Census Bureau, November 2003, 2, 9. See also, generally: Robert Shimer, "The Impact of Young Workers on the Aggregate Labor Market," *The Quarterly Journal of Economics* (August 2001): 969-1007.

[65] See discussion immediately below of the importance of the institutional environment to innovation. In Chicago, the Mayor's Council of Technology Advisors provides such a monthly forum. Powell and Grodal note that the academic literature evidences a strong positive relationship between formal "alliance formation" and innovation across diverse industries including chemicals, biotech, telecom and semiconductors (admittedly, all relatively technology-intensive industries; in *The Oxford Handbook of Innovation*, 65).

[66] Loose, fluid groups with related technical skills and/or work practices. Powell and Grodal 2005, 71.

easily conveyed across distance.[67] Through strong local ties, actors build trust and develop common mental models for approaching key problems. This relationship enables easier exchange of tacit knowledge between network members, and tends to facilitate pursuit of long-term, incremental innovation.[68]

Knowledge linkages *between* regions (and, specifically, between industries or clusters across regions) are important as well. Other regions' innovative efforts – particularly among those that are "neighbors" – may spill over and contribute to the local production of innovative outputs, particularly in certain academic fields or industries.[69] Inter-regional and international knowledge spillovers may be especially important to innovation in the current economic environment for three reasons. First, the complexity of modern technologies necessitates a more diverse array of expertise than may be available within a firm or region.[70] Second, firms may derive a competitive advantage from having access to distant basic science and analytic knowledge,[71] which is not very sensitive to distance decay.[72] And finally, non-local networks help firms avoid "cognitive lock-in" by broadening the scope and number of ideas to which they are exposed.[73]

Even in a globally connected environment, spillovers from research and development activities are affected by geographic proximity to the firms in which innovations occur. There is some evidence that university research tends to spread greater distances (beyond the metro area in which it takes place), while private-sector R&D tends to be contained to the region in which it

[67] See discussion, below, regarding the importance of face-to-face interaction particularly in the "solution-seeking" stages of the innovation process ("Significance by Stage of Innovation").
[68] Powell and Grodal 2005 (in *The Oxford Handbook of Economic Geography*), 65-66, 69, 72
[69] Crescenzi et al. 2007; Acs (2002, 19 and 54) also finds that spillovers may reach "beyond the MSA," measured as 75 miles from the central city.
[70] See, generally, Jan Fagerberg, David C. Mowery and Richard R. Nelson, Eds., *The Oxford Handbook of Innovation* (New York: Oxford University Press, 2005). In particular, see discussions in Pavitt ("Innovation Processes," 96-101) and Powell and Grodal ("Networks of Innovators," 59-60). See also Bjørn Asheim, Ron Boschma and Philip Cooke, "Constructing Regional Advantage: Platform Policies Based on Related Variety and Differentiated Knowledge Bases," Papers in Evolutionary Economic Geography, #07.09, Urban and Regional Research Centre Utrecht, Utrecht University, 2007, 13-14 and Mahroum et al 2008, 4-5. Mahroum et al point also point out that firms' ability to internalize new ideas from elsewhere ("absorptive capacity") and develop them for local application ("development capacity") are increasingly important to overall innovative capacity. Absorptive capacity is correlated with growth in Gross Value Added (GVA), and places that are good at absorption also tend to be good at development – i.e., the two capacities are mutually reinforcing.
[71] Industries using primarily analytic, codified knowledge are the ones most often studied in innovation research – Athey et al (2007) attribute this to high-technology industries having the "most visible innovation profile" (19-20).
[72] Moodysson et al (forthcoming), as cited in Asheim 2007, 15
[73] Asheim et al 2007, 17-18; Simmie's work related to innovative firms in the UK supports these theories, finding that they rely heavily on interactions with a global system of innovation, making their physical locations merely the places *from* which they operate, rather than *within* which they operate. They derive new knowledge form sources that lack a spatial component (e.g., government standards/requirements for safety, health, environmental impact), do not engage much in joint venture projects, form international relationships via their heavy concentration in exporting activity and tend to locate in large, diverse metro areas. Results are based on review of responses to Community Innovation Survey 3 in 2001. While the study is pan-European (15 countries), Simmie uses data from the UK only, representing a total sample of 8,172 firms in the following industries: production and construction, wholesale trade (excluding motor vehicles), financial intermediation and business services. (Simmie 2004)

occurs.[74]In some instances, very close geographic proximity – e.g., in the same research or business park – can further enhance knowledge spillovers.[75]

Strength of Network Ties. Evidence suggests that firms benefit from a combination of both direct and indirect (or, alternatively, strong and weak, respectively) ties within their network affiliations.[76] The former offer some of the innovation-related benefits mentioned above with respect to local networks, in that long-term, repeated interactions (even if not necessarily face-to-face), facilitate a shared foundation of knowledge, allowing members to approach problems from a common perspective.[77] Weaker, more indirect ties are characterized by infrequent interactions, possibly through more distant network linkages and offer the potential for generating more disruptive innovations, as more disparate knowledge bases are combined in new ways.[78]

Significance by Stage of Innovation. Different kinds of networks and spillovers are more important at different stages of innovation. Since tacit, experience-based knowledge is more difficult to apply and transfer via other means (e.g., written correspondence),[79] frequent and in-depth exchange of ideas, particularly with other actors in close spatial proximity, enhances the early stages of invention, testing and product development. Face-to-face interactions may play a more important role, for example, in the stages of innovation related to "solution-seeking,"[80] making close network relationships important up to and including the commercialization stage, when all stakeholders are collaborating to determine whether there is a viable product (or service or business model, etc.) to be brought to market.[81] The importance of geographic proximity and face-to-face interaction may decline, then, following product launch. Once a viable solution has been identified, and the focus shifts to dissemination of the innovative product, process or technology, the relevant activities such as marketing, production and so on are more easily

[74] Further, across an aggregate definition of the "high-tech" sector, university research only shows signs of spilling over to private-sector R&D within the same MSA. The specific geography over which university or private-sector R&D spillovers occur varies from one high-tech industry to another. Acs examines high-tech innovations in 43 states and 125 MSAs. See, e.g., Acs, *Innovation and the Growth of Cities*, 58-59, 68-73.

[75] See, generally, Michael J. Orlando, "On the Importance of Geographic and Technological Proximity for R&D Spillovers: An Empirical Investigation," RWP 00-02, Federal Reserve Bank of Kansas City, July 2000. For examples of successful innovative businesses arising out of research park settings, see also Carol Jean Carlson, Michael J. Keating and Gary N. Keller, "The Economic and Social Impact of University-Related Research Parks in the United States," Michael J. Keating and Associates, 2001.

[76] See discussion in Powell and Grodal (in *The Oxford Handbook of Innovation) 65-66.*

[77] Note, however, Powell and Grodal's review of a study by Godoe (2000), which concludes that "radical innovations were more likely to emerge form intimate and prolonged interaction," a finding contrary to the general consensus in the literature (65). Note also that the importance of strong/direct versus weak/indirect ties for innovation may vary by industry – e.g., strong appear more important for the steel industry, while weak are more so for the semiconductor industry (69).

[78] Powell and Grodal 2005 (in *The Oxford Handbook of Innovation*), 65-66, 69, 72

[79] See, e.g., Moodysson et al (forthcoming), as cited in Asheim 2007, 15

[80] This iterative and creative problem-solving phase of innovation draws most heavily on participants' experience with similar challenges in the past, making "hands-on" interaction and collaboration critical. See, Bengt-Åke Lundvall et al, "National Systems of Production, Innovation, and Competence Building," in *The Economic Geography of Innovation*, ed. Karen R. Polenske (Cambridge: Cambridge University Press, 2007), 217.

[81] Acs (2002) finds that university-firm proximity is more significant in introducing technologies to market than it is to patenting. Acs uses both patenting activity and innovations (introduction to market) as defined in the 1982 Small Business Administration (SBA) database as dependent variables in his regression analysis. The role of geographic proximity (i.e., being in the same MSA) had a larger positive relationship to market introduction of innovations as defined by the SBA database than it did to patenting activity. Acs 2002, 58

codified, making in-person interactions between innovators and entrepreneurs (i.e., creators versus commercializing agents) less significant to success,[82] but networks which connect inventions to entrepreneurs and investors more important. Ensuring ease of interaction among relevant actors throughout the innovation process – from researcher-to-researcher in the earliest stages and R&D, to industry/market in the product or process development and testing stages, to entrepreneur and investors in the later stages – can facilitate more successful innovation activities.

Networks factor into firms' ability to access and leverage new information in many and varied ways. The characteristics that make networks most effective – participants, functions, structure – will vary by stage of innovation. Broadly, achieving an open, dynamic environment for interaction among workers, firms and institutions facilitates higher levels of innovative activity. The more opportunities firms have to form both long- and short-term, strong and weak, long distance and proximate, relationships with complementary partners, the more innovation will occur.

4. Institutional Environment and Culture

The institutional environment and business culture provide incentives (or disincentives) for certain types of activities that contribute to the region's degree of innovative and entrepreneurial activity.[83] Institutional infrastructure – including government, academic institutions, civic and professional organizations and many others – shapes the ways in which innovation actors behave and interact with one another by establishing the processes, routines, rules and regulations that govern the engagement of actors in various types of transactions. For example, university policies concerning royalties affect the degree to which academic researchers can capture the economic benefits of their work and so influence their propensity to commercialize university-developed technologies.[84] Similarly, entrepreneurship is stifled in a business culture which does not value risk-taking and highly stigmatizes failure.

Tax and Regulatory Environment. A substantial body of literature addresses the roles of government in fostering innovation.[85] These include, but are not limited to: regulations and tax policies specifically aimed at particular types or stages of innovation (e.g., tax credits for R&D); public goods and programs which target particular stages of innovation (e.g., research labs, entrepreneurship training) as well as provide foundational support (e.g., more general human

[82] Bengt-Åke Lundvall et al, "National Systems of Production, Innovation, and Competence Building," in *The Economic Geography of Innovation*, ed. Karen R. Polenske (Cambridge: Cambridge University Press, 2007), 217.

[83] See, e.g., Mikel Landabaso and Benedicte Mouton, *Towards a New Regional Innovation Policy: 8 Years of European Experience Through Innovative Actions,* Draft for Publication (Brussels: European Commission Directorate-General for Regional Policy, 2002), 9-12 (section 1.3, New Instruments).

[84] De Gregorio and Shane find that the varying rate of new firm formation across universities is partially explained by both university eminence and university policies such as making equity investments in licensed start-ups and maintaining a low share of royalties. See, Dante Di Gregorio and Scott Shane, "Why do some universities generate more start-ups than others?" *Research Policy* 32 (2003): 222. For a review of a range of micro- and macro-level factors influencing new firm creation via university technology-licensing offices, see 210-214.

[85] See, e.g., Atkinson, *Supply-Side Follies*; Atkinson and Audretsch, *Economic Doctrines and Policy Differences: Has the Washington Policy Debate Been Asking the Wrong Questions?*; and *A Strategy for American Innovation: Driving Towards Sustainable Growth and Quality Jobs* (Washington, DC: Office of Science and Technology Policy, September 2009).

capital development, network organization and participation); and a style of and participation by government that helps create a more open, adaptive, flexible environment (e.g., streamlined processes for new businesses).[86] The ability of government, in particular, to adapt in stride with the economic environment may be an important factor in setting the table for innovation. That is, that government itself needs to innovate and reinvent itself as rapidly as the changing global economic environment warrants. (See Chapter VII for further discussion.)

Networks – Intermediary Institutions. Networks are extensively discussed above. They also, of course, are part of and shape the institutional environment. The presence of intermediary organizations and information networks that facilitate access, communication and support across public-private, industry and other boundaries can foster a more dynamic environment for innovation and entrepreneurship.[87] Intermediaries can act as bridges between typically "siloed" realms, such as finance, policy and regulation, place-based assets and education and research institutions, which can more effectively facilitate innovation if working in collaboration.[88]

Engagement of Universities and Research Labs. Universities, government agencies and other publicly funded research institutions have become particularly important partners for private firms.[89] Universities, in particular, provide private firms with key innovation inputs and early-stage ideas with potential for commercialization. They do this primarily by:[90]

- Producing key human capital (e.g., scientists, engineers);
- Conducting basic (as distinct from applied) research; and
- Engaging with industry partners to conduct market-based applied research.[91]

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[86] Cooke, for example, defines a region's degree of "embeddedness" as "the extent to which a social community operates in terms of shared norms of co-operation, trustful interaction and 'untraded interdependencies' (Dosi, 1988) as distinct from competitive, individualistic, 'arm's length exchange' and hierarchical norms…Regarding the organization of governance, the embedded region will display inclusivity, monitoring, consultation, delegation and networking propensities among its policymakers while the disembedded region will have organizations that tend to be exclusive, reactive, authoritarian and hierarchical." Philip Cooke, "Regional Innovation Systems, Clusters, and the Knowledge Economy," *Industrial and Corporate Change* 10(4) (2001): 960-961.

[87] See, e.g., David Audretsch and Max Keilbach, "Entrepreneurship Capital and Economic Performance," Discussion Papers on Entrepreneurship, Growth and Public Policy #0104, Max Planck Gesellschaft, 2004, 5 (subsequently published in *Regional Studies* 38 (2004): 949-959); Christie Baxter and Peter Tyler, "Facilitating Enterprising Places: the Role of Intermediaries in the United States and United Kingdom," in *The Economic Geography of Innovation*, ed. Karen R. Polenske, (Cambridge: Cambridge University Press, 2007), 261 – 288.

[88] See, e.g., Baxter and Tyler, "Facilitating Enterprising Places: the Role of Intermediaries in the United States and United Kingdom."

[89] See prior references in Networks and Information Exchange section of this chapter. For evidence of the increasing role of collaborative relationships between private firms, universities and federal laboratories in award-winning innovations (per analysis of data from *R&D Magazine*), see Fred Block and Matthew R. Keller, *Transformations in the U.S. National Innovation System, 1970 – 2006*, The Information Technology and Innovation Foundation, July 2008.

[90] See discussion of university-industry linkages in Keith Pavitt, "Innovation Processes," in *The Oxford Handbook of Innovation*, ed. Jan Fagerberg, David C. Mowery and Richard R. Nelson (New York: Oxford University Press, 2005): 93-95

[91] Industry-university partnerships can take many forms, including industry-funded research, university-provided consulting services and university-industry exchanges of personnel.

Successful university-industry partnerships often need to overcome challenges attributable, at least in part, to differences in cultural environments and misaligned goals between the two realms.[92]

Business Culture. Less tangible aspects of the region's business culture also have a powerful impact on the level of local innovation and entrepreneurship activity, influencing the way that private firms and individuals interact with public, civic and other institutional actors[93] through a set of norms, values, tacit conventions and "rules of the game."[94] Innovation is greater in regions that exhibit an openness to new people and ideas; appreciation of risk taking and tolerance of failure; promotion of cooperation and coordination; emphasis on learning; pursuit of public-private consensus; company commitments to social wellbeing; perception of science as socially valuable; strong interfaces between the scientific, technology, production and financial fields; university and workforce training systems linked to the private sector; and flexibility and adaptability of organizations, labor force and consumers.[95]

A region's institutional environment and culture are not only important in their ability to embrace change at a given point *in* time, but also in their ability to change *over* time – their "adaptive efficiency."[96] The ability of economies and institutions to continually adjust course and reinvent themselves over time, in response to changing circumstances, depends upon "the

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[92] For example, the private sector tends to exhibit a greater sense of urgency in moving projects forward than university partners, while universities may feel their R&D efforts are under-valued. See discussion of university-industry linkages in Keith Pavitt, "Innovation Processes," in *The Oxford Handbook of Innovation*, ed. Jan Fagerberg, David C. Mowery and Richard R. Nelson (New York: Oxford University Press, 2005): 93-95

[93] Philip Cooke, Mikel Gomez Uranga and Goio Etxebarria, "Regional Innovation Systems: Institutional and Organisational Dimensions," *Research Policy* 26 (1997): 488, including a discussion of studies by G. Sweeney, "National innovation policy or a regional innovation culture," Working Papers in European Industrial Policy, No. 1, EUNIP and H. Itami, "Mobilizing invisible assets: The key for successful corporate strategy," in *Information Resources and Corporate Growth*, ed. E. Punset and G. Sweeney (London: Pinter, 1989).

[94] Robert Atkinson and David Audretsch, *Economic Doctrines and Policy Differences: Has the Washington Policy Debate Been Asking the Wrong Questions?* (Washington, DC: Information Technology and Innovation Foundation, 2008), 16.Philip Cooke, Mikel Gomez Uranga and Goio Etxebarria, "Regional Innovation Systems: Institutional and Organisational Dimensions," *Research Policy* 26 (1997): 480; David Doloreux and Saeed Parto, "Regional Innovation Systems: Current Discourse and Unresolved Issues," *Technology in Society* 27 (2005): 146-147.Rodríguez-Pose (1999) describes this set of attributes as a place's "social filter," which "determines the rhythm at which any society adopts innovation and transforms it into real economic activity" (81-82). The author posits that at least among European regions, those that are less "innovation-prone" suffer from a rigid "social filter," which limits their innovative capacity. Many of these regions have a common industrial past in the mass-production economy, leading to a rigid and hierarchical social structure that impedes innovation.

[95] Joseph Cortright, *New Growth Theory, Technology and Learning: A Practitioner's Guide*, Reviews of Economic Development Literature and Practice, No. 4, U.S Economic Development Administration, 2001, 17, paraphrasing M. Olson, "Big Bills Left on the Sidewalk: Why Some Nations are Rich, and Others Poor," *Journal of Economic Perspectives* 10(2) (1996): 3-24; Jill Taylor, *What Makes a Region Entrepreneurial? A Review of the Literature* (Cleveland: Cleveland State University, Maxine Goodman Levin College of Urban Affairs, September 2006): 15-17; Rodríguez-Pose 1999, 81-82; Philip Cooke, Mikel Gomez Uranga and Goio Etxebarria, "Regional Innovation Systems: Institutional and Organisational Dimensions," *Research Policy* 26 (1997): 488; and European Commission, *Constructing Regional Advantage: Principles, Perspectives, Policies* (Brussels: European Commission Directorate-General for Research, 2006): 59-60.

[96] Joseph Cortright, *New Growth Theory, Technology and Learning: A Practitioner's Guide*, Reviews of Economic Development Literature and Practice, No. 4, U.S. Economic Development Administration, 2001, 18 (paraphrasing Douglass C. North, *Institutions, Institutional Change and Economic Performance* (Cambridge, MA: Cambridge University Press, 1990)).

willingness of a society to acquire knowledge and learning, to induce innovation, to undertake risk and creative activity of all sorts, as well as to resolve problems and bottlenecks of the society through time."[97] An environment that embraces and adapts to change, even change as drastic as Schumpeter's "creative destruction," plays a critical role in driving innovation and economic progress.

5. Investment Capital[98]

Though the causality may be complex, a large amount of empirical research highlights the positive relationship between successful innovation and access to stage-appropriate funding,[99]ranging from public grants for basic science research to R&D incentives for existing companies and venture financing for emerging high-growth businesses.

R&D Funding/Expenditures. R&D funding ensures sufficient resources dedicated to early stages of the innovation process in which solutions are formulated and technologies are developed, but which are higher risk, have longer time horizons to generate economic returns and for which the innovator may not capture all of the economic value created. These barriers and externalities

[97] Douglass C. North, *Institutions, Institutional Change and Economic Performance* (Cambridge, MA: Cambridge University Press, 1990), 80-81, as cited in Robert Atkinson and David Audretsch, *Economic Doctrines and Policy Differences: Has the Washington Policy Debate Been Asking the Wrong Questions?* (Washington, DC: Information Technology and Innovation Foundation, 2008), 15.

[98] This discussion of investment capital, and the research, are primarily focused on capital for new companies (with the exception of R&D incentives). A great deal of innovation, of course, occurs in existing firms, financed through their internal profits or broader corporate finance mechanisms. The complex corporate management dynamics – such as pressure to produce short term profits for shareholders – which may inhibit investment in innovation are beyond the scope of this paper. Better understanding policy and other options to influence these dynamics is an important area for further research, as noted in Section D.

[99] For evidence of the influence of publicly and university-funded R&D, including both basic and applied research, see OECD, *Regions Matter: Economic Recovery, Innovation and Sustainable Growth* (Paris: OECD, 2009): 44-45; also, discussion in Salter and Martin, "The Economic Benefits of Publicly Funded Basic Research: a Critical Review," *Research Policy* 30(3) (2001): 509-532, especially pages 515-516; D.A. Hicks and S.-G. Lee, "Regional Economic Impacts of Federal R&D by Funding Source and performer Type," *Regional Studies* 28 (1994): 619-632, as cited by Jeremy Howells, "Innovation and Regional Economic Development: A Matter of Perspective?" *Research Policy* 34 (2005): 1227-1228; Zoltan Acs, *Innovation and the Growth of Cities* (Cheltenham, UK: Edward Elgar Publishing Limited, 2002); Charles Jones, "Sources of U.S. Economic Growth in a World of Ideas," *American Economic Review* 92(1) (2002): 229. Regarding the role of venture capital funding, see Samila and Sorenson 2008 (as cited in RCF Economic and Financial Consulting, "Innovation Strategy Report," prepared for the Chicago Metropolitan Agency for Planning, 2009, 24); Colombo et al 2009a and Chemmanur et al 2008 (both as cited in Fabio Bertoni, Massimo G. Colombo, Diego D'Adda, and Samuele Murtinu, "Venture Capital Financing and Innovation in European New Technology-Based Firms: a Longitudinal Analysis on the Role of the Type of Investor," Paper for the 2nd Conference on Corporate R&D, December 2009, http://iri.jrc.ec.europa.eu/concord-2010/papers/bertoni_colombo.pdf); and Deutsche Bank Research, *Venture Capital: Bridge between idea and innovation?* (2008), http://www.dbresearch.com/PROD/DBR_MOBILE_DE-PROD/PROD0000000000225308.pdf.

particularly justify public subsidies for early-stage R&D.[100] Government-funded basic research, has substantially driven such major innovations as the internet.[101]

Seed and Venture Capital. Early stage investment capital often comes from "friends and family" and "angel investors" for start-ups, then from venture capital firms at later but still early stages of business growth. Access to capital can be a significant hurdle for new businesses with high growth potential.[102] Though only a small share of start-ups receive venture capital (VC) investments, VC in particular is often cited as a key ingredient to the success of innovative new businesses. VC investments provide a necessary bridge that sustains growing businesses between early-stage "friends and family" or angel funding and eligibility for traditional bank financing, providing them the opportunity to cross what has been referred to as the "valley of death" for innovative ventures.[103]

A model illustrating stages of innovation and their respective funding sources appears on the following page.[104]

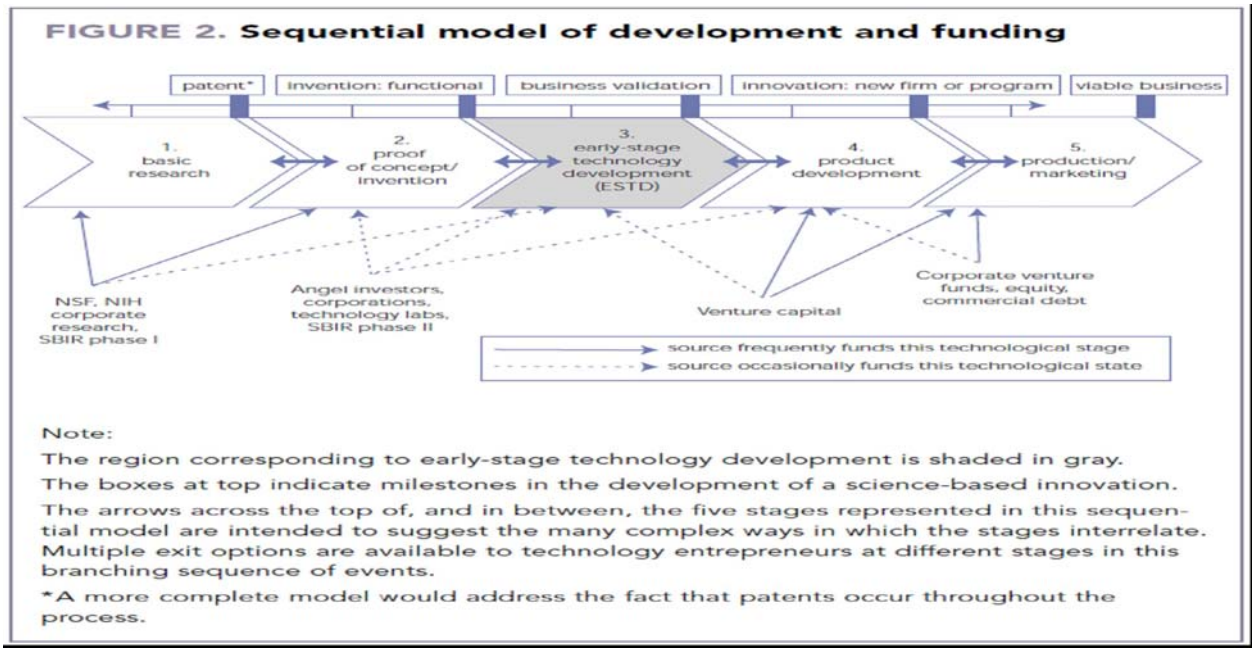
[100]Dimitri Zenghelis, "The Economics of network-Powered Growth," Cisco White Paper (August, 2010). The federal R&D tax credit appears to be a cost-effective policy tool for increasing corporate R&D investment. See, e.g., discussion in Atkinson, *Supply-Side Follies*, 233.

[101] NSF, *Technology in Retrospect and Critical Events in Science (TRACES)* (Washington, DC: National Science Foundation, 1969), as cited by Ammon J. Salter and Ben R. Martin, "The Economic Benefits of Publicly Funded Basic Research: a Critical Review," *Research Policy* 30 (2001): 513. See also, e.g., "A Trace of 'Traces,'" *MOSAIC* 1(1) (1970): 14-19, for excerpts of the larger TRACES study that highlights the role key R&D events have played in the emergence of major innovations.

[102] See, e.g., George S. Ford, Thomas M. Koutsky and Lawrence J. Spiwak, "A Valley of Death in the Innovation Sequence: An Economic Investigation," discussion paper prepared by the Phoenix Center for Advanced Legal and Economic Public Policy Studies for the Commerce Department, Technology Administration, September 2007 (available at http://www.ntis.gov/pdf/ValleyofDeathFinal.pdf) and Deutsche Bank Research, *Venture Capital: Bridge between idea and innovation?* (2008): 8.

[103] Deutsche Bank Research, *Venture Capital: Bridge between idea and innovation?* (2008): 8; George S. Ford, Thomas M. Koutsky and Lawrence J. Spiwak, "A Valley of Death in the Innovation Sequence: An Economic Investigation," discussion paper prepared by the Phoenix Center for Advanced Legal and Economic Public Policy Studies for the Commerce Department, Technology Administration, September 2007; NIST, *Between Invention and Innovation: An Analysis of Funding for Early-Stage Technology Development* (Gaithersburg, MD: Economic Assessment Office, Advanced Technology Program, National Institute of Standards and Technology, November 2002), 35-36.

[104]"Between Invention and Innovation: An Analysis of Funding for Early-Stage Technology Development" (NIST), 33.



6. Mechanisms Affecting Entrepreneurship and Small Firm Growth

A dynamic entrepreneurship and small-business community enhances innovation through both taking inventions to market, and because much innovative activity originates in these firms.[105] A high rate of new firm creation is linked with increased levels of innovative activity,[106] and a high rate of "business churn"[107] suggests that a region is replacing outdated firms with innovative and efficient companies. Creation of high-growth "gazelles," in particular, is a fundamental (some argue primary) source of job and wealth creation[108] in today's environment of "entrepreneurial capitalism."[109]

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[105] Zoltan Acs, *Innovation and the Growth of Cities* (Cheltenham, UK: Edward Elgar Publishing Limited, 2002), 18, 24-25; "Venture Capital: Bridge between idea and innovation?" Deutsche Bank Research, May 2008, 5. For a review of literature describing additional ways in which entrepreneurship drives growth, see David Audretsch and Max Keilbach, "Entrepreneurship Capital and Economic Performance," Discussion Papers on Entrepreneurship, Growth and Public Policy #0104, Max Planck Gesellschaft, 2004, 5-10.

[106] Paul Geroski, "What Do We Know About Entry?" International Journal of Industrial Organization 13(4) (1995): 431.

[107] Firm births plus deaths divided by the total number of firms.

[108] Zoltan Acs and Pamela Mueller, "Employment effects of business dynamics: Mice, Gazelles and Elephants," Discussion Papers on Entrepreneurship, Growth and Public Policy #2306 (Jena, Germany: Max Planck Institute of Economics, 2006), ftp://papers.econ.mpg.de/egp/discussionpapers/2006-23.pdf; Zoltan Acs, William Parsons, and Spencer Tray, "High Impact Firms: Gazelles Revisited," (Washington, DC: Small Business Administration Office of Advocacy, 2008), http://www.sba.gov/advo/research/rs328tot.pdf; David Birch, "Who Creates Jobs?" *The Public Interest* 65 (1981): 3-14; Magnus Henrekson and Dan Johansson, "Gazelles as job creators: a survey and interpretation of the evidence," Ratio Institute Working Paper 117 (Stockholm: Ratio Institute, 2008), http://www.ratio.se/pdf/wp/mh_dj_gazelle.pdf.

[109] Kauffman 2007 distinguishes between "entrepreneurial capitalism," in which the driving force behind economic growth is the creation of small – but rapidly growing – firms, and the "managerial capitalism" of the 1950s and 1960s, during which time large corporations were seen as the primary drivers of the national economy (5).

Driving Entrepreneurship/New Firm Starts. Many of the mechanisms that affect levels of entrepreneurship overlap with those already discussed in relation to innovation, including the presence of skilled, entrepreneurial human capital (both in entrepreneurs themselves, as well as their employees), a regulatory and legal environment in which there are few obstacles to new firm creation and start-up,[110] and the availability of stage-appropriate financing. It is also important that the innovation pipeline – ideas, applied R&D, testing, product development – be strong, so that entrepreneurs have a rich pool from which to select the most promising opportunities for commercialization.[111] Universities play a large role in developing technologies with commercial potential, and the more streamlined and timely is the process of technology transfer – moving ideas "out the door" – the more active and successful the entrepreneurial segment of the economy can be.[112]

Supporting Small Firm Growth. Relationships with complementary firms facilitate and accelerate growth of entrepreneurial ventures. Firms that provide knowledge-intensive business services (KIBS)[113] can also act as "bridges" or interfaces aiding small- and medium-sized firms' innovation activities. The explicit and tacit knowledge that small firms receive from KIBS providers, when combined with the firms' own industry- and firm-specific knowledge, enable an increased pace of firm growth and development.[114] Additionally, establishing strategic alliances with firms that exhibit complementary knowledge bases can increase small firms' level of innovative activity and enable them to grow more rapidly than they would if working in isolation.[115]

Myriad programs have been designed to provide technical and supportive services to small firms, with mixed success. It appears that entrepreneurs tend to benefit more from peer exchange and from mentors with deep business experience; and that technical assistance services are more effective when highly tailored to the type of business and stage of development, and packaged with practical hands-on engagement, finance or other types of tangible support.[116] Networks of

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[110] Kauffman 2007 cites specific regulatory areas that particularly affect entrepreneurs, including those around intellectual property, liability litigation and health care (2-3). Note that this paper focuses primarily on federal policy issues affecting entrepreneurship. The same issues, however, also extend to state and local policy. See also, the review of relevant studies of tax and regulatory climate's impact on entrepreneurs in Jill Taylor, *What Makes a Region Entrepreneurial? A Review of the Literature* (Cleveland: Cleveland State University, Maxine Goodman Levin College of Urban Affairs, September 2006), 12-14.

[111] Kauffman 2007 (3)

[112] Kauffman 2007 (22-23)

[113] KIBS include both traditional professional and business services, such as legal, accounting, marketing, and so on, as well as more technology-intensive services such as software design, network design, environmental services, etc.

[114] Emmanuel Muller and Andrea Zenker, "Business Services and Actors of Knowledge Transformation: the Role of KIBS in Regional and National Systems of Innovation," *Research Policy* 30 (2001): 1501-1516.

[115] Powell and Grodall 2005 (66-67)

[116] For a review of the literature on peer coaching, as well as specific case examples, see Nailya Kutzhanova, Thomas S. Lyons and Gregg A. Lichtenstein, "Skill-Based Development of Entrepreneurs and the Role of Personal and Peer Group Coaching in Enterprise Development, *Economic Development Quarterly* 23 (2009): 198-206. The authors' find that entrepreneurs benefit from peer exchange to both create a knowledge base and hone their expertise and skills necessary for successful business performance. Similarly, the National Women's Business Council cited the continued need for technical assistance programs, particularly those that offer guidance in areas such as taxes and financial management. The report also found that the need for technical assistance to entrepreneurs remains high, as entrepreneurs are less likely to be able to afford to hire the resources that they need (e.g., an attorney or an

private-sector partners (particularly peer networks between early-stage firms), technical assistance programs and professional service providers can be important mechanisms for strengthening small and emerging firms.

C. Practitioner Framework and Interventions

Considering the huge scope and often highly specific depth of work on innovation, how is the regional economic development practitioner to approach enhancing innovation rates in a specific regional economy? In short, there is no magic bullet or quick fix to turn a low-innovation economy into an innovation-driven one. A region must gain a deep understanding of its innovation environment – the infrastructure, stakeholders and their interactions – and develop a set of staged innovation initiatives tailored to its challenges and opportunities. One observer has characterized that as an "innovation journey" to effect large-scale change through a series of "small, achievable steps that have a visible and significant impact on the innovative capacity of a region."[117]

A framework for categorizing potential interventions is offered immediately below. A key message, though, is the importance of being strategic: the subsequent section offers some thoughts on how to use the framework to identify and target opportunities, and then provides examples. The practitioner community faces a significant challenge in developing systemic ways to support innovation and entrepreneurship, but a number of promising models are emerging, from which the field can learn and build.[118]

1. Framework

The activities that can be taken to increase regional innovation can be approached in three broad (and somewhat overlapping) categories: (a) Foundational – Inputs and Ecosystem; (b) Stage-Specific; and (c) Industry- or Cluster-Specific.

a. Foundational– Inputs and Ecosystem

Not by coincidence, the basic inputs and infrastructure for building regional innovation capacity are virtually identical to the leverage points discussed in depth in other chapters. That's because, as discussed, innovation is the key driver of long term economic growth. High levels of human capital (Chapter III), rich job pools in high growth clusters (Chapter IV), an open and dynamic

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accountant) and therefore have a greater need for group training and assistance opportunities. See also, National Women's Business Council, "Current Priorities and Challenges of Women Business Owners," Spring 2009, available at: www.nwbc.gov/idc/groups/public/documents/nwbc/2009townhallreport.pdf.

[117] Charles Leadbeater and James Meadway, *Attacking the Recession: How Innovation Can Fight the Downturn* (London: National Endowment for Science, Technology and the Arts (NESTA), December 2008): 14. Benneworth describes an "innovation journey" as consisting of five key stages: (1) gathering a cadre of enthusiasts, (2) arriving at an agreed vision and strategy, (3) piloting novel activities, (4) mainstreaming and (5) renewal. Each stage is preceded by a formative "critical moment," which, if not addressed appropriately could derail the journey. For more detail on the "innovation journey" framework, see Paul Benneworth, *Leading Innovation: Building Effective Regional Coalitions for Innovation* (London: NESTA, December 2007): 4-6, 19-38.

[118] Empirical evaluation of interventions is challenging and insufficient, especially for relatively new initiatives. Those included in this review are most often cited as strong, successful examples by practitioners and researchers.

institutional environment (Chapter VII) and to a more limited extent even spatial efficiency (Chapter VI) all cause economic growth partly through enhancing the conditions for or directly causing innovation. Add appropriate finance (as an input), and we've largely captured (and discussed in other chapters) the key ingredients for creating strong regional capacity for innovation.

Perhaps the one of these which most bears further comment (beyond what's in other chapters) more specifically tailored to innovation is the institutional environment. It's clear, in particular, that rich formal and informal networks of workers, firms, research institutions, investors and others play a key role in fostering innovation. Indeed, in addition to focusing on specific inputs (such as human capital or finance) and conditions (such as strong clusters or open government), the main foundational activity available at the regional level is to focus on building an "innovation ecosystem." Building a supportive institutional infrastructure and rich connections between stakeholders enables knowledge to flow and transactions to more readily occur, thereby leveraging "sticky" local knowledge to increase competitive advantage and capitalize on the output of local knowledge-creating organizations (universities and others).[119]

b. Stage-Specific

A second category of interventions focuses on particular stages of innovation. The stages and interventions can be grouped into three categories:

(1) Basic and applied research – The earliest stages from idea formation to invention: not all regions will have strengths in early-stage innovation, and most will want to focus within particular local specializations. A host of strategies and practice focus on enhancing early-stage innovation, including creation of research centers, incentives for private sector R&D, and others.

(2) Commercialization of Knowledge – Many regions produce ideas, but do not convert them to economic activity. Technology transfer and related programs focus on creating the networks, incentives and expertise to move the ideas from the lab to the marketplace.

(3) Entrepreneurship and Firm Growth – One vehicle for moving ideas to products, companies and markets is through entrepreneurship (so this category is closely related to commercialization). The leading programs for supporting entrepreneurship and firm growth effectively combine the right technical assistance and finance, and deliver them through customer, peer and market driven networks that include experienced mentors, investors and institutional partners. "Innovation ecosystems" are often in fact focused on and build from this stage.

[119] Asheim and Gertler, "The Geography of Innovation: Regional Innovation Systems" in *The Oxford Handbook of Innovation*, especially 298-300. See also the discussion of the components, functions and relationships encompassed by systems of innovation in Charles Edquist, "Systems of Innovation: Perspective and Challenges" in *The Oxford Handbook of Innovation*, 188-198. See also, generally, Philip Cooke, "Regional Innovation Systems, Clusters, and the Knowledge Economy," *Industrial and Corporate Change* 10(4) (November 4, 2001): 945-974; David Doloreux and Saeed Parto, "Regional Innovation Systems: A Critical Synthesis," Discussion Paper Series, United Nations University Institute for New Technologies, August 2004; and Philip Cooke et al, "Regional Innovation Systems: Institutional and Organisational Dimensions," *Research Policy* 26 (1997): 475-491.

c. Industry- and Cluster-Specific

In practice, it is often effective to target, tailor and deliver many of the "foundational" or stage-specific interventions as part of cluster strategies. Once high-potential clusters are analyzed, their circumstances dictate how to best tailor effective strategies for developing the right human capital, building networks, creating specialized finance and supporting R&D, commercialization or entrepreneurship.

2. Strategic Interventions

a. Being Strategic

"Innovation is a gamble."[120] There were nearly 400 auto companies[121] before three prevailed. Regions that want to be high-growth and competitive in the next economy have to take this gamble.[122] It seems critically important, though, to get past the generic innovation fad to more strategic interventions tailored to local economies. As discussed in Chapter II, the field of economic geography and the practice of regional economic development both confirm that regions are differentiating and specializing; that economic activity is not uniform across space; and that instead actors, assets, systems and environmental context interact to define local economies. This complex dynamic is particularly in play with respect to understanding the opportunities for innovation.

Like any form of place-based economic development, being strategic thus entails understanding the intersection between existing local assets and potential economic growth areas, identifying particular opportunities and barriers, and implementing tailored strategies to address them. In the context of innovation, this means understanding the local foundational capacity and the success of various stages of innovation and identifying specific opportunities both to enhance the foundational capacity and to generate more innovation at particular stages of the process and in specific sectors of the economy. Some industry sectors or clusters may provide richer opportunities for innovation because they are still emerging and evolving fields, so much remains be learned and applied – for example, alternative energy production or genomics. Others may be more mature, but still highly innovation-prone, such as mobile telecom technologies or financial services.

In addition to understanding the distinctive opportunities presented by the region's particular mix of firms, human capital, institutions and other assets, two other considerations common to economic development should inform selection of strategies:

- Cost-benefit analysis. While always very difficult to calculate, particularly with respect to innovation, strategy selection and prioritization should be informed by which are likely to

[120] Lord et al, "Making Sense of Innovation Fads and Fashions."
[121] As of 1910, per *Thomas' Register of American Manufacturers*. See, e.g., Steven Klepper and Kenneth L. Simons, "Technological Extinctions of Industrial Firms: An Inquiry into their Nature and Causes," *Oxford Journal of Industrial and Corporate Change* 6(2) (1997): 379.
[122] As mentioned in the opening section of this chapter, there are alternative paths to growth in the short term – e.g., increasing inputs to production or imitating other regions' innovations. Innovation, however, remains the sole long-term, sustainable path to continued economic growth.

produce the greatest returns for their costs, whether investments are made with public or private dollars.

- Market imperfections or potential for positive externalities. Public intervention and subsidy of innovation-related activities should be prioritized where the market will otherwise under-invest in certain types or stages of innovation. The most common justification for intervention, of course, is the market's tendency to under-invest in some types of innovation – such as basic science research and development – because the innovator often cannot capture all of the value. Public resources should also prioritize innovations which produce particularly positive public benefits, such as, for example, product innovation in alternative energy production (to improve environmental quality), or business model innovation in workforce training (to address access to opportunity and mitigation of poverty and inequality).

b. Selecting Interventions

Knowing, by now, the factors which drive innovation(labor market characteristics, business ecology, networks and information exchange, institutional environment/culture and investment capital), a framework for applying them, and some strategic guidelines, it is possible to illustrate how interventions might be guided by factors and strategies.

(i) Foundational Strategies – Inputs and Ecosystem

As discussed above and in the chapter on human capital, the knowledge exchanges and spillovers through which human capital contributes to innovation generally occur in the context of "many specific sectoral, technological or institutional channels."[123] For innovation purposes, in addition to generally increasing levels of human capital, strategies should be targeted to increasing human capital needed for and better aligned with the functions, occupations and clusters (discussed further in (iii), below) that exist and are emerging in the local economy where there is the most need and opportunity for innovation. Examples range from fairly broad strategies – like programs within universities to increase STEM graduates, such as those funded by the National Science Foundation's STEM Talent Expansion Program – to specific industry-driven advanced training programs housed at universities, such as the University of Washington's Master in Aerospace Engineering curriculum, which produces workers with the specific skill sets required to work in the region's aerospace industry.[124]

Connectivity among firms, workers and institutions can be enhanced by facilitating opportunities for cross-fertilization and idea exchange across the boundaries of related, but distinct fields.[125]

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[123] Storper and Scott, "Rethinking Human Capital, Creativity and Urban Growth," Journal of Economic Geography 9 (2009): 159.

[124] For more information on the National Science Foundation's STEM Talent Expansion Program, see: http://www.nsf.gov/pubs/2010/nsf10569/nsf10569.htm#pgm_desc_txt. The state of Washington has several education initiatives in place to specifically increase the production of workers qualified to work for companies in the regional aerospace industry, including, particularly, the Boeing Company. See the State of Washington's "The Business Case for Consolidating Boeing 787 Assembly in Washington," p. 19-20, available at http://www.psrc.org/assets/2834/WA_787_final.pdf.

[125] See discussion immediately below of the importance of the institutional environment to innovation. In Chicago, the Mayor's Council of Technology Advisors provides such a monthly forum.

This may take the form of networking events, interactive workshops, panel discussions and so on. Examples include the Mayor of Chicago's Technology Advisory Council, connecting companies, entrepreneurs, investors and others to explore emerging technology needs, markets and companies; and the MIT Deshpande Center, bridging the research-to-commercialization gap by linking finance and knowledge resources.[126] For another example, a series of 2009 federal Department of Energy (DoE) workshops brought together public-sector and university stakeholders with fleet representatives and fuel producers to improve the availability of alternative fueling infrastructure in their regions as part of the Clean Cities program aimed at achieving environmental and energy security.[127]

Strategies that focus on effecting changes to institutional infrastructure and culture may offer the greatest potential for enhancing the foundations for regional innovation activity. Government, in particular, can play a significant role in laying the groundwork for increased innovative capacity. Adopting regulations that reflect market-based principles (and revising existing ones to do so as well) – e.g., tradable permits, results-based performance standards rather than regulatory constraints – can both facilitate creative solutions and provide strong, long-term incentives for changes in business and consumer behavior.[128] In addition, assessing the potential impact of new regulations on innovation and entrepreneurship activities prior to passage (through careful cost-benefit analysis) can help guard against unintended adverse consequences for the region's innovation environment.[129] Beyond government regulation, easy-to-implement initiatives such as publicizing and celebrating innovation and entrepreneurial "success stories" as they happen and hosting innovation competitions to provide incentives for developing creative, outside-the-box solutions (the most extreme example being the well-known – though global, not regional – X PRIZE[130])can have a meaningful impact on the business culture, individuals' understanding of what it takes to be an entrepreneur and their willingness to take risks.[131] At least one privately owned firm, InnoCentive, exists solely to create and manage such innovation competitions on

[126] The Deshpande Center has delivered over $10 million in funding to more than 80 projects and spun out 12 companies, which have created more than 200 jobs and attracted over $180 million in funding from 13 VC funds (http://web.mit.edu/deshpandecenter/about.html). See, e.g., Baxter and Tyler, "Facilitating Enterprising Places: the Role of Intermediaries in the United States and United Kingdom," for additional examples in San Diego, Eastern Massachusetts, Research Triangle (NC), Central Belt (Scotland) and the Eastern region (UK) (268-283).

[127] The more than 8,400 stakeholders and nearly 90 coalitions developed in the context of the Clean Cities program displaced 446 million gallons of petroleum in 2009, and more than 2.9 billion gallons since 1993. Coalition efforts account for 700,000 of the alternative-fuel vehicles on the road in 2009 and the continued expansion of the nation's network of alternative fueling stations. See "Fueling Your Alternative Fuel Vehicle Fleet," *Clean Cities Now* 14(1) (2010): 6 and http://www1.eere.energy.gov/cleancities/accomplishments.html.

[128] Kauffman 2007 (30)

[129] Kauffman 2007 (29)

[130] The X PRIZE Foundation awards $10 million+ to the first person or team to achieve a specific humanity-benefitting goal – e.g., related to space travel, genomics, high-efficiency/low-emissions automotive technology (http://www.xprize.org/).

[131] The OECD, for example, advocates creation of identifiable role models and champions for innovation through promotion of regional success stories in a variety of ways – in a range of media, by different public and private voices and so on – to offer a more realistic impression of what being entrepreneur may entail (including failure). The OECD also notes the role that competitions can play in encouraging innovation, citing a case study in Mecklenburg Western Pomerania as an example. See, e.g., *Strengthening Entrepreneurship and Economic Development in East Germany: Lessons from Local Approaches* (Paris: OECD, March 2009), 73-76; and http://www.oecd.org/secure/pdfDocument/0,2834,en_21571361_38013663_39142133_1_1_1_1,00.pdf.

behalf of corporate clients. Its results have been praised in the business press and earned it several innovation awards.[132]

Finally, traditional economic development practitioners often are not best equipped to lead this activity, as a matter of their skill sets, development frameworks and networks. Engaging serial entrepreneurs and professionals with venture capital or business backgrounds is critical to this area of economic development practice. For example, JumpStart, Inc.,[133] one of the leading national models building innovation networks and ecosystems, broadly engages professional staff, mentors and partners who themselves have entrepreneurial, business and other private-sector experience.

(ii) Stage-Specific Strategies

Often, sophisticated analysis of a region's performance on innovation reveals specific barriers at particular stages of the innovation process. Some regions, for example, are simply not undertaking the R&D needed to generate inventions. Others produce lots of inventions (as reflected in their patent rates), but have low rates of moving them out of the universities and research labs to large companies or entrepreneurs who can take them to market. Others find that while entrepreneurs are converting the ideas to products, they face severe challenges financing and growing their companies. This kind of analysis leads to stage-specific strategies.

Basic and Applied Research

The basic and applied research stages will benefit most from strategies that increase the potential for *identification* of promising new technologies or practices and facilitate *exploration* of their commercial potential. This, of course, relies heavily on leveraging existing knowledge and generating new, cutting-edge knowledge. In regions where innovation in existing and emerging clusters is largely science- and technology-based, developing and deploying human capital in related fields (i.e., STEM, or science, technology, engineering and math) is critical to this stage of the innovation process. Production, attraction and retention of STEM degree holders or other types of human capital relevant to the region's areas of innovation (e.g., art/design) are high priorities.

From the point of view of regional economic development, better aligninguniversity and other research institutions' programs, policies and procedures with the needs and emerging opportunities in the marketplace, as conveyed through potential industry partners, will foster more successful collaborative relationships that lead to innovations with commercial potential. Consider, for example, Iowa State University's use of Industry Liaisons and Licensing Associates to proactively identify firms for which its research may prove commercially beneficial through both direct, one-on-one outreach and industry mixers.[134] Georgia Tech also

[132] For more information on InnoCentive, see http://www2.innocentive.com/. See also description of the business model and benefits to InnoCentive's corporate clients in Christian Terwiesch and Yi Xu, "Innovation Contests, Open Innovation, and Multiagent Problem Solving," *Management Science* 54(9) (September 2008): 1530.

[133] http://www.jumpstartinc.org/

[134] See this and other case studies presented in Diane Palmintera, Jerrill Joy and Echo Xiao Xiang Lin, "Technology Transfer and Commercialization Partnerships," prepared by Innovation Associates, Incl. under National Science Foundation Grant No. EEC-0413603, October 2007.

engages in considerable industry outreach activities through its Economic Development Institute, College of Engineering, Georgia Tech Research Institute and other departments and programs.[135] Further, institutions' research collaboration policies should be sufficiently flexible to adapt to unique public-private relationships as the need for new structures presents itself.

Expanding the connections between various types of individuals and organizations to combine and leverage their respective knowledge – and thus generate a higher quantity and quality of research – is also very important. Fostering "invisible colleges"[136] is one approach, in which a network of researchers (increasingly multidisciplinary in nature) forms around a common problem or issue. Initiatives such as the Aspen Design Summit and the Urban Design Lab at Columbia University, for example, provide venues for experts in wide-ranging fields – such as urban design and architecture, public policy, business management, healthcare, environmental sciences, education, communications, economics, law – to address critical issues such as climate change, poverty alleviation, education quality and public health.[137] The Kellogg Innovation Network (KIN) is one promising initiative to bring together major corporations, researchers, non-profits and the public sector in a multi-disciplinary approach to catalyzing innovation.[138] Another promising strategy is to establish closer ties between research institutions and private firms. Such relationships are mutually beneficial: researchers can focus their efforts on meeting

[135] See this and other case studies presented in Diane Palmintera, Robert Hodgson, Louis Tornatzky and Echo XiaoXiang Lin, "Accelerating Economic Development Through University Technology Transfer," Innovation Associates, Inc., February 2005.

[136] Powell and Grodal 2005, citing Crane 1972 (73)

[137] The Aspen Design Summit was held in November 2009 in an effort to galvanize the global design community to engage in projects that spur social change. One such project discussed was sustainable food intervention, which seeks to identify where design interventions might change the pace or scale of food transformations underway in order to eradicate childhood obesity. The conference specifically brought together more than 60 urban planning experts, architects, journalists, entrepreneurs, business experts, healthcare and laboratory practitioners, and academics to identify opportunities to demonstrate design thinking in crafting solutions for large-scale social problems and use existing networks and programs to accelerate change. Six projects have been initiated or expanded since their discussion at the summit. See http://www.aiga.org/content.cfm/aspen-design-summit.The Urban Design Lab at Columbia University was created in 2006 to address the need for a design-based approach to shaping the long-range future of sustainable urbanism. The Lab's work represents a collaboration between academics and professionals in urban design and planning, architecture, engineering, climatology, education, economics, environmental science, and public health, among others. Drawing upon the multi-dimensional and dynamic expertise of its contributors, the Urban Design Lab has assisted New York City communities in tackling environmental remediation, high-performance and green building design, micro-infrastructure, public health, climate change and sustainable economic development. UDL's recent work includes receipt of a 2009 Ultra-X grant from the National Science Foundation and the US Department of Agriculture Forest Service to collaborate with a wide variety of partners in monitoring the interaction of residents, green roof performance and urban ecosystems at the neighborhood level. Other examples of interdisciplinary projects include the New York City Regional Foodshed Initiative, the Urban Heat Island/Green Roofs Initiative in West Harlem and the Hudson Regional Modeling Initiative. For more information, see http://www.urbandesignlab.columbia.edu/?id=aboutus.

[138] Housed at Northwestern University's Kellogg Graduate School of Management, KIN is an "independent convening platform for accelerating innovation dialogue and action," bringing together "delegates from academia, government, non-profits and a wide range of industries: healthcare, technology, defense, utilities and communications to workshop on ideas related to building global prosperity." Each year, KIN hosts two "dialogue" events of no more than 50 people each and a global summit that draws together about 200 international leaders to continue the path toward global prosperity. In their most recent summit, topics addressed included (among others): how to spark the interest in broad innovation that leads to global prosperity, how companies are innovating to meet global resource challenges and how large healthcare companies can deliver innovative healthcare solutions to emerging markets. See http://www.kinglobal.org/.

industry- and market-identified needs and access an additional (non-public) funding stream, while firms gain access to a pipeline of new technologies and products for future commercialization.[139]

As previously mentioned, the market tends to under-invest in early-stage R&D, making financial support for such work an area in which public-sector intervention is warranted. In addition to the private-sector funding that can be generated through institution-firm partnerships, public-sector financial incentives such as R&D tax credits or competitive state and local research grants would aid in filling the early-stage funding gap.[140]

Commercialization

Similar to strategies that target the identification and exploratory (R&D) stages of innovation, developing the right human capital and leveraging it through particular types of relationships and networks are important to improving commercialization of new ideas. While improving the quality and quantity of STEM degree holders still matters at this stage, making institutional infrastructure and local culture conducive to bringing new ideas to the marketplace quickly and easily is the primary focus.

Expanding and strengthening regional institutional infrastructure often involves altering tech transfer relationships and streamlining interaction between research institutions and private firms. Technology transfer programs in particular should not only support the commercialization of viable technologies, but ensure that key university contributors have incentives to do so. Depending on local circumstances, revamping performance measures and incentives within the technology transfer programs at universities and other research institutions, including making commercialization activities part of the criteria for hiring and granting of tenure, may aid in ushering more new products to market.[141] In regions where there are more systemic challenges to

[139] Beginning in the 1980s, the Irish government began facilitating collaboration between industry and academia. For example, Intel recently opened its Technology Research for Independent Living (TRIL) Centre in Dublin, bringing together industry and academic experts to collaboratively invent and test new technologies that enable the elderly to live independently. The collaboration with Intel involves several leading Irish universities, including Trinity College and University College Dublin. See James Manyika, Susan Lund and Bryon Auguste, "From the Ashes: The Most Dynamic Economies Rely on Creative Destruction to Grow," *Newsweek*, 2010; see also, generally, www.trilcentre.org; and Henry Etzkowitz, "The Norms of Entrepreneurial Science: Cognitive Effects of the New University-Industry Linkages, *Research Policy* 27 (1998): 823-833.

[140] Atkinson contends that "government support of research is a key pillar of growth economics. Government should increase its investment in science and technology by at least $10 billion a year, with much of the money devoted to new industry-university research partnerships." Specifically, he argues that governments should invest more in funding early-stage research at universities or in joint industry-university projects, require states to match federal funding levels to spur local innovation and reform the R&D tax credit. Robert D. Atkinson, *Supply-Side Follies* (Lanham: Rowman and Littlefield, 2006), 216, 232-233.

[141] Innovation Associates found that in most examples of universities that maintain successful and innovative tech transfer offices, technology transfer is actively embraced by deans and department chairs. "These academic leaders set the tone and instituted incentives to create an academic culture that rewarded technology transfer and entrepreneurship." In other words, universities successful in transferring technologies often provide implicit or explicit rewards and incentives for faculty who participate in technology transfer and commercialization activities, and have hiring practices that favor industry and entrepreneurial experience. For example, the most successful universities give faculty credit toward tenure if they file a patent application and some credit for filing invention disclosures. They argue that these types of incentives "convey powerful cultural messages to the larger academic

commercializing university R&D, practitioners might consider implementing alternative, more nimble models to standard tech transfer offices, such as third-party negotiation of tech transfer deals or allowing third-party entities to compete with university offices to provide deal brokering services.[142]

Entrepreneurship & Firm Growth

Entrepreneurship and firm growth strategies also address the needs for human capital, networks and institutional infrastructure, but targeted to entrepreneurs and firms. They also place a heavier emphasis on financial capital than the earlier stages of the innovation process. Strategies for incorporating entrepreneurship and business-themed content into secondary and post-secondary curricula – in addition to adult education, in which it already tends to have more of a presence – can aid in producing human capital with both the know-how to start businesses and a more positive perspective on risk-taking.[143] Approaches to incorporating entrepreneurship coursework at the high school level include narrow modules such as the National Federation of Independent Business' Young Entrepreneur Foundation's free "Entrepreneur in the Classroom" curriculum,[144] as well as integrated, entrepreneurship-focused institutions such as the Leadership

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community" about the importance of innovation. See, Diane Palmintera, Jerrill Joy and Echo Xiao Xiang, "Technology Transfer and Commercialization Partnerships," Innovation Associates, Inc., October 2007: iv; and Diane Palmintera, Robert Hodgson, Louis Tornatsky and Echo Xiao Xiang, "Accelerating Economic Development Through University Technology Transfer," Innovation Associates, Inc., February 2005: ii, 14, 40, 57.

[142] An example is the Georgia Tech Research Corporation (GTRC), a third-party non-profit organization that holds title to and manages all intellectual property derived from university research and helps negotiate all tech transfer deals for university-produced technology. See, generally: www.gtrc.gatech.edu and Diane Palmintera, Robert Hodgson, Louis Tornatsky, and Echo Xiao Xiang, "Accelerating Economic Development Through University Technology Transfer," Innovation Associates, Inc., February 2005: 40. Another example, Iowa State University, maintains a user-friendly web portal that allows companies to register for technology brief emails in specific fields, facilitating interest in university-developed technologies. Diane Palmintera, Jerrill Joy and Echo Xiao Xiang, "Technology Transfer and Commercialization Partnerships," Innovation Associates, Inc., October 2007: 30, 44, 80.

[143] Degen, for example, argues that teaching entrepreneurship at universities provide the best way for students to become agents of knowledge and savvy businesspeople. He further argues that teaching entrepreneurship at universities cultivates students' innovative ideas, prepares them to start-businesses and teaches them to use risk and uncertainty to their advantage. Similarly, in an experiment designed to measure change in aversion to risk, Wharton, Parry and Potter supervised a university-level entrepreneurship class where students were told to create and market a company that sells CDs. After administering surveys that captured the students' perception of risk before and after the project, the researchers found that more than 25% of students became less risk averse after completing the project. See Ronald Jean Degen, "Teaching Entrepreneurship Students to Become Knowledge-Agents for Innovation," globADVANTAGE, Working Paper #64, May 2010: 10-11, 14-16, 24; and Robert Wharton, Linda E. Parry, and Paula Potter, "Does Entrepreneurship Education Make a Difference? Changing Students' Orientation Toward Risk, Ambiguity and Control," United States Association for Small Business and Entrepreneurship, 2003: 6.

[144] See http://eitccurriculum.com/, http://www.lephigh.org/LEPacademics.html. See also the Network for Teaching Entrepreneurship (http://www.nfte.com/), a program that teaches entrepreneurial skills to middle school, high school and young adult students and recipient of the 2002 Golden Lamp Award, educational publishing's most distinguished prize. The program provides students with skills in negotiating, pricing, finance and business planning, and students are encouraged to compete in an international business plan contest, where the winner is provided a grant to apply toward their business or college expenses. Third-party evaluations of the program have found that it significantly increased the business knowledge and skills of participants and that alumni start businesses at much higher rates (4 times more than a control groups). See http://www.nfte.com/why/research for more information. The Network also offers Bizcamp, a two-week summer camp program for high school students interested in entrepreneurship.

and Entrepreneurship Public Charter High School in Portland, OR.[145]

Network and information exchange strategies targeting the business creation and development stages should address both vertical and horizontal linkages for potential entrepreneurs. Creating mentoring programs that match individuals and young firms with experienced serial entrepreneurs provides a valuable source of real-world, hands-on guidance. Peer-to-peer networks can also be important to early firm success, as budding entrepreneurs can learn from each other's achievements and missteps, as well as find potential business partners within the peer network. San Diego CONNECT, creating networks that link finance, knowledge and place-based assets, as well as JumpStart, are leading examples.

Institutional strategies for the later stages of innovation primarily center around the establishment of intermediary institutions to facilitate early-stage firm growth. These include supportive intermediary institutions that provide or link innovators and potential entrepreneurs to a range of resources and business and financial support services such as legal, marketing, business planning and so on. Well-known and successful models include JumpStart, which also invests directly in a select portfolio of high growth-potential companies, and for later stage companies, Next Street Financial, which operates under a merchant banking model of combining technical assistance and flexible financing.[146] Because capital plays a critical role in firm development and growth, establishing a locally focused venture capital or loan fund, particularly if closely linked to other strategies or targeted to particular sectors, can further aid in supporting greater levels of firm creation and growth. Caution should be taken, however, in implementing capital-intensive strategies. Not all firms that benefit from local investment will in fact remain in the region over the long term, suggesting that strategies to fund new firms should be focused most heavily on those to which the region's characteristics (e.g., business ecology, existing clusters, human capital base, culture/climate, etc.) are well-matched.

(iii) Industry- or Cluster-Specific Strategies

Strategies that target particular groups of firms are largely derived by applying a cluster-specific lens to some of the foundational and/or stage-specific strategies already identified, often delivered through or in conjunction with a formal cluster-based organization. For example, the foundational strategy of improving education and skill levels can – and should – be tailored to address the high human capital needs of the region's key industry and functional clusters. Doing so should involve engaging key cluster employers, or an over-arching cluster organization, with local universities, community/technical colleges and other workforce development providers to co-design curricula. Industry- or occupation-specific professional organizations and networking events offer the opportunity for cross-fertilization across firm boundaries, which can contribute to generation of new ideas and forging of formal or informal partnerships among cluster members. San Diego CONNECT, mentioned above, and Chicago's I-Bio both undertake

[145] The LEP Charter High School in Portland, Oregon provides high school students with the leadership skills and entrepreneurial mindset to take the next steps in their lives. Though the high school is still new, it recently set a national example by increasing student's test scores an average of ten percentage points over a 4-year period and graduated 97% of its seniors in June 2010. See, generally: Jennifer Anderson, "Leaping High," *The Portland Tribune*, June 3, 2010; and http://www.lephigh.org/.

[146] For more information on these two models, see:
http://www.jumpstartinc.org/ and http://www.nextstreet.com/index2.html.

cluster-specific annual conferences and smaller networking and idea-sharing events throughout the year.[147] R&D, angel, venture capital and other funding streams can also be narrowly targeted to increase innovative activity within a region's highest-potential clusters, such as Chicago's CleanTech Venture Fund.[148]

D. Key Questions for Future Research and Product Development

To be strategic in implementing innovation-related interventions, there are three broad areas in which practitioners need to have better information and tools: (a) the extent to which each of the many varieties of innovation impact regional economic activity, and in what ways; (b) at a more nuanced level, what characteristics of certain elements of the innovation ecosystem are most likely to lead to growth-enhancing innovation; and (c) how to analyze and evaluate the performance of innovation infrastructure and processes in a particular region. The balance of this section lays out several potential research and product development projects to address each of these areas.

1. Innovation's Impact on Economic Growth (Research)

As discussed in the first section of this chapter, innovation can take on many and varied forms. To know which varieties to encourage or prioritize through interventions, practitioners need to understand which of these varieties are more likely to lead to a significant and lasting positive economic impact. A key line of inquiry, therefore, is the extent to which particular varieties of innovation are likely to have varying effects – more or less, better or worse – on a regional economy. Research questions that warrant further exploration include:

- Are certain types – products, services, processes, business models, organizational structures – more or less likely to lead to regional economic growth?
- Do certain sectors/clusters hold particular promise or potential for significant growth through innovative activities?
- How do the economic impacts of incremental innovations compare to those of more radical/breakthrough innovations?
- Does innovation have different implications for economic growth if it leads to creation of a new business (entrepreneurship), as compared to growth of an existing business?
- Do certain types, stages or certain sectors/clusters have greater potential for generating positive externalities, and what kinds (environmental, social, etc.)? For example, how does

[147] San Diego CONNECT, for example, holds an annual "Connect with CONNECT" networking event for the region's info-tech and biotech community, as well as policy and financial forums, workshops and many other events for members (http://www.connect.org/).

[148] While cluster-based organizations provide a vehicle for executing targeted innovation strategies, as discussed in the chapter on clusters, fostering the development of cluster-based organizations can be a challenging undertaking. Practitioners and researchers agree that the most successful of such organizations tend to evolve organically from within the private and non-government institutional sectors, with only limited involvement of the public sector. However, the public sector can have a carefully strategic role in supporting such organizations and networks – financially and through direct engagement to identify and execute innovation-related strategies – once they have begun to emerge.

entrepreneurial activity impact key urban issues such as spatial efficiency or racial and income equality?[149]

2. Influencing Factors/Mechanisms that Drive Innovation (Research)

Existing literature identifies a number of factors and mechanisms (discussed in Section B of this chapter) that affect a region's innovation activity. More work could be done, however, to further tease out some of the nuances in several areas.

- Counterfactuals – Most studies of innovation systems have examined success stories such as Silicon Valley, Research Triangle and the route 128 corridor in Massachusetts. While these studies provide valuable insights, it is generally understood that the unique combination of circumstances that gave rise to each place's now-stellar performance cannot be replicated elsewhere. Examining regions that have had less success in fostering robust, innovation-driven economies may provide additional lessons about how the factors and mechanisms described in Section B operate in a wider range of contexts.[150]
- Business Ecology – Research and experience suggest that the mix of businesses in a region – size, industry, firm structure, etc. – and how they interact affect the environment for innovation. More research is needed, however, to explore the specific characteristics of a region's business mix that are most likely to generate high levels of innovation and entrepreneurship. Is there an "ideal" mix of firms to maximize innovation potential? Is it a different mix if maximizing entrepreneurship is the focus? What firm characteristics matter most to constructing a dynamic mix for either purpose? How do these answers vary from place to place – are there common elements across places?
- Networks and Knowledge Spillovers – Networks, like innovation, come in many shapes and sizes. To facilitate interactions that will significantly impact innovation, practitioners need a better understanding of how to tailor network-related interventions for specific contexts. For example, how do network dynamics differ across types of clusters – i.e., are they different for industry clusters, as compared to functional or occupational clusters? How do networks differ as clusters emerge, mature and decline? Can particular network characteristics or features catalyze growth or help stave off decline? Do networks operate differently or have different impacts on innovation of various types – e.g., new products, services, ways of organizing production?[151]
- Entrepreneurship Education – Research and practice suggest that entrepreneurship and business-themed educational programs can increase individuals' willingness to take risks, and engage in new business ventures. However, rigorous evaluation of these types of secondary, post-secondary and adult education programs is lacking. Assessing the outcomes of entrepreneurship training and identifying what approaches work best, in what context and for what audience, would help practitioners formulate more effective initiatives.

[149] Glaeser et al 2010 (9)
[150] Howells 2005 (1226)
[151] Powell and Grodal 2005 (in *The Oxford Handbook of Innovation*, 79)

3. Tools for Practitioners (Product Development)

To know which interventions are called for, practitioners need to understand the region's innovation ecosystem and how it is performing. This includes assessing performance at each stage of the innovation process; pinpointing the primary actors and sources of innovation (firms, institutions, etc.); identifying regional assets and the extent to which they are being utilized; flagging gaps in the system or regional characteristics that may be negatively affecting performance. Doing so suggests several potential projects to develop better tools for practitioners.

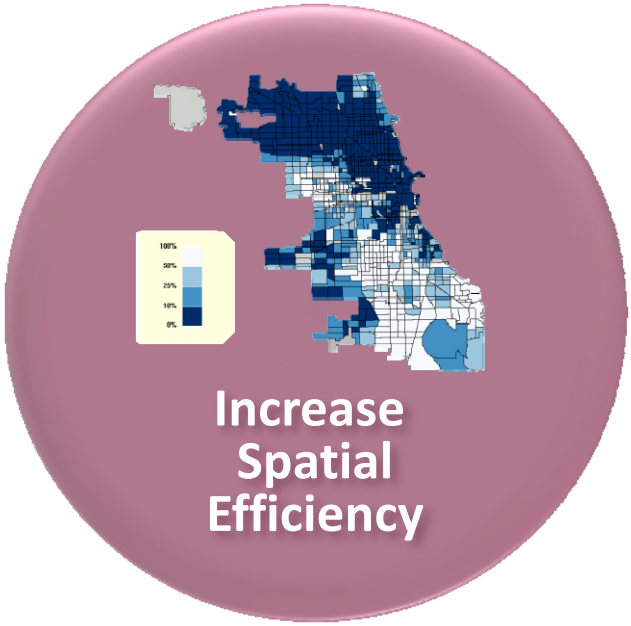
- Measuring innovation – Researchers and practitioners alike struggle with how to measure innovation outputs. The most common metrics tend to take some measure of patenting activity, but this measure is indirect at best (as many patents are never commercialized) and entirely excludes innovations for which patenting is irrelevant (e.g., organizational structures and business models). Other metrics have been tried, but each has significant shortcomings in terms of accuracy, data availability and/or difficulty of measurement and comparison across regions. Further efforts are warranted to develop measures that more appropriately characterize innovation outcomes of various types and in different contexts.
- Analyzing Regional Economies – Practitioners need better tools and methodologies for analyzing the innovation dynamics of their regional economies: by sector/cluster, by stage of the innovation process, and so on. This project would aim to further develop a framework and create tools for understanding in depth how a region is doing with respect to all of the factors and systems which drive innovation, and for identifying the best opportunities for intervention.
- Firm-Level Innovation – Innovation primarily takes place within firms, including particularly large firms. Many of the strategies discussed above, of course, are designed to improve the systems that will then enhance innovation by existing firms, by improving human capital, networks and so forth. In addition, a great deal of literature suggests what firms can do to enhance their own innovation levels, ranging from "flatter" organization to cross-disciplinary teams to rearranging the furniture.[152] While some systemic strategies are focused on influencing the practices of existing firms – such as the R&D tax credit – little work has been done to develop systemic strategies informed by and specifically targeted to the practices recommended by the firm-level business innovation literature. More broadly, more work is needed to design effective policy and program options to address corporate structure and management issues which inhibit innovation by existing firms.
- Getting to Scale – Innovation and entrepreneurship strategies have become an increasingly significant aspect of economic development practice, with a great deal of apparently successful and varied experimentation underway. Systematic identification and assessment of these programs, with the goal of beginning to develop more standardized methodologies,

[152] See, for example, the discussion of Hewlett Packard's organizational environment in Collins and Porras, *Built to Last: Successful Habits of Visionary Companies* (New York: Harper Business, 1994). See also, Laird D. McLean, "Organizational Culture's Influence on Creativity and Innovation: A Review of the Literature and Implications for Human Resource Development," *Advances in Developing Human Resources* 7(2) (May 2005); and Wineman, Kabo and Davis, "Spatial and Social Networks in Organizational Innovation," *Environment and Behavior* 41(3) (May 2009).

organizational models, products and services to support innovation and entrepreneurship would contribute to further developing this critical "community of practice."

CHAPTER VI

Improving Spatial Efficiency



***Note**: This is one of eight papers – an executive summary, six papers on specific aspects of regional economies and an appendix – generated by the "Implementing Regionalism" project, funded by the Surdna Foundation and undertaken by the George Washington University Institute of Public Policy and RW Ventures, LLC. Please see [insert web link] for the complete set of materials developed by the project.*

CHAPTER VI: Improving Spatial Efficiency[1]

A. Definition and Significance

The spatial configuration of economic assets within a region influences the operation of several important regional systems, including labor and housing markets, business investment and supply processes, and the political and transportation systems.[2] The purpose of this chapter is to inform practitioners regarding what we know and what we do not know about how spatial organization influences regional economic activity and prosperity. We also discuss what can be done to improve a region's spatial arrangement and what research needs to be conducted or tools developed to inform decision-making.

1. What is Spatial Efficiency?

"Spatial efficiency" characterizes the ease with which economic activities are transacted within a region. The concept builds upon the traditional notion of efficiency as accomplishing a task with minimal time, effort or cost. In the case of a regional economy, the primary economic transactions of interest are between firms (i.e., firm-supplier), between firms and their workers and between firms and their customers.

The term "spatial efficiency" has its origins in neoclassical economics – the use of land such that the most output possible is produced.[3] The industrial-economics field considers efficiency from the perspective of an individual firm; that the land usage is spatially efficient so long as that firm could not use the land in any other way to increase its output. Classical economists also examine the opportunity costs of the land used in its current capacity, as well as any negative externalities that result from a particular land use.[4] Another strand of economic literature examines the efficiency with which capital or labor is spread across the landscape.[5] In the public sector context, spatial efficiency has been used as a framework with which to evaluate location decisions of public infrastructure or services.[6] The public sector applications of spatial efficiency focus on choosing the locations of public services so as to maximize accessibility and minimize travel times.[7] Our definition of spatial efficiency is similar to these economic uses in that we are concerned with minimizing transaction costs and maximizing output at the level of the regional economy.

Thus, we define spatial efficiency as: the geographic arrangement of businesses and residences, the physical infrastructure that connects the region (i.e., transportation, communication), and

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[1] The lead authors of this chapter are Andrea Sarzynski and Alice Levy.
[2] See the Appendix to this report: Regional Systems and Regional Economic Growth.
[3] The term "spatial efficiency" has been used somewhat differently by other fields. For example, in the environmental fields, the spatially efficient approach to pollution abatement and climate change mitigation is to first remedy the least-cost source of pollution regardless of its spatial location. See Petschel-Held, et al., 1999. Further, the concept of *location efficiency* has been "defined as the extent to which automobile use can be reduced by land use factors" by urban planners. Goldstein, Holtzclaw and Litman, 2006, p.3.
[4] Balakrishnan, Desai and Storbeck, 1994; Louw, Krabben and Amsterdam, 2007.
[5] Petchey, 2009.
[6] Rasheed, 1986; Lall, Schroeder and Schmidt, 2009. For an early example of applying this concept to the public sector, with analysis of geographic accessibility to health centers in India, seeFisher and Rushton, 1979.
[7] Athanassopoulos and Storbeck, 1995; Murray, 2003; Thompson, et al., 1986.

the orientation of each towards the other that minimizes the time, effort, or cost required to conduct economic activities for the entire metropolitan region. We focus on several classes of economic activity, including business-to-business interactions, business-to-worker interactions, and business-to-consumer interactions.

Several implications of our approach are worth mentioning here:

- Spatial arrangements are highly dynamic, making the goal of "spatial efficiency" a moving target to a large degree.
- Spatial efficiency is context-dependent, meaning that what is spatially efficient for a particular region at a particular time may vary from what is spatially efficient for another region or at another time. Such variation complicates the study of spatial efficiency, but ultimately allows flexibility in crafting appropriate responses to regional problems and facilitating economic growth.
- Pursuing a goal of "spatial efficiency" as defined here may involve tradeoffs, such as for equity, quality of life or environmental health. Related, optimizing spatial arrangements to achieve particular ends (i.e., improved business-to-business interactions) may conflict with optimizing spatial arrangements to achieve other ends (i.e., improved business-to-worker interactions). We cannot optimize spatial arrangements for all interactions or purposes.
- We focus here on aspects of spatial efficiency as they relate directly to economic growth. We do not focus on other outcomes of regional interest, such as sustainability or equity, except to the extent that those outcomes influence economic growth. We note that strategies to promote economic prosperity, environmental sustainability and social equity (i.e., the "triple bottom line") appear to be aligning in recent years to mutual benefit.[8]

2. How Does Spatial Efficiency Influence Economic Growth?

A large literature has examined why cities form, and why cities are more productive and command higher wages than alternative spatial arrangements.[9] Much of this literature focuses on the benefits brought by the agglomeration of economic activity and opportunity within cities, and is largely covered in Chapters II (Regional Economies) and IV (Clusters and Cluster-Based Development). Alternatively, a separate literature examines the diseconomies of agglomeration (e.g., traffic congestion, pollution, crime) found in cities that may adversely impact economic growth. For the most part, these literatures treat geography in only a general manner and mostly with respect to city size as a surrogate for agglomeration economies.[10]

Here, we are interested in how the particular spatial configuration of activities within a region, of whatever size, may impact economic growth. Paul Knox offered a generalized model of urbanization from which we can visualize the macro-relationships.[11] Knox argued urbanization is driven primarily (but not exclusively) by economic change, which produces spatial outcomes such as land use patterns, built environment, neighborhood composition (here called social

[8] Ronderos, 2009.
[9] For a recent review, see Glaeser and Gottleib, 2009.
[10] Krugman, 1996.
[11] Knox, 1994.

ecology), and degree of urbanism.[12] These spatial outcomes then feed back into the economic development process, as well as feed into the policy and planning process.

The spatial arrangement of economic assets and activity within a region should influence regional economic prosperity *primarily* through transportation costs. Further, we expect that these transportation costs can be most directly influenced by efforts oriented around the location decisions of businesses and residents, and the provision of public infrastructure. The following section reviews the theoretical basis for how transportation costs impact regional economic prosperity. We discuss in a later section various strategies that can be used to minimize transportation costs and improve regional spatial efficiency.

e. Transportation costs (generally)

Transportation costs are a critical influence on economic activity. Specifically, transportation costs determine the access of workers to jobs, firms to labor pools, and supplier, buyers, and sellers to the market. Transportation costs include both production and consumption costs. On the production side, transportation costs occur for firms in the form of obtaining inputs and sending final products to market. To the extent that workers demand higher wages to compensate for their individual travel time and expenses, commuting becomes a cost of the production process. The travel time and expenses that individuals incur in moving to and from retail shopping centers represent costs of consumption and may reduce the price consumers are willing to pay for goods and services. Thus, from an economic perspective, transportation costs can reduce the number and type of economic transactions that occur by simultaneously increasing the costs of production and reducing the willingness to pay of consumers.

Cities originally evolved as an organizational form to reduce transportation and communication costs from economic activity.[13] As Edward Glaeser argues, "[a]ll of the benefits of cities come ultimately from reduced transport costs for goods, people and ideas."[14] In dense environments, the exchange of goods and ideas can happen quickly and this intensity of activity provides some of the strongest economic motivations for retaining vibrant, dense cities (as described in the Chapters IV and V). Certain firms exhibit more affinity for locating in dense locations within cities, including many knowledge-based industries.[15] Yet, the cost reductions from agglomerating activity in cities can slow or even be reversed as cities become congested or as their spatial organization stifles the efficient movement of goods, people, and ideas.

To better understand the current influence of spatial organization and transportation costs on economic activity, we must briefly consider the systems and interactions underlying the spatial structure of cities. Where businesses or residences locate within space depends on their willingness to pay (WTP) for particular locations. WTP is influenced by the utility that businesses or residences derive from that location, which can come from both economic and non-economic factors. For businesses, profit drives WTP; businesses will locate where they can

[12] The term "urban systems" in Knox's model refers to the hierarchical ordering of cities, in which only a few cities rise to global dominance and most other regions remain small and regionally-oriented.
[13] Anas and Moses, 1978.
[14] Glaeser, 1998, p.140.
[15] Belzer, et al., 2011a.

generate the maximum profit from their enterprise. Businesses must consider their location in relation to the location of their suppliers, markets, and employees, as well as where the business can obtain the most favorable government service and tax package. Residents must typically consider their housing location in relation to their employment as well as other supporting services, such as schools, transportation and amenities, which are in turn derived from residential public service and tax packages. Theoretically, businesses or residents compete for desirable land and the competition for land ensures that "land is allocated to its 'highest and best use'," i.e., that land is allocated efficiently in an economic sense.[16]

One of the major influences on the desirability of land comes from its *accessibility*; or how easy the location is to reach from other locations via available transportation networks (sometimes called *destination accessibility*). Locations near export nodes, such as ports or airports, often command high property values because their accessibility minimizes costs to transport goods.[17] Locations well-served by personal transportation networks, such as a central train station connected in a hub-and-spoke system to supporting rail lines, also command high property values because their accessible locations minimize transport costs for interacting with clients and suppliers and maximize agglomeration benefits. Often, the combination of central export nodes and high demand by manufacturing and office firms for accessible nearby locations results in core-oriented cities surrounded by residential development. Indeed, such monocentric cities serve as the starting point for much urban and regional economic theory.[18]

Contemporary urban areas tend to be more dispersed across space as transportation costs, especially for moving goods and people, have declined dramatically over the past century.[19] Transportation costs declined in part because of technology improvements (including communications technology improvements, which reduce the need for some physical interactions) and the restructuring of the global economy away from manufacturing activities. Cost reductions are also a result of extensive public investment in roads in the U.S., which have made even remote locations relatively accessible by automobile or truck today.[20] Our ubiquitous road network means that manufacturing firms can locate in non-central locations closer to their inputs or where public service and tax packages are cheaper. Office firms can select non-central locations that may be closer to their suburban workforce or consumer base. Higher-income workers can locate further from central nodes or from public transportation routes due to relatively high auto accessibility even in remote locations. These dispersed location decisions have resulted in arrangements termed "beyond polycentric" or "edgeless cities."[21]

Location decisions, in turn, structure daily travel behavior. Daily travel imposes time costs for the traveler and additional private travel costs that vary with mode and distance, such as for auto operation (gasoline, parking, insurance, etc.) or for transit or air fares.[22]In turn, daily travel behavior and location decisions are iteratively and dynamically influenced by travel costs. For

[16] O'Sullivan, 2002, p.175.
[17] Fujita and Mori, 1996.
[18] Alonso, 1960.
[19] Glaeser, 1998; Anas and Moses, 1978.
[20] Mieszkowski and Mills, 1993.
[21] Gordon and Richardson, 1996; Lang, 2003.
[22] Daily travel also imposes external (social) costs on the regional and national transportation networks, such as from traffic congestion.

instance, if driving costs are temporarily high (such as from an increase in gasoline prices), travelers may reduce their auto trips, substitute to walking, biking, transit, carpooling, or telecommuting, or otherwise modify their travel behavior to reduce costs. If driving costs remain high, travelers may relocate to more convenient locations for their housing, employment, or both.[23] Thus, location decisions and daily travel behavior reflect socioeconomics, as well as attitudes and preferences of residents and workers.[24]

Economic inefficiency arises when myriad individual decisions of residents and/or businesses may pull apart the spatial fabric of the region to the point where the entire region becomes inefficient to serve by conventional infrastructure and costs rise for everyone. In these situations, the traditional benefits of cities – to decrease the costs of moving people, goods, and ideas – no longer accrue. (Note that similar inefficiency also may exist in regions that have not yet achieved the degree of urban concentration required to provide transportation cost reductions.)

Public transportation, in particular, requires concentration of activity around nodes and along feeder lines to function efficiently. Areas with "uncoordinated" or "spotty" density can be difficult to serve by public transportation.[25] Public transportation also requires consistent patronage to support its annual operating and maintenance costs. Regions without effective public transportation place their travel burden almost entirely on road networks, which are prone to become congested and to increase all travelers' travel times and fuel costs. Building more roads in congested locations does not usually help, due to a well-documented phenomenon known as "induced demand."[26] Regions (or areas within regions) without effective public transportation options are particularly susceptible to energy price shocks.[27]

Neighborhood-scale design elements (i.e., density, land use mixing, sidewalks and streetscapes) may generate transportation cost savings by increasing destination accessibility and thereby influence the desirability of locating in particular areas.[28] These design features may in turn increase property values and drive the accumulation of wealth, spurring regional economic growth.[29]Neighborhood-scale design also may be related to the attraction and retention of businesses and workers.[30]Alternatively, regions without vibrant, desirable neighborhoods may be slow to achieve their growth potential.

[23] Cervero and Wu, 1998; Cortright, 2008b.
[24] Ewing, et al., 2008a.
[25] Filion and McSpurren, 2007; Pushkarev and Zupan, 1977.
[26] Downs, 1992; Gillham, 2002.
[27] Cortright, 2008b.
[28] Ewing, 1996; Urban, 2010; Bürer, Goldstein and Holtzclaw, 2004. Note that the causal link between travel savings from neighborhood design and regional economic growth is not necessary or clear, as it depends to a degree on travelers spending their savings on activities that benefit the regional economy.
[29] Cortright, 2008b.
[30] Some observers note that neighborhood design "cannot be relied upon for the *generation* of new economic activity within a region…[but] may instead have a strong *distributional* effect on regional economic activity" (emphasis in original). Belzer, et al., 2011a, p.10.

f. Spatial mismatch

A subset of the transportation efficiency problem just described arises when the geographic arrangement of housing and businesses makes it difficult for individuals to travel to the jobs that they are qualified to hold. Generally there are two assumptions behind arguments about this "spatial mismatch." First, the resources offered by markets and/or institutions in and/or across metros vary spatially; and second, households have unequal ability to live in locations where markets and institutions are most desirable. Suburban zoning practices may limit the ability of low-income individuals to live in the suburbs, and racial discrimination can make suburban living particularly difficult for minority populations.[31] Formally, the spatial mismatch hypothesis "states that the suburbanization of jobs and involuntary housing market segregation have acted together to create a surplus of workers relative to the number of available jobs in central-city neighborhoods."[32] This mismatch results in an inability of city residents to find work, lower city wage rates and higher commuting costs (that could make the returns to work negligible for low-wage positions).[33]

Spatial mismatch introduces inefficiency into the labor market in the form of underutilized human capital. Regions are most efficient and economically successful when they are able to use all of their assets, leaving no places or people behind.[34]Businesses in areas suffering from spatial mismatch may find it is harder to locate and attract appropriately skilled workers or may face higher labor costs because of greater worker turnover and higher associated hiring and training costs, resulting in lower productivity and slower economic growth.

Spatial mismatch is a function of both the location of jobs and housing, and of the specific types of jobs and housing available across the metropolitan area. Jobs and the people qualified for them are in some cases moving in opposite directions with entry-level jobs such as manufacturing, retail and data-entry positions moving towards the suburbs while less-educated workers are increasingly concentrated in the inner city. At the same time, highly-skilled professional jobs such as lawyers and management consultants may be moving into the city, while highly-educated workers often locate on the increasingly distant urban fringe.[35]This arrangement of jobs and people increases transportation costs across the region and could be become uneconomical in an era of higher gas prices, especially.[36]

Finally, regional geography is becoming increasingly complex. The traditional approach of viewing mismatch as a city vs. suburb phenomenon may be losing its relevance, as suburbs diversify and the line between cities and suburbs continues to blur. The principle of spatial mismatch remains the same, however; a region suffers when its residents cannot easily access employment opportunities or when firms cannot easily draw upon the entire region's labor force.

[31] Holzer, 1991.
[32] Ihlanfeldt, 1999, p.216.
[33] Shen, 2000.
[34] Pastor, 2000; Weissbourd, 2004.
[35] Dreier, Mollenkopf and Swanstrom, 2001.
[36] Cortright, 2008b.

g. Other pathways

Other pathways may connect spatial efficiency with economic growth but are not covered in detail here, including housing affordability, energy and environmental costs, and public service costs. For instance, the spatial arrangement of housing of different types and qualities will strongly influence housing prices and affordability in a region, which will affect labor supply, demand and wages; consumer demand for goods and services; human capital and educational attainment; property taxes and demand for government services; etc. An entire paper could be devoted to housing and its spatial arrangement with reference to regional economic prosperity. Instead, we focus here on the interactions of the housing and labor markets and other regional systems as they determine transportation costs and the relative efficiency of a region's economy.

Aregion's spatial arrangement also relates to building-related energy demands and the efficiency with which energy can be provided to consumers.[37] These energy costs tend to be internalized in location decisions or in private transactions with energy providers, but may pose a barrier to regional economic growth where building energy costs are particularly high. Likewise, the environmental impacts related to transportation and energy use in regions (especially air, water and land pollution) and from overcrowding may impact public health, deter businesses or workers from locating or staying in the region, and constrain regional economic growth.[38] The environmental impacts tend to be studied as local diseconomies of agglomeration and, in severe cases, can have profound impacts on regional economic growth.[39]

Finally, the location of households and businesses is a major driver of public service costs because households and businesses are consumers of government services. In poorly organized areas, public service costs rise, necessitating higher tax burdens for a given level of public goods.[40] These higher tax burdens serve as disincentives for firm location while simultaneously reducing capital and income available for spending within the region. (For more on the impact of public services and tax burdens on regional economic growth, see Chapter VII.)

3. What Does the Empirical Evidence Indicate? (Overview)

For the most part, scholars have not directly investigated the impact of spatial efficiency (or related concepts) on regional economic outcomes. One notable exception is Weissbourd, who assessed the relationship between urban form and population growth, income growth, and wage growth across U.S. metropolitan areas from 1990-2000.[41] Urban form was characterized using several variables including: commute times, density gradients, discontiguity (measures the dispersion of development), as well as composite measures that account for regional residential density, the accessibility and connectedness of street networks, and the strength of activity centers and downtown areas. Weissbourd found only minimal relationships between these measures of urban form and regional economic growth. For example, between 1990 and 2000 commute times were insignificantly related to income and wage growth while public transit and

[37] See Anderson, Kanaroglou and Miller, 1996; Ewing and Rong, 2008.
[38] Mills, Feenberg and Zisler, 1978; Dreier, Mollenkopf and Swanstrom, 2001.
[39] Knox, 1994.
[40] Carruthers and Ulfarsson, 2003; Carruthers and Ulfarsson, 2008b.
[41] Weissbourd, 2004.

street accessibility were marginally but positively related to income and wage growth *in the city*. Contrary to expectations, density was marginally *negatively* related to income growth in cities.[42] Weissbourd hypothesized that the relationship between economic growth and urban form is nonlinear, with only very sprawled areas experiencing negative effects. Further, negative effects were more likely to be observed in central cities, than in the region as a whole.

Using a different approach, Persky and Wiewel assessed the economic costs and benefits of a new manufacturing plant if it located in a suburban greenfield location or in the central city of the Chicago metropolitan area.[43] The authors found that the suburban greenfield location had social costs in the form of externalities and public sector losses that exceed the city location, but that the size of the social cost gap was approximately equal to the private net benefits experienced by the firm that choose the suburban location. Thus, the net economic benefit of the two hypothetical locations is equal but the suburbanization of manufacturing activities results in a transfer of resources to the private beneficiaries of the suburban plant.

One challenge in quantifying the impact of spatial efficiency on metropolitan growth rates is that much of the existing literature is concerned with the impact of the spatial arrangement of regional activity on central city outcomes. For example, opponents of sprawl argue that the associated deconcentration causes employment increases for the region to occur at the expense of the central city. This argument does not necessarily imply that the entire region is worse off, only that the central city is worse off. Significantly less empirical analysis exists regarding the impact of spatial outcomes on the economic growth of the region as a whole.

Another challenge in quantifying the impact of spatial efficiency on economic outcomes is that spatial efficiency is itself a product of regional economic growth, whether measured by employment, wages or income. For instance, employment growth necessarily affects the spatial arrangement of resources because the new jobs will have to locate somewhere. Employment growth will require the total land area of the region to expand and/or increase the density of the existing land area, which influences the region's spatial efficiency. Wage increases imply employment increases and/or a change in the composition of jobs, either of which would cause changes in spatial efficiency. If income growth is associated with a residential preference for larger homes at the urban periphery, we may observe an inverse relationship between housing density and regional income growth. This endogeneity is expected if we recall Knox's stylized model, which placed economic change as the predominant driver of urbanization and its subsequent spatial outcomes. Similarly, Persky and Wiewel argue that the region's economic growth rate determines its pattern of spatial development, with slower growth regions most likely to experience employment and population deconcentration.[44]

Perhaps the most difficult challenge in quantifying the impact of spatial efficiency on economic prosperity is that the entire concept of spatial efficiency is highly dynamic and depends on the local context. Each region varies with respect to its physical geography and climate, the types of firms and economic activities conducted within the region, demographic and socioeconomic

[42] Negative relationships between density and income growth in cities may result from urban agglomeration externalities, such as traffic, crime, pollution and concentrated poverty.
[43] Persky and Wiewel, 2000.
[44] Persky and Wiewel, 2000.

characteristics, land use regulation and policy, historical factors, among others. Each region could become more or less spatially efficient over time. Constructing tractable empirical measures of spatial efficiency to be used in comparative research may obscure spatial organizational problems facing particular regions, or for particular types of interactions within a region.

While there is little empirical evidence regarding the direct impact of spatial efficiency on regional economic outcomes, there is a rich literature on the relationships between spatial arrangements and transportation costs (especially costs for workers from commuting and spatial mismatch, less so for costs to businesses). The following paragraphs summarize the findings. (The reader can find more detailed information about the empirical evidence and ways to measure "spatial efficiency" and related concepts in the Appendix to this chapter.)

First, researchers typically find statistically significant relationships between spatial arrangements and transportation costs in the anticipated directions. That is, residents of denser or more compact areas are likely to drive less, own fewer or more fuel-efficient vehicles and incur lower personal transportation costs.[45] These relationships appear to hold for both commuting and non-work travel. The reduced driving effort required in denser and more compact areas indicates those areas are more spatially efficient than their more sprawling or decentralized counterparts. The presence of some inconsistent empirical results regarding the specifics of the density and travel relationship suggests that practitioners should not focus exclusively on a strategy of increasing density within a region, but rather must examine how density is patterned throughout the region and how spatial patterns influence accessibility and travel costs.[46] The location decisions of businesses, in particular, appear important in structuring daily travel behavior.

Second, the research literature suggests that spatially inefficient regions are likely to suffer from spatial mismatches that result in involuntary unemployment among low-income, predominantly minority and transit-dependent city residents.[47]Spatial mismatch appears most likely in larger urban areas and may result from housing segregation by race and income, racial discrimination, and inadequate public transportation options for reverse commuters.

Despite the volume of research on topics relating to spatial efficiency, the research literature is divided over the magnitude of transportation cost reduction that could be expected from changing spatial arrangements.[48] Most simulation-based research finds a larger potential impact than has been demonstrated by research on actual travel behavior.[49] Various confounding factors complicate the empirical study of spatial efficiency (i.e., demographics and self-selection bias)

[45] Newman and Kenworthy, 1989a; Holtzclaw, et al., 2002; Brownstone and Golob, 2009; Sultana and Weber, 2007; Miller and Ibrahim, 1998; Wang, 2000; Shen, 2000.
[46] Frank and Pivo, 1995a; Cervero, 1996; Miller and Ibrahim, 1998; Levinson and Kumar, 1997. Note that densities may be patterned differently within a region for housing than for jobs, requiring parallel analyses of both aspects of metropolitan land use. Cutsinger, et al., 2005.
[47] Ellen, 1999; Ihlanfeldt and Sjoquist, 1998; Ihlanfeldt, 1999; Holzer, 1991; Cooke, 1996; O'Regan and Quigley, 1998.
[48] Bento, et al., 2005; Ewing, et al., 2008a; Ewing, Pendall and Chen, 2003; Transportation Research Board, 2009; Boarnet and Crane, 2001; Brownstone, 2008; Brownstone and Golob, 2009.
[49] Rodier, 2009.

and may be why few studies have effectively quantified the impact of spatial efficiency on regional economic outcomes.[50]

We conclude that spatial efficiency is likely to be an important factor in structuring regional activity but that behavior is highly dependent on individual and business preferences and other contextual factors about the region, such as its size, age, climate, geography, culture and governance structures. The onus, then, appears on the individual region to evaluate the extent of its own spatial efficiency in the context of its specific economic assets, activities and transactions and to identify interventions that can improve its spatial efficiency and foster economic prosperity.

B. Intervention Strategies

The following sections review the primary strategies and interventions that might be pursued to improve spatial efficiency. We affirm that spatial efficiency is context-dependent, meaning that what is spatially efficient for a particular region at a particular time may vary from what is spatially efficient for another region or at another time. In addition, all activities are constrained to some degree by regional climate, topography, culture and history, as well as by previous location and investment decisions that may "lock-in" land use and activity patterns for years to come. By necessity, interventions must be tailored to local circumstances and resources.

1. What Strategies Can Improve Spatial Efficiency?

Spatial efficiency reflects the geographic arrangement of businesses, residences and infrastructure that minimizes the effort associated with conducting essential economic activities in a particular region. Economic activity is easier to conduct and can be more productive when the relevant parties are located in close proximity to one another, or can easily be connected. Thus, two primary strategies can improve spatial efficiency: foster co-location or improve connectivity.

First, spatial efficiency can be improved by encouraging businesses or residences to locate near one another, known as co-location. Practitioners can employ various tools to influence location decisions, including designating growth areas, influencing neighborhood design and influencing travel prices. Influencing individual business location decisions may have the broadest impacts on the efficiency of the regional economy, especially for large employers, as many economic activities are oriented around each business location.

Second, regions may also invest in regional infrastructure to simultaneously reduce the time or effort required to conduct daily activities for many businesses and residents without changing their locations. Infrastructure investments to improve connectivity might focus on roadways, transit, communications networks or some combination thereof. Infrastructure investments may improve the desirability of particular locations and will influence future location decisions and economic activity for decades to come.

[50] Bhat and Guo, 2007; Vance and Hedel, 2007; Ewing, et al., 2008a.

In many regions, spatial efficiency will be promoted by organizing economic activity around existing infrastructure, and especially at fixed points such as transit stations, highway interchanges and existing activity centers, so as to make best use of current capacity and prior investments. Coordinating activity around existing infrastructure may reduce transportation costs for businesses, workers or residents, especially if such activity improves the efficiency of the entire regional transportation network.[51] Alternatively, regions may focus on extending public transportation to existing concentrations of employment or shopping previously underserved by transit, such as in suburban employment centers and "edge cities."[52]

In some regions, activity-concentrating efforts may be counterproductive if the region suffers from severe congestion externalities that might be relieved by some degree of deconcentration.[53] These regions may focus on reorienting activity away from the most severely-congested areas to less-congested activity centers, which themselves could be organized around existing or planned infrastructure.

The never-ending challenge for regions is then to foster an organizational structure that maximizes the regional transportation cost-savings derived from urban concentration while minimizing impacts from congestion on businesses and residents. Such efforts are proving increasingly important as the economy has shifted from manufacturing to service and knowledge industries, where the face-to-face exchange of ideas is critical for generating agglomeration benefits and knowledge spillovers (see Chapters IV on clusters and V on innovation).[54] Regions may be most effective at realizing such benefits if they can facilitate interactions between certain types of firms or functions, as in the case of "functional clusters."

Any strategy to overhaul a region's spatial structure must take a long-term view. Both businesses and residents face high costs for relocating and location adjustments tend to occur slowly over time. Regions may be more able to influence new development than existing development. Similarly, large-scale infrastructure investments may be expensive and time-consuming to implement and require some certainty about future travel demand, which may be difficult to obtain without some certainty about the concentration of future economic activity.

2. What Specific Interventions Can Improve Spatial Efficiency?

Practitioners have many entry points through which they might influence spatial efficiency. A comprehensive review of each possible intervention is outside the scope of this analysis. Instead, we highlight five types of mutually-reinforcing interventions that might improve spatial efficiency and foster regional economic prosperity, and which may benefit from thinking and acting regionally.

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[51] Coordinating activity around existing infrastructure should also reduce public service costs for government, which may translate into lower costs for business and residents in these areas.

[52] Tysons Corner, VA is an edge city outside Washington, DC where policymakers are bringing rail transit and housing to what has become a regionally dominant employment and shopping destination. See Belzer, et al., 2011a; Garreau, 1991.

[53] Sarzynski, et al., 2006.

[54] Glaeser and Gottleib, 2009.

a. Concentrating development to reduce travel costs

Various interventions limit the supply of available land for development, whether for open space conservation or more generally to delimit growth areas, such as through zoning or growth boundaries. These interventions influence the location decisions of businesses or households.[55] Many interventions seek to limit development to areas surrounding existing infrastructure or to ensure that development proceeds with necessary infrastructure (i.e., adequate public facility ordinances, impact fees).[56]Successful approaches have been adopted at the local level and by some states, including Oregon and Maryland.

Land supply restrictions tend to drive up the density and cost of development on available land, which should improve the spatial efficiency of a region and limit the effort required to conduct essential activities. Increased density can only happen if zoning and other land use regulations allow for higher-density development and if the housing market (or office, retail markets) responds by supplying denser developments. Large-lot zoning and other exclusionary practices may intentionally limit densification and certain types of mixed-use development. Densification and exclusionary practices both limit the availability of affordable housing within a jurisdiction and push the burden of providing affordable housing onto other jurisdictions within the region. The result may be to increase regional travel costs and potentially to create a spatial mismatch between the locations of available jobs and housing.

Oregon provides one example of how regional action has concentrated development and fostered regional economic growth. Passed in 1973, Senate Bill 100 requires each urbanized area in the state to adopt an urban growth boundary. Local land use plans, zoning regulations, and business permitting processes are designed to expedite private development within the growth boundary. Outside the boundary, land is reserved for farms, forests, parks, or other natural areas. While the Portland metropolitan area still experiences some challenges, such as a shortage of affordable housing, its growth boundaries and concurrent investments in public transit have led to denser urban development, encouraged economic resurgence in poorer neighborhoods, preserved open space outside of the boundaries, and improved the regional quality of life.[57]

Thus, land supply restrictions may be most successful if coordinated at the regional level but combined with local rezoning or upzoning in designated areas that are connected to the regional infrastructure network (existing or planned). Local incentives (i.e., special tax abatements, density bonuses, historic preservation tax credits) may be needed to ensure the supply of higher-density, mixed use, and affordable development in designated areas and to avoid the exclusionary consequences of land restrictions. Business incentives can be targeted to particular firms or functions to maximize agglomeration benefits and knowledge spillovers, pursuant to a regional cluster growth strategy (see Chapter IV, on clusters).

Even without regional action, localities may designate special districts or zones for redevelopment that can leverage private investment to achieve economic development goals. For instance, tax increment financing (TIF) is one tool that could be used for improving

[55] Pendall and Martin, 2002.
[56] Carruthers and Ulfarsson, 2003.
[57] Rusk, 1999.

residential and commercial properties within blighted areas.[58] Within TIF zones, property taxes levied on the original assessed value are sent to local taxing authorizes, while taxes levied on increases in the assessed value are used for infrastructure improvements and other economic development efforts. In general, properties in TIF zones have experienced larger increases in value than properties outside TIF zones (although the evidence appears context-dependent and most studies have not yet examined the regional impacts of such strategies). The combination of higher property values with improved public investment should draw jobs and services to needy areas and improve the efficiency of conducting business in and around the TIF zone.

The selection of growth areas or zones by the government sector should be undertaken in consultation with developers, residents, and other stakeholders, who will have much control over the eventual success of any growth management or redevelopment effort. The consultation process may help to address NIMBY concerns of local residents or businesses about higher densities, traffic congestion or other disamenities of agglomeration.[59] The selection of zones also provides the private sector with some certainty over the location of future development (and public services), helping to facilitate private investment.[60]

b. Using neighborhood or building design to reduce travel costs

Neighborhood or building design elements can be used to decrease travel costs and attract new businesses or residents.[61] For instance, many planners now advocate for "traditional" neighborhood designs with short, gridded streets, sidewalks, higher density residential development, small neighborhood stores, good public transit access and public open space.[62] Residents and workers in neighborhoods with these features tend to drive less and walk, bike, or use public transit more than in single-use, car-oriented neighborhoods.[63] These design features should improve regional efficiency by shortening trip lengths, reducing transportation costs and improving labor supply. The benefits of neighborhood design can be amplified if these neighborhoods are strategically oriented around a regional infrastructure network that connects residents with employment opportunities, markets, and other amenities. Extensive neighborhood redevelopment within a region may also moderate regional wages, as workers may be more productive or demand less in wages to compensate them for their travel costs.

Transit-oriented development (TOD) and transit villages are frequently touted as the design standard for accommodating growth in a spatially-efficient manner. Such development designs bring increased activity to transit service areas, which boost the potential riders on the network, and thereby may improve the viability and efficiency of the entire transit network and restrain future transportation costs. The effect on ridership and regional transit efficiency may be most pronounced if TOD concentrates employment and other trip destinations near transit, as opposed

[58] For more on TIF, see Man, 2001.
[59] NIMBY means "not in my backyard" and is a common response by existing residents or businesses to new development that may bring additional traffic, congestion, crowding, crime, pollution, etc. For an exploration of how NIMBY influenced development in Toronto, see Filion and McSpurren, 2007.
[60] Filion and McSpurren, 2007.
[61] Holtzclaw, et al., 2002.
[62] Ewing, 1996; Condon, 2010.
[63] Dieleman, Dijst and Burghouwt, 2002b.

to exclusively boosting residential densities.[64] To succeed, TOD may require building code changes, rezoning or upzoning (special districts or overlay zoning are common), and location incentives to ensure the desired type of development around transit stops. Location incentives could be targeted at the attraction and retention of firms that prefer transit-accessible locations, such as knowledge-based industries and arts, cultural, and entertainment establishments.[65]

With its higher density, mix of uses, and active streetscapes, TOD-style development is attractive to residents and businesses that value the close proximity of employment, shopping, and recreation and that may be willing to trade-off higher property values for lower transportation and building-energy costs.[66] Some analysts believe there is large untapped market demand for this style of development, due in part to changing socio-demographics, industrial composition, and to improved familiarity with TOD development. As a result, developers may already experience financial incentives to integrate aspects of TOD design into new buildings even without formal TOD zoning or government incentives.

Many regions do not have high-quality transit networks and are predominantly auto-oriented.[67] In these areas, as in high-growth areas, the focus may need to be on creating "transit-ready" areas, which are designed *as if* around transit stops but are not (yet) connected to a high-quality transit network.[68] Residents and businesses may gain some of the travel savings from higher-density and mixed-use development, even if they cannot immediately benefit from transit availability. In turn, transit-ready areas are well positioned to receive transit financing when it becomes available, and when the surrounding density of residences, businesses, retail and other amenities is sufficiently dense to support transit usage.

Existing areas may be more difficult to redesign to match the standards proposed for new development. Indeed, slow growth regions may struggle with a legacy built environment that is pervasive and difficult to change. Even so, many older suburban neighborhoods are well-connected to the regional infrastructure network. Redeveloping them and other underutilized accessible areas makes the best use of previous investments and may save considerably on future transportation and public service costs.[69] Brownfields redevelopment incentives, historic preservation tax credits, and other place-based strategies may be used to influence redevelopment in accessible locations, which could produce a more spatially-efficient urban form. Even redevelopment of small commercial strips along major arterial roads into more walkable, mixed-use centers may improve the accessibility of nearby neighborhoods, reduce trip lengths and constrain future transportation costs.[70]

[64] Ewing and Cervero, 2001; Belzer, et al., 2011b; Transportation Research Board, 2009.
[65] Belzer, et al., 2011a.
[66] Duncan, 2011; Belzer, et al., 2011a.
[67] For instance, only thirty-four metropolitan areas in the U.S. had fixed-transit systems in 2008, many of which had very limited transit offerings and only a few had large or extensive fixed-transit networks. Belzer, et al., 2011a.
[68] Porter, 2002.
[69] Rodier, 2009.
[70] Boarnet, et al., 2011; Belzer, et al., 2011b.

c. Investing in infrastructure to reduce travel costs

The previous approaches influence spatial efficiency predominantly by influencing the location decisions of businesses or residents, and thereby influencing their activity and interactions. Regions also can focus on improving the infrastructure connecting businesses, residents, markets, and amenities, which should reduce the time and effort required to conduct essential economic activities and should influence business decisions about production. Common interventions include investing in public transit infrastructure or improving infrastructure management and operations, which can be achieved on an incremental basis and within a relatively short time period (less than 10 years).

Public transit investments can improve the destination accessibility of locations near transit. Consider the impact of opening a new transit station. That station can serve residents and businesses that are already located nearby and may improve the viability of transit trips for residents or workers in other locations that need to access the area surrounding the new station. The new station may potentially relieve congestion at nearby stations or on area roadways if persons switch to using transit rather than driving. By adding one station, regions can potentially make their entire transportation network (roadways and transit) operate more efficiently and reduce costs for the region's travelers. Travelers may find that they can forego the expense of operating and maintaining a personal vehicle once transit service improves in their area, reducing their overall travel costs. The new station may also improve the desirability of the area surrounding the station, thereby influencing future location decisions and concentrating development in transit-accessible zones.[71]

Larger concentrating effects are typically expected from fixed-transit investments, such as light rail and subways, than from bus transit investments because fixed-transit stops are more likely to attract the kind of high-density development projects that could substantially reduce travel demand. In addition, regions with extensive fixed-transit networks experienced less employment sprawl over the past decade than regions with smaller transit networks, suggesting that fixed-transit investments may help to slow the virtually ubiquitous employment de-concentration trend that began following World War II.[72]

However, fixed-transit takes a long time to plan and secure necessary investment, and is quite expensive to construct. Few regions have the resources to open or expand fixed-transit offerings right now, and the future of federal funding for new transportation infrastructure is highly uncertain. Some public transportation advocates suggest that bus-rapid transit and other bus system improvements, such as express bus service, dedicated bus lanes, priority lighting for buses at signals, and raised bus stops may prove a faster and more feasible approach for reducing travel costs in cash-strapped regions. Bus transit investments may also be more flexible in adapting to future travel needs than fixed-transit systems.

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[71] Regions with extensive fixed-transit networks (more than 201 stations) have a significantly larger share of their region's employment located in transit-accessible locations (known as the "transit zone capture rate") than regions with smaller transit networks. There appears to be a large bump in the capture rate when comparing regions with large networks (70-200 stations) to those with extensive networks, suggesting that the addition of new stations may have a non-linear effect on transit-accessible employment depending on the size of the existing transit network. Belzer, et al., 2011a.

[72] Belzer, et al., 2011a; Kneebone, 2009.

In addition to investing in transit, regions benefit from investments in freight transport planning and infrastructure. Freight transport has been rapidly growing in recent years, especially on roadways but also for air and sea freight, and is largely neglected as part of the regional transportation planning process.[73] Multi-modal transportation hubs located at strategic places within regions would help to facilitate and streamline the transfer of goods from air to rail to roads, and between cities or regions, reducing shipping costs for businesses.[74] Inland cities are also increasingly reliant on airports for movement of freight cargo and connections to global markets, making strategic investments in improving airport operations and expanding capacity a high priority for these regions.[75]

Finally, in today's knowledge economy, regions benefit from investments in high-quality communications infrastructure such as broadband technology. This infrastructure alleviates the need for some physical travel and improves the rapid exchange of ideas, which fosters agglomeration benefits and knowledge spillovers as discussed elsewhere. Investments that improve the reach of the existing communications network can also improve the efficiency and productivity of the labor market, by extending the reach of firms to qualified workers via telecommuting or other flexible work options.

d. Influencing the costs of travel

Some planners and economists, among others, argue that transportation costs are currently too low to be of much influence on location decisions and regional spatial efficiency.[76]Low travel costs allow residents and businesses to select locations that are optimal for reasons other than transportation (such as proximity to good schools for families, or to suppliers, workers, or consumers for firms), but which may generate a sub-optimal spatial arrangement for the region as a whole when transportation costs rise, especially for automobiles.

There has been much speculation in the research literature and popular press about how higher fossil fuel prices could influence the spatial structure of cities, dating back to the energy crises of the mid-1970s.[77]Some note the game-changing potential for high gasoline prices to devalue far-flung, auto-dependent suburbs and to alter the home-buying decision calculus in favor of more accessible locations, as seen in 2008 and again during the spring of 2011.[78]

Travel costs are relatively low, in part, because travelers do not pay the full social costs (in an economic sense) for their transportation, due to externalities with extensive regional impacts such as traffic congestion and air pollution.[79] Travel costs are also low because of a long history of public subsidies for infrastructure (whether for roadways, airlines, railroads, transit, etc.),

[73] Brown, Southworth and Sarzynski, 2008.
[74] For instance, regions could learn from the "freight village" experience in Europe and other energy- and cost-saving efforts, such as Europe's Best Urban Freight Solutions program and EPA's Smartway Transportation Program. Brown, Southworth and Sarzynski, 2008.
[75] Lang, Sarzynski and Muro, 2008.
[76] Haines, 1986; Small, 1980.
[77] Romanos, 1978; Evans and Beed, 1986; Small, 1980; Haines, 1986.
[78] Cortright, 2008b.
[79] O'Sullivan, 2002. Other externalities could be included here with more national and international impacts, such as for securing energy supplies domestically and from overseas.

resulting in a situation where passengers do not pay the full cost of their use and their travel is subsidized out of general tax revenues.

Thus, one strategy to encourage spatially-efficient location decisions is to "get the prices right."[80] That is, to internalize the external costs from transportation so that travelers face the true costs of their behavior and can make more informed decisions that should result in a more spatially-efficient urban arrangement and in higher use of cheaper transportation modes (i.e., walking, biking and public transit).

The reality is that regions have little direct control over many private transportation costs, such as for gasoline, insurance or private vehicle purchase. Regions also have little incentive to substantially or rapidly increase private transportation costs to match true costs because the region may lose residents or businesses to cheaper areas.[81]

Regions can employ various transportation demand-management (TDM) tools to influence prices, encourage less driving, reduce congestion, improve mobility and improve the overall efficiency of the regional economy.[82]TDM tools include congestion pricing, tolling, performance parking, car or bike sharing, and incentivizing employer-based programs such as telecommuting and employer-supported housing. TDM tools are highly flexible and can be tailored to local problems, resources and public-private governance arrangements. The general idea with TDM tools is to retain mobility but get people out of cars during peak travel times and using other modes, so as to improve the efficiency of the entire regional transportation network.

TDM tools can be used in concert with other strategies to improve spatial efficiency. For instance, regions may need to invest in new infrastructure to accommodate regional growth or otherwise to improve spatial efficiency. Infrastructure is extremely expensive to build and, in the case of roadways, can rapidly shift traffic to the new road while stimulating waves of nearby development. Transportation planners and state and local governments are turning more often now to tolling or congestion pricing strategies that put a price on use of the roadway to help pay for the investment by users (as opposed to taxpayers) as well as to slow the spread of congestion and sprawl along new roadways. Likewise, regions may invest in car or bike sharing programs at the same time as investing in public transit so as to more effectively discourage private vehicle use and encourage transit use.[83]

Public-private partnerships can be employed to implement TDM strategies and to engage the business community on interventions that save them money. TDM tools that generate fees can also be reinvested in the community to promote local support, such as performance parking fees

[80] Brown, Southworth and Sarzynski, 2008.
[81] This "leakage" problem is one reason why pricing strategies are thought to be more effective when implemented at a larger scale, such as multi-state or national initiatives, than at the local level.
[82] Rodier and Johnston, 1997; Vance and Hedel, 2007.
[83] Car-sharing limits overall auto use by allowing individuals to rent a vehicle when they need it (often on an hourly basis) as opposed to paying the full cost of owning a vehicle. Localities have implemented various car- or bike-sharing programs, such as City CarShare in San Francisco and Capital Bikeshare in Washington, DC, or other incentive programs to get people out of cars, such as the Car Free Diet program in Arlington, Virginia. In some cases, similar programs have been initiated by non-profit organizations in supportive markets, such as ZipCar and CarShare Chicago.

that help to moderate short-term parking demand and where fees can be used for improvements such as to adjacent sidewalks, road crossings, landscaping, bus shelters and street furniture.

Getting the prices right may be financially painful for some travelers in the near term, especially when residents or businesses have few travel options and face higher costs. In this case, regions may also benefit by providing travel subsidies to individuals that face difficulties conducting their daily activities with existing transportation options. Travel subsidies most typically include free or reduced transit fares (such as for children, students, the disabled or elderly), when the primary barrier limiting travel is affordability. Subsidies may include subsidized parking or car sharing arrangements when existing public transit offerings are not adequate to provide mobility to jobs. These individually-targeted subsidies should reduce personal travel costs, which should improve labor supply decisions and alleviate some of the negative employment consequences of spatial mismatch. The subsidies could be paid for out of fee receipts from other TDM or pricing schemes, among other options.

e. Improving efficiency with regional planning and financing

Finally, residents and businesses benefit when development and infrastructure are coordinated and seamlessly integrated across jurisdictional boundaries within a region and beyond (for more, see Chapter VII on governance). Such coordination and integration requires long-term regional planning efforts, especially around land use, transportation infrastructure and green infrastructure (i.e., open land and connections that promote essential ecosystem services including habitat conservation, water filtration, etc.).

One approach to promoting coordination between jurisdictions is regional tax sharing. Tax sharing allows a region to equalize the resources of local governments, providing at-risk communities with the resources to lower taxes and improve services, while making regional land-use planning a legitimate possibility.[84] Tax sharing also helps to address the "fiscalization of land use" resulting from jurisdictions competing with each other for retail activity (i.e., sales taxes), which can lead to an inefficient regional distribution of retail activity and consumer access to goods and services.[85]

Even without formal tax sharing arrangements, regions must be effective in their local coordination and planning in order to be competitive for scarce public resources and for new private-sector investments. Efforts such as regional visioning can help to bring public and private actors together to discuss their desired futures and to identify concrete actions that could be taken to achieve their goals. The challenge for regions will always be to coordinate the variety of individual and business location decisions, travel choices and governance activities so as to improve the efficiency of conducting key economic transactions within the region.

C. Recommendations for Future Research

Our research indicates that improving spatial efficiency is likely to have positive economic returns through transportation cost savings. However, there is a dearth of evidence directly

[84] Rusk, 1999; Gallivan, et al., 2007; Orfield, 2002.
[85] Lewis, 2001.

connecting existing spatial structures with economic outcomes for regions, prompting the need for both applied research and tool development.

1. Measurement of Spatial Efficiency

Researchers need a high-quality, long-term, comparative data set with which to evaluate spatial efficiency in a number of regions. There is a lot of debate within the urban studies literature about how best to measure spatial outcomes and some researchers fall back on existing measures of urban sprawl, including simple measures of regional density (see Appendix to this chapter). Yet, it is not clear whether these measures are the most appropriate ones for research on economic outcomes. Most sprawl research focuses mostly on personal travel outcomes rather than on the conduct of other business activity, which is likely to strongly influence economic outcomes. In addition, most existing research has focused only on large metropolitan areas in the U.S., and we have much less information about spatial efficiency in smaller regions. These smaller regions may benefit the most from developing new spatial metrics, as these regions may have less capacity to conduct their own data collection and analyses.

2. Rigorous Case Study Analyses and Typology Development

Two strands of complementary research should proceed once we have a high-quality, long-term, comparative data set on regional spatial patterns. One strand of research would explore in more detail the conditions under which spatial patterns developed, furthering our understanding of why certain areas may be spatially efficient while others may suffer from various degrees of spatial inefficiency. What have the successful regions done to achieve their success? Can their actions be replicated elsewhere, and how? This research should help identify the particular actions that practitioners might take to obtain desirable spatial patterns within their own regions.

A second strand of research would explore in more detail the consequences of spatial patterns for economic development. That is, how have various spatial arrangements and adjustments impacted regional economic growth? Further research could work to develop typologies of spatial arrangements in the context of economic development, and to delve more deeply into the conditions required to achieve positive returns such as through careful comparative, case-study analysis.

The research community should also explore in more detail the individual pathways through which spatial efficiency impacts economic growth. For instance, we need better information on how spatial structure influences transportation costs other than for commuting, such as for business-to-business interactions or business-to-consumer interactions. We need better information about which regions suffer from spatial mismatch and how spatial mismatch influences regional economic outcomes (as opposed to individual outcomes).[86] We could benefit

[86] Related, we need a better understanding of how spatial patterns (beyond just density) influence public service costs and how those costs influence regional economic development. Currently, research finds that less dense configurations lead to higher capital costs and lower operating costs. However most research in this area looks at single jurisdictions rather than regions, resulting in a skewed view of the regional consequences of jurisdiction decisions. Such research might better employ a cost-benefit framework with a moderate time horizon that can account for both upfront and annual expenditures and that spans multiple jurisdictions.

from studies that examine the current status of cities previously suffering from spatial mismatch, to identify the extent to which the problem persists over time or could be remedied by selective interventions.

3. Identifying Promising Interventions

Regions also need reliable evidence regarding which of the strategies and interventions mentioned above are most likely to change spatial structure and to bring economic benefits to their region, as well as at what cost. It would be useful to compile an open, online learning space where practitioners, academics, and others could submit information regarding local and regional strategies and their impacts. The learning space organizers could develop a template of items that all submissions should discuss so as to provide some degree of comparability. The organizers could also commission a regular paper series extracting lessons learned across cases and encourage feedback from the policy and practitioner communities as to what additional information or analysis would be necessary to improve their decision-making.

All future research should measure regional outcomes when evaluating local policies. Many strategies that could improve spatial efficiency are targeted at small neighborhoods or segments of cities (e.g., TOD, TIFs, brownfields redevelopment and enterprise zones). While existing research has evaluated the impact of these policies on the participating communities, research typically does not look at the impact of these policies on the region as a whole. Are the positive outcomes observed in small districts achieved at the expense of neighboring jurisdictions or do the improvements in spatial efficiency benefit the region as a whole? Because the major systems in an economy operate at the regional (and not neighborhood) level, it is critical that policies undertaken to improve neighborhoods not undermine regional outcomes.

4. Improving Available Tools

Researchers should work with regional leaders and practitioners to develop better tools that can be used to understand regional dynamics and for identifying what would be optimal policy interventions given their unique economy and characteristics of place.[87]

At the regional level, tools are needed to better identify the competitive advantages of the region and ways in which places can effectively compete with multiple regions and in a network of places.[88] Tools could evaluate the potential for improving regional competitiveness through strategic investments in infrastructure (communications and transportation), given the larger networks in which the region is located. Tools should also consider how to integrate regional economies with adjacent rural or "frontier communities" in order to promote mega-regional economic growth and competitiveness.[89]

At the sub-regional level, more tools are needed to understand and promote sub-regional specializations and clustering of activity. Such tools might employ maps of sub-economies and

[87] For a list of available tools, see online reference guide at http://www.iedconline.org/?p=ED_Reference_Guide, summarized in Ronderos, 2009, pp.26-27.
[88] Ronderos, 2009.
[89] Ronderos, 2009.

hierarchies of transportation nodes, to highlight ways in which these sub-economies fit into larger regional, national and international networks. As one example, Baltimore has been developing data and models of transportation networks and how they connect with neighborhoods and sub-economies, which could be expanded and adapted for use elsewhere.[90] Practitioners also need easy-to-use metrics for assessing the impact of current and proposed development plans. The tools might build from earlier data-driven efforts to assess spatial conditions, such as the U.S. Environmental Protection Agency's Smart Growth Index.[91]

Finally, as discussed with respect to "interventions" above, myriad strategies, policies, products and tools are being tested to influence spatial efficiency, ranging from TOD to congestion pricing. Systematic identification and assessment of these interventions, and development of sophisticated and comprehensive materials to guide practitioners in determining which ones are best suited to their regional circumstances, and particularly how to successfully design and implement them, is the next critical step in expanding the practice of enhancing spatial efficiency for regional economic development.

[90] For instance, see http://www.baltometro.org/transportation-planning/socio-economic-indicators and http://www.bniajfi.org/

[91] http://www.epa.gov/dced/topics/sg_index.htm

Spatial Efficiency: Appendix 1 – How Can We Measure Spatial Efficiency?

One approach to measuring spatial efficiency is to assess the overall land use pattern within a region, from which we can infer spatial efficiency. A variety of different metrics have been used to measure land use patterns, falling generally into groupings by density, proximity, centrality, and concentration.[92]

Density metrics are frequently employed to capture the intensity of development within a region (whether measured by population density, housing density, employment density or some variation thereof). In principle, regions with higher density (i.e., more persons per unit of land area) may be more spatially efficient, as the distance required to transport people or goods within a region may be shorter and the viability of mass transportation improves in denser areas. Alternatively, denser areas may be subject to more extensive traffic congestion, reducing spatial efficiency. Thus, traditional density metrics are inherently limited in their ability to fully capture the spatial efficiency of a region. Density metrics tend to better capture city size and the phenomenon of urban agglomeration, discussed elsewhere.

Another group of metrics operationalize the *proximity* of different land uses, such as the average proximity or distance of jobs to housing or of housing to retail opportunities. Regions with greater proximity of land uses should be more spatially efficient, as with density, except if the proximity generates extensive congestion externalities. In some cases, researchers examine measures of the "jobs-housing balance," which reflects the employment opportunities available within a given area (such as a county or a political jurisdiction).

A third group of metrics examine the degree to which a region's activity (i.e., employment, commuting) is oriented around a central city. Regions with single central cities are known as monocentric or mononuclear, and this urban structure serves as the theoretical basis for urban and regional economic theory. Other regions may be organized around more than one city, and are variously considered polycentric, polynuclear, multicentric or multinuclear. Still other regions may be more fully decentralized with few obvious centers and have been called "beyond polycentric."[93] A large debate exists over whether monocentric, polycentric or dispersed development patterns are most spatially efficient.

Many discussions related to spatial efficiency focus on urban sprawl, which could be a case of spatial inefficiency. As regions grow, they must increase their land area and/or build more densely. In many cases, metropolitan growth is characterized by both expanding land area and by increasing density.[94] In some cases, however, a region experiences declines in central city population or employment accompanied by land area growth (i.e., decreasing density), a trend they refer to as "deconcentration." Many concerns about sprawl are related specifically to deconcentrating areas and where the resulting patterns may be spatially inefficient.

The previous metrics are most frequently calculated at the regional level. Yet, land use within regions may vary considerably. Households, in particular, may be more sensitive to the land use

[92] Cutsinger, et al., 2005; Galster, et al., 2001.
[93] Gordon and Richardson, 1996.
[94] Persky and Wiewel, 2000.

surrounding their homes rather than to the broader regional structure. For this reason, some scholars measure spatial patterns at small-area geographies, such as census tracts or traffic analysis zones.[95]In some cases, researchers argue that neighborhood density serves well enough as a surrogate for other important aspects of the local spatial structure, such as land use mixing and transit accessibility.[96]

The biggest drawback with using land use metrics to measure spatial efficiency is that we are inferring activity based on spatial structure without much empirical evidence of how people behave in different environments. For this reason, some researchers attempt to directly measure regional efficiency, or at the least, symptoms of regional *inefficiency*. Such measures might include average commute times or distances by travel mode, amount of congested roadways in the region, degree of roadway usage compared to capacity, availability of public transport services, etc. Scholars interested in the local public service implications of spatial efficiency might measure the average response times for fire or ambulance services, for instance. Some economists also compare actual behavior to what might be theoretically optimal given a certain spatial arrangement, such as with "excess commuting."[97]

A hybrid approach between measuring pattern and measuring behavior is to examine the *accessibility* of particular locations within a region, which should have a direct bearing on the location decisions of businesses and residents and thereby on their daily activities. Scholars may be interested in specific types of accessibility and sometimes by different travel modes (i.e., by auto vs. by transit or walking). For businesses, scholars may be interested in: (1) access to appropriately-skilled labor, (2) access to suppliers, (3) access to markets and (4) access to other public services. For residents, scholars may be interested in: (1) access to occupationally-appropriate jobs, (2) access to retail, educational, and recreational opportunities and (3) access to other public services. Theoretically, firms and residents should face lower costs for transacting business and conducting daily activities if they locate in areas with high accessibility, except again if such accessible areas suffer from congestion externalities.

Thus, as a complex phenomenon, the choice of appropriate operational measure depends in large part on which aspect of spatial efficiency is being studied and at which spatial scale. New measurements and tools are needed to provide clarity to the concept of spatial efficiency.

[95] Song and Knaap, 2004.
[96] Bhat and Guo, 2007; Brownstone and Golob, 2009.
[97] Horner, 2004.

Spatial Efficiency: Appendix 2 – Literature Review on Transportation and Public Service Costs

As described above, we expect that the spatial arrangement of economic assets and activity within a region should influence regional economic prosperity primarily through impacts on transportation costs. Further, we expect that transportation can be most directly influenced by efforts oriented around the location decisions of businesses and residents, and the provision of public infrastructure. The following sections review the empirical evidence of the relationship. We also review the literature regarding public service costs, although we find that the relationships with regional economic growth are much less clear and indirect than for transportation costs, and thus do not consider public service costs a dominant influence on regional growth.

a. Transportation Costs

The literature regarding the impact of spatial organization on transportation costs is far from settled.[98] The best available data on travel behavior in the U.S. concerns the journey-to-work, and as a result, most literature focuses specifically on commuting costs (reviewed separately below). Yet, approximately 80% of personal trips in the U.S. are conducted for purposes other than commuting (according to the 2009 National Household Travel Survey), and a growing amount of travel is oriented around freight movement. Thus, the spatial efficiency of a region is likely to have impacts on travel costs generally, which in turn are expected to impact a region's economic development as described above.

i. Driving Behavior

Newman and Kenworthy sparked a debate in the planning community with their conclusion that land use and transportation planning differences among 32 cities worldwide appeared to account for some of the variation in gasoline use per person, after considering differences from energy prices, income and vehicle efficiency.[99] Their most frequently cited finding was a nonlinear and declining relationship between density and energy use: the lowest-density cities (all in the U.S.) had the highest per capita gasoline use and highest-density cities had the lowest per capita gasoline use. The authors then advocated for creating denser, more compact and centralized city-regions as a policy strategy to reduce auto-dependence and encourage non-auto travel.

The Newman and Kenworthy studies have been frequently criticized in the research literature, especially regarding methodology and comparability of cases across countries, although studies in the U.S. context often conclude with similar policy prescriptions. For instance, residential density was the strongest predictor of both vehicle ownership and use across neighborhoods in Chicago, Los Angeles and San Francisco, after controlling for household income and size.[100] The authors were able to produce similarly shaped non-linear relationships between residential density and vehicle use as were produced by Newman and Kenworthy for density and gasoline

[98] Guo and Chen, 2007; Cervero and Duncan, 2006.
[99] Newman and Kenworthy, 1989b.
[100] Holtzclaw, et al., 2002.

use per capita. Transit availability was also found to be important to the auto ownership choice, while pedestrian/cycling friendliness was important in understanding auto use.[101]

Holtzclaw and other researchers argue that individual suburban neighborhoods should be designed to discourage auto-use and encourage non-auto travel models. Such "neotraditional" or "new urbanism" design features might include higher densities, finer-grain land use mixing, shorter street blocks within a gridded street pattern, all of which presumably brings destinations into closer proximity and shortens trip lengths, thereby potentially making non-auto travel modes more attractive. Areas that have historically adopted such design features, such as urban neighborhoods in the Netherlands, do often have lower car use when compared to their more suburban and rural counterparts.[102]

The problem is that neighborhood design features do not unambiguously result in less auto-use; by reducing trip lengths and the associated cost of travel between locations, such design features may theoretically increase the number of auto trips and thereby increase net auto travel.[103] Certain household characteristics, such as two-worker households with kids, are closely associated with auto use regardless of income or other urban structure factors.[104] Recent research in the San Francisco Bay Area found that households in jobs-rich (i.e., accessible) areas made more frequent vehicle trips but their net vehicle miles (and vehicle hours) traveled were lower than households in jobs-poor areas.[105] Whether reducing trip distances leads to reduced overall travel appears to depend on whether the area also experiences reduced speeds (such as from traffic congestion or specific traffic calming design features) enough to discourage vehicle trips.[106] It also appears to depend on whether trip lengths are reduced sufficiently to entice non-auto travel, as many people appear unwilling to walk to destinations outside of ¼ mile.[107] From an economic perspective, shorter auto trips may still be "efficient" as long as those trips enable productive economic transactions (despite any equity or environmental impacts that may also accrue), complicating the empirical study of auto use, travel, and regional economic impact.

Self-selection bias is an important problem to consider when inferring the potential impact of changing spatial structure on transportation costs. That is, households may choose their location based on their preferences for transportation costs, and thus without adequate analytical controls for preference (or socio-demographics, which some say can simulate preference), studies may overestimate the potential response in driving behavior to land use change.[108]

A recent study investigating self-selection bias in a sample of households in San Francisco found that the built environment (i.e., buildings and infrastructure) influenced both whether the household owned a car and where the household located within the metropolitan region.[109] Yet, the research found that household socioeconomics, especially income, dominated the decision of

[101] Holtzclaw, et al., 2002.
[102] Dieleman, Dijst and Burghouwt, 2002a.
[103] Crane, 1996.
[104] Dieleman, Dijst and Burghouwt, 2002a.
[105] Cervero and Duncan, 2006.
[106] Boarnet and Crane, 2001.
[107] Boarnet and Crane, 2001.
[108] Ewing, et al., 2008b.
[109] Bhat and Guo, 2007.

where to live within the region, and thus the researchers cautioned against oversubscribing impacts to the built environment.[110] Research in Germany found a larger influence of the built environment on household location and driving behavior after controlling for household socioeconomics and potential self-selection bias.[111] Unfortunately, German cities tend to have much more substantial transit offerings than U.S. cities (as well as have other policy, governance, socioeconomic differences discouraging auto travel), limiting its comparability to the U.S. context.[112]

The most recent and careful empirical study on the influence of neighborhood-level urban form on travel behavior found nuanced relationships between neighborhood density, vehicle usage, and fuel consumption when controlling for socio-demographics.[113] The authors conducted a structural equations analysis to predict fuel consumption based on vehicle usage (VMT) and density, based on a sample of household travel behavior from California in 2001. The authors found that the net effect of increasing residential density by 1,000 housing units per square mile (40% of the mean) was to decrease VMT by 1,171 miles per year per household (5%) and reduce fuel consumption by 64.7 gallons per year per household (5.5%), all else equal. The density effect was a compound result of driving fewer miles in dense areas, owning fewer vehicles in dense areas, and owning more fuel-efficient vehicles in dense areas (likely as a response to parking constraints).

There remains substantial debate as far as the magnitude of impact that could be generated by altering land use and regional spatial structure. One widely-cited study argued that moving a hypothetical household from a region with a sprawling spatial structure like Atlanta to a region with a more concentrated spatial structure like Boston could decrease household VMT by nearly 25%, with even larger gains to be had by moving to a region with highly concentrated spatial structures like New York and Chicago.[114] Ewing, Pendall and Chen found a difference of approximately 25% between driving behavior in the most sprawling regions and in the least sprawling regions within their sample of U.S. metropolitan areas.[115] Likewise, Ewing et al. found that doubling gross population density across an urbanized area could decrease regional driving by approximately 15-20%.[116]

A recent scenario analysis found the potential for behavior change to be smaller.[117] For the scenario with a doubling of density of 25% of new housing (which decreases VMT in these households by 12%), the authors found an approximately 1% nationwide reduction in VMT by 2030. For the scenario with a doubling of density for 75% of new housing (which decreases VMT in these households by 25%), the authors found an approximately 8% nationwide reduction in driving by 2030. Part of the change in driving behavior was expected due to use of smaller, more efficient vehicles in denser areas and to some shift in travel from personal vehicles to

[110] Bhat and Guo, 2007.
[111] Vance and Hedel, 2007.
[112] Transportation Research Board, 2009; Rodier, 2009.
[113] Brownstone and Golob, 2009.
[114] Bento, et al., 2005.
[115] Ewing, Pendall and Chen, 2003.
[116] Ewing, et al., 2008b.
[117] Transportation Research Board, 2009.

public transportation.[118] The authors discussed the feasibility of changing development patterns as modeled in their analysis, noting that even the doubling of density in 25% of new housing units would be a significant departure from recent trends, which have been towards lower densities.

Other scholars have expressed skepticism over the ability of policy or planning to influence spatial structure to the degree necessary to meaningfully impact driving behavior.[119] For instance, one careful analysis concluded "that we still understand too little about [the transportation-land use] link to design informed policy" and "that we have other options available that can better meet the transportation planning needs of the immediate future."[120]

Despite skepticism in the social science research community, the planning and engineering communities have virtually accepted that land use is an effective strategy to reducing driving behavior and its associated energy and environmental impacts.[121] Increasing destination accessibility or proximity to transit will automatically reduce driving demand in commonly-used simulation models (i.e., TRANUS; MEPLAN; UrbanSim). Depending on the area studied, input parameters, and stringency of the modeled land use change, such simulation models have predicted between 0-10% reduction in regional vehicle miles traveled over 40 years, with a median reduction of 1.7%.[122] Rodier suggests that land-use only policies may have only marginal impacts in areas with high quality transit (i.e., at least 10% commuting via transit, such as in European and Washington, D.C. regions), but may have stronger impacts in "the more sprawling and rapidly growing regions (e.g., Sacramento) where trend land use patterns do not take full advantage [of] existing transit capacity."[123]

Adding investments to transit systems or auto pricing policies (such as the congestion pricing adopted in downtown London) to land use policies may have a much larger combined effect on costs over a 10-40 year period than land use policies used alone.[124] For instance, adding transit improvements to land use scenarios may bump up the VMT reductions to 25% over 40 years (median 15.8%), whereas adding auto pricing policies to transit policies may bump up VMT reductions to 40% over 40 years (median 17.1%). The largest potential reductions appear from a combination of all three types of policies (land use, transit improvements, and auto pricing) at up to 80% VMT reduction over 40 years (median 24.1%). As Rodier notes, however, "these policies may be considered very aggressive in the U.S. context" and may be difficult to implement.[125] It is also worth noting that a few simulations found that aggressive pricing and land use policies result in increased regional VMT over time as businesses and households relocate away from high-cost central locations.[126]

[118] Transportation Research Board, 2009.
[119] Brownstone and Golob, 2009; Brownstone, 2008.
[120] Boarnet and Crane, 2001, p.14.
[121] Rodier, 2009; Ewing, et al., 2008b.
[122] Rodier, 2009.
[123] Rodier, 2009, p.20.
[124] Rodier, 2009.
[125] Rodier, 2009, p.19.
[126] Rodier, 2009.

In addition, few researchers consider potential costs once a region hits a certain density level and roadways become congested, which can bring widespread costs to an entire region. For instance, Sarzynski et al. found that two measures of roadway congestion – the average number of vehicles on the freeway and the average hours of congestion delay per capita – were both higher in regions with higher regional density, after controlling for previous levels of congestion and for other land use variables, such as proximity of jobs and housing and degree of centralization.[127] Regions with highly centralized housing also tended to suffer more roadway delay per capita. These findings suggest that increasing regional density or housing concentration in an already congested region may be unlikely to reduce the costs of roadway congestion. That being said, a certain level of regional congestion is required to make transit systems more desirable and efficient to operate, and thus the end goal for regions may not always be to reduce highway congestion. One study noted that "congestion can be an ally of planners who seek to eliminate automobile trips, as some reduction in trip speeds, possibly due to increases in congestion created by higher densities, can provide an incentive for persons to avoid driving."[128] Readers are left with the somewhat incongruous conclusion that travel costs may need to increase (via congestion) to decrease travel costs (from reduced driving).

Finally, while most research attention has been focused on residential density, some researchers note that increasing employment density, especially in centers and around transit stops, may improve accessibility for workers and businesses throughout the region and be more likely to reduce regional transportation costs than increasing neighborhood residential density.[129] Unfortunately, few empirical analyses compare such potential scenarios and most simulation studies combine both increased residential density and employment concentration in the same scenario, making it difficult to compare the effectiveness of different densification policy strategies. Overall, the expectation is that increasing density at either the workplace or the residence will improve spatial efficiency.

ii. Commuting Costs[130]

Although commutes comprise only a fraction of total transportation behavior (i.e., less than 20 percent of daily trips), their costs to workers and to businesses influence the efficiency of conducting economic transactions with the region, as described above. The abundance of empirical research on this topic has not revealed consistent findings, however. Some of the variation in results come down to analysis of different aspects of commuting behavior, such as commute times vs. commute distances or travel mode, or from differences in how those measures were computed (i.e., estimated distance or measured with an odometer). Other variation in results comes from whether the analysis considers aggregate behavior (such as averaged for residents in a particular region) or considers individual commuting behavior. Further variation is introduced because researchers use different measures of spatial efficiency, such as density or degree of centralization, and specific measures may not be comparable across studies or over time.

[127] Sarzynski, et al., 2006.
[128] Boarnet and Crane, 2001, p.173.
[129] Transportation Research Board, 2009; Ewing and Cervero, 2001.
[130] While not covered in detail here, commuting travel distance and travel mode both have important implications for other costs such as public infrastructure costs, energy use and environmental pollution.

Research using aggregate measures for a regional geography has often found that average commuting times are longer in regions with higher average density.[131] Yet, regional density (measured at the metropolitan or urbanized area level) may act more as a surrogate for city size or urban age than as a measure of intra-regional spatial structure. In addition, when examined in light of other measures of spatial structure, the relationship between regional density and commute times is not obvious.[132] Using regional measures of spatial structure may also obscure important differences in commute behavior and costs found within the region, as spatial structure is rarely uniform across an entire region.

For this reason, scholars have further investigated the relationship between commuting behavior and residential densities measured for smaller geographies, such as census tracts or blocks. Some of this research has found relatively consistent travel times across different locations for both commuting and non-work behavior, whether in central cities or far-flung suburbs.[133] One explanation for the relative stability of travel times arises when considering travel mode.[134] Commuters traveling by private automobile may travel further distances but travel faster speeds than commuters traveling by public transportation, who may travel less distance but at slower speeds. Travel distance and travel speeds combine to produce relatively stable average travel times. Another explanation is that commuters adjust their household or employment locations such that journey-to-work times remain relatively stable.[135] Businesses may also adjust their location to be closer to their workforce. The dynamic adjustment of businesses and residents to minimize commute times is discussed in the literature as the "co-location hypothesis."[136]

Although varying considerably in methodology, study area, and specific findings, econometric research has often found that the attributes of neighborhoods are correlated with the commuting costs of its residents. For instance, using a national dataset of individual commute trips in 1990, Levinson and Kumar found that the relationship of commuting time to neighborhood density was non-linear for commutes by automobiles; commute times declined as density dropped below 7,500 persons per square mile but increased with density above 10,000 persons per square mile.[137] The increase in commute times via automobile from high density neighborhoods appeared to represent a congestion disamenity effect, as predicted by economic theory. Transit commuters, by contrast, did not experience a disamenity effect from higher density living, which may reflect the fact that transit works better in high density neighborhoods.[138]

Another study using a national dataset of households in large U.S. cities found that both neighborhood density and the nearby mix and proximity of land uses had important impacts on the choice of commuting mode (i.e., driving vs. transit, walking or biking) in 1990.[139] Workers tended to choose non-auto commuting only when their neighborhood density was high and when there was a mix of non-residential land uses within close proximity (i.e., 300 feet) of their

[131] Levinson and Kumar, 1997; Izraeli and McCarthy, 1985; Gordon, Kumar and Richardson, 1989b.
[132] Sarzynski, et al., 2006; Ewing, Pendall and Chen, 2003.
[133] Gordon and Richardson, 1997; Levinson and Kumar, 1994.
[134] Wang, 2000.
[135] Gordon, Richardson and Jun, 1991; Gordon, Kumar and Richardson, 1989b.
[136] Cervero and Wu, 1998.
[137] Levinson and Kumar, 1997.
[138] Levinson and Kumar, 1997.
[139] Cervero, 1996.

homes.[140] Similar results were found from household travel surveys from Seattle and Toronto.[141] These studies suggest that we cannot focus exclusively on density, but rather must look at how density is patterned throughout the region.

More recent analysis has affirmed that commuters living in low-density outlying suburbs of relatively monocentric regions tend to commute further and longer than commuters living in higher-density close-in neighborhoods.[142] Yet, travel requirements between suburban homes and suburban jobs may be less than travel requirements between suburban homes and city jobs (or city homes and suburban jobs).[143] These findings suggest that commuting costs depend critically on both residential and employment choices and opportunities. For instance, Levinson found that increasing the availability of jobs in housing-rich suburban areas (as well as increasing the availability of housing in jobs-rich areas) decreased individuals' automobile commute times in the core-dominant Washington, DC region.[144] Similar results were found regarding employment accessibility in Boston and Chicago, which both have large central cities.[145] Sarzynski et al. confirmed that metropolitan areas with relatively close proximity of jobs to housing (i.e., Las Vegas) had shorter average commute times in 2000 than areas with housing further from jobs (i.e., New Haven).[146]

Even so, research has not consistently demonstrated region-wide benefits from employment decentralization on commuting. For instance, the San Francisco Bay area did not experience shorter average commute distances or times following rapid employment decentralization from 1980-1990, nor were commute times shorter in decentralized city-regions in the Netherlands as opposed to more centralized regions.[147] Commuting behavior clearly varies with city size and cultural factors, with results from medium-sized Quebec and from smaller regions in Europe diverging considerably from results found in Washington, Boston or Chicago.[148] Part of the discrepancy may come down to the degree of congestion found within the study area, as decentralization in an already congested area may do little to improve commutes for local residents. Differences may also arise from transit availability, as the availability of alternatives to driving will most certainly influence the propensity of households to choose non-auto modes.[149]

The empirical literature is also mixed regarding the relative importance of spatial structure on commuting costs and thus on the magnitude of cost reductions that could be achieved by changing spatial arrangements. Most researchers acknowledge at least three types of factors that influence individual commute behavior: personal attributes (gender, age, education), household attributes (income, automobile ownership, married, young children), and spatial structure.[150] In

[140] Cervero, 1996.
[141] Frank and Pivo, 1995b; Miller and Ibrahim, 1998.
[142] Sultana and Weber, 2007; Miller and Ibrahim, 1998; Wang, 2000; Shen, 2000.
[143] Sultana and Weber, 2007; Gordon, Kumar and Richardson, 1989a; Schwanen, Dieleman and Dijst, 2003.
[144] Levinson, 1998.
[145] Shen, 2000; Wang, 2000.
[146] Sarzynski, et al., 2006.
[147] Cervero and Wu, 1998; Schwanen, Dieleman and Dijst, 2003.
[148] Vandersmissen, Villeneuve and Theriault, 2003; Schwanen, 2002.
[149] Rodier, 2009.
[150] Schwanen, Dieleman and Dijst, 2003.

several studies, personal or household attributes were found to be at least as important if not more important than location or structure in determining individual travel behavior.[151] It is widely agreed that individuals self-select into the neighborhoods where they live for a variety of reasons and commutes may represent only one part of that decision calculus.

Other studies focusing on job accessibility near residences have found accessibility to be the most important factor influencing individual commute times.[152] Shen also found a stronger influence of residential location on commute times for workers commuting by modes other than the personal automobile (i.e., transit, walking).[153] Most studies using individual-level observations found a large degree of unexplained variation, suggesting that observable commute behavior may be only moderately influenced by socioeconomics or spatial structure (at least as measured by the existing literature).

A notable gap in the literature remains in tracing how changes in spatial structure over time impact commuting costs.[154] Indeed, almost all of the existing literature draws conclusions about the potential impact of changes in urban structure using results of cross-sectional analysis or single case studies from which it may be difficult to draw causal inferences. Yet, what policymakers and practitioners need to know is whether interventions to change the spatial structure have noticeable effects on commuting. Such analysis is particularly difficult because regional spatial structure changes slowly, on the order of decades, and few datasets are available to model long-term impacts. In addition, much of the empirical literature relies on simple models of the relationships between land use and commuting behavior, despite methodological concerns about the simultaneous operation of land use and transportation systems and the presence of time-lags in observing behavior change.[155] For instance, analysis indicating only a minor influence of spatial structure on commuting behavior may result because complex relationships and interactions are difficult to model properly. In these cases, the best solution may be to employ regional simulation models that consider the complex dynamic interactions between land and housing markets with transportation networks, which all impact the location choices of businesses and residents.

Thought exercises have been employed to illustrate the role of location choice on transportation costs. For instance, Persky and Wiewel compared the costs of congestion externalities for a hypothetical new electrical equipment plant locating in the outer suburbs of Chicago to those associated with a central city location.[156] Using data from the 1990 Census, the authors found that 95% of suburban jobholders drove to work compared to only 61% of city jobholders, and rates of carpooling were higher among city jobholders. Using data on actual commute times and commuting modes, the authors estimated that the average suburban worker generated about 30% more vehicle time than did the average city worker. Simulating the projected congestion increases resulting from a city versus a suburban location, the authors estimated that a city location resulted in approximately 47,000 fewer commuting hours than did an outer suburban

[151] Sultana and Weber, 2007; Bento, et al., 2005; Punpuing, 1993; Schwanen, Dieleman and Dijst, 2003; Giuliano and Small, 1993; Cervero and Wu, 1998; Guo and Chen, 2007.
[152] Shen, 2000; Levinson, 1998.
[153] Shen, 2000.
[154] Vandersmissen, Villeneuve and Theriault, 2003.
[155] Sarzynski, et al., 2006.
[156] Persky and Wiewel, 2000.

location. Assuming that congestion costs $0.35 per mile and the average speed of travel in the Chicago metro was 30 miles per hour in 1990, these extra commuting hours carried economic costs of about $500,000 for the suburban location over and above the city location.[157]

Other thought exercises place the regional commuting cost savings from compact development at billions of dollars per year. For instance, commuters in Portland, OR and Chicago saved approximately $1.1 billion and $2.3 billion, respectively, in vehicle costs from shorter distance commutes compared to the median driver nationally.[158] In Portland, shorter commutes were estimated to also save another $1.5 billion in commuting time, for a total annual savings of $2.6 billion.[159] (Additional savings would be expected if residents drove less for other purposes besides commuting, such as for shopping or recreation.) Another scenario analysis placed the nationwide transportation cost savings at approximately $2.2 trillion over 10 years if all new development was targeted in smart-growth communities (50% greenfield vs. 50% infill), with even larger savings of $2.8 trillion if all new development was in smart-growth infill communities.[160]

b. Public Service Costs

There are many ways in which the spatial efficiency of a region could impact the price of public services. For instance, spatial mismatches increase demand for public services. Similarly, geographic expansion will increase the demand for public services in lands previously uninhabited. However, it is also possible that in addition to increasing demand for public services, spatial efficiency may impact their cost or price. This section is specifically concerned with this latter price impact.

Literature describing a relationship between spatial efficiency and the per unit cost of public services begins with the premise that decreased density requires an expansion of infrastructure causing the marginal price of new service locations to exceed their average price. In particular, the extension of roadways and venues providing utilities requires these services to travel further to reach relatively fewer numbers of people. To the extent that other services such as police protection and education exhibit economies of scale, per unit costs of these services will rise as well. Their infrastructure requirements (such as schools and police stations) also exhibit increasing marginal costs with reduced density.

Unfortunately, there is little conclusive evidence as to the existence of this relationship. The most widely cited study of this phenomenon is the 1974 report *The Costs of Sprawl*, which found that public services in sprawling regions cost about twice what they would in denser regions.[161]

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[157] In addition to the commuting costs, suburban households put 0.5 more cars on the road than central city households do; resulting in 250 more vehicles on the road as a result of the new firm choosing a suburban location, which resulted in an additional $100,000 in annual accident costs and an almost additional $20,000 per year in pollution costs. Together, the extra costs required as the result of a single new suburban firm location equaled about $620,000 compared to the costs required had the firm located in the central city.Persky and Wiewel, 2000.

[158] Cortright, 2008a; Cortright, 2007.

[159] Cortright, 2007.

[160] Bürer, Goldstein and Holtzclaw, 2004.

[161] Council on Environmental Quality, Department of Housing and Urban Development and Environmental Protection Agency, 1974.

More recent research has also found a negative relationship between density and the price of public services, both in the aggregate, and for specific services such as roadways and sewers. Research also generally finds that the cost of public services rise with the spatial extent of urbanized land, making sprawl doubly inefficient from a public service provision prospective. More specifically, Carruthers and Ulfarsson find that density (defined as the number of jobs and residents per square acre of *urbanized* land) and the spatial extent of urbanized area (defined as the total number of developed acres) are both inversely related to per capita public sector costs in the areas of police protection, highways, and schools.[162] Carruthers and Ulfarsson find that the density of developed land reduces local government spending and the spatial extent of developed land increases public expenditures.[163] Based on these findings, the authors estimate that if the entire nation's land use had developed 25% more densely, 2002 fiscal year local public expenditures would have been $3.63 billion less, while if existing development had occurred in 25% less land area, they would have been $6.56 billion less. These savings translate into an average per county cost reductions of $1.18 million and $2.13 million, respectively.

However, there are also reasons to believe that the price of public services declines with low-density, sprawling regions. As Carruthers and Ulfarsson note, newly urbanizing areas often are associated with the creation of new local governments and/or special districts in order to keep pace with increased demand for public services and increasing revenue needs.[164] The creation of such institutions and sprawling land use outcomes are simultaneous as these types of governments are essential for the development of urban fringe suburbs, but they also often impose fiscal zoning and growth control strategies that lead to less dense development. The Tiebout model of metropolitan governance suggests highly fragmented areas with multiple governmental authorities should have *lower* per capita municipal expenditures since the large numbers of governing bodies introduces competition into the system, forcing down costs. Indeed, Carruthers and Ulfarsson note that empirical research generally finds an inverse relationship between the number of jurisdictions and their overall expenditures and in their own research, they find that the per capita number of special districts and the per capita number of municipal governments are both inversely related to per capita public expenditures, except in the case of roadways and trash collection.[165]

Several studies have found that there is an inverse or U-shaped relationship between density and the price of public services. For example, Ladd looks at the relationship between population density and per capita local expenditures including expenditures from all local governments within each county including county governments, municipal governments, townships, education districts and other special districts.[166] Ladd's model of public expenditures specifies demand, cost and public service preference variables; intergovernmental relations variables; and density and population change variables; and public expenditures are separated into current use, capital and public safety. The hypothesized impact of density on public service costs is ambiguous. On the hand, there are potential economies of density in the production of public services. On the other hand, higher density requires that more services be provided through the public rather than

[162] Carruthers and Ulfarsson, 2003.
[163] Carruthers and Ulfarsson, 2008a.
[164] Carruthers and Ulfarsson, 2003.
[165] Carruthers and Ulfarsson, 2003.
[166] Ladd, 1992.

private sector and increases the amount of public goods needed to provide a given level of public service. Ladd finds a U-shaped impact of population density on public expenditures; with the relationship being driven by the impact on current account and public safety spending. Where population is sparse, increasing density lowers public service costs, but after density reaches 250 people per square mile, public service costs increase. A county with population density of 1,250 persons per square mile is predicted to have public service costs 19% higher than a similar county with population density of 250 per square mile. About 13% of this increased costs come from public safety spending while the others come from current account increases.

As the above study indicates, critical to the findings reported in the literature on spatial form and public sector costs are the specific costs being assessed. For example, Carruthers and Ulfarsson report that higher density is associated with lower per capita police, road and school spending but associated with higher spending in "other transportation" (which includes parking facilities and public transit) and sewerage.[167] In a review of the literature, Slack notes that studies analyzing the costs of "hard" services (infrastructure such as local streets, sewerage collection lines, water distribution pipes, storm drainage systems, and local schools) find that denser areas have lower per capita costs.[168] On the other hand, studies analyzing the relationship between "soft" services (education and social services, for example) find that small one- and two-bedroom, high-rent multifamily housing; and office, industrial, warehouse, and retail properties generate more in tax revenues than they require in expenditures.[169]

Also critical in understanding the relationship between density and public sector costs, is the size of the area. Holcombe and Williams argue that "the general conclusion is that for communities larger than 50,000, where most of the concern for sprawl is centered, higher population density does not reduce the per capita expenditures for providing government services."[170] In fact, for populations of over 500,000 increasing density is associated with higher per capita total and operational expenditures. However, the authors note that for infrastructure expenditures, there may be a negative relationship between spending and population density, although the negative relationships observed only hold for cities up to 250,000 in the case of highways and 500,000 in the case of sewers.

In addition to the size of the area and the type of expenditure being analyzed, the methodology matters. Studies of infrastructure costs are engineering studies analyzing the costs of infrastructure across hypothetical communities; and these tend to find an inverse relationship between density and public service price.[171] Other studies conduct statistical analyses using actual data on public expenditures.[172] Generally, these latter types of studies are much more likely to find a positive relationship between density and public service costs, particularly where soft services are concerned.[173] Most of the studies above describe the relationship between per capita expenditures and land use.

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[167] Carruthers and Ulfarsson, 2003.
[168] (2002)
[169] Slack, 2002.
[170] Holcombe and Williams, 2008, p.360.
[171] Council on Environmental Quality, Department of Housing and Urban Development and Environmental Protection Agency, 1974.
[172] Ladd, 1992; Carruthers and Ulfarsson, 2003.
[173] Slack, 2002.

An alternative approach to this question is the Cost of Community Service studies, which estimate the ratio of public expenditures to public revenues by land categories. These studies have the goal of estimating the impact of various land uses within a single jurisdiction and generally group land uses in residential, commercial/industrial, and agricultural/open space. In a meta-analysis of 125 Cost of Community Service studies, Kotchen and Schulte conclude that most studies find that commercial/industrial and agricultural/open space ratios are less than one (they generate more revenues than they require in expenditures) while residential uses are greater than one (they require more expenditures than they generate in revenues).[174] Interestingly, as population density rises, commercial/industrial and agricultural/open space ratios about *doubles* while residential ratios remain unchanged. The authors admit that they have no explanation for the commercial/industrial result. On the other hand, they suggest that the reason for the higher expenditures relative to revenues in agricultural/open space land located in denser areas is that these tend to be smaller open space areas such as urban parks, which are expensive to maintain but bring in no revenue. With respect to the null finding on residential ratios, the authors suggest that the density may be too crude to measure the actual impact of density on the costs of community service for residential property.[175]

Similar to the costs of community service methodology, one approach to assessing the impact of spatial efficiency on public sector costs involves estimating the difference in net local fiscal contributions between alternative firm locations. Using this approach, Persky and Wiewel estimate that in 1990 Chicago, a new manufacturing plant located in the suburbs would cause about $1.5 million more public costs than the same plant located in the central city.[176] The primary reason behind the larger public costs of the new suburban plant is the difference between average and marginal costs in public expenditures.

Together these studies do not provide particularly strong evidence for public sector savings associated with spatial efficiency, whether public sector costs are evaluated using a per capita expenditures or an expenditures relative to revenues approach. They do suggest potential savings on infrastructure resulting from a more compact urban form, but it is unclear to what extent these savings are offset by increases in operating costs. Given the somewhat ambiguous results presented here, if spatial efficiency improves economic growth in a region, it is unlikely that reduced public sector costs are the primary mechanism by which this outcome occurs.

[174] Kotchen and Schulte, 2009.
[175] Kotchen and Schulte, 2009.
[176] Persky and Wiewel, 2000.

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CHAPTER VII

Fostering an Effective Institutional Environment – Government and Governance

***Note**: This is one of eight papers – an executive summary, six papers on specific aspects of regional economies and an appendix – generated by the "Implementing Regionalism" project, funded by the Surdna Foundation and undertaken by the George Washington University Institute of Public Policy and RW Ventures, LLC. Please see [insert web link] for the complete set of materials developed by the project.*

CHAPTER VII: FOSTERING AN EFFECTIVE INSTITUTIONAL ENVIRONMENT: GOVERNMENT AND GOVERNANCE[1]

A. Definition and Significance

In this chapter we examine how government and governance within metropolitan regions affect regional economies and regional economic growth. We focus on the organization of government and governance within metropolitan regions, on the taxing and spending activities of governments within a region, and on the culture of governmental institutions.

The collection of institutions and the culture they foster shape the economic activity that occurs in a region. While *government* is the predominant part of this institutional environment, it is only one piece of the puzzle of regional *governance* as carried out by a broader range of regional institutions. To clarify, *government* is a territorially based body that makes authoritative decisions (for which it has constitutional or legislative authority) that are binding on residents and businesses within its boundaries.

We define *governance* (admittedly a somewhat contested concept, see the appendix to this chapter) as the process of governing through which decisions are made that are intended to affect societal outcomes, including economic, social, environmental and other important outcomes. As Bradway and Shah (2009, p. 242) define it, governance is "the formulation and execution of collective action at the local level. Thus, it encompasses the direct and indirect roles of formal institutions of local government and government hierarchies, as well as the roles of informal norms, networks, community organizations and neighborhood associations in pursuing collective action." In this conception government (the public sector) is nearly always involved and usually plays a vital role, but other sectors - non-profit organizations, foundations, civic elite organizations, business leadership organizations, labor unions, social service organizations, and the inter-organizational collaboration among these various groups - may play important roles as well.

In the American system there is no general purpose unit of government at the regional level. Instead there are a variety of different kinds of local governments within a region, including counties, municipalities (and, in some states, townships), school districts, and various special districts. While there are no regional general governments, there are regional special districts in most metropolitan areas. Since local governments in the United States are creatures of their state government, the potential activities of local governments vary from state to state.

Regional governance is the process through which decisions are made that are explicitly meant to affect economic, social, environmental, and other important societal outcomes throughout the entire region or at least throughout parts of the region that extend beyond single governmental jurisdictions. Regional governance thus explicitly *excludes* decisions of a single unit of

[1] The lead authors of this chapter are Hal Wolman, Alice Levy and Diana Hincapie. The chapter draws upon both Wolman et al., *Economic Competitiveness and the Determinants of Sub-National Area Economic Activity* (2008) and Kosarko and Weissbourd (2010), *Economic Impacts ofGO TO 2040*. Small segments of the text are lifted verbatim from these papers.

government such as a city or county acting on its own or a private firm pursuing its own interests, even if these actions have an impact on societal outcomes throughout the region. Given the lack of regional governmental institutions (other than regional special districts and regional or multi-jurisdictional planning entities), regional governance usually requires cooperation among local governments and among other institutions with regional interests or missions.

Every region has some means of regional governance and we characterize these as regional governance regimes. These may vary from some regions where agreement is reached through ad hoc intergovernmental negotiations and agreements, to regions where governance is a product of decisions by regional special authorities, to other regions where there are formal systems of multi-purpose regional institutions.

Government plays a fundamental role in the economic development process. Economic development is largely a product of market forces, but market rules and operating procedures, including property rights and contract law, are set and enforced by government. Government plays a role in the economy through the provision of public goods that are collective in nature and through efforts to counter market imperfections such as externalities or poor information. For example, government at the state and local level, but often financed at least partially by the federal government, provides the public infrastructure that services economic activities. It also provides public services (e.g., police, fire, waste management) to both business and households. To finance its services, state and local governments impose taxes that are part of the cost of doing business and, since these taxes and the services they finance vary among states and among local governments, they are a consideration in business and household location decisions. Similarly, state and local governments impose regulations that affect business and economic activity. Furthermore, these decisions vary across states, metropolitan areas and local governments, rendering some more favorably poised to generate economic growth than others.

Determining how government can enable and improve the performance of the private sector – where wealth is overwhelmingly created – without displacing or unnecessarily distorting it, is one of the most complex challenges in driving regional economic growth. Economic theory is sometimes used as a rationale for limiting government's role to a narrow set of functions related to addressing market imperfections. However, if as North and others believe, effective institutions can play a central role in facilitating economic progress, there is a strong case to be made for improving government (and other institutions) as a strategy for pursuing economic growth.

B. Local Government Structure and Regional Economic Growth

1. Discussion

Regional economic growth is highly affected by local governmental activity. However, as discussed in Chapter II, given the nature of the various regional systems that interact to produce regional economic growth, the real economy in a metropolitan area is regional in scope. Despite this, there are virtually no multi-purpose local governments at the regional level (the Twin Cities and Seattle are two exceptions). In other words, the regional governmental system operates at a

different geographic scale than does the regional economic system. Labor markets, housing markets, land markets and the transportation network are all regional in nature. However, the formal political system is emphatically not regional in nature. This discrepancy has generated substantial challenges for policymakers interested in promoting economic growth and a substantial body of literature describing such challenges, which we summarize below.

The proliferation of governments within the typical American metropolitan region is frequently characterized as "fragmentation." Fragmentation can be either horizontal or vertical. Horizontal fragmentation refers to multiple governments of the same type. Within a metropolitan area there are likely to be many separate general purpose governments, including large numbers of municipalities, often two or more counties, and in states with townships, several townships. In addition to general purpose local governments (which are responsible for multiple functions and have taxation and regulatory powers), there are a variety of special districts created to provide specific services. The most widespread of these are school districts, but there are many other types as well, some of which may even be region-wide, and most of which have revenue-raising powers.

In addition to horizontal fragmentation, fragmentation also exists vertically through the overlapping of many of these different kinds of governments. Thus, in most states, a resident will be served (and taxed by) a municipality, a school district (which may or may not be coterminous with the municipality), a county (of which the municipality, along with other municipalities, will be a part), and various special districts whose boundaries, unless the special districts are established by the municipality, are unlikely to be shared by the municipality. In short, these various levels of government overlap each other.

Why does this matter? What are the costs and benefits that result from this fragmented system?

We begin with the problems that horizontal and vertical governmental fragmentation of metropolitan regions pose for regional economies and regional economic growth.

- *Incentive structure biases against regional decision making*. The institutional structure of US metropolitan areas is composed of many general purpose local governments, each of which is governed by officials elected by the voters residing within the local government jurisdiction. Elected officials respond to their electors and their concerns (indeed, this is the way representative democracy is supposed to operate), and this response is strongly reinforced by the possibility of being voted out of office at the next election if they fail to do so. Thus, to the extent that "acting regionally" or in the region's interest is perceived by residents of a local government to be counter to local interests, local elected officials will be loath to act regionally. However, there surely are situations that are "win-win," i.e., where local interests coincide with the interests of the overall region in promoting regional economic growth. This should particularly be the case with respect to the location of employment; given that regional labor markets make it possible for residents of one locality to commute to jobs in another local jurisdiction within the region, a local jurisdiction concerned with employment for its residents should support new or expanded employment anywhere within the region. However, in practice, we often see that local tax structures induce competition between local governments within the region instead of cooperation.

- *Local tax structure within metropolitan areas encourages inter-jurisdictional competition rather than cooperation.* The property tax is the primary tax base for virtually all local governments. A local government is able to generate property tax revenue from a firm or household *only if* it locates within its boundaries. If the firm locates outside of a jurisdiction's boundaries, the jurisdiction is able to capture additional revenue from its residents who commute to work in the firm, *only if* the jurisdiction has a local income tax. In most states local governments are prevented by state law from imposing a local income tax, although several states with very large cities do permit these cities to levy such a tax. As a consequence, the incentive for elected local officials (who have to provide services to their residents paid for through local revenue), is to attract local development within the jurisdiction's borders. The economic development policies that are generated by this incentive are low tax rates and/or a series of tax breaks and subsidies provided to firms that locate in the jurisdiction. In the absence of a region-wide governmental body, regional economic development policy at its core often consists of a series of local government incentives designed to attract employment from one local government within the area to another rather than a coordinated effort to engage in activity to promote regional economic growth wherever it most appropriately might occur within the region. As Oates (1972) notes, the result is an erosion of the local tax base, lower tax rates, and the provision of services at a lower level than is optimally efficient. Regional planning or economic development organizations might engage in regional marketing efforts, promote cluster networks and provide data, but they usually do not have the ability to *implement* a regional economic development strategy.

- *Local government horizontal fragmentation and local land use regulation reinforce inter-jurisdictional competition.* Local governments control land use policy within their boundaries, virtually always without regional or state coordination or oversight. They thus zone land to produce their desired environment and to encourage positive fiscal outcomes, a process known as "fiscal zoning." Some suburbs, particularly the wealthier ones, engage in forms of exclusionary zoning (e.g., large lot requirements, restrictions on multi-family rental housing) that effectively prohibit low- and moderate-income households from living within the jurisdiction and thus reduces the high service costs relative to property tax contributions of such households. Others zone out commercial and industrial uses. Where local sales taxes are important, local governments may zone for retail development at the expense of other uses. All of these practices may have seriously adverse implications for regional spatial efficiency (see Chapter VI).

- *Vertical fragmentation provides incentives for higher levels of both taxes and public services.* As Berry (2009) argues, while multi-purpose governments must make fiscal tradeoffs among competing priorities, single-purpose governments are budget maximizers with respect to the single function for which they are responsible. Furthermore, special district elections have lower turnout rates and are likely to consist disproportionately of voters with a strong interest in increasing the services that the special district provides. As a result, Berry concludes (p. 180), "the single function politicians provide higher spending on each service, and the aggregate budget (for the geographic area) is larger than it would be if there were only one government. This is the fiscal equivalent of a common-pool problem."

- *Fragmented government imposes administrative and regulatory costs on businesses that operate in multiple jurisdictions within a region, requiring them to negotiate through additional layers of regulation and permitting requirements.*

The above discussion suggests that the institutional structure of local government in U.S. metropolitan areas, buttressed by the local tax structure, serves to discourage, if not prevent cooperation and collaboration on regional economic growth and development issues. Indeed, it is also argued that local government fragmentation prevents cooperation on a wide-range of activities. However, there are many issues where local interests do not compete with regional interests and/or where services or facilities for a local government can, for reasons of cost and logistics, only be provided regionally. These services and facilities are usually provided through a single-purpose regional authority (e.g., a regional water authority; regional airport authority, regional transportation authority). In other cases they are provided through consultation, informal cooperation or negotiated inter-local agreements among two or more local governments. Oliver Williams (1965) several decades ago observed that infrastructure decisions were politically relatively easy to deal with regionally, while "lifestyle" decisions involving social access or decisions directly affecting resource redistribution were politically dangerous and thus extremely unlikely to be undertaken. It is important to stress that fragmentation does not prevent regional governance; it is the structural context in which regional governance occurs and which therefore shapes the nature of regional governance.

It is also important to note that that the fragmented local government structure in metropolitan areas does not *always* adversely affect regional cooperation and collaboration and, indeed, may produce substantial benefits. Indeed, some economists argue (see Wallace, 2008 for a review of the literature, also Oates and Schwab, 1991) that fragmentation and the existence of many local governments may have some positive impacts. Following Tiebout, they contend that fragmentation and many local governments result in competition to provide services more efficiently and at lower tax costs. If a region can lower its average tax cost without lowering its level or quality of services, it will have a competitive advantage over other regions.

As this suggests, there are two schools of thought on the ideal level of centralization/fragmentation. Defenders of fragmentation argue that as the number of local governments increases, it spurs efficiency of operations in governmental units resulting in greater economic growth. This viewpoint is often traced back to Tiebout's theory of local expenditures (1956), in which Tiebout argued that multiple competing local governmental units allowed "consumer-voters" (presumably including businesses) to select the communities that best satisfied their preference patterns. The greater the number of communities, the more likely the "consumer-voter" will be able to locate in a place that meets his/her ideal preferences. Further, the need to compete for "consumer-voters" provides an incentive for local governments to operate efficiently. In addition, some argue that tax competition among many local governments will result in driving down the cost of doing business throughout the region by reducing the tendency of local governments to use taxes on businesses (who are non-voters) to cross-subsidize taxes on households (who are voters).

On the other hand, opponents of fragmentation (often called consolidationists) argue that large, multi-service governments achieve economies of scale and scope, resulting in more efficient operations and greater income growth for the region as a whole (Nelson and Foster, 1999). They argue that local government competition is a zero-sum game resulting in: corporate welfare, subsidies to land or property-based interests, levels of taxes and services that do not reflect resident preferences, and/or higher, unnecessary costs imposed upon communities and residents. Further, critics of government competition argue, such government interventions into the private market create economic rents distorting investment location decisions and creating inefficiencies in capital markets (Feiock, 2002). They also note that in a coherent, streamlined government, there is greater transparency, increased accountability of public officials to local constituents, and lower transaction costs.

2. What Does the Empirical Evidence Show?

To what extent is there empirical support for the proposition that fragmented local government retards economic growth or that regional government or governance promotes it? While the above discussion presents the powerful logic that underlies the presumed adverse relationship between fragmentation and regional economic growth (as well as the logic that underlies the contrary proposition), there is a relative paucity of empirical evidence.

Part of the problem results from the fact that measuring regional governmental fragmentation and regional governance has proven difficult and contentious. Different researchers employ different operational measures, making it difficult to compare research findings across studies[2] and helping to account for the diversity in the findings on its effects that we discuss below.

While measures of government fragmentation have a reasonably long history of use in empirical research, this is not the case for regional *governance*. Little systematic work has been done to specify the range of capacities for and degrees of regional action, and their relationship to successful regional development. Perhaps because the concept of regional governance is rather vague, there have been few efforts to attempt to operationalize and measure it (but see discussion in Section F on a suggested research and development agenda).

There have been some efforts to develop typologies of regional government or governance (for a review of these typologies, see Millar, 2008, pp. 10-19). However, these typologies are conceptual only; with few exceptions[3]they are not actually utilized to classify or describes

[2] Measures of fragmentation have included a count of all local governments in the metropolitan area (Hill, 1974, Dolan, 1990, Cutler and Glaeser, 1997), local governments per capita within the MSA (Hawkins, 1971; Hill, 1974; Zeigler and Brunn, 1980; Parks and Oakerson, 1992), a count of local *general* purpose governments or local *general purpose* governments per capita within the region (Lewis, 1996; Ellen, 1999), and more complex measures that attempt to account not only for the number of local governments, but for their relative importance or influence (Lewis, 1996; Mitchell-Weaver, Miller, and Deal (2000); Millar, 2002). Berry (2008, 2009) develops measures of *vertical* fragmentation measures, including special function jurisdictions per municipality and the number of *overlapping* jurisdictions per municipality in the metropolitan area.

[3] Hitchings, 1998, classifies metropolitan areas into one of four categories: 1) ad hoc regions where governments work together but do not have a written regional plan, 2) regions where a regional plan exists, but there is no authoritative implementing mechanism, 3) regions where a regional plan exists and there is some supervisory mechanism responsible for implementing the plan, even if implementation means simply receiving compliance

specific metropolitan areas. Indeed, at present there is no data set on regional organizations and activity by metropolitan area available that would permit empirical development of regional government or governance typologies (see section F).

Below we describe the research that has attempted to assess the relationship between horizontal and vertical fragmentation and economic growth. The results are ambiguous.

Several studies look directly at the effect of government and governance structure on regional economic outcomes such as employment, income, or firm births Foster (2001) concludes that the theoretical and empirical evidence of the effects of regionalism in achieving metropolitan goals, like achieving equity, environmental sustainability and regional economic growth, provides a mixed and inconclusive picture. Swanstrom (2002) agrees, observing that, "the evidence that fragmentation hurts regional economic development is both weak and mixed. Some studies find that fragmentation reduces regional economic growth (e.g., Paytas, 2001; Hamilton, Miller, and Paytas, 2004), while Stansel (2005) finds that fragmentation increases regional income growth. Grassmueck and Schmuel (2010) find that the results are sensitive to the way that horizontal fragmentation is measured. When local governments per capita is used as the measure of fragmentation, the more fragmented a metropolitan area is, the lower its regional employment growth, whereas using a measure that adjusts for the relative importance of various local governments produces results that's how that fragmentation increases regional employment (see also Nelson and Foster, 1999).

Looking at horizontal centralization, Paytas (2001) assesses the impact of fragmented local government on the economic competitiveness of metropolitan areas between 1972 and 1997. Economic competitiveness is defined in terms of income growth using a shift-share technique that calculates metropolitan income growth after accounting for both regional employment trends and national income trends[4]. He finds that between 1972 and 1997, fragmentation has been increasing[5]and that there is a large negative statistically significant impact between the extent of horizontal fragmentation and metropolitan competitiveness.

Hamilton, Miller, and Paytas (2004) conduct an analysis very similar to that employed by Paytas (2001) assessing the determinants of metropolitan competitiveness in terms of the income shift

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reports from local governments in the region, and 4) authoritative regions in which a regional plan exists and there is a regional body with the authority to enforce compliance with the plan by local governments.

[4] Horizontal decentralization is measured using a Metropolitan Power Diffusion Index (MPDI) that the authors calculate. The MPDI is based on 24 expenditure categories and shows the relative power of various overlapping governmental institutions without obscuring the importance of small local governments[4]; a value of 1 indicates perfect consolidation and values increasing up to infinity indicate increasing decentralization. Vertical decentralization is measured using Stephens' State Centralization Index (SCI) which accounts for the services delivered by the state, services financed by the state but delivered by other units of government, and state government personnel. In addition to including both measures of centralization, Paytas includes an interaction term to the hypothesis that horizontal fragmentation matters less in centralized states. Mathematically, the MPDI calculates the sum of the square root of each municipality's percentage of metropolitan expenditures by expenditure category. The MPDI can also be calculated using revenues instead of expenditures.

[5] Paytas argues that the increase is due to the creation of new governmental units (especially special districts and authorities) as a means of evading constitutional debt limitations. Paytas notes that much of this decentralization has been conducted under the auspices of increasing economic development but that this dispersion of authority may actually create additional challenges with respect to maintaining regional competitiveness.

share and characterizing metropolitan governing using both the MPDI and the SCI. They also find that fragmentation is negatively related to regional income growth.

Grassmueck and Shields (2010) look at the impact of government organization on MSA economic growth between 1992 and 2002. The authors measure governmental organizational form with the Hirschman-Herfindahl Index (HHI) and the metropolitan power diffusion index (MPDI), both of which rest upon the assumption that government units with spending authority are those with the political and economic power to influence economic growth[6]. When fragmentation is measured in terms of the HHI and MPDI for all local governments in the metropolitan area, Grassmueck and Shields find that horizontal fragmentation is associated with *increased* employment and per capita income growth. This finding is in direct contrast to the results reported by Paytas (2001) and Hamilton, Miller, and Paytas (2004) even though one of their measures of horizontal decentralization was identical to that used in the prior two studies. However, in addition to their measures of fragmentation using the HHI and MPDI, Grassmueck and Shields run a model with the number of governmental units per capita and find a negative coefficient in both the employment and population models suggesting the when government fragmentation is measured in this manner it has a detrimental impact on economic growth.

Carr and Feiock (1999) look at a specific type of regionalism, city-county consolidation, to test whether this rather extreme form of reducing fragmentation affects development patterns and efforts to attract new business to a metropolitan area. City-county consolidation is a form of regional governance in that a single government organization replaces several, theoretically resulting in reduced service delivery costs, clear lines of government authority, improved accountability and regional cooperation. The authors employ a time-series research design from 1950 – 1993 for nine consolidated governments[7], each of which is also compared to counties in its own state. Their measures of business attraction include the number of manufacturing establishments and the number of retail and service establishments in the county (both of which were obtained via County Business Patterns). They find that once both the time comparisons and cross-state comparisons are included in their models, there is not a significant impact of consolidation on the number of business establishments, suggesting that if economic development is the purpose of reducing fragmentation, consolidation is unlikely to induce the desired results, but that consolidation did not *reduce* economic growth in these areas either[8].

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[6] The HHI is a measure often used to measure the market power of various industries (or companies) and in the present study, the authors measure governments' market share in terms of the ratio of local governments' unit's expenditures relative to all government expenditures in the metro area. The primary advantage to this approach relative to simple counts of the number of governments is that it distinguishes active and powerful governments from the inactive and weak ones. HHI scores range from 0 to 1, with 0 indicating high fragmentation and 1 indicating consolidation. The MPDI is a variation of the HHI, but is calculated in such a way that 1 indicates consolidation and values up to infinity indicate increasing levels of fragmentation.

[7] City of Anchorage/Anchorage County, AK (merged 1975); City of Jacksonville/ Duval County, FL (merged 1967); City of Columbus/ Muscogee County, GA (merged 1970); City of Indianapolis/ Marion County, IN (merged 1969), City of Lexington/ Fayette County, KY (merged 1972); City of Houma/ Terrebonne County, LA (merged 1984); City of Butte/ Silver Bow County, MT (merged 1976); Carson City/Ornsby County, NV (merged 1969); City of Suffolk/ Nansemond County, VA (merged 1972)

[8] However, Carr and Feiock argue that it is possible that the increased professionalism, planning capacity, and legal, jurisdictional and financial resources resulting from consolidation enhanced the efficiency of local development efforts, even if total development remained unchanged. The authors argue that the problem with local jurisdictions competing for economic development is not these efforts but rather their costs, which increase with zero-sum

Nelson and Foster (1999) look at the relationship between metropolitan governance structure and regional per capita income, one measure of regional economic outcomes across the 287 largest MSAs between 1976 and 1996. The authors find that existing case studies and aggregate studies provide inconsistent evidence. One of the limitations to much existing research, Nelson and Foster argue, is the inability to find appropriate measures of regional governance. For example, one of the most common approaches to assessing fragmentation is to use the number of governmental units (per capita or otherwise standardized) but such an approach treats all local government influences as equal which is not a valid assumption. Instead Nelson and Foster set forth a number of characteristics, each of which captures some aspect of fragmented metropolitan governance. These include:

- Central-city dominance (percentage of MSA population residing in central city)
- Central-city elasticity (ratio of central-city population in 1980 to 1960 divided by the ratio of land area in 1980 to 1960)
- Special-service district dominance (ratio of special-purpose governments excluding school districts relative to general-purpose governments)
- School districts per one million population
- General purpose elected officials per one million population
- Special purpose elected officials per one million population
- City-county consolidations
- Single-county, two-tiered federations
- Regional special purpose districts (limited to water and wastewater)
- Regional multipurpose districts (such as Minneapolis-St. Paul, Portland, and Seattle)

Using this approach to characterizing governance, Nelson and Foster (1999) find that as the percent of the MSA population residing in the central city increases (suggesting less fragmentation), regional per capita income decreases. The special-purpose government dominance variable (suggesting fragmentation) is negative (though marginally significant). Neither school district nor general purpose elected officials densities are significant, nor are city-county consolidations. Multipurpose districts are positive as are regional utility districts (though the latter are only marginally significant), while single-county two-tier federations are negative and statistically significant. Nelson and Foster (1999) conclude that central city inelasticity may hinder regional economic growth but that having at least a few thriving suburbs is also important to economic growth. They argue that although having numerous small governments does not lead to efficiency-producing competition between local governments, a minimum number of municipalities in competition with one another does enhance efficiency. Further, fragmented

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completion while a consolidated local government could achieve similar results at a lower cost. Alternatively, the lack of findings may be attributable to the fact that consolidations typically leave sub-county units in place (such as school districts and municipal governments), rendering the consolidation much less meaningful in practice than it is in theory.

decision making (in the case of more elected officials and special purpose districts) leads to reduced per capita personal income.

Stansel (2005) looks at the impact of horizontal decentralization (fragmentation)[9] on metropolitan population and per capita income growth between 1960 and 1990. Decentralization is measured as (1) the per capita number of general purpose governments and public school districts, and (2) the share of the metropolitan population residing in the central city. Stansel found that the per capita number of governments was directly related to both population and per capita income growth, suggesting that horizontal decentralization improves economic competitiveness. Similarly, the central-city's share of regional population was inversely related to both population and per capita income growth, suggesting that horizontal concentration is related to reduced economic competitiveness.

There is also a substantial literature assessing the effects of fragmentation on service costs within the region, an important topic but only indirectly related to regional economic growth. Since higher-priced (or less efficient) public services will impact economic growth, the inference is that if fragmentation drives up the cost of public services, it will also result in decreased economic activity. Boyne (1992) and Hawkins and Ihrke (1999) conduct literature reviews of these studies; both find inconclusive results.[10] However, in a review of over 2000 articles and books, Dowding, John and Biggs (1994) conclude that public expenditures *decrease* as the number of governments increases, i.e., fragmentation reduces per capita spending on public services in a region. Berry (2009) examines the extent of *vertical* fragmentation within metropolitan areas and finds that such fragmentation is positively related to levels of taxation and spending within the region.

Taken together, the diversity of findings provides some, but not unambiguous, support for the conclusion that fragmentation causes adverse effects on regional economic outputs. The same is

[9] Stansel notes the discrepancy between their findings and those of Nelson and Foster (1999) and suggest that one explanation is that they used all metropolitan areas while Nelson and Foster used only large areas and there may be critical differences between metros of different sizes. For example, mass transit is likely to be in higher demand as population increases, and mass transit creates significant externalities across local jurisdictions that are best rectified with coordinated action. Indeed, when the analysis is conducted separately for the largest metros, Stansel finds that the relationship between decentralization and economic growth is weaker for such metros and stronger for the smaller metros.

[10] Boyne conducts a meta-analysis of studies in the U.S. exploring a relationship between fragmentation and concentration in government and spending. In 20 tests between spending and horizontal fragmentation (measured as number of local governments or number of local governments per capita), 11 find a negative relationship, 5 find a positive relationship, 1 finds a non-linear relationship, and 3 find an insignificant relationship. The type of relationship found is related to the type of government studied. For example, studies using multi-purpose governments tend to find that spending decreases as fragmentation increases while those looking at single-purpose governments are more likely to observe a positive or insignificant relationship. With respect to vertical fragmentation, Boyne (1992) finds that the evidence is much thinner and due to measurement problems is unable to provide convincing evidence one way or another. Hawkins and Ihrke (1999) conduct a literature review that includes 30 studies of the effect of metropolitan government fragmentation and 25 studies of the effect of city-county government consolidation that illustrates the diversity of findings regarding these issues. Of the 30 studies of fragmentation, 21 showed that fragmentation was either cost-neutral or *lowered* the costs of public services, while 9 showed increasing costs. Of the 25 studies of consolidation, 16 found that consolidation did not produce the hypothesized benefits, while 9 of them did show a positive relationship.

true with respect to the effect of fragmentation on regional economic efficiency, though the evidence here provides somewhat stronger support. However, Howell-Moroney (2008) argues that any efficiency gains may be insufficient to offset some of the costs associated with horizontal fragmentation which include urban sprawl and concentrated poverty. Thus, while decentralization may offer some increased efficiency benefits, it is not clear whether they are worth the equity costs.

C. Local Government Taxes, Public Services and Regional Economic Growth

1. Discussion

The role of local government taxes is one of the most misunderstood areas, particularly in public debate, in the area of government and governance. Since local government taxes are indisputably an element of firm operating costs, it is argued that lower local taxes promote growth and high local taxes hinder it. Later in this section we discuss the empirical literature on this question. Here we examine its logic.

Taxes fund public services. While taxes are indeed an operating cost to firms, if they result in public services of equal or greater value to firms, then taxes are a promoter of growth rather than a deterrent. Local taxes provide infrastructure construction and maintenance, police and fire protection, water, sewer, and waste disposal, all of which are services that most business establishments make use of. Taxes also provide support for labor force skill development through funding the elementary and secondary education system. The value of these services will vary among different kinds of firms, but the calculation is still the same: if the value of the services produced equals or exceeds the taxes paid then the taxes are not a deterrent to growth. It *is* the case that if the same level of services can be provided at lower tax cost in one jurisdiction relative to another, then that jurisdiction, ceteris paribus, will be more attractive as a location of economic activity.

What are the conditions under which taxes *are* a deterrent to growth? First, if services are not provided efficiently, then taxes will be higher than they need to be to provide a given service level. As noted above, this is a deterrent to economic growth. Secondly, if taxes on businesses are used to cross-subsidize services to households, then the value of taxes on business will exceed the value of the public service they receive and jurisdictions that do not cross-subsidize in that manner will be more attractive as a location of economic activity.

In general, however, taxes constitute a relatively small percentage of business operating costs and thus are not likely to be a very important consideration in a firm's decision to locate in one region relative to another. Indeed, empirical research shows that the importance of taxes pales relative to labor quality and cost and transportation concerns in *inter-regional* location decisions.[11]

However, it *is* true that within a region, given that regional labor markets and transportation connections to external markets render these costs relatively similar, differences in local taxes, while small relative to other operating costs, may affect decisions on where firms will locate

[11] For a review of this voluminous literature, see Wolman et al., 2008.

within the region. Thus, as noted above, given the property tax returns for locating within a jurisdiction, local governments engage in competition to attract businesses. This competition, which passes for local economic development policy in many local governments, mostly just redistributes economic activity within the region and does nothing to promote regional economic growth.

From the point of view of regional economic growth and development, there is no regional tax system, and the "average tax" for the region is largely an irrelevance. A business or household doesn't locate in an average jurisdiction, but on a specific tract of land in a specific jurisdiction that has its own tax system. Unless a firm is unable to find a suitable jurisdiction whose taxes and public services are to its liking, there should be no tax/service barrier to deter a firm from locating somewhere within the region and contributing to regional economic growth. (However, wherever they locate within the region, assuming the region is completely within one state, the firm will be subject to state taxes and if state taxes do not provide services of value to the firm, the region as a whole may be less attractive than regions in other states.)

While a firm pays taxes only to local governments that have jurisdiction over the land on which the firm locates, firms rely on services throughout the entire region – e.g., the regional infrastructure, labor market skills that are a product of education systems throughout the region, etc. Thus, the average quality of public services throughout the region may affect inter-regional location decisions of firms and therefore the region's economic growth. There are some public facilities and infrastructure components that are particularly important to business location, since they serve to link the region to the national and global economy. Probably the most important is an airport that has frequent direct service to national and international centers or to regional hubs that provide such services, and a well-maintained regional highway system with links to major interstates, both east-west and north-south. In addition, the quality of the intra-regional transportation system, both public and private, affects a firm's ability to induce workers to commute from throughout the entire labor market area, thus increasing the labor pool, and, if commuting is relatively easy and inexpensive, moderating worker wage demands.

As the above discussion suggests, understanding and creating the best tax-value proposition for a particular local economy is a critical issue for regional growth strategies.

2. What Does the Empirical Evidence Show?

The considerable literature assessing the impact of taxes and public spending on economic development can be summarized as follows: when the quality and quantity of public services are held constant, tax increases deter economic growth; when taxes are held constant, increases in the quantity or quality of public services attract economic growth. However, the magnitude of these effects is subject to considerable debate. In a meta-analysis of the literature on the effects of taxes, Bartik (1992) found a small, but statistically significant and negative relationship between tax rates and economic growth[12].

[12] Bartik estimated an elasticity in the range of -0.1 to -0.6, with the magnitude very sensitive to model specification and data source. Noting Bartik's conclusion, Wasylenko (1997, 38) remarks, "The range of the elasticity is not estimated with much precision, and it matters a great deal to policymakers whether the elasticity is -0.1, -0.6, or somewhere in between."

Most of the literature finds negligible or small effects of state taxes on business location decisions or state economic growth.[13] However, studies suggest that impacts are generally more pronounced within metropolitan areas. For example, Mark, McGuire, and Papke (2000), Bartik (1994) and Wasylenko (1997) have each independently estimated that a 10 percent reduction in local business taxes will increase economic activity in the community by around 20 percent – *assuming all other communities leave their property tax rates unchanged and there is not an offsetting decrease in local spending*. However, it should be noted that both the assumption of unchanged quality and quantity of public services, and the assumption of constant tax rates in neighboring jurisdictions are seldom likely to be met.

As noted above, both the level of taxes and the quality and quantity of public services impact economic growth. On the service side, government services may either reduce a firm's operating costs or provide a desired amenity (or both). Not surprisingly, not all public services provide an equal inducement to firm locations. Of the public services covered in his literature review, Fisher (1997) finds that only for transportation are there consistent findings of a positive relationship, while other services – public safety, education and public capital – have different effects across different studies. However, in a review incorporating more recent literature, Thompson (2010) concludes that, "public infrastructure investments increase productivity and decrease costs of private sector firms," thereby leading to greater economic growth. He also observes that, "in the short-run, spending on education is effective at generating jobs because it is such a labor intensive industry…" Numerous studies on the long-term economic impacts of spending on education show that it can boost employment and incomes in a state or region. Several studies suggest that transfer payments have a negative impact on economic growth.[14]

In addition to the impacts of taxes and spending, governments may undertake endeavors specifically designed to draw economic activity into the region; yet the extent to which these endeavors achieve their aims is a major source of disagreement within the field of economic development. Tannenwald (1996) notes that fiscal competition between sub-national governments is a 350-year-old practice in the U.S., and that in moderation, it can promote efficiency in state and local government. Opponents argue that competition between local governments rewards businesses for actions they would have taken anyway and redistributes economic activity within the region without creating any new economic activity. In a review of the impact of specific tax abatements, Malpezzi (2001) notes that virtually all state and local governments provide some such incentives and that in some cases, these incentives matter at the

[13] Two literature reviews, Lynch (1996) and Kusmin (1994), find little evidence that the level of state and local taxation figures prominently in business location decisions. Lynch, in particular, stresses that there is no evidence that state and local tax cuts stimulate economic activity or create jobs. Tomljanovich (2004) examined the effect of various taxes on state economic growth and also concluded that sales tax rates, corporate income tax rates, property tax rates and income tax rates have little or no effect on state growth rates. This result is generally consistent with the findings above. However, Yamarick (2000) found that both personal income and marginal property tax rates have a negative impact on growth in state economic activity, whereas the sales tax rate is insignificant.

[14] For example, Modifi and Stone (1990) estimated the effect of state and local taxes and expenditures on manufacturing employment and investment for all 50 states and found that while transfer payments had a negative impact on economic activity; spending on health, education, and public infrastructure produced a positive impact. In contrast, Dalenberg and Partridge (1995) found that total metropolitan employment was positively related to education spending but negatively related to highway spending.

margins while in other cases, they simply reward firms for actions that would have been taken anyway. However, Bartik (2009) finds that customized job training by community colleges is more than ten times as effective in creating jobs as are tax incentives. Surveys such as those by Rubin (1990) often find that firms do not cite specific incentives as the determining factor in their location decisions. As is the case with taxes and spending, empirical literature generally shows that such incentives are much more likely to impact firm decisions at the *intra-regional* level than at the *inter-regional level* (Anderson and Wassmer, 2000; Bartik, 1992; Haughwout and Inman 2002). Thus, it appears that for taxes, public services, and specific incentives aimed at attracting firms, government activities are much more likely to affect the distribution of economic activity within the region than they are to impact overall growth levels.

D. Local Government, Business Climate and Business Culture

The competence of local government – its ability to provide services and manage its resources efficiently, to administer its regulatory and permitting systems fairly and without delays, to operate transparently and without corruption – are factors affecting the willingness of businesses to locate within the jurisdiction and/or to operate efficiently within it. Surveys of business executives (see Cohen, 2000) generally find that an area's business climate is an important determinant of location decisions. While cited as important in qualitative research, the attributes of business climate that attract firms are difficult to define and even more difficult to measure, but may include cultural attitudes towards businesses, state and local laws restricting business activity and governing labor relations, and inefficient government bureaucracy resulting in permitting and licensing delays.

In addition to local government basic competence, local government ethos may also affect business and the economy. A political culture of corruption and favoritism may impose a real cost on businesses located within the jurisdiction and deter other firms from locating there.
Indeed, recent changes in the economy suggest similar changes may be necessary in governance in order to facilitate economic growth. The speed of change in today's economy explains the growing emphasis on innovation as a central component of economic development. The challenges of the modern economy demand flexibility, quick detection and solution, as well as the willingness to start from scratch when the first solution fails or the next problem pops up.[15] Innovative, open and flexible places may be better equipped to confront the ever-changing challenges presented. Many successful firms have recognized the significance of the changes in the economy and have modified their organizational cultures and structures to be flatter and less top-down oriented; more responsive and open to new people and new ideas; more flexible and willing to embrace change; and less afraid to take big risks. These new approaches allowed the firms that implemented them to better innovate, adapt and compete.

We suspect that similar changes in governance may allow regions, too, to be more innovative, adaptive and competitive. The traditional machine politics of favoritism, old-boy networks and bureaucratic inefficiency do not fit well with the needs of modern economies. More broadly, the institutional environment of a region (including governments, universities, corporations and

[15] See Singer and Paluso, "When the Trend Is Not Your Friend," Executive Agenda, AT Kearney Consultants, 2009, for examples of companies whose great success depended on adapting quickly to changing circumstances with innovative and risky ideas.

organizations) may support, or hinder, the pursuit of a flexible, open, innovative and entrepreneurial region.[16] In addition to the explicit policies, rules and regulations that make up the institutional environment, cultural values also contribute to the creation of productive places. These difficult-to-quantify characteristics include the celebration (in the press and by public officials) of entrepreneurs and innovators; cooperative networks and coordination within and between sectors; openness to new people and ideas; flexibility and adaptability; tolerance of failure; and enthusiasm for taking risks.[17]

Although government is not the only institution whose culture impacts the economy, it is uniquely positioned to extend its influence to other sectors (see Visser, 2002, for development of a cultural model of inter-local relations). A government that uses technology to streamline processes and diminish bureaucracy, and is sensitive to the unintended consequences of regulation, removes barriers to entrepreneurship and innovation. By being more open and transparent, governments can provide businesses, citizens and institutions with the key data and information that reduces market entry and transaction costs. Greater willingness to collaborate across sectors – creating public-civic-private partnerships – creates more access for firms. Flexibility and adaptability allow governments to address arising problems (in the economy or otherwise) more quickly and effectively. Governments that are willing to take risks may find new solutions for long-standing inadequacies in education, health care and transportation. Each of these cultural and structural changes has its own intrinsic value for a successful region, but their primary importance is the effect they have on economic actors and the regional economy.

E. Policy Recommendations for Consideration

1. Bringing about more effective regional governance within metropolitan areas to bolster regional economic growth

The organization of governments within U.S. metropolitan areas has been a controversial issue for more than 50 years. The early debate centered upon problems of coordination and planning that were thought to result from a fragmented local government system. Fiscal equity concerns were also seen to result from fragmentation: without the ability to redistribute across the entire region, some local governments were faced with low property tax bases per capita, while luckier ones had a much more robust tax base.

The policy solution proposed was some form of general purpose regional government. However, except for Seattle, Portland, and the Twin Cities, there are virtually no instances of multi-purpose

[16] See, e.g., Mikel Landabaso and Benedicte Mouton, *Towards a New Regional Innovation Policy: 8 Years of European Experience Through Innovative Actions,* Draft for Publication (Brussels: European Commission Directorate-General for Regional Policy, 2002).

[17] See, e.g., Bart Van Looy, Koenraad Debackere and Petra Andries, "Policies to Stimulate Regional Innovation Capabilities Via University-Industry Collaboration: An Analysis and an Assessment," *R&D Management* 33 (2) (2003): 209-229; Stephan G. Goetz and David Freshwater, "Determinants of Entrepreneurship and a Preliminary Measure of Entrepreneurial Climate," *Economic Development Quarterly* 15 (1) (February 2001): 58-70; Annalee Saxenian, *Regional Advantage: Culture and Competition in Silicon Valley and Route 128* (Boston, MA: Harvard University Press, 1996); Robert Atkinson and Scott Andes, "The 2008 State New Economy Index," The Information Technology and Innovation Foundation, November 2008; and Jill S. Taylor, "What Makes a Region Entrepreneurial?: A Review of the Literature," (Cleveland, OH: Center for Economic Development, Cleveland State University, September 2006).

regional government in the United States, and all three of these are quite limited in scope (city-county consolidations are more common, but while many may have served as multi-purpose regional governments when the consolidations occurred, in most places population growth in the region has moved considerably beyond the original county).

Over the past two decades "regional governance" has superseded regional government as the preferred solution for problems affecting regional areas. The focus of regional governance is not on creating a single regional government, but on inducing cooperation and collaboration among local governments and other sectors and actors, with formal government being only one player. The expectation is that metropolitan areas with strong regional governance, i.e., with multiple organizations and actors interacting to address regional problems, will be more successful in addressing problems and bringing about regional economic growth than those regions engaged in lower levels of collaboration and activity.

The shift of focus from government to governance is manifested in increasing efforts at regional planning, including regional visioning exercises held in regions such as Salt Lake City, Sacramento, Denver, Chicago, and Washington (see Knapp and Lewis, 2010). However, while regional planning and goal setting is now occurring with increasing frequency, implementation of these sometimes heroic efforts is still extremely difficult. Virtually all of the recommendations require action by actual governments, and, since there still is no viable multi-purpose government at the regional level, this often requires voluntary cooperation among many local governments. How can coordinated action among local governments within metropolitan regions to bring about higher levels of regional economic development be encouraged?

The fundamental problem hindering collaborative regional activity to bring about greater levels of regional economic growth is the incentives for localization that characterize US metropolitan areas. From the broad macro-economic point of view of the region it may matter little where within the region economic activity locates (although there are both equity and spatial efficiency concerns). However, it matters deeply to individual local governments, since they receive no property tax yield unless the activity locates within their boundaries. The result is a form of prisoners dilemma that can only be broken through structural reform that is extremely unlikely to be forthcoming (i.e., some form of multi-purpose regional government), through a cooperation pact (whether formed regionally or, more likely, imposed from above), or through locally generated activity that serves regional interests as well, what Feiock (2007) terms, after Eleanor Ostrom, the Institutional Collective Action approach (ICA).

Thus, the current structure of local governments and local fiscal institutions provide local governments with strong incentives for pursuing their own rather than regional interests except in those cases where local self-interest and regional (or at least inter-local) collaboration clearly coincide. However, even when local and regional interests coincide, the frailty of regional institutional frameworks often imposes substantial transaction costs on efforts to engage in collaborative activity (see, for example, Kwon and Feiock, 2010). How could incentives be changed to promote local government behavior that would also be in the region's interest and how can institutions be strengthened or created to reduce transaction costs of arranging such behavior?

a. Restructuring incentives to promote more effective regional governance

Since the incentives that mitigate collaborative regional behavior with respect to economic development are rooted in the structure of local fiscal institutions, i.e., the fact that property tax receipts are tied to the locality in which a business or household locates, the most direct solution would seem to be metropolitan tax-base sharing such as exists in the Minneapolis-St. Paul region to mitigate the localization incentives. Metropolitan tax-base sharing in the Twin Cities region requires localities to contribute 40% of their growth in commercial-industrial tax capacity to a regional pool. The resulting funds in the pool are then redistributed to local governments within the region with municipalities with a lower-than-average tax capacity receiving a higher per capita share (Orfield, 2002, p. 107). The system resulted from state legislative action.

Meeting the revenue needs of competitive local governments within a region through visible redistribution of general tax resources is a hard sell politically for local governments and makes voluntary tax-base sharing schemes unlikely. However, regional support for specific purposes may be more politically feasible. Millar (2002) points to several instances where regional voters have supported "cultural asset districts," adopting a regional tax to support cultural assets that are regional in scope but located in the core city.

A more effective way of meeting these needs is through the state fisc, i.e., through state taxing and spending decisions that, in aggregate, provide greater resources to fiscally strapped local governments. The most direct means of accomplishing this is through a state equalization grant that provides money to local governments based primarily on their tax capacity and which can be used by the recipient as revenue sharing for any purpose. The United States is one of the few advanced democracies that does not have some form of general equalization grant at either the federal or state level, although state education equalization grants are routine in most states. A less visible approach is to redistribute through individual state programs for specific purposes such as state highway grants, housing and community development grants, or police and fire grants to local governments.

Another means for reducing inter-jurisdictional competition within metropolitan areas is through state changes in the local tax structure. Michigan, for example, now funds education largely out of the state sales tax and has removed the local property tax as a major means for raising local revenue, thus reducing the incentive for local governments to compete against each other for rateables.

Local governments can also be leveraged (or even required) to engage in cooperative activity. State governments could provide incentive funding for localities in regions that develop *and implement* regional economic development plans. State governments (or the federal government) could also provide funding for regional visioning exercises with citizen input that result in regional plans with recommendations for implementation. Or, states could require intergovernmental collaboration within metropolitan regions as a condition for applying for federal grant programs[18]. At a minimum, state governments could make sure that their laws do

[18] However, this approach may be too similar to the one tried at the federal level during the 1960s and 70s through the A-95 program and which proved unworkable. OMB circular A-95 required proposals from a local government within a metropolitan area to be certified by a regional planning agency within the area (usually a COG) that the

not hinder or prevent regional collaboration from occurring among local governments. More proactively they could provide incentives to encourage regional collaboration, as some states have done (see Millar, 2002), even if they don't require it.

The federal government could also use its federal aid as a lever to encourage greater local government collaboration and in regional economic development. It could, for example, provide economic development assistance to local governments within metropolitan areas only if there is a regional economic development plan and evidence that the plan is being implemented. Or, it could cease providing economic development assistance to local jurisdictions at all and provide aid only to a regional economic development body that presented an application signed off on by the central city and a majority of other jurisdictions in the region.

b. Strengthening institutions to promote more effective regional governance

Local governments already engage in a substantial amount of inter-local (and sometimes regional) activity, even though the transaction cost of doing so is often quite high. Kwon and Feiock (2010) point to several different types of transaction costs:

- Information costs: the cost of a local government obtaining information on problems faced by other local governments with whom collaboration to mitigate the problem might be possible, the range of possible solutions, the resources of other local governments, and their preferences over possible outcomes.
- Agency costs: the extent to which agents – i.e., local government officials – engage in activities that depart or might depart from the preferences of the principals they represent, i.e., their residents.
- Negotiating and bargaining costs: the time cost of arranging agreements that are acceptable to the potentially collaborating local governments.

How can these transaction costs be reduced? At the regional level a first step is to encourage greater regional activity by creating, supporting, or facilitating networks that bring together the potential actors concerned with economic growth in the region, including local governments, voluntary organizations such as COGs, foundations, non-profits, and civic organizations to discuss regional problems and how they might be addressed. Indeed, regional organizations of some sort (both formal and informal) abound: a 1999 survey by the national Association of Regional Councils (Atkins et al., 1999) of 80 regions found an average of 15 regional organizations per metropolitan area.

Olberding (2002) argues that while strategies to "regionalize" a broad range of activities, either through formal institutions or through collaborative networks, have generally proven very difficult, collaborative efforts around one or a small number of functions have proven more

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proposal was consistent with an existing regional plan. However, the COGs, voluntary organizations consisting of local governments within the region, were too weak a reed on which to hang this requirement. The process that ensued was one of logrolling – I won't oppose your proposal if you don't oppose mine – with the threat of withdrawal from the COG as the ultimate weapon for a local government whose application was not approved.

successful. She conducted a survey of all metropolitan areas from 1980-1997 and identified 191 regional partnerships for economic development in147 metropolitan areas. The classic argument that collective action or prisoner dilemma problems can only be addressed through authoritative action by government has been questioned by Ostrom (1998), Axelrod (1997) and others. Olberding cites both to suggest that such organizations are more likely to form when cooperative norms already exist in a region. She writes:

> Scholars have long recognized the difficulty of achieving and sustaining voluntary cooperation among a large number of individuals with no central authority – the so-called "dilemma of collective action." Axelrod… argues that, in situations with large numbers of individuals or groups, the solution to this dilemma is cooperative norms – or the extent to which parties usually act in a collaborative or coordinated manner or are expected to act in such a manner..." Other scholars have also concluded that cooperative norms – or something conceptually similar – are critical for shifting from competitive to cooperative behavior. For example, in her comprehensive review of the cooperation literature, Ostrom (1998) concludes that the key determinant of cooperation is "norms of reciprocity."

Olberding's empirical work with respect to regional economic development partnerships supports this. Using a variety of measures of the existence of cooperative norms such as business and civic associations per capita, she concludes that the existence of such norms is positively related to the existence of regional economic development partnerships. In terms of public policy the major concern is how to promote such norms where they do not currently exist. Axelrod's empirical research (1986) suggests that norms of trust arise after repeated interactions among individuals and groups where trust can be experienced (see also Feiock, 2004, who posits a theory of "institutional collective action." This suggests that even efforts to create a venue or network for discussions of regional economic needs and concerns may have later payoffs[19].

Feiock, Tao and Johnson (2004) make the same argument and buttress it with empirical support. In the context of governance, they contend that trust and social capital among governments is built when local governments engage in cooperative agreements aimed at improving regional outcomes. These agreements allow for resource exchange and other commitments; when commitments are honored, trust is built and social capital created. In fact, in their empirical work they find that the greater the number of inter-local agreements involving revenue transfer among local governments within a metropolitan area (implying the existence of cooperative action), the more likely the region is to have a metropolitan economic development partnership (implying the ability to act on a regional basis).

More elaborate efforts such as regional visioning and community planning efforts may flow from (or possible stimulate) collaborative regional economic growth activity. As noted above, these kinds of activities rarely result in direct implementation. However, they can set up constituencies and interest groups that can continually press local governments to engage in cooperative activity to accomplish at least some of the recommendations (see Knapp and Lewis

[19] Note that there is nothing in Olberding's work (or anyone else's) that shows that the existence of regional economic development partnerships result in greater regional economic growth. Indeed, Carr and Feiock (1999; 2003) present evidence that governmental consolidation does not enhance economic development.

for a discussion). Creating or bolstering networks of regional actors might stimulate regional collaboration on some issues. Development of metropolitan mayors' coalitions as has occurred in Denver and Chicago provides a good forum for mayors to discuss their common regional interests and to serve as a body to consider implementation of regional activity.

2. Tax and spending recommendations

The most important challenge with respect to taxes and spending is to get local government within a region to understand that their economic policy needs to consist of more than tax reduction or subsidization. Low taxes are not always good if they produce inadequate levels of public services required by businesses. High taxes are not always bad if they produce high-quality public services. It *is* true that high taxes supporting high-quality public services may embody locational disincentives if the public services delivered are not those that meet business needs (e.g., welfare or public assistance payments) or if the same quality of public services is being provided elsewhere in the region at lower tax costs.

The financing of regional activities is a constant concern in nearly every region where such activities take place. The most direct means of financing regional activities (and the one most consistent with economic theory) would be through a tax imposed upon residents and businesses in the area that benefit from the activity. Indeed, there are many examples of such regional taxes for specific purposes such as regional transportation systems, airports, regional parks and recreation, etc. There are very few examples of regional taxes for multi-purpose use other than those in Minneapolis-St. Paul and Seattle. However, in general, we know very little about how regional activities are financed.

With respect to spending, Williams (1965) was the first of many to observe that there is much less political and public opposition (and even support) for regional infrastructure activity than for purposes that involve what he called "life-style" activity or that involve substantial social interaction (particularly among racial groups, e.g., regional school catchment areas), or visible redistribution among income classes, racial/ethnic groups or local governments. Regional economic development activity would seem to be closer to the former set of activities than to the latter, although, as we have seen, local governments are likely to be the primary roadblock. If regional activity does build upon itself, as suggested by Axelrod (1986, 1997), this suggests the "low-hanging fruit" approach of attempting to encourage regional activity where there is some support.

Absent some enforceable (and unlikely) agreement among local governments not to engage in what is almost always, from a regional perspective, non-productive competition to provide tax incentives to attract businesses within their boundaries, local governments are likely to continue to engage in these kinds of activities. If they are compelled to do so, however, they at least should do so strategically, focusing tax incentives on sectors tied to the locality's existing base and growing clusters. In addition, incentives should be designed with clear performance requirements (e.g., local jobs created) and with clear "clawback" provisions if these performance outcomes are not met or if the firm moves out of the local government jurisdiction within a specified period of time. Since local tax incentives are usually provided under state law, these provisions are likely to require changes at the state level.

3. Modernizing Local Government and Local Government Culture/Climate

As discussed, the institutional environment of a region (including governments, universities, corporations and organizations) may support, or hinder, the pursuit of a flexible, open, innovative and entrepreneurial region.

Although government is not the only institution whose culture impacts the economy, it is uniquely positioned to extend its influence to other sectors. Potential actions might include:

- Streamline processes and reduce governmental delays by concerted efforts to rationalize procedures (particularly permitting procedures) and by using technology to remove barriers to entrepreneurship and innovation
- Promote greater transparency and engage in increased efforts to combat local government corruption since corruption (grafts, kickbacks, payoffs) serves to impose an invisible tax on firms located within the area.
- Focus on efforts to provide a given level of services more efficiently (i.e., at least cost) through efforts to eliminate true waste and to engage in identifiable and validated best practice techniques.
- Provide higher-quality and more timely data to businesses, citizens and institutions, in an effort to be more open and transparent and empower them to make better decisions
- Increase collaboration across sectors to catalyze beneficial public-private partnerships
- Engage firms, citizens and civic sector institutions more readily in the work of government (from community health to public safety)
- Champion flexibility and adaptability to enable emerging problems to be addressed more quickly and effectively
- Take calculated risks in considering new solutions for long-standing inadequacies in education, health care and transportation

Each of these cultural and structural changes has its own intrinsic value for a successful region, but their primary importance is the effect they have on economic actors and the regional economy.

F. Government and Governance Research and Development Agenda

We have noted that regional governance is complex and that regional regimes vary considerably across regions. However, we have also noted that very little is known about how much regional activity exists by region, of what kind, through what kinds of structures, involving which sectors as participants, and with what results. Unfortunately, at present there is no data set on regional organizations and activity by metropolitan area available that would permit empirical development of regional government or governance typologies. Constructing such a data set would require a survey of regions designed to gain information on the formal and informal regional organizations and activity. Such a data set is a foundational requirement for characterizing metropolitan areas by the nature of their regional governance and employing the result as a variable.

Clarifying the variation that exists from one region to another in regional development capacity and action is baseline work that would then allow addressing many other questions, especially concerning when and to what it extent regional governance arrangements account for differences in regional economic development among regions.

Conceptually each metropolitan area could be characterized by its regional governance arrangements (or "regime"), with regions differing according to their degree of fragmentation (both horizontal and vertical) of formal local governments, the nature and extent of single purpose regional governments, the existence and mix of regional cooperation among formal governments on an ad hoc basis, the presence of voluntary local government organizations such as councils of government (COGs) or informal mayors organizations, and the presence of collaborative networks as well as non-governmental regional organizations and actors who engage in systematic interaction, and specific regional initiatives. Each metropolitan area could be characterized in terms of its regional arrangements. The result would be a regional governance regime variable for which each metropolitan area could be assigned a value and which could then be used in empirical research to test propositions about the effect of regional governance on regional economic growth.

We thus suggest a multi-stage research program focused on regional activity and its effect on regional economic growth.

1. Regional Activity and Regional Economic Growth

- **Develop and gather data on measures of the key attributes of regions.** To identify the circumstances under which desired regional economic development outcomes are most likely to be achieved, we would begin by defining the independent variables: regional attributes such as regional governance structures, collaborative networks or specific initiatives that indicate the degree to which the region exhibits regional capacity and regional action. This would involve identifying the most relevant attributes, based on literature and case studies, as well as the range of values that can be observed for each attribute. For example, different types or degrees of regional organizational structures and governance, local government fragmentation, tax base sharing, coordinated activities, land use planning, and so on. The next step would be to collect data on these attributes, largely through survey research.
- **Develop a typology of regions (likely using hierarchical clustering statistical analysis).** Using the attributes and data collected in "A," as well as perhaps some basic distinguishing characteristics with respect to economic structure, it would then be possible to create a typology that groups regions into different categories with respect to their capacity for and action at a regional level. Differentiating types and degrees of "regionalism" is useful for its own sake, but more importantly creates the foundation for analyzing what types are most successful in specific circumstances for particular outcomes.
- **Develop measures of important regional economic development outcomes.** Serious conceptual work needs to be done in terms of the dependent variable as well: what we mean by regional economic development and how we wish to measure it, particularly with respect to equity, sustainability and regional spatial efficiency. Traditional measures need to be updated and supplemented both to add inclusiveness and sustainability goals, and with

measures of the underlying systems and system performance, so we know not just the results, but what accounts for them (and can be improved).

- **Model the effects of regionalism on economic development and related outcomes**. With the foundational work from A through C, we can then analyze what "types" of regions and what specific regional attributes and activities are most effective for achieving which economic development goals.

2. Financing Regional Activity

- **Survey metropolitan areas to determine how various kinds of regional activity are financed.** We know very little about regional financing mechanisms or how these mechanisms are related to results. Since financing is critical for many kinds of regional activities, this kind of knowledge would be extremely useful for many regions contemplating regional activity.
- **Why are regional taxes successfully imposed in some regions and for some purposes while rejected in others?** What kinds of circumstances, framing and political campaigns are more likely to result in success? What kinds of regional financing mechanisms are more likely to be successful, under what circumstances, and why? These research questions would be pursued both through a set of case studies and, if possible, through multivariate analysis.

3. Government and Governance 2.0

As mentioned, a great deal of promising practice is emerging with respect to government becoming more transparent and efficient, better engaging citizens and firms, and fostering cross-sector networks and partnerships. These practices range from making more data and analytic tools available to using web-based applications to enable reporting problems or getting services to fostering cross-sector targeted development organizations. Systematic identification and assessment of these practices, and development of materials to guide policymakers in how to successfully design and implement them, is needed to enable governments to more broadly transition to and support the open, flexible, entrepreneurial culture which supports regional economic growth in the current economy.

A basic research program to begin this work might include:

- **Undertake foundational research on the evolving institutional environment.** One could extend the review of literature and practice undertaken for this project to more deeply examine the hypothesis laid out above, as well as its potential implications for regional economic development practice. The work would involve peer review and feedback, similar to that of this initial workshop, and culminate in both actionable insights for practitioners and an agenda for future research and product development.
- **Develop measures of dynamism.** To test the hypothesis that more dynamic regions fare better in today's economy, one could operationalize dynamism by looking at a range of objective and subjective variables such as the rate of firm creation, the percentage of small entrepreneurial firms, rate of employee turnover in government, average education levels, percentage of jobs requiring a college education, levels of high-speed internet access, degree

of access to information (openness), ease of finding and filling out necessary bureaucratic paperwork and a measure of the acceptance of risk-taking and failure.

- **Analyze the effect of dynamism measures on economic outcomes.** Some studies have already analyzed states by their readiness for the "new economy." They do not, however, compare these measures against more traditional economic variables to establish that the states further along the "new economy" pathway are, in fact, achieving more positive economic outcomes. Further research should compare variables of dynamism with regional employment, GRP growth, wages and real personal income and wealth distribution.

Government and Governance: Appendix

Defining governance

One of the challenges in defining governance – no matter at which level one is talking about – is the wide variety of definitions used by those examining the issue, or the fact that some writers do not provide a definition even when criticizing about other authors not doing so. Writing in 1997, Rhodes counted six different definitions of governance in use. Writing about the changes in British government during and after Margaret Thatcher's reign as prime minister, Rhodes (1997) ultimately defines governance as "self-organizing, inter-organizational networks" (p.53) and notes that "The phrase local *governance* is now used in the place of local *government* to capture the range of organizations, drawn from the public, private and voluntary sectors, involved in delivering local services" (p. 8, emphasis in original). This is similar to Savitch and Vogel (2000), who find that "*governance* [emphasis added] conveys the notion that existing institutions can be harnessed in new ways, that cooperation can be carried out on a fluid and voluntary basis among localities and that people can best regulate themselves through horizontally linked organizations" (p. 161, as cited in Norris 2001). Meanwhile Stoker (1998) includes the fact that "Governance identifies the blurring of boundaries and responsibilities for tackling social and economic issues" (p. 18) as one of his five principles of governance.

Some attempt to distinguish between various forms of governance. Oakerson (2004) offers the idea of regional governance as polycentrism as "a process of decision making whereby multiple independent actors interact to produce an outcome that is commonly valued" (p. 21) in contrast to monocentrism, where "a single actor (or cohesive set of actors) provides direction to others" (p. 21). He distinguishes them because "Polycentrism describes a pattern of governance that emerges from the interactions of multiple independent centers of authority, whereas monocentrism describes a pattern of governance by a single center of authority" (p. 21). Lewis (2004) also considers the polycentric model, linking it to Charles Tiebout's theories on regional diversity.

Hooghe and Marks (2003) take a different approach in their work, outlining two types of multi-level governance that they label Type I and Type II. They analogize Type I governance to federalism in that "every citizen is located in a Russian Doll set of nested jurisdictions, where there is one and only one relevant jurisdiction at any particular territorial scale" (p. 236). In Type I governance, jurisdictions are general purpose, at a few levels, and do not have overlapping memberships. In contrast, Type II governance "is composed of specialized jurisdictions … [and] is fragmented into functionally specific pieces" (p. 236). There are benefits to both types of governance, according to Hooghe and Marks, and "Type I and Type II governance are not merely different means to the same end. They embody contrasting conceptions of community" (p. 240).

Characteristics of governance

While there are still disagreements over the exact definition of governance, there usually is some general agreement over its characteristics. First and foremost, governance includes actors outside the sphere of government—these actors are from the private and nonprofit sectors. Wallis (1993) notes that, "The capacity of all three of these sectors to act out of enlightened self-interest in pursuit of the betterment of the region constitutes the *civic infrastructure* of the region" (p. 132, emphasis in original) and that "Effective governance must fully employ the civic infrastructure of the region" (p. 133). Likewise, Stoker (1998) argues that governance brings recognition of the range of groups that have taken over some of the traditional tasks of government" (p. 21).

Even as these non-governmental actors play a larger role in governance, there is usually still a role for government in governance. Oakerson (2004) argues that "Governance structures … require access to governmental authority (to prescribe, invoke, apply and enforce rules) but need not be confined to governmental institutions. Governments are a necessary condition of governance, but not a sufficient condition" (p. 20). Similarly, Peters and Pierre (2001) find that:

> We have been witnessing a development from a "command and control" type of state towards an "enabling" state, a model in which the state is not proactively governing society but is more concerned with defining objectives and mustering resources from a wide variety of sources to pursue those goals (p. 131).

Practically speaking, in its examples of regional governance in the United States, the Alliance for Regional Stewardship (2006; hereafter "the Alliance") shows how many governance structures are the creation of regional governments and ultimately must work with those governments to accomplish their goals. Formal government also can provide the coercion sometimes needed to affect change, but Oakerson (2004) notes that "the actual use of coercion through command and control is a highly ineffective instrument for undertaking many of the activities on which governance depends" (p. 20). There are those, however, who do argue that governments are unnecessary to governance – as noted above, Oakerson writes that "Governments are a necessary condition of governance" (p. 20) but also that "that metropolitan *governance* can and does occur without metropolitan *government*" (p. 17, emphasis in original); in the same volume, Post (2004) notes that "'regional governance' refers to the policy decisions made by existing governments" (p. 68) – but this seems, in general, a minority viewpoint.

The structure of governance can take many forms, and this is partly due to the differing definitions of the term "governance." Sometimes, governance is a formal government arrangement such as a special purpose district, an intergovernmental compact, or an intergovernmental agreement. However, Norris (2001) cites a 1997 study of special district government in Southern California by Bollens that found "but a faint connection to the true potential of regional governance" (as cited in Norris, p. 560). More often, governance takes the form of multi-sector compacts or networks, often with a formal structure but a more diffuse structure that, in the words of the Alliance (2006), "avoids the false choice between top-down directives and bottoms-up initiative by offering an adaptive system that can produce innovative solutions" (p. 8). Generally, formal city or city-county consolidation is not a method of

governance – Oakerson (2004), for example, argues would be to the "detriment" of governance (p. 41). However, these differing structures of governance all lead to concerns of accountability; as Stoker (1998) notes:

> The dilemma suggested by the blurring of responsibilities is that it creates an ambiguity and uncertainty in the minds of policy-makers and public about who is responsible and can lead to government actors passing off responsibility to privatize providers when things go wrong. Worse still is the enhanced possibility of scapegoating raised by more complex governance systems (p. 21-22).

The Alliance, however, argues that multi-sector compacts are one attempt to create an accountability mechanism (2006), but it still seems likely that there will be accountability issues with the involvement of large numbers of outside-government actors present in these organizations.

Often, the structure of regional governance leads to a decentralized system in which power is more diffuse and flexibility is greater. Both the types of governance defined by Hooghe and Marks (2003) offer decentralization and more flexibility, compared to conventional government, even as the different structures provide different methods of operation and different roles for various actors. This decentralization is necessary, Stoker (1998) argues, "Because no one single actor, public or private, has the knowledge and resource capacity to tackle problems unilaterally" (p. 22). Likewise, Post (2004) argues that flexibility is present more in governance versus government structures because "Changing regional government often requires a significant change in the existing political structure of local government, whereas changing regional governance maintains existing local governments and simply requires a shift in the behavior of these governments" (p. 68).

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APPENDIX

A Systems Approach to Understanding the Regional Economy

***Note**: This is one of eight papers – an executive summary, six papers on specific aspects of regional economies and an appendix – generated by the "Implementing Regionalism" project, funded by the Surdna Foundation and undertaken by the George Washington University Institute of Public Policy and RW Ventures, LLC. Please see [insert web link] for the complete set of materials developed by the project.*

APPENDIX B: A SYSTEMS APPROACH TO UNDERSTANDING THE REGIONAL ECONOMY[1]

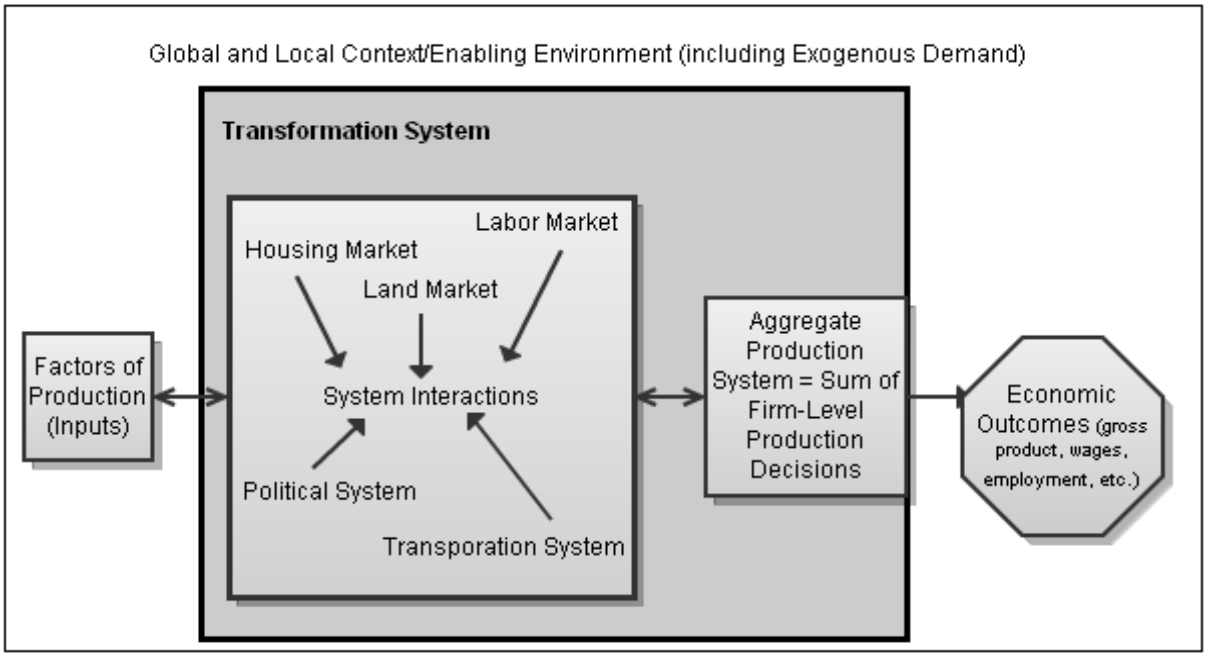
Our goal in this appendix is to gain a better understanding of how various regional systems interact to bring about metropolitan economic growth. Our focus is thus on the systems that interact to produce regional economic outcomes – namely output, jobs, and income – in other words, economic growth. Below we set forth and describe these various systems – the production system, the land, labor, and housing markets, the transportation system, and the political system – and how they interact. We examine system inputs, outputs and decision-making processes. We also identify possible problems in each of these systems that reduce the ability of the region to attain higher levels of economic growth and prosperity.

We conceive of *systems* as decision-making institutions and processes that transform *inputs* and *resources* derived from the environment to produce outputs. The *output* of one system may be an *input* into another system, and thus the performance of a system may depend critically on the performance of other systems. Figure 1 describes – in a necessarily simplified way – the regional economic system and how *factors of production* (human, physical and financial capital) are translated and transformed by regional systems to result in *economic outcomes* (gross product, jobs, income/wages, profits, etc.).

The *transformation system* in the regional economy – the system through which inputs are transformed into outputs – consists of multiple systems and interactions that feed into and support the "aggregate production system" through which individual employers, in the aggregate, make decisions about what kind of output to produce, how much to produce, and the processes through which they will produce it. The decision-making institutions at the core of the regional economy are employers (primarily private firms) and the processes through which they make these decisions are market-determined. In short, individual businesses and market conditions are central to regional economic performance.

[1] The lead authors of this appendix are Hal Wolman, Andrea Sarzynski and Alice Levy.

FIGURE 1. A STYLIZED DEPICTION OF A REGIONAL ECONOMY



A region's economic output and rate of growth result from the economic behavior and fortunes of firms located there, as well as from its ability to attract or generate new firms. Businesses will locate within a region when the cost of producing and bringing to market their goods and services is lower than elsewhere. In this way, businesses are concerned with the region's supply characteristics, such as its physical and human capital, and its infrastructure, all of which serve as *inputs* into the broader regional economic system. Businesses may also be concerned with the regional economy's *environment*, including local or regional amenities; natural and physical features of the region; and state and local services, taxes, and regulation.

While traditional economic development policy has focused on attracting businesses from outside the region, most regional economic growth results from expansion or productivity increases of existing firms already located in the region[2]. Economic growth also results from import substitution, which occurs when firms move into the region to provide goods and services for local consumption that were previously imported from outside of the region, thus producing new jobs. Economic growth also occurs via the birth of new firms that produce goods and services for export and come into being as a result of entrepreneurial behavior by residents located within the region. New firm birth requires residents with good ideas and a tolerance for risk that allows them to put their capital and time into a new business.

Our goal in this paper is to "unpack" the various components of the regional economic transformation system and set forth how they relate to one another and operate to transform inputs into regional economic outputs. Here, we explore the role of six systems in generating

[2] For a complete review of the determinants of economic competitiveness literature, see Wolman, Levy, Young and Blumenthal. (2008). Economic Competitiveness and the Determinants of Sub-National Area Economic Activity. Washington, DC: The George Washington Institute of Public Policy, WPO 34. Retrieved December 15, 2009 from the World Wide Web: http://www.gwu.edu/~gwipp/Competitiveness%20lit%20rev%20final%20word.pdf.

regional economic growth: (1) the aggregate production system, (2) the labor market, (3) the housing market, (4) the land market, (5)the transportation system, and (6) the political system.[3] We describe each of these systems, how they interact with other important systems, and problems that may prevent the system from operating effectively. *We are ultimately concerned with how regional systems can be improved to bring about greater regional economic growth.*

A. Aggregate Production System

The aggregate production system (see

Figure 2) underlies business decisions about production, including what goods or services to produce, how much to produce, what factors of production to use and in what combination, how many workers to hire and at what wage, and how much profit to spend on research and development or other business development activities (as opposed to returns to owners and investors). Typically, the production system operates through profit maximization calculations of individual firms. Businesses consider a variety of factors when making their production decisions, including (but not limited to):

- External demand (and price) for a firm's goods and services
- Costs of supplies, transportation, and communication
- Availability and cost of factors of production, including land, labor, and capital.[4]

They do so within the context of policies set by the public sector (such as business licensing regulation, taxes and the supply of public infrastructure and services) that impact:

- The profit maximization calculation by influencing prices and availability of inputs (land market, labor market, capital market, and the costs of supplies, transportation and communication)
- Costs of production
- Profits received after accounting for taxes and fees.

Business decisions result in the quantity of goods and services produced (output); the level of employment and wages paid; and the profit generated *by the individual firm*. Taken together,

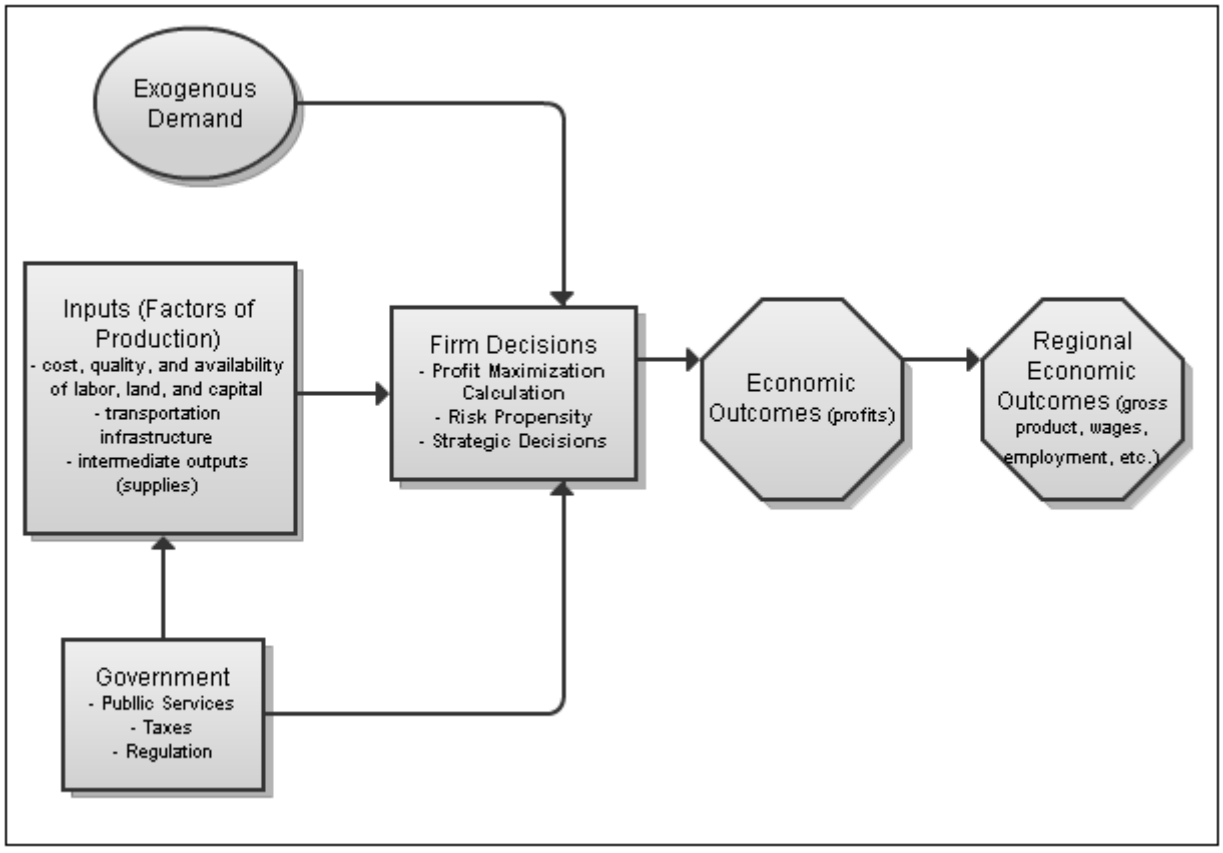
[3] We acknowledge that there are other components that are part of the transformation system such as the capital market, retail market, and social systems and that policy and practice could be better informed by future research that includes additional systems.

[4] More precisely, firms decide how much to produce based on the price established by exogenously determined demand and the cost of production of each additional unit of output (producing until marginal revenue from the last unit produced equals the marginal cost of producing it). They determine how much labor to hire and at what price based on the relative cost of labor and capital to produce a unit of output. Relative cost depends upon the marginal productivity of labor and capital. If the cost of labor increases relative to capital, businesses will substitute capital for labor. As the cost of capital increases relative to labor, they will substitute labor for capital. Thus, improvements in technology lower the price of capital relative to labor. Improvements in labor-management relations, worker morale or worker skills (at the same wage level) or a real decline in wages lowers the price of labor relative to capital.

firm production decisions in aggregate determine the region's output, employment, earnings and rates of growth, thus forming the basis of regional economic performance.

Regional economic outcomes reflect the nature of the goods and services the region specializes in producing and the cost of inputs, as well as the efficiency and productivity of the aggregate production system in producing them. The aggregate production system is likely to have higher value outputs and output growth in regions that specialize in high-demand growing sectors (such as information technology and professional, scientific, and technical services) than in regions specializing in declining sectors. Performance of the aggregate production system will also likely be highest in areas with high-quality, low-cost inputs such as land and labor. In addition, the aggregate production system will produce higher levels of output in more populous regions where greater agglomeration economies occur as a result of more intensive clustering of firms, suppliers, specialized labor and knowledge spillovers. These clusters produce external economies of scale that produce cost savings for all firms within the region (see Chapter IV, on clusters).

FIGURE 2. THE PRODUCTION SYSTEM



Given a particular set of industries, there are several problems that may reduce aggregate production system performance. One or more of the inputs may be costly or of lower quality than similar inputs in other areas, thus placing regional firms in the production process at a competitive disadvantage. Firms may employ old technologies or combine inputs in a less productive manner than firms in other regions. They may suffer from poor management and decision-making; unwillingness to take risks; a lack of planning and innovation with respect to

product development, marketing, and/or worker training; and adversarial labor-management relations leading to rigidity in the production process. Existing or potential business owners in the region may be insufficiently entrepreneurial, unwilling to take risks to invest their capital in new businesses or business expansion. Although these are problems that occur at the individual firm level, they may reflect a prevailing culture in the region that is strong enough to affect regional economic outcomes.

B. Labor Market

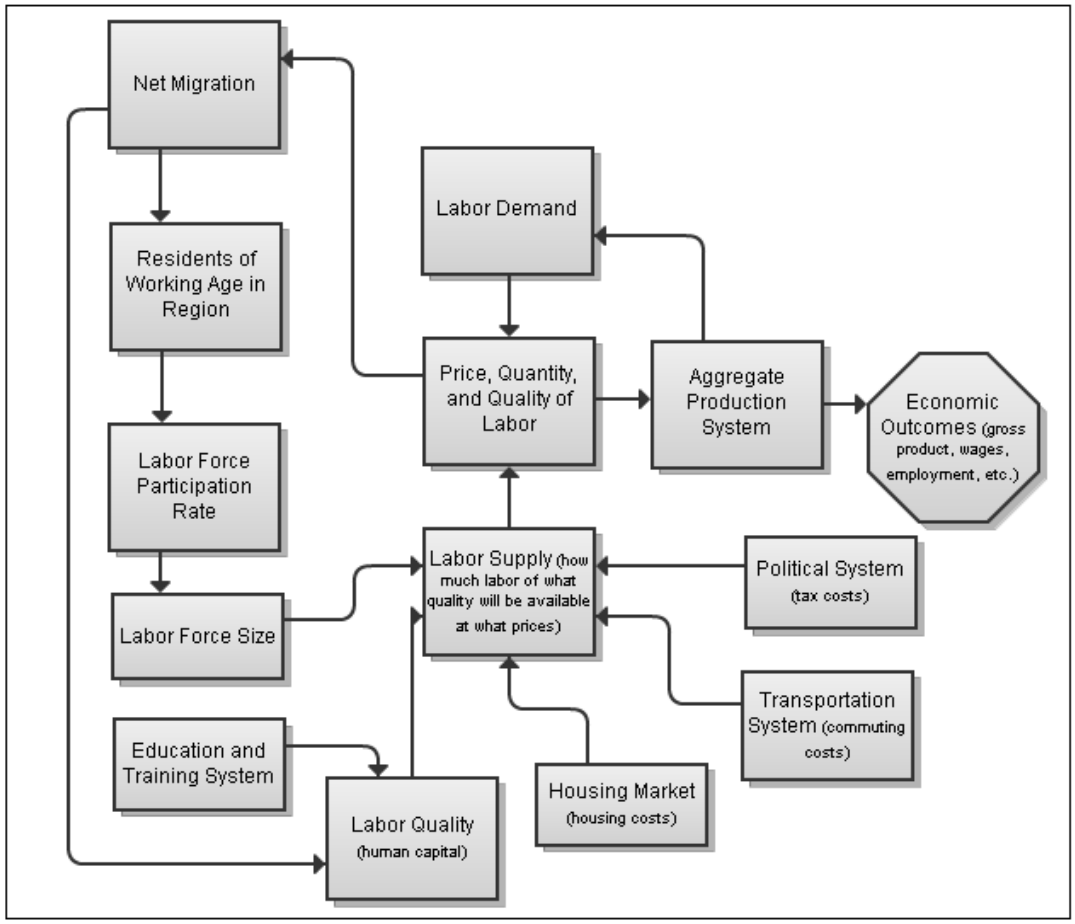
Two economic outcomes of interest are set by the regional labor market: wages and the level of regional employment (see

Figure 3). A well-functioning labor market matches the demand for labor by firms (determined by the aggregate production system, as discussed above) with the amount and quality of labor that workers are willing to supply. The availability and cost of labor of a given quality plays an important role in inter-regional business location decisions, since labor costs tend to be the highest share of operating costs for most businesses.

Regional labor supply is determined by the number of individuals of working age within the region, the labor force participation rate (the percentage of individuals of working age who are either working or actively seeking work), and worker decisions about the wage rates at which they will work. These decisions about wage rates (and number of hours to be worked) reflect individual worker opportunity cost (or what labor economists term a worker's "reservation wage"). The reservation wage must equal or exceed the value a worker places on leisure time(plus any transfer payments the worker receives in lieu of working) and must also cover the costs of commuting and living in the region; thus regional transportation systems and housing markets are inputs into labor supply.

Labor supply is also influenced by net migration into the region from workers outside of the region. Workers will be attracted to the region if jobs are available and real wage rates (accounting for the cost of living) are higher locally relative to elsewhere, or if the region has other attractions such as low housing costs or high quality amenities. The supply of labor can be increased through net in-migration, through increases in the labor force participation rate of individuals already in the region, or in the longer term, through net natural growth of those of labor force age within the region.

FIGURE 3. THE REGIONAL LABOR MARKET



In addition to balancing the amount of labor demanded and supplied, the regional labor market works to balance the skills and education needs of businesses with the skills and education levels of available workers. Worker skills and education reflect the "human capital" of the labor force, which can be produced both from educating or training workers within the region or by attracting skilled labor from outside of the region. In general, workers with higher amounts of human capital will garner higher wages and high wage jobs may attract workers with high levels of human capital. There is a close connection between the education and training systems and labor quality. (For more on human capital, see Chapter III on human capital).

As the above discussion suggests, the performance of regional labor markets is highly dependent on other regional systems, including the aggregate production system, the housing market, the transportation system, the education and workforce development systems, the political system. It is also dependent upon the area's social and cultural system. For instance, regions that are unwelcoming to foreign immigrants reduce labor market flexibility, particularly in responding to availability and cost problems. Likewise, the extent to which the labor market is fully regional depends on the accessibility of the transportation system; regions with poorly performing transportation systems are likely to have labor markets that operate more at sub-regional levels rather than regional levels and thus operate less efficiently.

What kinds of problems can impede the operations of a regional labor market? Labor supply concerns include quality, costs (for various levels of quality or quality-adjusted cost), and availability, all of which interact with each other to some extent.

Labor quality: A *skill mismatch* can occur in a regional labor market if the skills of workers do not match the skills required for available jobs. Such mismatches are a frequent occurrence in rapidly changing regional economies in which workers with low skills and poor education (or with inadequate "soft skills" such as attitude and work ethic) do not meet the needs of employers for higher skill levels. Problems in the primary and secondary education system as well as in the workforce development system are transmitted directly to the labor market through inadequate labor market skills. If firms find the level of human capital is inadequate in a region, they can respond by raising wages in the hope of attracting qualified in-migrants from outside of the area. Such labor market adjustments may be difficult if housing costs are high or if the area's features and amenities are not attractive. By the same token, a region's labor market may suffer if the most talented products of its education system move out of the area to settle elsewhere, creating a "brain drain" for the region.

A *spatial mismatch* can occur in a regional labor market if potential workers with appropriate skills find it difficult to gain access to jobs for which they are qualified but from which they are physically distant. The movement of employment opportunities to the suburbs and the inability of the central city poor to follow them, either because of lack of income to pay for housing in the suburbs, residential discrimination in the case of minorities, inadequate transportation, or poor information about suburban job opportunities, has made spatial mismatch an important concern in many regions. To the extent that spatial mismatch deprives suburban employers of qualified employees, it constitutes both a labor quality and a labor availability problem in labor markets.

Labor costs: High (relative to other areas) quality-adjusted labor costs can result from a shortage of qualified labor in a region, from high housing costs, transportation costs of commuting and/or local taxes (that are reflected in worker wage demands), from the existence of unions that negotiate high wage settlements when unions are not present in some other competitive regions, or, in the short-term, from wage "stickiness," since wages, particularly those governed through contracts, are difficult to adjust downwards. As a result, layoffs become the most likely response to downturns.

Labor availability: Rapid economic expansion can lead to labor availability problems and drive up wages for current workers (and costs for employers). The labor force can potentially grow through either increasing the labor force participation rate of existing residents (discouraged workers, teenagers, second workers) or through in-migration of workers from outside of the area. Here again, the attractiveness of the area as a place to live as well as a place to work is an important determinant of whether regional labor markets are able to respond to the need for more workers. (Conversely, a well-functioning regional labor market will result in out-migration of workers if the region experiences a long-term economic downturn relative to other regions.)

Labor market institutions: An inefficiently operating set of labor market institutions will hinder the matching of potential workers seeking employment with potential employers seeking

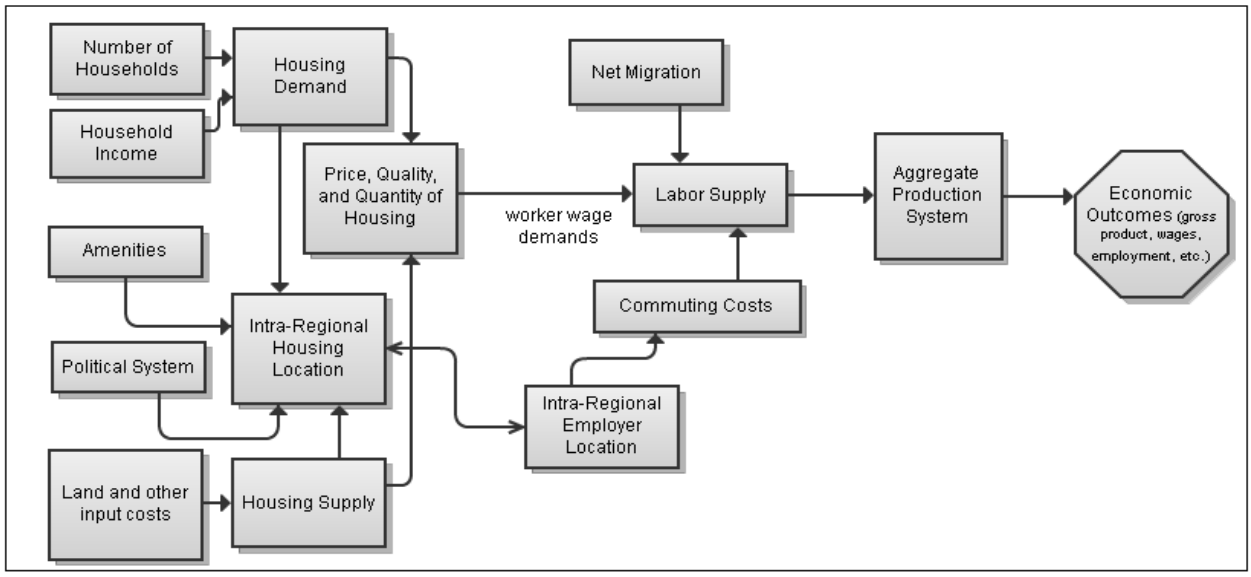
workers through poor job information exchange. It will also make it difficult to link employer needs to potential workers through workforce training institutions and through community college programs such as customized training.

C. Housing Market

The regional housing market (see figure 4) is the primary mechanism through which households make decisions about where to locate within regions. Such location decisions stem in large part from housing prices (both sales prices and rents), which vary considerably within regions. As with all markets, housing prices result from the interaction of consumer demand for housing with the quantity and quality of housing supplied within a region.

The housing system relates to economic growth because workers must travel from home to work and this travel imposes costs both for themselves and others, if the transportation system is congested. These travel costs are reflected in worker wage demands. Similar travel costs accrue for consumers to access markets and thus effectively reduce their income and ability to pay for goods or services. The quality and price of available housing is also a determinant of net migration and worker wage demands, both of which impact economic growth via their influence on labor supply.

FIGURE 4. THE REGIONAL HOUSING MARKET



Overall regional housing demand is a function of the number of households in the region and the households' income and assets (which determine their buying power). However, housing markets are sub-regional as well as regional. Where households locate *within* theregion relates to differences in housing prices across different parts of the region and household preferences for different kinds of housing types and tenures (homeownership vs. rental), age and condition of housing, accessibility to transportation, the presence or absence of amenities and differences in tax/service packages offered by local governments across the region). Of particular concern for analyzing how systems interact to affect regional economic growth, household decisions with respect to housing location also reflect proximity to employment via the area transportation

network or, if more than one household worker is employed, a location that reflects consideration of the joint cost of commuting to work.

Overall regional housing supply consists of the existing housing stock, both owner-occupied and rental, and new housing production. The supply cost of new housing production is a product of its own regional production process for housing units, which reflects the costs and availability of inputs particularly land, as well as labor, building supplies and developer/builder profit expectations. The supply cost of rental housing reflects the original capital cost, maintenance costs and the landlord's reasonable return on investment. Housing prices differ across the region as a result of differences in land value (itself a function of the demand for land), and differences in the tenure, type, condition, and accessibility of housing described above.

How can difficulties in the housing market hinder regional economic growth? High housing prices in a region will be reflected in worker wage demands and will also serve to deter in-migration of workers into the area without a wage premium to reflect the high housing cost.[5] Poor quality housing may also deter in-migration and thus affect both worker availability and quality. The *location* of housing within the region with respect to employment locations of households and the transportation network between housing and jobs also will be reflected in worker wage demands. These relationships reflect the spatial efficiency of the region and are discussed elsewhere.

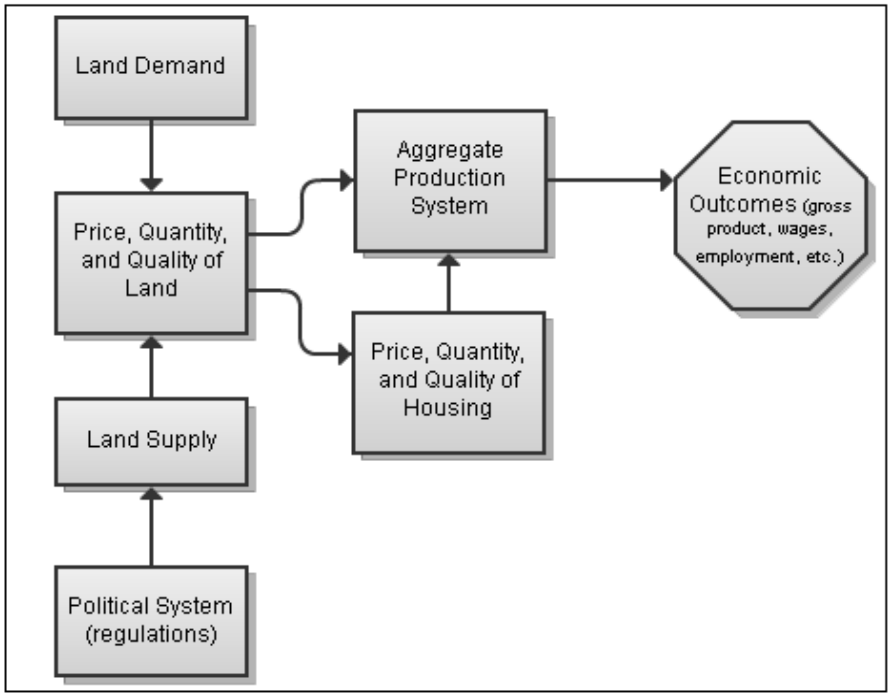
D. Land market

Land markets are relevant to regional economic growth because land costs or rents are a part of the cost of doing business. Like housing markets, land markets are regional and sub-regional. Prices are set in land markets through the interaction of the supply of land available at varying qualities and the demand for land for various uses. Land costs vary within a region because of differences in the demand for land resulting from its locational attributes (accessibility and quality). They also vary as a consequence of differences in land use regulations and tax policies across local jurisdictions. These differences in the availability and cost of land costs will affect where firms will locate within a region. To the extent that average land costs are higher or lower in a region relative to costs in other regions, land costs will also affect inter-regional location decisions.

Land markets also affect residential location decisions, since land costs are reflected in housing costs. Sub-regions where there is high demand for land or where supply is restricted through local government policy (through, for example, exclusionary zoning devices such as minimum lot size requirements) will have higher land and housing prices. Residential land costs will also reflect the tax/service package of local jurisdictions, which will be capitalized into land prices. Land costs thus affect housing prices and so determine where residents will locate within the region. These location decisions in turn affect labor supply and the level of wages required to meet or exceed worker opportunity costs. Additionally, because land markets influence the relative location of residences and businesses, they also affect travel time, distance and costs for workers and consumers.

[5] However, higher wage demands may be offset to the extent that high housing prices reflect higher housing quality or the capitalization into housing prices of amenities valued by households.

FIGURE 5. THE REGIONAL LAND MARKET



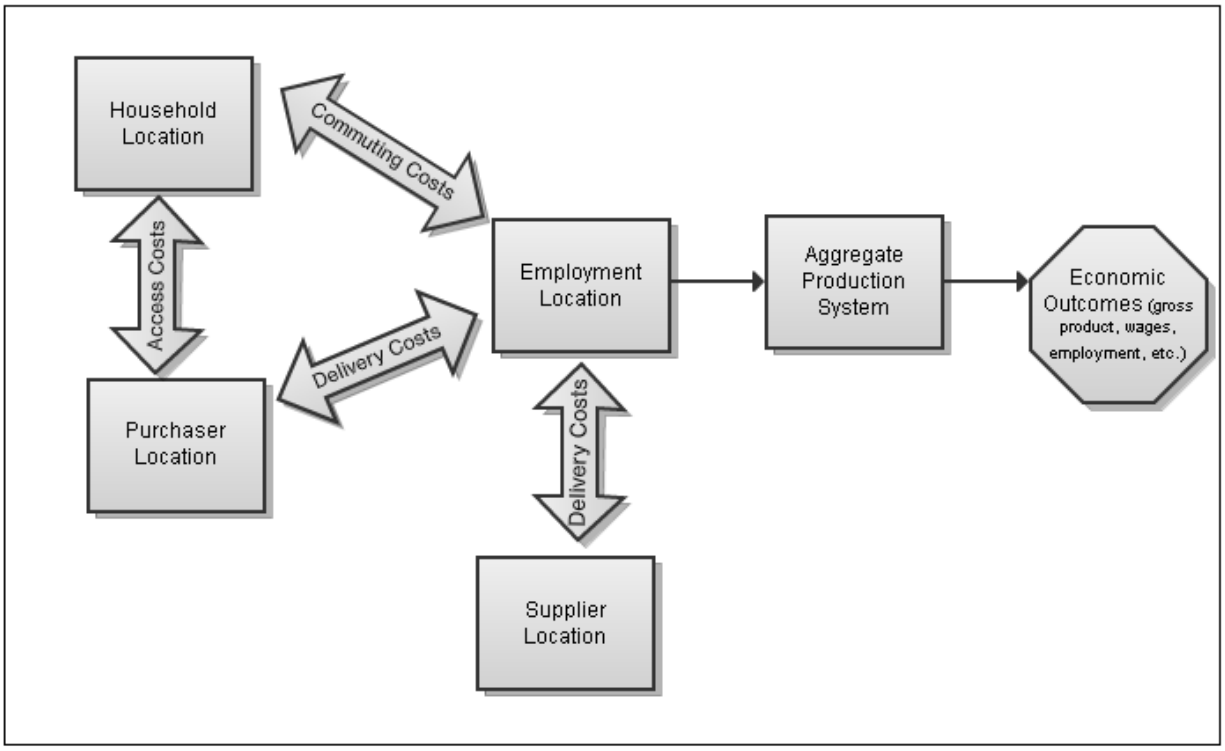
High land prices (relative to those in other regions) may place firms in the region, particularly land intensive ones, at a competitive disadvantage because land prices are an input cost to firms and their local suppliers. Problems of land availability may result from the existing utilization and pattern of land use that makes land assembly difficult and/or expensive, from land use regulations that limit the use of land for specific purposes and may drive up the price of land, or from prior uses of land that rendered the land environmentally hazardous and thus expensive to prepare for new uses. Land costs are, as already noted, a component of residential housing costs as well, and therefore are reflected in worker wage demands.

E. Transportation system

At the regional/intra-regional level the transportation system consists of the network that moves people and goods within the region and provides access to inter-regional and national transportation networks. It consists of an infrastructure (roads, rail tracks and stations, bridges, airports, trails, etc.) and vehicles that make use of the infrastructure to move people and goods (cars, trucks, buses, airplanes, railroad rolling stock). In terms of its relationship to regional economic growth, the transportation network performs a linking function (see figure 6). It is the means through which workers (labor supply) commute from residences to employment sites. Its characteristics thus affect worker opportunity cost and labor supply, an important factor in the aggregate production system. The transportation system also links businesses to suppliers and consumers, and provides access for businesses within the region to inter-regional transportation networks for delivery of supplies needed for the production process and for delivery of goods to external markets. Thus, the ease of access to inter-regional transportation networks can directly affect business and consumer costs. In addition, the characteristics of the regional transportation network will affect both business and household location decisions within the region.

The core dynamics of the transportation system relate to the travel activity of households and firms. Travel activity imposes monetary costs for the traveler, including the costs of gasoline, vehicle maintenance and depreciation, parking or transit fares, and time. Workers account for the costs of commuting when making decisions about labor supply and desired wage rates. Businesses also account for travel costs as an input into the production process, especially with respect to accessing suppliers and markets. In addition, the location of the region with respect to the national transportation network – such as its connections to interstate highways, railroads, ports and waterways, and airport connections to national and international markets – affect the region's competitive advantage relative to other regions.

FIGURE 6. THE REGIONAL TRANSPORTATION SYSTEM



Within the system, the extent of travel activity and its split among various transportation modes (automobile, public transit, etc.) affects the performance of the entire transportation system. The system performs well when there is excess capacity in relation to travel demand by users. When travel demand approaches (or even exceeds) capacity, such as during rush hours, congested conditions typically occur. Such impacts on system performance feed back into decisions about how to manage existing infrastructure, how much to invest in new capacity, and into the location and investment decisions of both businesses and households.

Transportation system inadequacies can adversely affect regional economic growth in several ways. Poor public transportation systems can isolate workers or potential workers who do not own automobiles from available jobs throughout the region and limit the choices of others who might otherwise prefer to use public transportation to automobiles. Congested roadways due to

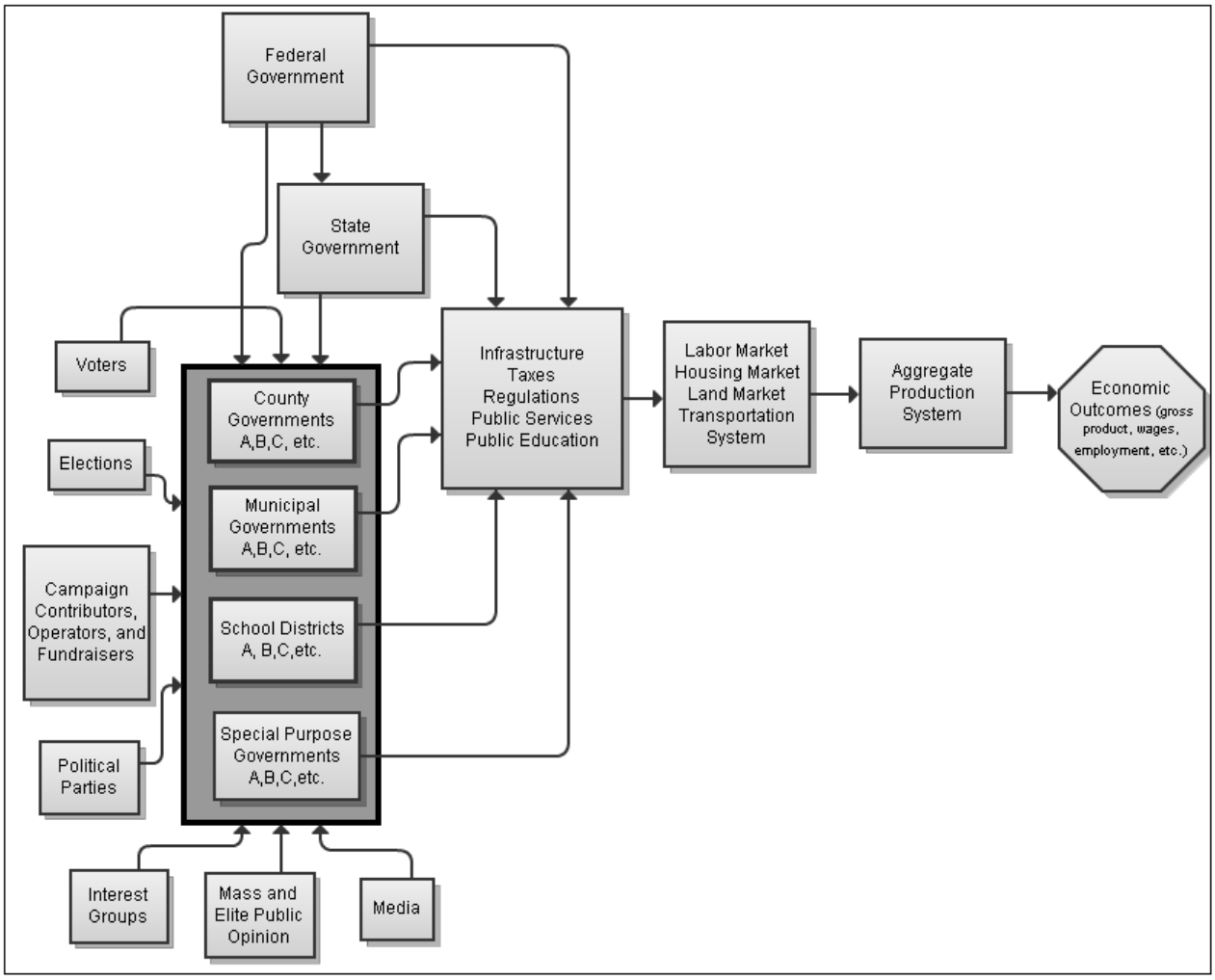
either inadequate capacity or poor maintenance result in increases in the time cost of commuting and add to workers wage demands. They also can add to business supply and delivery costs. Transportation network access and egress points thus affect the spatial relationship of workers, employers, suppliers, and customers to each other and thus the spatial efficiency of the region (see also Chapter VI on spatial efficiency).

F. The Political system (the public sector)

The public sector consists of local governments within the region (municipalities, counties, townships, and special districts within the region as well as region-wide jurisdictions to the extent they exist, e.g., single purpose regional authorities). It also consists of state and federal government activities that affect occupants within the region. The local public sector constitutes an important, but not the sole, set of institutions that comprise the system of regional governance, defined broadly as, "as the process of governing through which decisions are made that are intended to affect societal regional outcomes, including economic, social, environmental and other important outcomes. In this conception government (the public sector) is nearly always involved and usually plays a vital role, but other sectors – non-profit organizations, foundations, civic elite organizations, business leadership organizations, labor unions, social service organizations, and the inter-organizational collaboration among these various groups – may play important roles as well. (See Chapter VII).

The transformation system of the political system consists of the decision-making processes of local government institutions. Inputs to the political system are provided by the voters who elect political officials, the interest groups that lobby local government decision makers, the residents who contact officials to make their views known, and the local elites whose control of resources and name recognition give them access to public officials. The political system transforms these inputs into public policy outputs.

FIGURE 7. THE REGIONAL POLITICAL SYSTEM



Political system outputs that affect regional economic growth include public services, public infrastructure construction and maintenance, taxes and regulations on private sector activity (see figure 7). Of particular relevance to regional economic development, they also include incentives and subsidies to induce firms to invest within jurisdictional boundaries. These public sector outputs are important to economic development both at the regional/intra-regional level and at the inter-regional level. Within the metropolitan area, the package of public sector taxes, services, regulations and incentives differs substantially among local jurisdictions and the impact of these on business costs affects business location decisions within the region. Similarly, the impact of these public sector outputs on housing costs (as a result of differences among local governments in property tax and service levels that are, in turn, capitalized into housing prices) affects residential household location decisions among local jurisdictions. Local governments that are able to provide services that businesses desire (police and fire protection, waste disposal, efficient transportation networks) at lower tax costs than other jurisdictions will be more effective at attracting businesses. It is important to understand that higher local taxes per se do not necessarily put a local government at a disadvantage if the government provides services that businesses value and does so at a lower tax cost than in other jurisdictions in the region. The same is true for residential location – if higher taxes support a quality system of elementary and

secondary education, for example, they do not necessarily place a local jurisdiction at a disadvantage in attracting residents who value education. To the extent that these public sector decisions affect housing costs and the location of households relative to firms, there will be an impact on both labor supply and spatial efficiency as already discussed.

Although education is technically a subset of public services, it deserves specific attention because of its importance. The local education systems at the K-12 and community college levels affect the human capital (skills and abilities) of the region's "home-grown" labor force, which impacts labor supply decisions, wage rates and earnings. Regions with a more highly educated and trained labor force have a competitive advantage for the kinds of activities requiring highly educated or trained labor. Further, the quality of the K-12 education systems is one of the most important inputs into the local housing market.

Local government land use regulation impacts the land market, which is an input into both the aggregate production system, as well as the production of housing (and its costs). Public sector decisions with respect to the provision (or non-provision) of affordable housing affect residential location decisions. Land use decisions that make use of exclusionary zoning techniques to limit the ability of low and moderate income households to buy or rent in suburban locations may impede the access of these households to suburban employment opportunities.

Local government regulation of business activities affects the cost (both monetarily and in terms of time) of doing business, which impacts the aggregate production system. Governments may be viewed as "business unfriendly" as the result of high business taxes without provision of equivalent levels of business services or as the result of regulations that are numerous, severe, and/or have high compliance costs (in terms of money or time). Local government mismanagement and corruption may have the same effect. To the extent that these characteristics are seen to characterize large numbers of local governments within a region or to characterize a dominant city or county government or the state government, it may have a deterrent effect on the location of firms within the entire region.

However, since most regions have a large number of local governments, it is not usually meaningful to characterize an entire region in terms of its level of local taxation, quality of services, or regulatory environment. In most cases, a firm or household will be able to find some location within the region that meets its needs. However, regions that engage in less effective regional governance (a strategic system we discuss in Chapter VII) may experience cooperation and collaboration problems that affect business and residential costs and location decisions and thus have an impact on regional economic growth. In addition, state taxes, public services, and regulations apply to the entire region (unless the region is located in more than one state), and these state public sector outputs can affect the region's competitive advantage in an inter-regional context.

G. Conclusion

This appendix has presented a brief and necessarily simplified description of the core regional systems that interact to produce regional economic growth. The focus has been on how these systems operate and interact and on system inefficiencies or problems that might reduce

economic growth from its potential. These systems underlie (and to some extent help produce) a series of other processes and outcomes that we focus on in the body of our report because they are, in our judgment, the most fertile points of intervention for improving regional economic outcomes. These five "leverage points" are innovation, clusters, deployment of human capital, spatial efficiency and governance. This appendix serves as the underpinning for the discussion in each of the chapters on these five leverage points.