The Center-periphery Dilemma and the Issue of Equity in Regional Development

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Introduction

Variations exist among regions. These variations manifest themselves in the levels of the population's economic and social well-being. Different regions are endowed with production factors and characteristics that offer different opportunities for specialization, which can be exploited to gain regional comparative advantage. They then may add to the region's aggregate income and well-being. It is of paramount importance, then, first to identify a region's comparative advantages and then to devise policies that exploit those advantages. Many outlying regions (peripheral regions) suffer from a high rate of unemployment, a low level of per-capita income, and net out-migration. Most often the out-migrants come from the highly-educated and highly-motivated population. Among them, we can find a high percentage of potential entrepreneurs. Outlying areas attract less investment than do central regions because of the low marginal productivity of factors of production in the former. In order to alleviate these hardships and prevent them from being further inflicted on outlying regions, central governments often devise incentive and investment programs whose main objective is to reduce gaps among regions and, thus, to reduce regional inequalities.

Over the past three decades, high-technology industries have expanded worldwide at a tremendous pace, and in this respect Israel is no exception. Attracting high-tech firms to outlying regions is now in vogue, due in part to the image the projects as a magnet for highly educated and highly paid employees. Public/private investment in large-scale facilities, such as highways and railways, technological incubators, universities, and hospitals, are among the projects proposed in order to facilitate economic growth in outlying areas

This chapter will critically discuss the spatial implications of public investment programs designed to facilitate the development of peripheral regions, with an emphasis on innovative technologies and transportation. We begin with the economic growth model, and the Conversion - Diversion hypothesis, followed by Krugman's New Economic Geography model. This is

followed by a discussion of the spatial concentration of economic activities—agglomeration economies, clustering, and networking—that spawn innovations, entrepreneurships, and start-ups, and in turn result in the creation of new enterprises. All this activity contributes to regional growth. We then turn to a recently-employed policy instrument – the technological incubator—and an extensive assessment of the impact of investment in transport infrastructure on regional development, particularly a peripheral region.

Economic Growth: Conversion – Diversion and the NEG Model

The restrictive assumptions embedded in the neoclassical growth model - exogenous technology, constant returns to scale, and diminishing marginal productivity of capital in a perfect competition situation - do not provide a good explanation for the observed process of continuous growth in per-capita income and, thus, in the standard of living (Solow, 1956 and 1970). The endogenous economic growth models that emerged in the 1980s prompted by the seminal work of Romer (1986) and Lucas (1988), brought to the fore the importance of endogenous technological progress (Aghion and Howitt 1998; Romer 1990, 1994; Grossman and Helpman1991, 1994; Nijkamp and Poot 1997). Thus, technological progress could explain the persistent growth in income and, consequently, in income per capita or standard of living.

In recent years, researchers have become increasingly aware of the role of technological progress and innovation on regional development and economic growth. Regions with a high level of innovation have become a destination for highly skilled labor and an impetus for improved social and physical infrastructures. These regions enjoy at times unique opportunities for the development of new firms, the expansion of their market share, profitability, and employment growth.

Industries that are heavily engaged in technological innovation usually possess a high market value resulting from a comparative advantage, at least during the first stage of the diffusion process. Open economies can take advantage of an expanded market and, through increasing returns to scale, have the benefit of greater production efficiency and a higher rate of economic growth. Greater production efficiency enables industries to expand their domestic market share through import substitution and increases in local consumption and, at the same time, to

penetrate new foreign markets and raise their export share (Porter 1990; Krugman 1979, 1991a, 1991b, 1995).

In a classic article published in l955, Simon Kuznets hypothesized that the relationship between economic growth and inequality follows an inverted U-shaped curve. In the early development stage, regional income differentials increase, subsequently stabilize, and then, when the economy matures, personal income inequality among regions diminishes.

Kuznets hypothesis suggests that poor economies tend to grow faster than rich economies, thus decreasing disparities among regions. Indeed, empirical studies in general support this hypothesis (Barro and Sala-i-Martin 1991, 1992, and l995, Chapter 11). Convergence is further reinforced by the phenomena of increased globalization, trade liberalization, and treaties among countries like the EU and NEFTA that enable the flow of production factors – labor mobility, products (export), and direct foreign investment (FDI). It is facilitated by specialization and increasing returns to scale. Nevertheless, although disparities among countries decrease, a widening gap may be observed between regions within countries. This divergence phenomenon originates from a greater concentration of economic activity in a few central areas, enabling the agglomeration economies fueled by technological progress and pecuniary externalities. Central areas enjoy greater efficiency in the production of goods and services than do outlying areas. Consequently, economies of agglomeration are the principal force that exacerbates inequalities among regions in a given country (Rietveld and Bruinsma 1999; Kanbur and Venables 2005).

In China, for example, although the economy was growing at an astonishing rate in the last decades, a significant differential annual rate of growth was observed between the booming coastal regions and the interior, and these gaps were increasing rapidly (Fujita and Hu 2001; Li and Xu 2008). Similarly, in counties of the European Union disparities in per-capita income levels between countries have narrowed; at the same time, regional disparities within countries have widened (Geppert and Stephan 2008; Fan et al. 2009).

In 1991, Paul Krugman (1991a) published his seminal paper, "Increasing Returns and Economic Geography," which presented a synthesis of the core-periphery model and the neo-classical endogenous growth model. It was the basic framework for the New Economic Geography (NEG) model. The NEG model explains the formation of large varieties of agglomeration economies in

geographical space in a general equilibrium framework. It treats simultaneously trade, economic growth (increasing returns to scale), and economic geography (i.e., the location of people and economic activities in space). In order to reduce the cost of transporting goods and to benefit from increasing returns to scale, firms and workers are pulled together toward selected places where agglomeration economies prevail.

Krugman showed how in equilibrium, inequality in per-capita income exists between regions (Krugman 1991b). He alluded to centripetal and centrifugal forces that shape the economic landscape (see also Losch 1954). The former, centripetal forces, pull economic activities together to form the spatial concentration of economic activities in a few selected points in space and in locations where agglomeration economies are in existence. The latter, centrifugal forces, push them apart (Fujita and Thisse 1996; Fujita and Krugman 2004; Fujita and Mori 2005). Krugman lists some of these opposing forces in the table reproduced below (Krugman 1998, 8.

Table 1: (Insert about here)

Agglomeration, Innovation, and the Location of High-Tech Industries

Profit-maximizing location decisions made by individual entrepreneurs cause firms to cluster together in select discrete locations (Ellison and Glaeser 1997, 1999; Malmberg and Power 2005). Different regions offer different opportunities for specialization, which when exploited may add to the aggregate income and well-being of a region. Since entrepreneurs strive to maximize profits, they are motivated to invest in regions where the greatest profits can be attained, given some pre-specified level of probabilities of the risk involved owing to uncertainties. Profit will be maximized in regions where there is comparatively higher productivity of inputs, such as labor, capital, and efficiency, in the network of transport and other systems of communication.

Agglomeration Economies and Industrial Clustering

Theoretical and empirical studies support the effect of agglomeration economies and clustering of industries on production efficiency (see, for example, Shefer 1973; Nakamura 1985; Shefer and Frenkel 1999; Fujita and Thisse, 1996 2002; Mukkala 2004; Graham 2008).Modern location theory demonstrates the significant role that agglomeration and localization economies play in

explaining the growth of cities as a hub generating new ideas and technological progress (Jacobs 1969; Glaeser et al. 1992; Glaeser 2008). Agglomeration economies, localization economies (measured by the size of industries in a given location) and the economies of scale of the single firm are the principal forces fostering the continuous concentration of people and economic activities in a selected point in space. Agglomeration economies, though, are not a very tangible concept, since they encompass several loosely-defined factors. They can be measured by the number of employees in a particular industry (localization economies) or by the diversity of workers residing in a given locality (Shefer 1973).

There are two major groups of variables that affect the rate of innovation by firms. The first group is *internal* to the firm, and the second is *external* to the firm (Davelaar and Nijkamp 1989). The first group refers to the firm's structural attributes, and includes the following characteristics: size, age, ownership type and location of firm, as well as the type of industry to which it belongs and the extent of technological change and innovation in R&D activities taking place in the firm. R&D activities can be measured either by the number of employees engaged in R&D or by the total expenditure allocated to it (Shefer and Frenkel, 2005). The second group of variables, which are *external* to the firm, creates the *local innovation milieu.*

Local Innovation Milieu

The local innovation milieu includes the degree of local innovation, the degree of cooperation and collaboration among firms (*networking*), and the degree of economies of industrial localization and urban agglomeration. Spillovers between firms are very important in enhancing a firm's productivity and innovation capabilities. Agglomeration economies play a significant part in the increase in the rate of a high-tech firm's innovation potential (Fujita and Thisse 1996, 2002).

One methodological framework for analyzing local innovation milieu is depicted in the two, two-dimensional diagrams that comprise Figure 1ure). In both figures the vertical axis represents the degree of local innovativeness; i.e., the rate of innovation in a specific locality. The horizontal axis measures local synergies; i.e., the degree of socio-economic interaction among firms located in a cluster—*networking*. Such interaction is considered a cost-reducing factor that diminishes

uncertainty and increases production efficiency (Camagni 1995; Kleinknecht and Poot 1992; Shefer and Frenkel 1998).

Figure 1: (Insert about here)

Most central regions are expected to\be found on the upper-right-hand quadrant, and most peripheral regions on the lower-left-hand quadrant of the diagrams in Figure 1 (Shefer and Frenkel 1998).

A production milieu becomes attractive when companies cluster within it, creating economies of scale and agglomeration economies (Davelaar 1991; Audretsch and Feldman 1996; Porter 1998; McCann and Shefer 2004). A region's comparative advantage is manifested in its technology level, developed infrastructures, social capitals (quality of personnel, etc.), and institutional framework, compared to other regions (Frenkel 2000).

Spatial Diffusion of Innovation

Diffusion of innovation is a complex process, involving changes in the behavior of economic agents. The diffusion process may be understood by integrating three basic elements: companies, environment, and technology. The integration of these three elements creates the early necessary conditions for adopting innovation. Development regions are able to adopt technologies associated with production processes; however, they may face severe difficulties in adopting advanced product innovation. Process innovation usually can be bought "off the shelf" on the open market. Product innovation, on the other hand, is not as readily available. The reason for this is that innovation is the means by which a firm can maintain competitive edge over its rivals. Therefore, product innovation is less transferable in terms of diffusion.

In space, we can presume that a greater amount of uncertainty and limited bits of information are being transmitted to a location at a distance from the concentration of people and economic activities - the metropolis. Thus, we can hypothesize that the process of diffusion of innovation in space follows the form depicted in Figure 2a. Two major processes can be distinguished: the first is movement from the center to the boundaries, or the periphery (suburbs), of the metropolitan area; the other is the strong connection, in spite of the distance separating them, between centers of activities - metropolitan areas. These affinities between centers traverse

intermediate areas that could be considered peripheral to the metropolis. Thus, the spatial diffusion of innovation, from the center to the periphery follows the pattern depicted in Figure 2b. That pattern portrays a sequential process that gradually declines in intensity from the heart of the metropolis outward. Given these diffusion processes, we would expect that the rate of innovation will follow similar spatial patterns; that is, a gradual decline in the rate of innovation as one proceeds from the center toward the periphery.

Figure 2: (Insert about here)

Agglomeration and localization economies affect positively and significantly the rate of innovation in high-tech industries, but their affect on low-tech industries is much less pronounced (Audretsch 1998; Shefer and Frenkel 1998). The electronics industry is affected positively and significantly by the high concentration of people and economic activities. Its rate of innovation rapidly increases with the prevalence of agglomeration. Agglomeration economies, on the other hand, do not affect significantly the rate of innovation in low-tech industries.

Consistent results have been obtained in various empirical studies of the effects of agglomeration. One obvious conclusion that can be drawn from this consistency is that it would be counter- productive to push electronics firms away from the core. On the other hand, the rate of innovation in firms belonging to the low-tech sector, such as plastics and metals, will be affected only marginally and insignificantly by a move from the core toward the intermediate and peripheral regions. These conclusions suggest that public policies designed to promote regional growth and development should be industry-specific (Shefer, et al. 2001).

Entrepreneurship and Innovation

A major element in building new markets, invigorating business sectors, and furthering economic growth in general is entrepreneurship (Schumpeter 1934; Acs and Armington,\ 2004; Audretsch and Keilbach 2004, 2005). Regions that traditionally encourage entrepreneurship and innovative activities have a higher probability of growth. An absence of entrepreneurship will lead to insufficient resource utilization, which may retard the growth of firms, cities, and regions (Acs and Storey 2004).

Entrepreneurial1`1 development of technological innovation depends mainly on a production milieu that encourages a high level of local innovation and the synergy of different factors to

create regional comparative advantages (Mukkala and Ritsila 2004). The existence of entrepreneurship capital is one way to define a region's ability to create and attract new firms.

Technological Incubators in Peripheral Areas

The aim of a technological incubator program, as a development program "from below," is to foster entrepreneurial activities from the very beginning of a project's initiation. Not surprisingly, the incubator has the advantages and drawbacks typical of this kind of program. On the one hand, it can help to create a healthy entrepreneurial culture by empowering local people and encouraging them to develop their own firms locally. On the other hand, it works very slowly: at least 10-15 years are needed in order to assess the actual impact of the program on employment and economic development. Then again, a technological incubator located in a peripheral region may be able to provide a number of functions that are seldom found in these areas, such as venture capital supply, business and legal services, and the filtering of valuable ideas.

The idea of the technological incubator program emanated from the desire to encourage and support budding start-ups in their critical years before reaching maturity. The incubator increases a small firm's chances of graduating from the incubator—and therefore of survival—by supplying them with such basic services as assistance and consultation in outlying areas, thereby helping to accelerate their rate of growth (Sherrod 1999). Enterprises that began life in an incubator have been found to have a higher rate of success than those that did not.

At a national level, the technological incubator program may be seen as a tool for filtering and developing new ideas and for providing seed-capital. At a local level, the incubator may be viewed as a means of local economic development, since it can induce the creation and development of new firms in a specific location. A good example is the award-winning Austin Technology Incubator, which generated more than $1.4 billion and created some 3,000 jobs (Wiggins and Gibson 2003; NBIA 2002). Hannon and Chaplin (2003) reported, on the basis of a literature survey, that evidence from the USA and the UK strongly suggested that most incubator tenants came from the immediate locality and that most of the firms that graduated from an incubator stayed within the same locality.

Technological incubators are not limited to the industrialized world. They now can be found in such countries as China, Turkey, Brazil, South Korea, and Indonesia, where the economy has passed through structural changes. Among the developing countries, the largest technological incubator program exists in China and Brazil. In China, there were 131 technological incubators in operation in 2000, consisting of 7,693 companies and 128,776 employees. By 2000, a total of 836 companies had graduated from the program (Harwit 2002; Xu 2010). In Brazil, 107 high-tech-based incubators and 40 mixed (traditional and high technology) incubators were in operation in 2003 (Etzkowitz and Klofsten 2002, 2005).

The Israeli Technological Incubator Program was initiated by the Chief Scientist's Office (CSO) in the Ministry of Industry and Trade in the early 90's. The program was designed, among other things, to help with the absorption of new immigrants from the former Soviet Union and with assimilating the vast technological knowledge and experience that they had brought with them (Shefer and Frenkel 2003). Ten years after the establishment of this program, it was discovered that incubators were capable of enlarging their budget from non-governmental sources, mostly in the form of royalties, sale of shares, dividends, and strategic partnerships. These new sources of funding suggest that the government's large-scale support, which was needed at the initial stage, can gradually be withdrawn over time, once outside private funding sources are developed and attained. Still, technological incubators located in peripheral regions require more public support, and for a longer period of time, than do those located in the central regions of the country (Frenkel, et al. 2008)..

Following a universal trend in the developed world, Israel moved to privatize some of its publicly-run technological incubators. A recent study by Frenkel et al. (2008) examined this process. The main conclusion was that private incubators do not substitute fully for the role served by the Public Incubator Program. Israel's Public Technological Incubator Program was founded to meet national objectives, such as geographical distribution, which includes rural and peripheral areas, as well as special incentives for populations like minorities and new immigrants, for whom such activities would otherwise be out of reach. In other words, the basic justification for public incubators still stands: they promote not only an economic and a business interest but also a national and social interest, such as helping minorities' entrepreneurs and new immigrants, increasing exports, and developing peripheral areas.

Investment in Transportation Infrastructure and Economic Integration

New transportation infrastructure may clearly reduce travel times and, hence, the cost of doing business in a specific region; however, its larger effect on the regional economy is much more complicated to predict. Other relevant economic factors that can influence a region's overall economic performance must obtain in order to attract economic activities to the region. Without the necessary regional business climate, a new transportation link may actually hinder growth by making it more cost-effective to move resources, including both human and physical factors of production, from that region to more developed areas (Blum 1982; Rietveld 1994; Rietveld and Bruinsma 1998; Biehl 1991; Rietveld and Nijkamp 2000).

New transportation infrastructure is not, by itself, a driving force for regional development; rather, it can induce growth when used in conjunction with complementary private investment and other public initiatives and policies designed to raise the region's relative competitive advantage. As a factor of production, the transportation infrastructure has a value that can vary from sector to sector and industry to industry. Thus, in order to predict the outcome of a given investment in transport infrastructure, the industries in that region must be checked for sensitivity to transportation costs (Batten and Karlsson 1996; Banister and Berechman 2000). Investment in infrastructure may encourage development in underdeveloped regions, but its construction alone is not enough to bring about the desired economic changes. Other factors, such as the economic climate in the relevant region, the relative price of factors of production (labor, capital, and materials), and agglomeration economies, tend to determine the viability of a region more than does its basic infrastructure (Vickerman 1991; McCann and Shefer 2004).

Adequate transportation infrastructure is a necessary, but not a sufficient, factor for the economic development of a region. On the other hand, the undersupply of transport infrastructure can severely hinder growth. The impact of a new transportation link, such as the Cross-Israel Highway (a north-south toll road - Route 6, further inland and parallel to the main coastal road), on core vs. periphery development trends should be carefully studied. In Europe, for example, the Channel Tunnel has had great impact, both short- and long-term, on development patterns in

northwest Europe. However, as Vickerman points out, "the crucial question is whether such infrastructural investment can be the driving force in regional development, independently of other factors, or whether it has only an enabling role" (Vickerman 1987a, 1987b).

The case of the Channel Tunnel, as well as other examples of corridor development in Europe, show that a new link that improves access to major metropolitan areas may have the potential to either encourage or hinder the development of areas peripheral to those metropolitan centers. A further analysis of the users of these new links in their respective regional economic contexts is needed to better understand and predict net economic outcomes.

Transport and Regional Development

The outcomes of transportation investments on the regional economy manifest themselves through observable and measurable changes in the relative *accessibility* of the region affected (Bruinsma and Rietveld 1996). It has been shown empirically (Lynde and Richmond 1992) that public capital infrastructure plays an important complementary role in the productivity of the private sector. Other studies suggest that heavy infrastructure investment during the 1950's and 1960's may have been a key, previously underrated, factor in the strong economic performance of the United States in that period (Aschauer 1989, 1990).

Investment in transportation contributes to economic development if it significantly reduces transportation costs, thereby improving the net return on mobile resources in the area. Mobile resources can be attracted to the impact area of a new facility by providing this area with a better return than competing locations. If any economic activity is attracted from other sites within the defined region, then it cannot be viewed as new economic development. Therefore, how an affected area is defined can play a significant role in the corresponding net impact of a particular investment. Uncertainty about future demand for the transport facility makes an accurate benefit-cost analysis very difficult.

Rather than seeking economic efficiency, an alternative criterion for guiding investments in transport infrastructure is income redistribution. If the goal of government policy is to influence investment patterns in a particular area, then infrastructure investment may not be efficient in the traditional sense. It could be said that the government is aiming at "place prosperity" rather than "people prosperity". A government may wish to spread out economic development, with the

hope that improved accessibility will lead to the attraction of economic activity that could balance development across the country. However, trying to distribute development evenly may diminish countrywide growth, leaving residents possibly worse off than if there had been no such policy objective.

Good transportation facilities are not enough to ensure that economic development will occur. The area must be able to attract the necessary factors of production, labor, capital, and materials. Without these factors, even a good transportation facility will accomplish little. The safest way to generate economic development is to focus on cost savings for users and consumers.

Inefficient or insufficient investment in capital infrastructure precipitates urban decay (Shefer 1990). The efficiency of capital investment is greatest during a period of sustainable growth and development. When the level of public and private investment falls below that required for the satisfactory maintenance and replacement of infrastructure in a certain area, the competitive advantages of that area will gradually decline as its productivity erodes. The amounts as well as the mix of public and private investment, with a positive input required from both sectors, are crucial for sustainable development (Shefer 1990).

Economic Impact of Transport Investment

Using a simple model of a regional economy, it may be seen that transportation investments can affect the regional economy in two significant ways. First, the transport system affects the movement of goods and people within a region, largely shaping how various components of the regional economy relate to one another. Second, investments in the transportation system can affect economic ties between a region and the outside world. In this regard, it can either inject additional income into the regional economy (a stimulus) or cause income to leak out of the region (a dampening effect).

Firms may also experience changes brought about by transportation investments from the demand side, benefiting from increased flows of visitors into the region or from an increase in the overall population base of the area. However, the impacts on regional firms are not all necessarily positive. Firms from outside the region may compete more intensely within the

region because of lower distribution costs. Furthermore, increased sales by one firm may be offset by decreased sales by other firms in the region that did not directly benefit from the transportation improvements.

The impact on households is reflected mainly in the income and employment status of individuals. Households also are major consumers of products produced within the region. When regional firms change their output—and hence their derived demand for labor—the income and employment of individuals are affected. Transportation investments can also lower the costs of locally produced goods by increasing competition from firms that import into the region.

This traditional economic analysis ignores the benefits to individuals of reduced travel times to work and commercial centers, since it considers households merely as inputs into the production process of a region or as consumers of regionally produced products. It does not incorporate the time saved by individuals (as opposed to firms) directly into projected economic benefits of transportation improvements, neither does it look at the potential tax-base increases brought about by an influx of population stemming from the greater accessibility and reliability of travel means within the region. Moreover, the effect on local government of transportation improvements will be seen in revenues generated from changes in land value and land use in the vicinity of the improvements.

From the neoclassical economic perspective, it is logical to expect that reductions in production costs produced by investments in transportation will lead to increased market shares for firms whose accessibility is improved. These increased market shares will translate into increased production by the affected firms, leading to enhanced employment and income for the region. However, profits may leak from the region or may result in little net impact, especially when most firms sell to the same market or purchase inputs from a fully employed economy.

Export income accrues to a regional economy when goods are shipped out via the transportation system or when tourists visit a region and make non-resident purchases. At the same time, transportation impacts are quickly dampened when the amount of regional importation increases. The money that is then injected into the economy is spent and re-spent. In each cycle of spending, a certain amount leaves the region as payments for imports and other leakages, the net change in the local or regional economy being called the multiplier effect.

The influence of improvements in the transportation system on the regional economy involves the impact of transportation infrastructure on the operation of the economy. Users, both the providers of transportation services (truck lines, etc.) and users of transportation services (firms, households), are the initial benefactors. The beneficial aspects are reflected in either lower production costs or increased demand for outputs. Ultimately, user impacts are transferred to non-users. Cost saving by firms may be capitalized into new investment in the region, resulting in direct and indirect impacts on output, employment, and income in the economy. Alternatively, the cost saving may be passed on directly to consumers as lower prices or higher wages , leading to higher local consumption. Non-users who own land may also benefit from a rise in land values. These non-user benefits go together with benefits to the revenue streams of local governments.

Conclusions

The center-periphery dilemma has long occupied researchers and policy-makers. Uneven distribution of resources across space, imperfect mobility, indivisibility of production factors, and the need to economize on scarce resources all induce the concentration of economic activities at discreet and selected points. Consequently, variations in the population's economic and social well-being exist among the various regions. In order to reduce regional disparities, government agencies devise policies and initiate programs whose main objectives are to increase population, employment level, per-capita income, and in general the rate of welfare of peripheral regions. Different regions offer different opportunities for investment and specialization. It is therefore necessary first to identify the endowments and the comparative advantages of the region and, only then, to devise policies that will advance the declared objectives.

In the past few decades, high-tech industries have undergone tremendous expansion world-wide, stimulating a new wave of industrial growth. Policy makers view high- technology industries as a crucial component of regional economic growth and, increasingly, as an important part of a region’s export-base. Attempts to attract high-tech industry to peripheral regions that appear to be at a disadvantage because of their distance from the urban center may encounter some problems. Yet, many policy makers maintain optimism that high-tech industrial development is possible anywhere because of expanding communication technology, which continually

increases the freedom of footloose (Shefer and Bar-El 1993). The valued image of the high-tech industry derives mainly from the well- paid prestigious jobs in R&D. Industries, however, consist of many activities. Mass production, which mostly demands semi-skilled and unskilled manual labor, is a more footloose activity than is R&D, and hence it is more likely to locate in, or move to, peripheral areas. R&D activities, on the other hand, require agglomeration economies and clustering of economic activities for formal and informal networking and knowledge spillovers. R&D activity, which spurs innovation by its very nature, demands a local milieu, which can be found primarily in central areas where a large pool of human capital, social capital, and creative capital is offered (Shefer and Frenkel 1998; Florida 2002).

Krugman's NEG model (1991a, l991b), as well as other scholars such as Venables (1998) and Fujita et al. (1999); Fujita et al. (2000), showed how trade theory, comparative advantages, trade liberalization, and globalization, induced greater economic concentration. Because of the inherent advantages of centers over peripheries, disparities among regions, like inequalities in per-capita income, do not vanish over time. On the contrary, the centripetal forces exacerbate inequalities across space, particularly within countries.

Investment in transport infrastructures that improve and expand roads, railways, and other transport networks could improve the competitive advantage of peripheral regions. Investments in transport infrastructure improve accessibility, regional competitiveness, and the field of opportunities for people, thus contributing to the economic integration of outlying areas. However, it is essential to identify the missing, or weak, links in the transport networks so as to insure the effectiveness of an investment program that will advance regional growth and reduce inter-regional disparities. There is no universal policy that can be applied to yield successful results. The most appropriate policies are regional specific – given the special circumstances associated with a region's location, endowments, comparative advantages, and disadvantages relative to other regions.

In addition to short-term public policy programs that include investment in institutions building, infrastructures, and incentive programs for outlying areas, it is important to initiate long-term education and training programs that will build up and enhance human capital, improve the skill

of local labor and, subsequently, attract and develop both entrepreneurs and capital to these peripheral regions.

Competitive markets motivated by private investors, could lead to a high concentration of economic activities in central regions. However, this 'private equilibrium' may deviate from the 'social optimum' which takes into account both costs born and benefits enjoyed by the entire society (Dohe 1998; Charlot et al. 2006). In such instances of market failure government intervention is necessary. Such interventions could imply investment in transport infrastructure and/or labor force training (in order to upgrade the labor force). These steps could reduce the gap between private and social optimums and enhance the competitiveness of peripheral regions (Malul and Bar-El 2009). It is therefore of paramount importance to thoroughly evaluate the cost-effectiveness of alternative incentive programs that are intended to reduce inequalities among regions. Furthermore, there are additional societal objectives such as equity and justice that should be accommodated, sometimes even at the expanse of pure economic efficiency.

References

Acs, J.Z. and Armington, C. "Employment Growth and Entrepreneurial Cities." *Regional Studies* 38, no. 8 (2004): 911-927.

Acs, J.Z. and Story, J.D. "Entrepreneurship and Economic Development." *Regional Studies* 38, no. 8 (2004): 871-877.

Aghion, P. and Howitt, P. *Endogenous Growth Theory*. Cambridge MA: MIT Press, 1988.

Aschauer, D.A. "Is Public Expenditure Productive?" *Journal of Monetary Economics* 23 (1989): 177-200.

Aschauer, D.A. "Why Is Infrastructure Important?" In *Is There a Shortfall in Public Capital Investment?*, by A. (ed.) Munnell. Boston, MA: Federal Reserve Bank of Boston, 1990.

Audretsch, D. "Agglomeration and the Location of Innovative Activity." *Oxford Review of Economic Policy* 14 (1998): 18-29.

Audretsch, D. and Feldman, M.P. "R&D Spillovers and the Geography of Innovation and Production." *American Economic Review* 86 (1996): 630-640.

Audretsch, D. and Keilbach, M. "Entrepreneurship, Capital, and Economic Performance." *Regional Studies* 38, no. 8 (2004): 949-959.

Audretsch, D. and Keilbach, M. "Entrepreneurship Capital and Regional Growth." *Annals of Regional Science* 39, no. 3 (2005): 457 – 469.

Banister, D. and Berechman, J. *Transport Investment and Economic Development.* London, UK: UCL Press, 2000.

Barro, R.J. and Sala-i-Matin, X. "Convergence." *Journal of Political Economy* 100, no. 2 (1992): 223-251.

Barro, R.J. and Sala-i-Matin, X. "Convergence across States and Regions." *Brookings Papers on Economic Activity* 22, no. 1 (1991): 107-182.

Barro, R.J. and Sala-i-Matin, X. *Economic Growth.* New York, USA: McGraw Hill, 1995.

Batten, F.D. and Karlsson, C.eds. *Infrastructure and the Complexity of Economic Development, .* Berlin, Germany: Springer, 1996.

Biehl, D. *The Role of Infrastructure in Regional Development.* Vol. 1, in *Infrastructure and Regional Development*, by W. R. (ed.) Vickerman, 9-35. London, UK: Pion, 1991.

Blum, U. "Effects of Transportation Investment on Regional Growth: A Theoretical and Empirical Investigation." *Papers and Proceedings of the Regional Science Association* 49, no. 2 (1982): 169-184.

Bruinsma, F. and Rietveld, P. *The Accessibility of European Cities: Theoretical Framework and Comparison of Approaches.* Amsterdam: Dept. of Economics, The Free University, 1996.

Camagni, P.R. "The Concept of Innovative Milieu and its Relevance for Public Policies in European Lagging Regions" *Papers in Regional Science* 74, (1995): 317-340.

Charlot, S., Gaigné, C., Robert-Nicoud, F. and Thisse, J.-F. "Agglomeration and Welfare: The core–Periphery Model in the Light of Bentham, Kaldor, and Rawls." *Journal of Public Economics* 90, (2006): 325–347.

Davelaar, J.E. and Nijkamp, P. "The Role of the Metropolitan Milieu as an Incubation Centre for Technological Innovation: A Dutch Case Study." *Urban Studies* 26 (1989): 517-525.

Davelaar, J.E. *Regional Economic Analysis of Innovation and Incubation.* Aldershort, UK: Avebury, 1991.

Dohse, D. "Infrastructure Provision and Locational Efficiency in a Federation: a Numerical Approach." *Papers in Regional Science* 77, no. 3 (1998): 241–263.

Ellison, G. and Glaeser, E.L. "Geographic Concentration in U.S. Manufacturing Industries: A Dartboard Approach." *Journal of Political Economy* 105, no. 5 (1997): 889-927.

Ellison, G. and Glaeser, E.L. "The Geographic Concentration of Industries: Does Natural Advantages Explain Agglomeration?" *The American Economic Review* 89, no. 5 (1999): 311-316.

Etzkowitz, H. "Incubation of Incubators: Innovation as a Triple Helix of University–Industry–Government Networks." *Science and Public Policy* 29, no. 2 (2002): 115–128.

Etzkowitz, H., and Klofsten, M. "The Innovating Region: Toward a Theory of Knboledge-based Regional Development." *R&D Management* 35 (2005): 243-255.

Fan, S., Kanbur, R., and Zhang, X. *Regional Inequality in China: Trends, Explanation, s and Policy Responses.* London, UK: Routledge, 2009.

Florida, R. *The Rise of the Creative Class,* New York, NY: Basic Books, (2002).

Frenkel, A. "Can Regional Policy Affect Firms' Innovation Potential in Lagging Regions?" *The Annals of Regional Science* 34, no. 3 (2000): 315-341.

Frenkel, A., Shefer, D. and Miller, M. "Public vs. Private Technological Incubator Programs: Privatizing the Technological Incubators in Israel." *European Regional Studies* 16, no. 2 (2008): 189-210.

Fujita, M. and Hu, D. "Regional Disparity in China 1985-1994: The Effects of Globalization and Economic Liberalization." *Annals of Regional Science* 35 (2001): 3-37.

Fujita, M. and Krugman, P. "The New Economic Geography: Past, Present, and the Future." *Papers in Regional Science* 83 (2004): 139-164.

Fujita, M. and Mori, T. "Frontiers of the New Economic Geography." *Papers in Regional Science* 84, no. 3 (2005): 377-405.

Fujita, M. and Thisse, J.-F. "Economics of Agglomeration." *Journal of the Japanese and International Economies* 10 (1996): 339-378.

Fujita, M. and Thisse, J.-F. *Economics of Agglomeration, Cities, Industrial Location, and Regional Growth.* Cambridge, UK: Cambridge University Press, 2002.

Fujita, M., Krugman, P., and Venables, A. *The Spatial Economy: Cities, Regions, and International Trade.* Cambridge, MA: MIT Press., 2001.

Fujita, M., Krugman, P. and Mori, T. "On the Evolution of Hierarchical Urban Systems." *European Economic Review* 43 (1999): 209 – 251.

Geppert, K. adn Stephan, A. "Regional Disparities in the European Union: Convergence and Agglomeration." *Papers in Regional Science* 87, no. 2 (2008): 93-217.

Glaeser, E.L. *Cities, Agglomeration, and Spatial Equilibrium.* Oxford, UK: Oxford University Press, 2008.

Glaeser, E.L., Kallal, H.D. and Scheinkman, J.A. "Growth of Cities." *Journal of Political Economy* 100, no. 6 (1992): 1126-1152.

Graham, D.J. "An Empirical Analytical Framework for Agglomeration Economies." *Annals of Regional Science* 42 (2008): 267-289.

Grossman, G.M. and Helpman, E. "Endogenous Innovation in the Theory of Growth." *Journal of Economic Perspectives* 8, no. 1 (1994): 23-44.

Grossman, G.M. and Helpman, E. *Innovation and Growth in the Global Economy.* Cambridge, MA: MIT Press, 1991.

Hannon, D. P., and Chaplin, P. "Are Incubators Good for Business? Understanding Incubation Practice—The Challenges for Policy." *Environment and Planning C: Government and Policy* 21 (2003): 861-881.

Harwit, E. "High–technology Incubators: Fuel for China's New Entrepreneurship?" The China Business Review 29, no. 4 (2002): 26-29.

Huriot, J.-M. and Thisse, J.-F. eds. *Economics of Cities: Theoretical Perspectives.* Cambridge, MA: Cambridge University Press, 2000.

Jacobs, J. *The Economy of Cities.* New York, USA: Random House, 1969.

Kanbur, R. and Venables, A. eds. *Spatial Inequality and Development.* Oxford, UK: Oxford University Press, 2005.

Kleinknecht, A. and Poot, T.P. "Do Regions Matter for R&D?" *Regional Studies* 26, no. 3 (1992): 221-232.

Krugman, R.P. "A Model of Innovation, Technology Transfer, and Trade." *Journal of Political Economy* 83 (1979): 253-266.

Krugman, R.P. *Development, Geography, and Economic Theory.* Cambridge, MA: MIT Press, 1995.

Krugman, R.P. "Increasing Returns and Economic Geography." *Journal of Political Economy* 91 (1991a): 483-499.

Krugman, R.P. *Geography and Trade.* Cambridge, MA: MIT Press, 1991b.

Krugman, R.P. "What's New about the New Economic Geography?" *Oxford Review of Economic Policy* 14, no. 2 (1998): 7-17.

Kuznets, S. "Economic Growth and Income Inequality." *American Economic Review* 45 (1955): 1-28.

Li, S. and Xu, Z. *The Trend of Income Disparity in the People's Republic of China.* Discussion Paper No. 85, ADB Institute, 2008.

Losch, A. *The Economics of Location.* New Haven, CT: Yale University Press, 1954.

Lucas, R.E. Jr. "On the Mechanics of Economic Development." *Journal of Monetary Economics* 22, no. 1 (1988): 3-42.

Lynde, C. and Richmond, J. "The Role of Public Capital in Production." *The Review of Economics and Statistics* 74, no. 1 (1992): 37-44.

Malmberg, A. and Power, D. "(How) Do (Firms in) Clusters Create Knowledge?" *Industry and Innovation* 12, no. 4 (2005): 409-431.

Malul, M., and Bar-El, R. “The Gap between Free Market and Social Optimum in the Location Decision of Economic Activity.” *Urban Studies* 46, no. 10 (1999): 2045-2059.

McCann, P. and Shefer, D. "Location, Agglomeration, and Infrastructure." In *Fifty Years of Regional Science*, by J. G. M. and Plane, D. A. (eds.) Florax, 177-196. Berlin, Germany: Springer, 2004.

Mukkala, K. “Agglomeration Economies in the Finnish Manufacturing Sector." *Applied Economics* 36 (2004): 2419-2427.

NBIA The 2002 State at the Business Incubation Industry - Business Incubation Industry Survey, National Business Incubation Association, USA, 2002.

Nakamura, R. "Agglomeration Economies in Urban Manufacturing Industries: A Case of Japanese Cities." *Journal of Urban Economics* 17 (1985): 108-124.

Nijkamp, P. and Poot, J. "Endogenous Technological Change, Long Run Growth, and Spatial interdependence: A Survey." In *Innovative Behaviour in Space and Time*, by C. B., Lombardo, S. and Nijkamp, P. (eds.) Bertuglia. Berlin, Germany: Springer, 1997.

Porter, M. "Clusters and the New Economics of Competition." *Harvard Business Review* 76, no. 6 (1998): 77-90.

Porter, M. *The Competitive Advantage of Nations.* New York, NY: Free Press, 1990.

Rietveld, P. and Bruinsma, F. *Is Transport Infrastructure Effective?* Berlin, Germany: Springer, 1998.

Rietveld, P. and Bruinsma, F. "The Impact of Road Infrastructure on Productivity, Employment, and Regional Inequalities in Europe." In *Regional Development in an Age of Structural Economic Change*, by P. and Shefer, D. (eds.) Rietveld, 135-149. Aldershot, UK: Ashgate, 1999.

Rietveld, P. and Nijkamp, P. "Transport Infrastructure and Regional Development." In *Analytical Transport Economics*, by J. and Heertje, A. (eds.) Polak, 208-232. Cheltenham, UK: Edward Edgar, 2000.

Rietveld, P. "Spatial Economic Impacts of Transport Infrastructure Supply." *Transportation Research A* 28, no. 4 (1994): 329-341.

Romer, P.M. "Endogenous Technological Change." *Journal of Political Economy* 98, no. 2 (1990): S71-S102.

Romer, P.M. "Increasing Returns and Long-Run Growth." *Journal of Political Economy* 94, no. 5 (1986): 10002-1037.

Romer, P.M. "The Origins of Endogenous Growth." *Journal of Economic Perspective* 8, no. 1 (1994): 3-22.

Schumpeter, J.A. *The Theory of Economic Development.* Cambridge, MA: Harvard University Press, 1934.

Shefer, D. "Localization Economies in SMSA's: A Production Function Analysis." *Journal of Regional Science* 13, no. 1 (1973): 55-64.

Shefer, D. "A Mathematical Model for the Location of Industry in Developing Areas." *Environment and Planning A* 7 (1975): 251-262.

Shefer, D. and Bar-El, E. "High Technology Industries as a Vehicle for Regional Growth in Israel's Peripheral Regions." *Environment & Planning C* 11 (1993): 245-261.

Shefer, D. "Innovation, Technical Change and Metropolitan Development: An Israeli Example." In *Sustainability of Urban Systems: A Cross National Evolutionary Analysis of Urban Innovation*, by P. Nijkamp, 167-181. Aldershot, UK: Avebury, 1990.

Shefer, D. and Frenkel, A. "Agglomeration and Industrial Innovation in Space." In *Regional Development in an Age of Structural Economic Change*, by P. and Shefer, D. (eds.) Rietveld, 53-71. Aldershot, UK: Ashgate, 1999.

Shefer, D. and Frenkel, A. *Evaluation of the Israeli Incubators Program and Projects within Them.* Haifa, Israel: The S. Neaman Institute for Advanced Science and Technology, Technion – Israel Institute of Technology, 2003.

Shefer, D. and Frenkel, A. "Local Milieu and Innovations: Some Empirical Results." *Annals of Regional Science* 32, no. 1 (1998): 185-200.

Shefer, D. and Frenkel, A. "R&D, Firm Size, and Innovation: An Empirical Analysis." *Technovation* 25 (2005): 25-32.

Shefer, D., Frenkel, A., and Roper, S. "Innovation and Plant Characteristics of High Tech Firms in Israel and Ireland." In *Public Investment and Regional Economic Development*, by D., R. McQuaid, R., McCann, P. and Shefer, D. (eds.) Felsenstein, 109-129. London, UK: Edward Elgar, 2001.

Sherrod, L. *Incubating Your Business. Essence*, http://www.findarticles.com 1999.

Solow, R.M. "A Contribution to the Theory and Economic Growth." *Quarterly Journal of Economics* 70 (1956): 65-94.

Solow, R.M. *Growth Theory: An Exposition.* Oxford, UK: Oxford University Press, 1970.

Venables, A. J. "The Assessment: Trade and Location." *Oxford Review of Economic Policy* 14, no. (1998): 1-6.

Vickerman, R. W. "The Channel Tunnel: Consequences for Regional Growth and Development." *Regional Studies* 21, no. 3 (1987a): 187-197.

Vickerman, R. W. "The Channel Tunnel and Regional Development: A Critique of an Infra-Structure-Led Growth Project" *Project Appraisal* 2, no. 1 (1987b): 31-40.

Vickerman, R. W. (ed.) (1991) *Infrastructure and Regional Development*, London: Pion.

Wiggins, J. and Gibson, V. D. "Overview of US Incubators and the Case of the Austin Technological Incubator." *International Journal of Entrepreneurship and Innovation Management* 3, no. ½ (2003): 56-66.

Xu, L. “Business Incubation in China: Effectiveness and Perceived Contributions to Tenant Enterprises.” *Management Research Review* 33, no. 1 (2010): 90-99.

Table 1: Forces Affecting Geographical Concentration and Dispersion

Centripetal Forces	**Centrifugal Forces**
• Market-size effects (linkages)	• Immobile factors
• Thick labor markets	• Land rents / commuting
• Pure external economies (Knowledge spillovers)	• Pure external diseconomy (Congestion)

Krugman, 1998, 8.

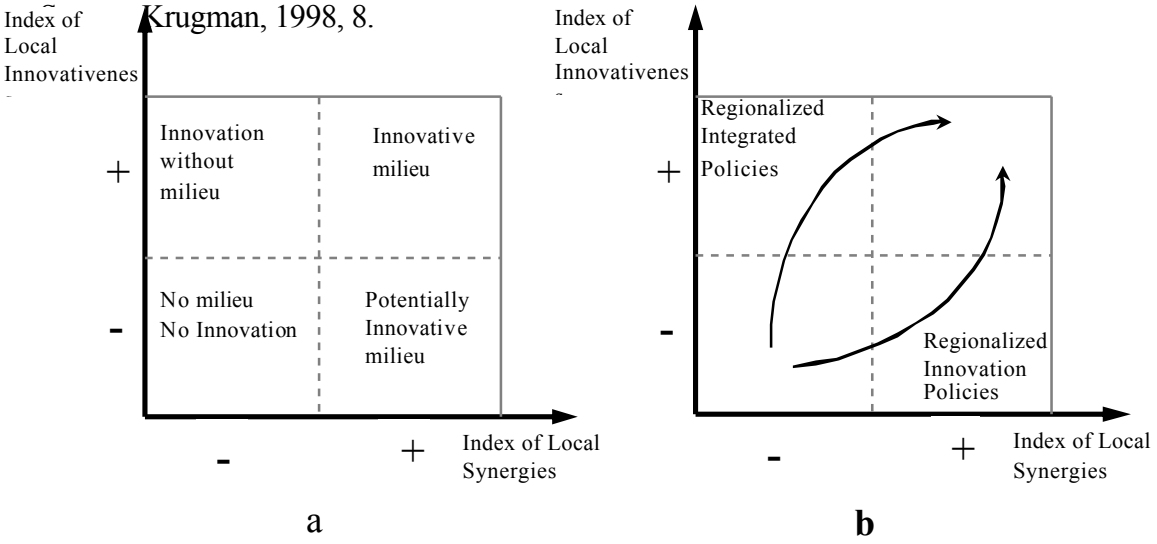

Figure 1: Sub-areas of an Innovative Milieu Source: Shefer and Frenkel 1998, p. 188

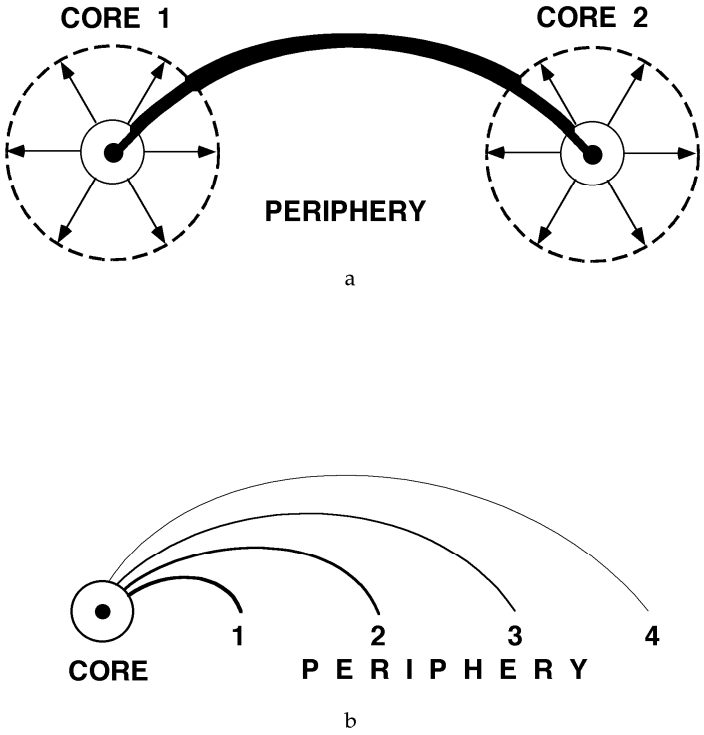

Figure 2: Spatial Diffusion of Innovation(Source: Shefer and Frenkel 1998), p. 190.