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## Article

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## **Spatial Policy for a Competitive Regional System: Economic and Social Infrastructure Elements<sup>1</sup>**

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**ABSTRACT.** The optimal formation of regions changes over time, which prompts the question: how can regions survive by expanding their unique competitive advantages? One of two key factors cited in response to this question is competitive economic forces related to economic infrastructure elements. The other is attractiveness, which is relevant to social infrastructure elements. The first part of this paper explores elements of the former, dealing with localisation and activity-complex economies from the standpoint of agglomeration economies. The second part examines elements of the latter, such as attractiveness of large metropolitan areas where positive and negative aspects of urbanisation economies and diseconomies coexist. The final part of the paper offers an integrated framework that features both economic and social infrastructure elements, indicating how a sustainable regional system can be coordinated.

**JEL Classification.** D62, H11, O18, R12

**KEYWORDS.** *Spatial organisation, agglomeration economies, sustainable regional growth, welfare, infrastructure*

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## 1. INTRODUCTION

The spatial formation of regions in the Middle Ages featured a simple, nonhierarchical, central-place system. In that system, there was a church at the centre and various goods were traded at the central square. As highlighted by Thünen (1826 [1966]), highly perishable products were delivered from areas near the centre, while durable products were shipped from more distant areas. This particular distribution scheme formed concentric rings, with various rings involving completely different farming systems. Such form can still be found today but in a few limited places, i.e., Charlesbourg in Quebec. Other more typical places generally feature more complex spatial formations, and the optimal formation of the economic space changes over time.

Some regions have strong centripetal forces, and others are losing their competitive power. These may be dominated by spatial hierarchies in what is called a hierarchical central-place system. Central-place theory was systematically investigated by Lösch (1944 [1954]) with respect to market areas. Market-area analysis reveals how final goods are distributed across an economic plain. While central-place theory addresses various aspects of spatial configuration, several additional factors also need to be considered in examining an actual spatial hierarchy. Here, the question is how regions can survive by expanding their unique competitive advantages. Hence, additional factors include the following two primary location tactics. One creating a competitive economic force related to the elements of economic infrastructure. This involves localisation economies and activity-complex economies, viewed within the framework of agglomeration economies. These both relate directly to producer surpluses. Another is attractiveness, which is related to elements of social infrastructure, and may include the attainment of well-being. These elements are typically found in large metropolitan areas where positive factors of urbanisation economies and negative factors of urbanisation diseconomies coexist. Evans (1972) provides an evaluation of a region including these positive and negative factors.

Parr (2002) categorises localisation, urbanisation, and activity-complex economies, in external terms, as composing agglomeration economies. These spatially-constrained economies also have internal scale, scope, and complexity elements, and they involve horizontal, lateral, and vertical integration, respectively. As revealed by Weber (1909 [1928]) in his location-triangle analysis, agglomeration economies are trade-offs against transportation costs. The individuals' and firms' decision making with regard to location can be affected by such spatial factors.

MOSPI (2012: 11-12) classified the terms for economic and social infrastructure as follows. First, economic infrastructure is defined as the elements of infrastructure that promote economic activity including roads, highways, railroads, airports, sea ports, electricity, telecommunications, water supply, and sanitation. Social infrastructure is defined as that part of the infrastructure

which promotes the health, education, and cultural standards of the population, including schools, libraries, universities, clinics, hospitals, courts, museums, theatres, playgrounds, parks, fountains, and statues. This social infrastructure has both direct and indirect impact on welfare.

Although policy makers tend to be concerned with developing a better industrial environment for firms, attractiveness for households, which may be related to social infrastructure elements, can also play an important role. For instance, Glaeser et al. (2001) addressed critical urban amenities as the presence of services and consumer goods, aesthetics and the physical setting, good public services, and speed. Mulligan et al. (2012) insisted that the access of households to private or to public services should not be neglected from spatial analysis. Hence, households' welfare needs to be included in the analytical framework when a competitive regional system is examined.

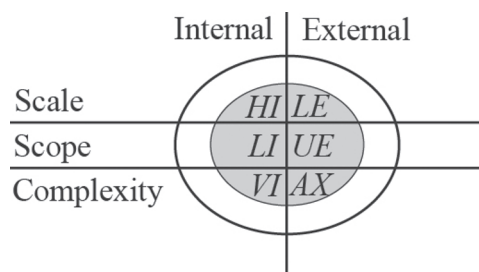
With this background, we examine various economic infrastructure elements in section 2, then investigate social infrastructure elements in section 3. Both elements are analysed within a single framework in section 4, and the integrated framework is expanded upon in section 5. Finally, section 6 provides concluding remarks. Overall, this paper makes a case for how the various factors of a sustainable regional system can be coordinated.

## 2. ECONOMIC INFRASTRUCTURE ELEMENTS

It has been commonly recognised that the population of a region will increase up to a certain point as more job opportunities become available there. This implies that investment in industrial activity plays an important role in initiating and sustaining the centripetal forces of a regional population. Appropriate investment brings with it spatially-constrained external economies across the region. For example the semiconductor industry in Silicon Valley enjoys localisation economies, where the spatial closeness of different but closely related firms within the same industry allows highly advanced local economic activity to create cost-saving opportunities. Other, more traditional examples can be found in the cutlery industry in Solingen, Germany and the stringed music instrument industry in Cremona, Italy. While these economies used to sustain local economic systems in earlier times, nowadays it may also be necessary to improve other agglomeration elements unless those specialised industries are exclusively competitive in the market.

Agglomeration economies feature spatially-constrained internal and external economies of scale, scope, and complexity, according to Parr (2002), as seen in the shaded areas of Figure 1. There, localisation economies [*LE*] are spatially-constrained external economies of scale. Other elements in spatially-constrained external economies are urbanisation economies [*UE*] and activity-complex economies [*AX*]. Spatially-constrained internal economies are also

agglomeration economies, which in Figure 1 relate to scale (horizontal integration [*HI*]), scope (lateral integration [*LI*]), and complexity (vertical integration [*VI*]). Since internal economies are not external to the firm, the focus of this analysis is limited solely to the external dimension.



**Figure 1.** Agglomeration economies (Source: Parr, 2002, with modifications)

In addition to localisation economies, of which examples were given above, there are activity-complex economies to draw upon, such as the nonferrous metal industries in Birmingham, UK, aerospace and related industries in Los Angeles, and the Ford Campus in Chicago, to name just three. Localisation and activity-complex economies may create more job opportunities within a region as long as the labour is locally supplied, so that the amount of tax revenue collected by the local government increases. Although higher-level technical attributes may reduce the absolute labour supply due to the realisation of more efficient processes, this analysis simply assumes that agglomeration economies bring a greater number of job opportunities.

Localisation and activity-complex economies may not be maximised in the absence of unique skilled-labour pools and research institutions. The effects of these economies can directly reflect either improved production functions or reductions in the unit costs of processes (Meade, 1952; Scitovsky, 1954). Here, it should be noted that localisation and activity-complex economies are beneficial only for firms or, because of tax revenues, the local government. In addition, these may be supported by better public services such as airport shuttles, highways, railroads, and telecommunications, which are shared between regional economic agents, including other firms, industries, and households. To maintain better public services, it is essential to keep both the local population and economic activity at certain levels, which can be attained by other elements of agglomeration economies, namely, those of urbanisation.

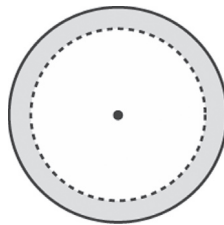
While localisation and activity-complex economies relate directly to industrial activities, urbanisation economies may more closely resemble the notion of social infrastructure elements, rather than economic infrastructure elements, which are detailed further in the following section.

### 3. SOCIAL INFRASTRUCTURE ELEMENTS

The focus of the previous section was on population increases that result in job availability in particular localities. In this section, another factor, the centripetal force of the population exerted by attractiveness, is examined. Here, social infrastructure elements may be more pertinent than economic infrastructure elements. In general, attractiveness is available in a large metropolitan area, whenever positive urbanisation economies and negative diseconomies successfully coexist.

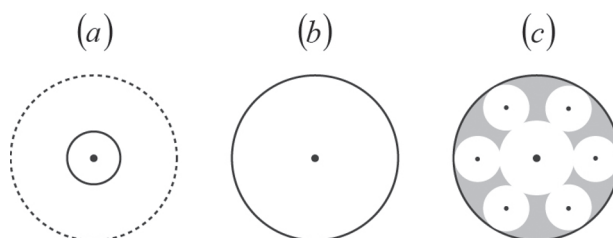
Excessive population density exacerbates negative elements, which include higher land prices, congestion, and pollution. These are referred to as “urbanisation diseconomies”. When these exist, the main objective of a local government may be to optimise the population density across the economic plain. Although an intuitive outcome might be to physically expand the metropolitan area, this can also cause several accessibility problems such as “food deserts” and spatial consumer exclusion. Nakamura (2010) investigated spatial consumer exclusion, including the mechanisms of food deserts, a term that suggests that there are consumers who are unable to obtain goods and services that are distributed at the centre of the market area.

This situation is illustrated in Figure 2, where the solid circle is the regional boundary and the broken circle is the optimal market-area radius for firms. In this case, consumers within the shaded area may not be able to obtain goods and services, and the consumers within this area face spatial consumer exclusion.



**Figure 2.** Spatial consumer exclusion

Although such problems may not be discussed in Lösch (1944 [1954]), they can be observed in many regions, particularly in developed countries. The process of spatial consumer exclusion is illustrated in Figure 3. We assume that the initial spatial configuration of a region is represented by the solid circle in (a). As the regional population increases, the area of the region expands up to the broken circle. When the local population is at a maximum, the actual spatial configuration is defined as the solid circle in (b). As the population decreases, which can be seen in many developed countries, there is a central place and surrounding peripheral central places, depicted as the white zones in (c). With such a spatial configuration, consumers located in the shaded area in (c) will be outside all market areas for goods and services. Here, consumers in the shaded area face spatial consumer exclusion.



**Figure 3.** Spatial consumer exclusion process

To preclude such a situation from occurring, predicting a region's population level and economic activity may yield indications that its size and scale of expansion should be limited. However, at the same time, attractiveness should be improved across the region. As a result, developing attractiveness is important but the facilities that produce that attractiveness may be best concentrated at the central place. At a more precise level, facilities can be divided into two types: normal and luxury. The former may be facilities essential for making a living, such as super markets, pharmacies, and petrol stations, to which accessibility should always be guaranteed across the region. This is particularly important in situations where a region's further regional economic growth is limited, making it impossible for a highly advanced transportation network to be developed to fulfil intraregional transportation needs.

By contrast, locating luxury facilities in every place may not be sustainable. Also, households will make use of them much less frequently than normal facilities. Hence, these should be solely located at the central place. Only if both types of facilities are appropriately situated across the economic plain can the region be recognised as satisfactorily attractive.

#### 4. CUMULATIVE CAUSATION

Hitherto, economic and social infrastructure elements have been investigated as parts of different frameworks. This section demonstrates that well-balanced infrastructure development will help a local economy improve its economic efficiency more than development of exclusively economic or social infrastructure elements. Why should this be? To answer this question, the argument can be examined using a framework of consumer and producer surpluses. Economic infrastructure elements, then, reflect production efficiency, while social infrastructure elements mainly relate to the welfare of households (which provide labour) in a particular region. As a result, both infrastructure factors may indirectly affect producer and consumer surpluses.

A well-balanced development process has advantages for both producer and consumer surpluses, which can be explained using cumulative causation. First, an improvement in economic infrastructure elements increases the producer surplus by enhancing production by

adding pecuniary and technological externalities. By contrast, improving the social infrastructure increases the consumer surplus by providing highly advanced educational, medical, cultural, and other social services, enhanced by a better intraregional transportation network for commuting. These things generally increase the welfare of households, who also provide the labour for production in the region. The improvement of social infrastructure elements can thus expand producers' production efficiency. A set of efficient and advanced production systems may result in improved localisation or activity-complex economies in the area. Once cumulative causation is established, additional tax revenues from the more advanced regional system can be invested in economic and social infrastructure elements.

If the region is too small for such cumulative causation to emerge, an alternative remedy is to establish wider regional coordination between neighbouring regions. As long as its interregional transportation network is well organised, this alternative may allow economic agents to access a variety of goods and services available within the more widely coordinated area. The idea is somewhat similar to a joint location strategy of three different firms by subsidiary payment described in Weber (1909 [1928]) and indicated by Isard (1956:176-182) to be a component of bargaining strategy in game theory.

## 5. POLICY AND PRACTICE

The previous sections have explained how two types of infrastructure elements need to coexist for a region to sustain economic growth. This can be interpreted as follows. The size and scale of a region can be expanded by adding more economic infrastructure elements, but those elements should always be maximised with respect to localisation and activity-complex economies. As these economies may be bolstered through the use of highly advanced information and communications technology, the presence therein of highly skilled labour and outstanding research institutions is essential. To attract highly skilled labourers, it is important for a region to offer a sufficient number of amenities, including a variety of goods and services. These may include, among other amenities, outstanding schools and universities, advanced medical centres, and various cultural facilities, which are fully supported by a well-organised network of intraregional and interregional transportation, as well as communication networks. Such amenities are made available through additional investment in social infrastructure elements, but that additional investment requires financial resources at the regional level.

Since portions of local budgets come from tax revenues collected from local households and firms, one can see that a sustainable local population and economic activities are essential to further economic growth. Stable revenue collected by the local government enables regional development to expand and offer more advanced facilities, such as outstanding research



institutions, which will in turn promote localisation and activity-complex economies in the short and middle run, and foster intellectual knowledge in the long run. In this way, economic and social infrastructure elements mutually interact, and they can be coordinated by the local government.

Moreover, it is clear that there are two regional divisions: the core and peripheral areas. Spatial policies will be different in the core than at the periphery. First, for the core area, the local government should consider how urbanisation economies can be maximised by minimising diseconomies under a given spatial hierarchical system. By contrast, for peripheral areas, the local government needs to improve social infrastructure elements to the optimal level, in line with the long-term local population predictions. The local government is also responsible for controlling the development of interregional transportation and communication networks. For instance, if the core area needs access to peripheral areas for opportunities that involve lower-priced land, less congestion, and other differentiated factors, it will be important to expand interregional accessibility. Also, if peripheral areas come to offer a variety of goods and services otherwise offered by the core area, interregional accessibility will become essential in order to mitigate spatial consumer exclusion.

In examining the sustainability of a regional system, economic forecasting may play a crucially important role. One related approach used in such forecasting is the regional econometric input-output model (REIM), initially formalised by Israilevich et al. (1997). In addition, data envelope analysis (DEA) enables evaluation of the impact of infrastructure investment on the regional economy. DEA was applied to transportation network attributes by Suzuki and Nijkamp (2011), and Suzuki et al. (2012) further expanded the analysis. Although these extensions are beyond the scope of this paper, applications should be left as future avenues of investigation.

## 6. CONCLUDING COMMENTS

This paper has examined how sustainable regional systems can be coordinated when there is severe interregional competition. We found that to be competitive, a region requires social infrastructure elements, specifically attractiveness and attainment of well-being those are beneficial for households, in addition to economic infrastructure elements relating to localisation and activity-complex economies those are directly relevant to producers.

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