

Regional Systems and Regional Economic Growth: A Systems Approach to Understanding the Regional Economy.¹

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A Systems Approach to Understanding the Regional Economy

Our goal in this working paper 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.

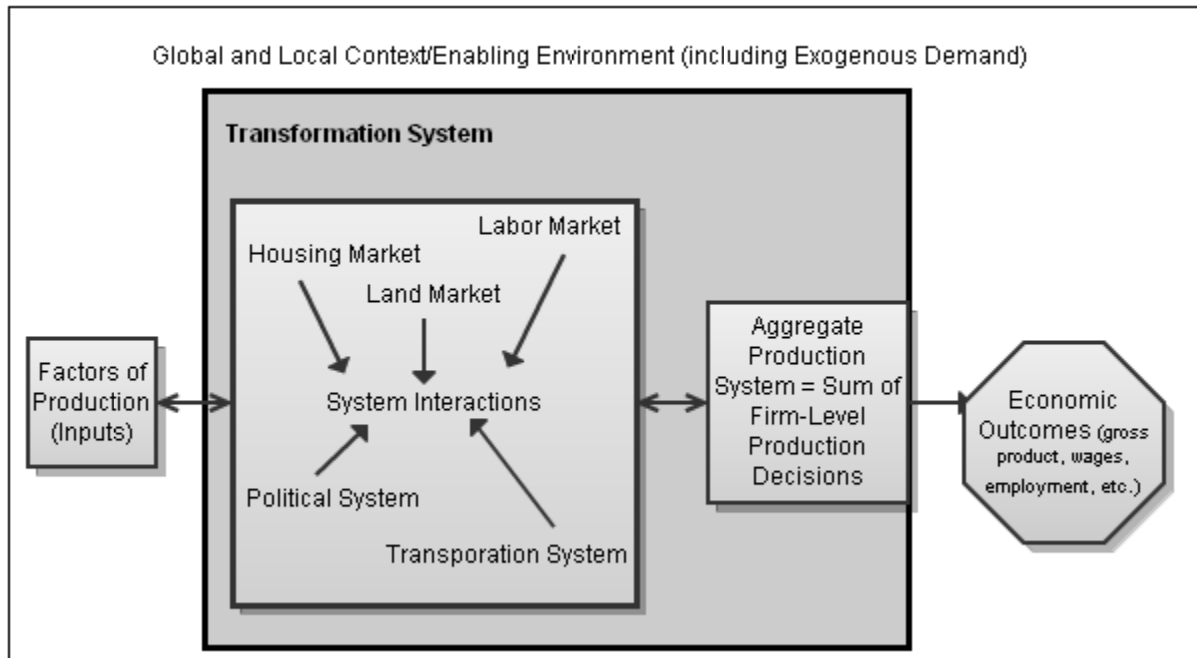
We conceive of *systems* as decision-making institutions and processes that transform *inputs* and *resources* derived from the environment to produce outputs. The *output* of one system may be an *input* into another system, and thus the performance of a system may depend critically on the performance 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

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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.

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 region². 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 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.*

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

² For a complete review of the determinants of economic competitiveness literature, see Wolman, Levy, Young, & 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>.

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.

- the costs of supplies, transportation, and communication
- the 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)
- the costs of production
- the profits received after accounting for taxes and fees.

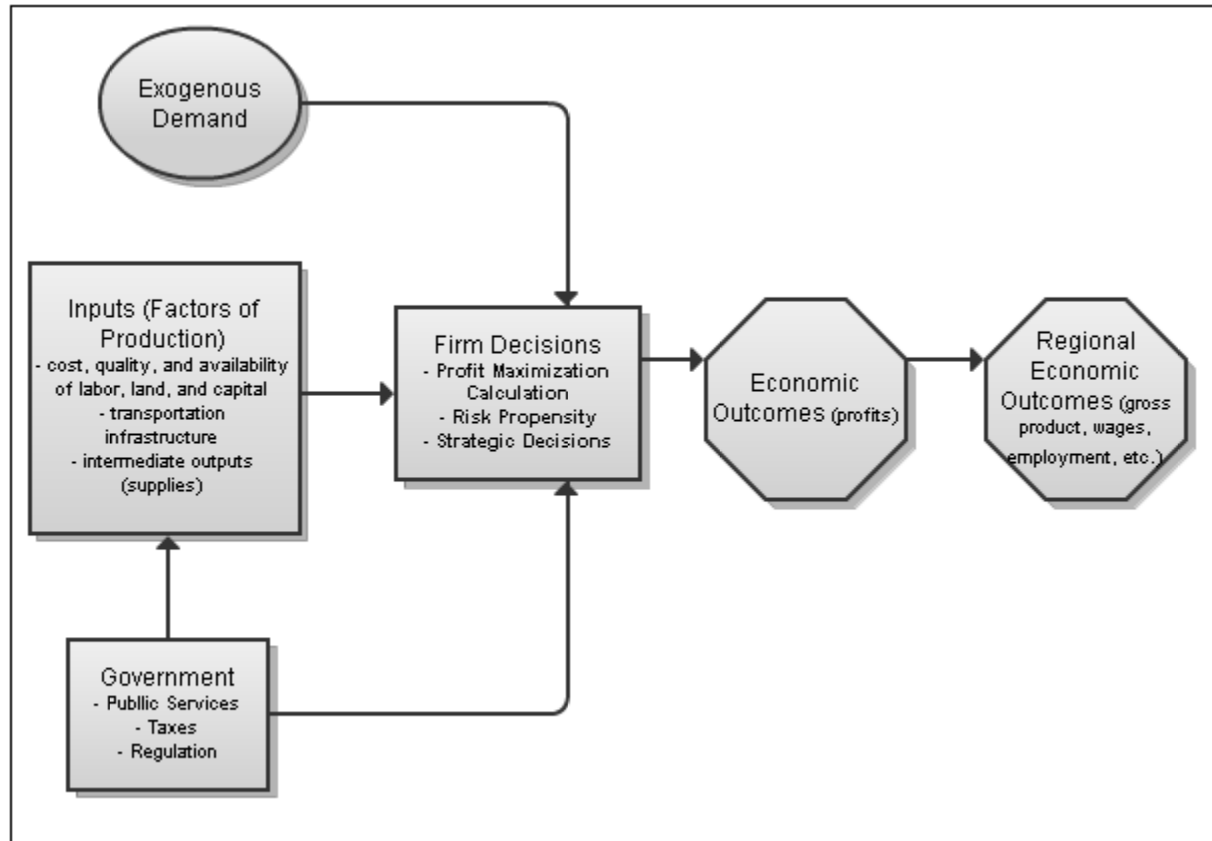
Business decisions result in the quantity of goods and services produced (output); the level of employment and wages paid; and the profit generated *by the individual firm*. Taken together, firm production decisions in aggregate determine the region's output, employment, earnings, and rates of growth, 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

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.

economies of scale that produce cost savings for all firms within the region (see chapter ? 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 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.

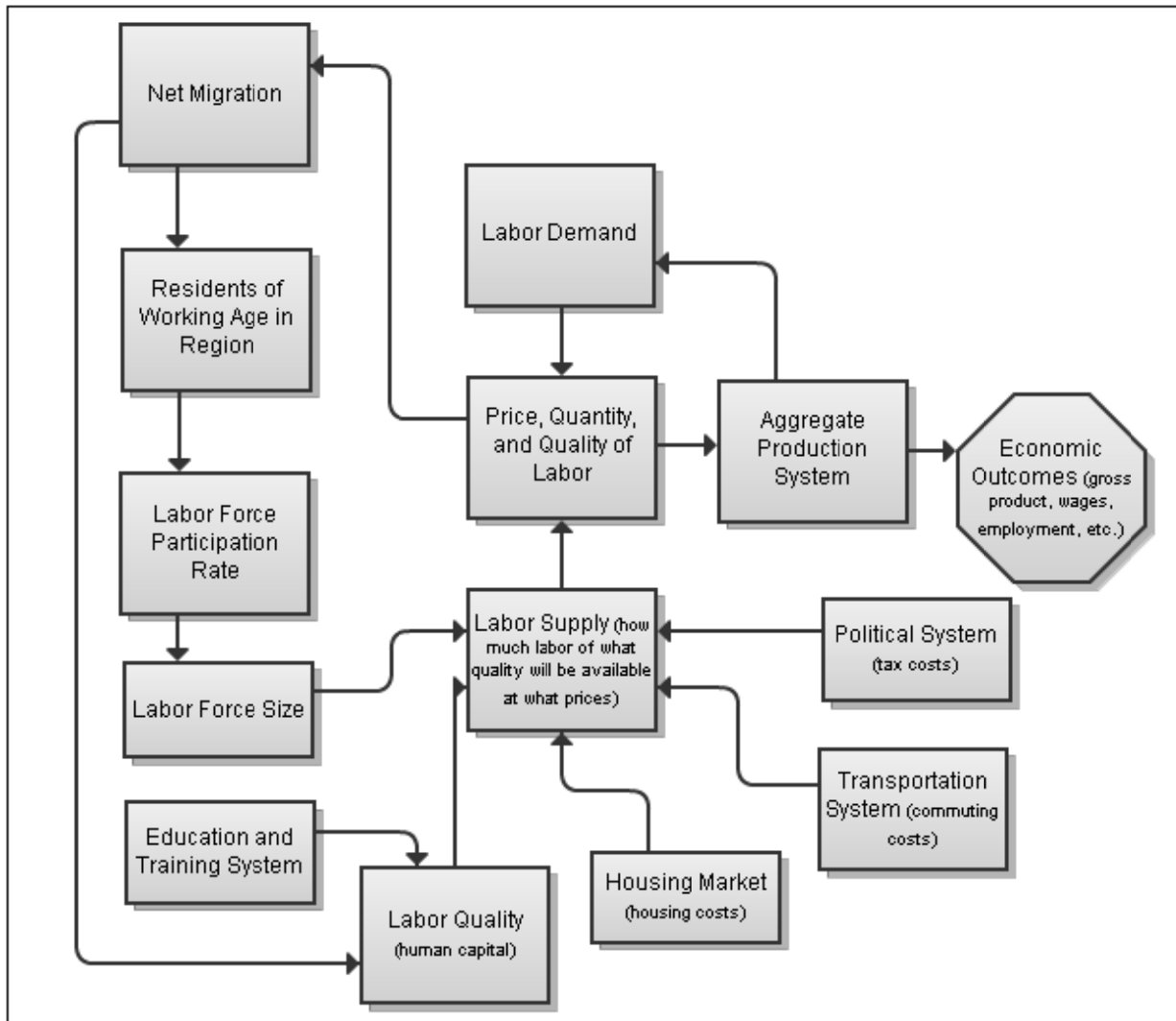
Labor market

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 working paper 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.

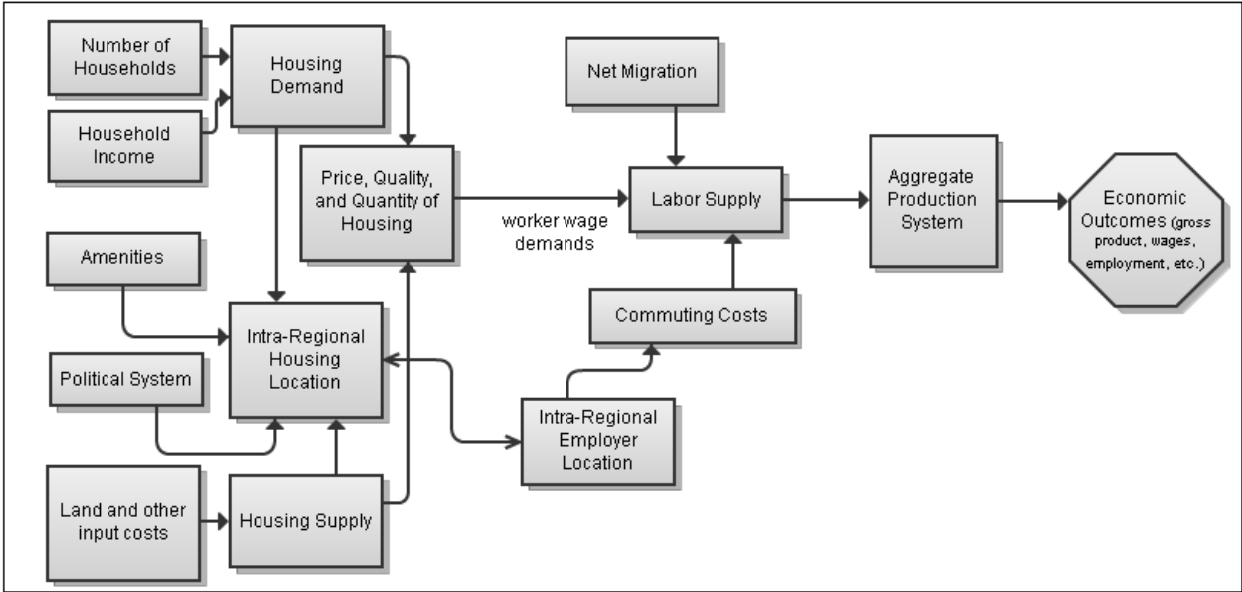
Housing market

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* the region 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.

Land market

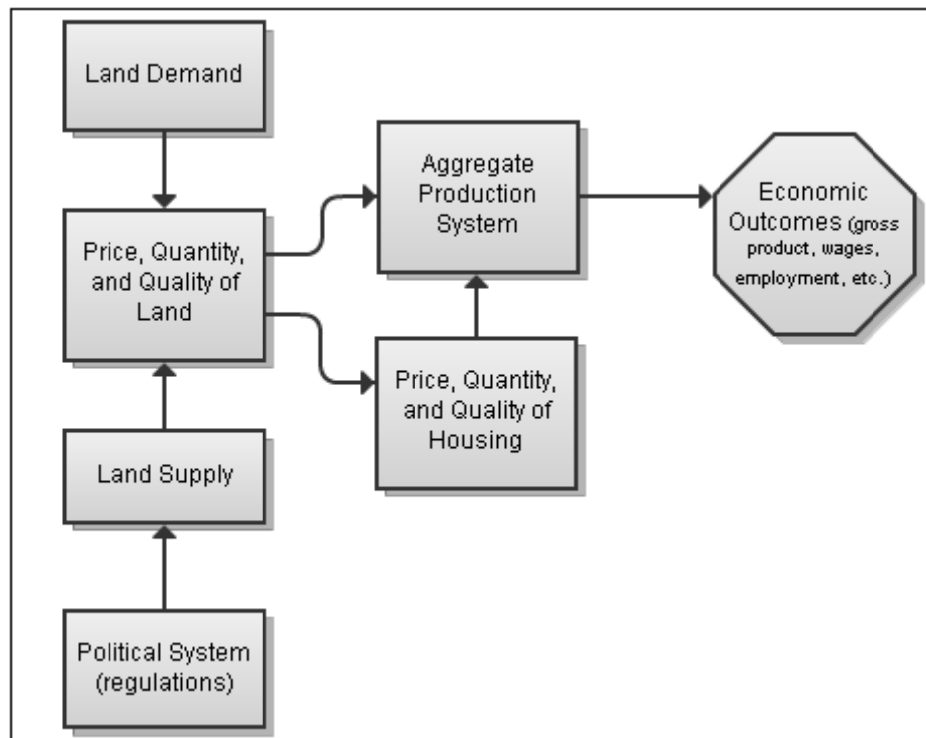
Land markets are relevant to regional economic growth because land costs or rents are a part of the cost of doing business. Like housing markets, land markets are regional and sub-regional. Prices are set in land markets through the interaction of the supply of land available at varying qualities and the demand for land for various uses. Land costs vary within a region because of

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.

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.

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.

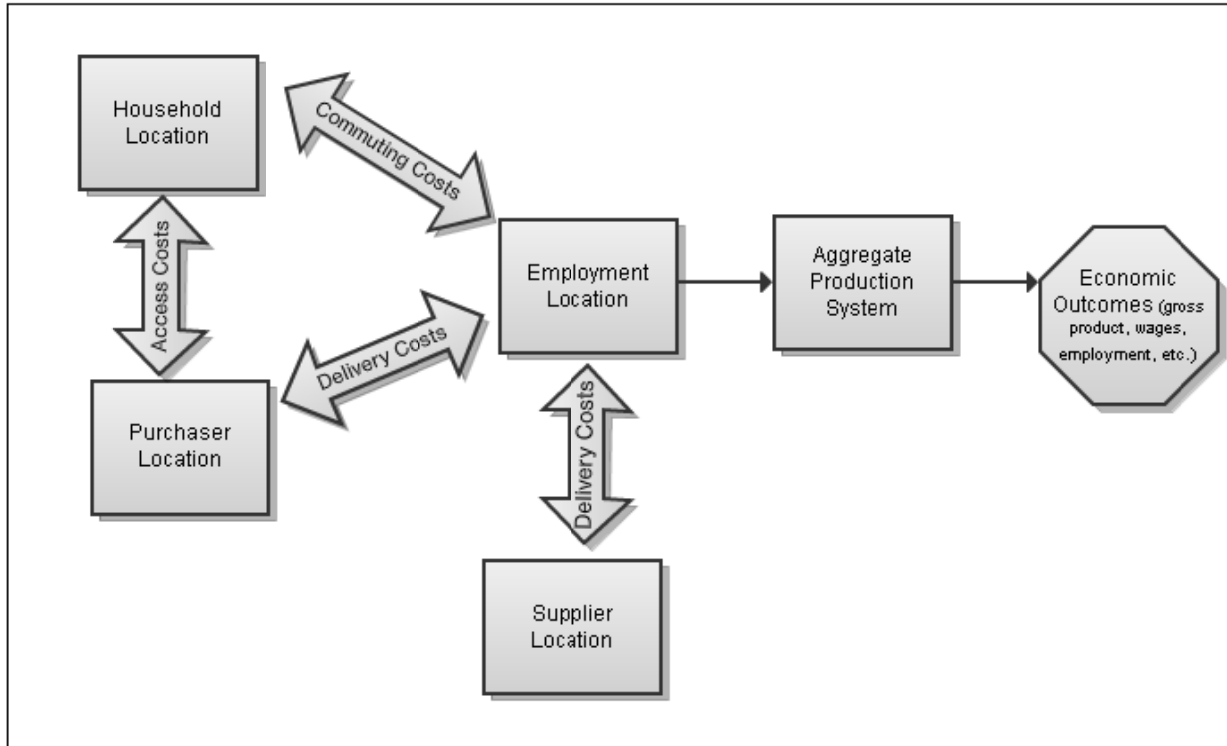
Transportation system

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.

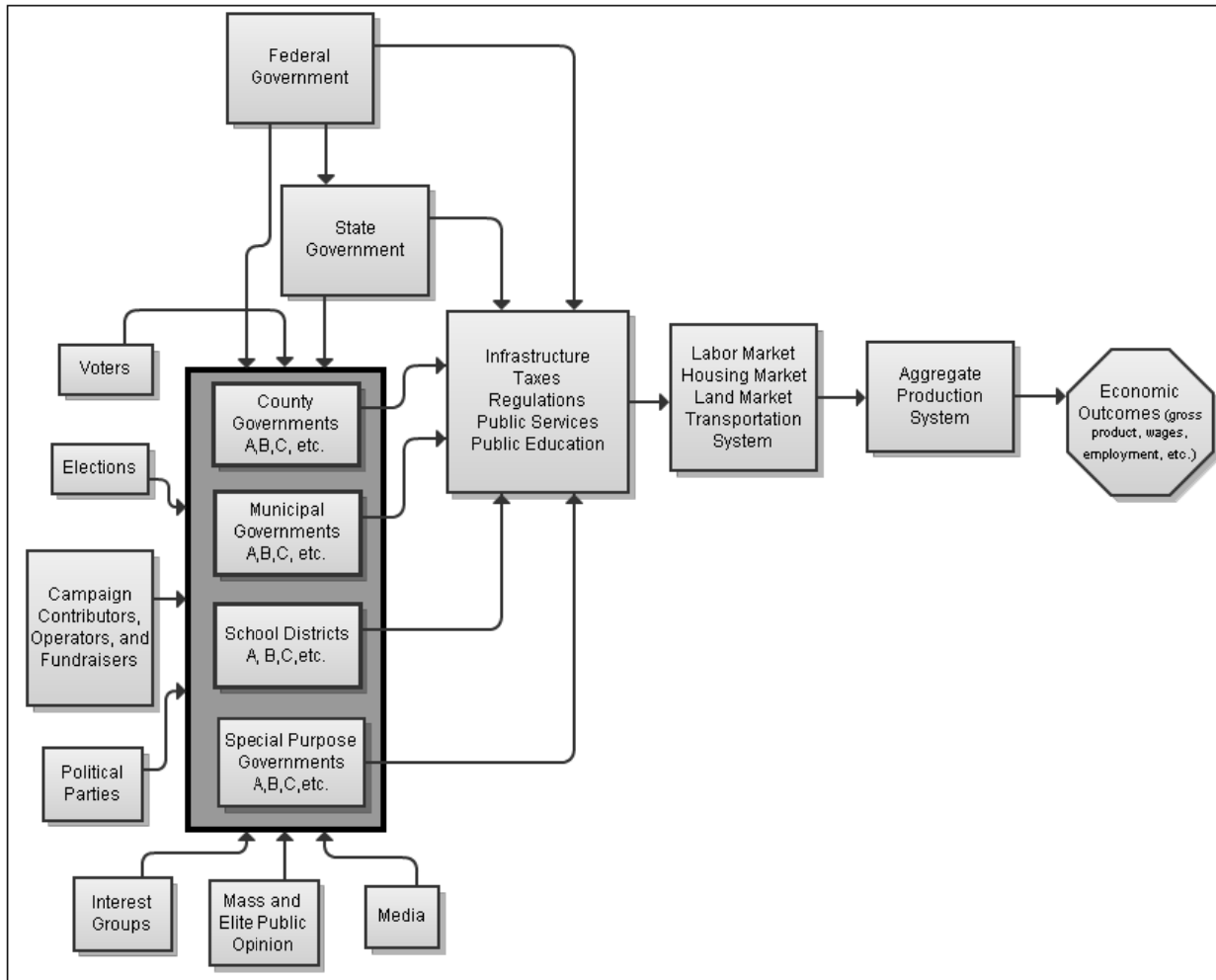
Transportation network access and egress points thus affect the spatial relationship of workers, employers, suppliers, and customers to each other and thus the spatial efficiency of the region (see also the working paper on Spatial Efficiency).

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 on Government and Governance, GWIPP Working Paper # 44).

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 working paper on regional governance and regional economic growth) 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.

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.