

Why do old industrial regions decline? An exploration of potential adjustment strategies

Ron Boschma & Jan Lambooy

University of Utrecht
Faculty of Spatial Sciences
Department of International Economics and Economic Geography
P.O. Box 80.115
NL-3508 TC Utrecht
e-mail: r.boschma@geog.uu.nl / j.lambooy@geog.uu.nl

first draft paper to be presented at the European RSA-congress
Dublin, Ireland, august 23-27, 1999

1. Introduction

In the 1970s, the decline of many old industrial agglomerations in Western countries could be observed, which were confronted with severe competition from low labour-cost countries like Taiwan and South Korea (Norton, 1979; Martin & Rowthorn, 1986; Rodwin & Sazanami, 1989; Hirst & Zeitlin, 1989; Chisholm, 1990). These old industrial regions had often showed long periods of economic growth, before they declined or even collapsed. The principal source of their growth was the specialisation on products which were (1) basic inputs to other sectors (steel, trains and rail infrastructure, chemical products, electronics), or (2) mass consumption goods (textiles, cars). These products had a strong position on the market, but only for a certain - sometimes quite long - period. Their physical and institutional structure had been developed in order to sustain these basic sectors. Educational institutions, railway connections, ports and housing, all had received a strong impact from this dominant production structure. Their position became vulnerable due to developments like technological change or the increasing opportunities to shift production to other regions or countries with cheap labour. Within a decade or so, many urban agglomerations lost many jobs in mature industries like textiles, steel making, coal mining and shipbuilding.

This was something quite unexpected, because, traditionally, regional economists

focus attention on the positive impacts of agglomeration economies on regional development. In fact, it played a crucial role in the explanation of how spatial concentration comes about (Lambooy, 1986). Economic activities were supposed to benefit from all kinds of positive externalities in those large agglomerations. Marshall already acknowledged that the bigger these agglomerations, the more firms may benefit from a wide range of business services, a greater variety of potential suppliers and more specialized buyers, and a larger and more diversified pool of (skilled and low-cost) labour. Moreover, economic activities could take advantage from local externalities that arise from information or technological spillovers in large agglomerations. There is more opportunity for interaction and knowledge diffusion (and thus for learning), which not only facilitates the acquisition of relevant information but also minimizes the costs of obtaining it (Pred, 1966).

So, how could this economic collapse have happened in leading industrial regions? This process of de-industrialization was not supposed to take place in regions that were well-endowed with agglomeration economies. Or had theory overestimated the importance of agglomeration economies, or are agglomeration advantages not necessarily everlasting? Since the 1980s, many approaches have made an attempt to explain of why old industrial regions might enter in a stage of economic decline. Some stated that industrial decline in agglomerations should be considered a natural phenomenon, which is comparable to the evolution of product life-cycle (Norton, 1979). Others have provided an explanation for why old industrial regions are confronted with problems of adjustment (Krugman 1993; Grabher, 1993). However, this literature may have overstressed the importance of diseconomies of agglomerations in those areas. Have we not been too pessimistic about the chances of old industrial regions to recover their local economies? Maybe we have to consider that agglomerations do not decline as such; they possibly contain declining sectors, but because of the strength of other advantages they always contain the seeds for revival. But what are the basic factors for such a recovery? Is urban size a necessary and sufficient condition to attract new growth? Or, are the locational whims of technological change unpredictable and probably preferring new urban areas and not the old ones? Are old cities capable to renew and develop new economic specialisations, while other sectors keep declining? What for example about the revival of the region as a source of economic growth and the renewed role of agglomeration economies for regional development stressed in the most recent literature (Storper, 1997; Morgan, 1997)? In what way may this be applicable to old industrial regions? Do all old agglomerations follow a general development rule, or are some agglomerations more 'vital' than others that they more easily adjust to new challenges? Thus, is there a need to differentiate between various types of old industrial regions, and if so, how?

These issues are addressed in this paper. We concentrate on analysing the problems of adjustment old industrial regions may be (or have been) confronted with. More in particular, we attempt to make an (though not exhaustive) analysis of the potential role of

agglomeration (dis)economies in generating new variety in old agglomerations. This type of region offers an unique case, because both agglomeration and dis-agglomeration economies are expected to play a role in this respect.

In Section 2, we devote attention to the various theoretical frameworks (from neo-classical economies to evolutionary theory) that, each in a different way, have provided an explanatory framework for the industrial decline of old agglomerations. We make a distinction here between traditional and more modern approaches. In Section 3, we focus more on the importance of the environment for the development of new variety. Here, we present two theoretical views with respect to adjustment strategy's that shed light on the particular interplay between types of agglomeration economies, types of innovations and types of restructuring process. The first view regards the environment as a 'selection-environment', which generates mainly 'path-dependent innovations' rooted in 'localisation economies', that set in motion a process of 'adaptive restructuring'. The second view regards the environment as the 'locus of opportunities', which is further associated with 'pathless innovations', 'urbanisation economies' and 'deep restructuring'. In Section 4, we devote attention to the possible policy actions that aim to deal with the process of structural adjustment in old industrial areas. We discuss the policy implications of several approaches described in Section 2. Section 5 draws the conclusions.

2. Why do old industrial regions decline?

Without pretending to be exhaustive, we focus attention on the various theoretical approaches that have provided an explanatory framework for the industrial decline of old agglomerations. Broadly speaking, these approaches tend to share a rather pessimistic view on the future well-being of old industrial regions. In fact, they either refer to their industrial decline as a natural and inevitable process, or they emphasise the huge problems of adjustment old industrial regions are often faced with. Nevertheless, these approaches differ considerably when pointing out the reasons behind this (Lambooy, 1998). Here, we make a rough distinction between traditional and modern approaches in order to clarify this issue.

In Section 2.1, we group together approaches that put emphasis on the decline of the mono-structure of old industrial regions, which trigger a cumulative decline in the region's output that further damages the local economy through negative feedback mechanisms. By doing so, they treat the notion of '(dis-) agglomeration economies' in quite a traditional way. As they stress the impact of external shocks, they do not give much attention to the problem of how the decline of the respective sector may be related to the particular characteristics of the regions involved. As set out in Section 2.2, this stands in contrast to approaches that adopt theoretical insights from institutional and evolutionary economics. In fact, they make use of notions like 'path dependency' and

'institutional lock-in' in order to explain the problems of adjustment old agglomerations are often confronted with. By doing so, they apply a more modern approach of '(dis-) agglomeration economies' when they explain the (poor) ability of old agglomerations to learn and innovate in terms of underlying mechanisms that are of a socio-cultural rather than of a economic nature (Malmberg & Maskell, 1997).

2.1 Specialisation, cumulative causation and disagglomeration economies

The economic decline of old industrial regions has often been linked to their high rate of specialisation in 'mature' industries with a low growth-potential such as textiles, steel making, shipbuilding, among others. The export base theory of growth has explained the decline of old industrial regions in terms of a decline in export demand in those sectors that could be conceived as the engines of regional growth. A recent example here is the military aerospace cluster of South California, which became victim of huge cuts in defence spending as a result of the end of the Cold War (Scott, 1993). Models of cumulative causation (Myrdal, 1957) have shed light on the adverse consequences in old agglomerations. They argue that, once a process of regional decline has set in, it becomes self-reinforcing through all kinds of multiplier and accelerator mechanisms. However, this whole argument, which relies heavily on exogenous causes, has been criticised because, among other reasons, it neglects the importance of local indigenous factors for regional growth. Steiner (1985) summarised it as follows: "the negative structural concentration may be the starting point for an analysis, and it can influence further factors which are important for growth, but it cannot be regarded as *the* reason for slow growth" (p. 389). Nevertheless, it makes us aware of the fact how success or failure of agglomerations may depend on circumstances that lie outside the scope of the regions themselves. In this respect, the whole debate about how global competition affects the welfare of regions is highly relevant (Amin & Thrift, 1994).

While exploring the implications of the Economic and Monetary Union for Europe, Krugman (1993) draws on the example of the old industrial region of New England, which in the late 1980s was confronted with a large external, idiosyncratic shock due to a fall of defence spending, among other reasons. In essence, Krugman claims that increased regional specialisation (as in the United States, due to the greater integration of the US market) makes regions more vulnerable to external random shocks (such as shifts in consumer taste, or new technology) and thus to region-specific recessions. Till so far, this reasoning is familiar to the remarks made earlier about the importance of the structural component. However, he then explains that it is almost impossible for old industrial areas like the New England region to recover from such region-specific recessions, leading to permanently lower levels of employment. Krugman associates this persistent, durable nature of region-specific recessions with the presence of high factor mobility. This is because labour mobility (out-migration of labour) prevents the wage flexibility

mechanism (through lower relative wages) to restore the competitive position of the unfortunate region in a self-correcting way. In his own words, "... in states that suffer adverse shocks there is no discernible tendency for states to recover lost jobs. Instead, workers simply move out until unemployment rate falls to its natural level" (p. 254). This conclusion is contrary to conventional neo-classical belief that, in case of low flexibility of labour, sectoral shocks are likely to trigger high unemployment because the equilibrating forces of labour mobility and wage flexibility are largely missing. This last way of thinking is, by the way, quite predominant in Europe, which is illustrated by the fact that the current poor economic performance and persistent high unemployment rate in Germany is often attributed to the inflexibility of its labour market.

The product life-cycle approach (Vernon, 1966) has made use of the role of innovations to interpret the economic backwardness of old industrial agglomerations. In the late 1970s, authors like Norton (1979) and Rees (1979) thought that the rise and decline of industrial regions could automatically be associated with industry life cycles analogous to the Kondratieff long waves. According to Rees (1979), the Manufacturing Belt of the United States had lost its function as technological seedbed during the post-war period, because of the outflow of large production plants into the peripheral regions of the so-called Sunbelt. It is quite plausible indeed to state that, at later stages of the development of new industries (when the products and technology mature and standardise), their changing input requirements necessitate a relocation to areas where specific cost-advantages (that is, low labour costs) are available, such as the Sunbelt states. There is, however, no reason to believe that this relocation process in itself would harm or erode the dynamic capacity of leading industrial regions (Van Duyn & Lambooy, 1982; Lambooy, 1986). On the contrary, it may even reinforce and reproduce the leading positions of old agglomerations. This is because it enables their leading firms to tap off the advantages of both the home region (where its most dynamic parts, such as R&D facilities, take advantage of localised technological learning) and the host region (where its plants benefit from a favourable cost structure) (Storper, 1992). Therefore, this explanation leaves unanswered the question why old agglomerations have often lost their ability to develop new products and to regenerate their local economies.

There are authors who have applied the production life-cycle approach to address this issue (Markusen, 1985; Steiner, 1985). They stress the fact that the nature of 'agglomeration economies' may be changing through the various stages of the life-cycle. This basic idea has been heavily debated in the literature that was preoccupied with the optimal size of a city (Richardson, 1973). After a certain size of a city, dis-agglomeration economies (or diminishing returns) are believed to come into being, caused by congestion effects, high labour and land costs. Steiner (1985) claimed that, as new products mature, 'localisation economies' gain importance at the expense of 'urbanisation economies'. He suggested that "old industrial regions are regions with externalities of similarity (in contrast to externalities of diversity in agglomerations) in which the dominance of a few

large plants creates intra-regional barriers for new firms” (p. 395). Markusen (1985) explained the gradual loss of agglomeration economies in terms of the tendency of markets to become oligopolistic and vertically integrated in the course of time. This reduces the opportunities for new firms to benefit from external agglomeration economies. In fact, local resource markets may become dominated to such an extent by a few large enterprises that new industries have nearly no access to such regional resources. For example, they may be detrimental to the flexibility of the local labour market and the availability of supporting local suppliers, on which new firms may depend so much in their early stage of development. Moreover, it may harm the entrepreneurial spirit in the course of time, because of the evolution of a working culture that shows risk-averse behaviour and is not used to take initiatives. This may result in few spin-offs from the large companies. This process of spin-off is further discouraged because these large firms largely operate in mature markets (such as steel making) with a low growth-potential.

In other words, this latter approach has linked the lack of endogenous potential of old industrial areas to new insights in the field of industrial organisation. The poor innovative capacity of old agglomerations is largely explained in terms of the negative impacts of large, vertically-integrated corporations on their local environment. Nevertheless, this idea reflects a kind of determinism not only because of the seemingly inevitable character of this development, but also because it does not allow to differentiate between types of old agglomerations. Moreover, it provides only a partial explanation for the decline of old industrial agglomerations, because it does not incorporate modern insights in institutional and evolutionary economics. We turn attention to this subject now.

2.2 Sclerotic milieus, institutional lock-in, path dependency and problems of adjustment

Network theory and institutional thinking have extended this idea to the political-economic realm. Here, we make use of modern theoretical notions like ‘path dependency’ and ‘institutional lock-in’ in order to clarify the problems of adjustment old agglomerations are often confronted with. By doing so, we apply a modern approach of how to explain ‘(dis-) agglomeration economies’ (Amin & Thrift, 1994; Malmberg & Maskell, 1997). This is because the poor ability of old agglomerations to learn and innovate is explained in terms of socio-cultural factors (such as sclerotic milieus and institutional lock-in) rather than purely economic factors (such as over-specialisation and vertical integration of the division of labour). In essence, they all stress, in one-way-or-another, the interaction patterns between economic, political and institutional actors that may affect their ability to react to new changing circumstances. For reasons of simplicity, we divide this section in three parts in order to disentangle this socio-cultural dimension. First, we devote attention to the approaches that have emphasised the network or

organisational dimension, which, in a way, builds on the remarks made at the end of the previous section (Saxenian, 1994). Secondly, we refer to the approaches that have focussed on the institutional dimension (Olson, 1982; Grabher, 1993). Thirdly, we build on evolutionary ideas, which are here related to notions like 'path dependency' and 'collective learning' (Camagni, 1991; Boschma & Lambooy, 1999).

First, we briefly discuss the work of some authors (Herrigel, 1990; Saxenian, 1994) that have built on new insights from the industrial organisation literature in order to come to grips with the underlying mechanisms behind the industrial decline of old agglomerations. By doing so, they refer to a particular type of network constellation in those areas which affects their ability to adjust. Herrigel (1990) has proposed the notion of 'autarkic-firm-based industrial order' in order to describe the situation in the Ruhr area. This idea is much associated with the overall predominance of the large companies set out in the previous section, which has affected the regional labour market, the local infrastructure and the institutions. Herrigel (1990) also points out that the large companies have established their own "top-down network" which is a "hierarchical organisation structure that inhibits the diffusion of knowledge and the innovativeness of firms outside the complex. It causes small firms to supply large firms by blueprint production. This makes inhouse marketing and extensive R&D unnecessary. Hence, these suppliers are restrained from shifting to more promising markets" (Hassink, 1997, p. 7).

Saxenian (1994) makes use of the notion of 'industrial system' in order to clarify the poor recovery performance of Route 128 (in contrast to the experience of Silicon Valley). She relies on a rather broad definition of industrial system, which consists of corporate organisation, industrial structure (intensity and nature of inter-firm linkages), culture and local institutions. In Route 128, she has found a 'independent firm-based industrial system' (in contrast to a 'regional network-based industrial system'), which is dominated by a small number of integrated corporations. "Hierarchical structures limit the ability to adapt quickly as conditions change and risk-avoidance becomes self-reinforcing as there are only a handful of successful role models to inspire potential entrepreneurs" (Hassink, 1997, p. 8).

This approach makes an attempt to describe the particular structure of industrial organisation in a region, and how this may affect its economic well-being. By doing so, it accounts for the fact that networks or milieus may have adverse impacts on the economic performance of regions. Saxenian (1994) has shed light on this subject when she distinguished between the two types of industrial systems described above. This may also have something to do with the remark made by Porter (1990) that too much co-operation and co-ordination may seriously harm dynamic behaviour as a result of a decrease in competition and domestic rivalry. Others have pointed out that the competitiveness of regions not only depends on the internal structure of networks, but also on the degree of openness of networks (Camagni, 1991). However, there is still much work to be done on this subject. Hassink (1998) already stated that "the line between successful and open

regions and old industrial, insular, inward-looking industrial districts can be very thin” (p. 9). This kind of approach also suffers from the fact that it directly links types of network to economic success or failure of agglomerations, which may also depend, as described in Section 2.1, on external factors (Harrison, 1992; Bianchi, 1994). Moreover, the future well-being of old agglomerations is expressed in quite deterministic and fatalistic terms and, therefore, this view leaves us with little insight in how old agglomerations may improve in this respect. In fact, the ‘good’ agglomerations described by Saxenian (1994) and Hassink (1997) are all areas that had not experienced any industrial past (Silicon Valley, Baden-Wurttemberg, Third Italy).

Secondly, the political-institutional dimension has been incorporated in the explanatory framework for why old agglomerations may fail to adjust. Amin & Thrift (1994) stressed the importance of ‘institutional thickness’ for regional development, which they defined as “the combination of factors including inter-institutional interaction and synergy, collective representation by many bodies, a common industrial purpose, and shared cultural norms and values...” (Hassink, 1998, p. 10-11). Olson (1982) and Grabher (1993) have referred to notions like ‘political lock-in’ or ‘institutional sclerosis’. According to their view, the lack of adaptability is associated with vested interests due to a self-sustaining coalition of large firms, labour unions and local policy makers, which actively oppose the required changes when their dominant positions are threatened.

However, here we end up in the same debate when we discussed the adverse impacts of networks or clusters. That is, we have no clue whatsoever how to associate ‘institutional thickness’ with regional economic success or failure. In fact, “many authors point to the fact that institutional thickness cannot only be associated with successful regional development, we can find thick layers of institutions in structurally weak regions, such as old industrial areas, as well... Hudson (1994), for instance, states that the culture of dependence of old industrial areas was sustained through the particular and thick institutional tissue of such areas... Under these circumstances, it would seem that localized institutional thinness may have held emancipatory and radical transformatory potential” (Hassink, 1998, p. 10-11).

The final part of this section explores how evolutionary notions like ‘path dependency’ and ‘collective learning’ have been applied to grasp the poor ability of old industrial regions to learn and innovate. We have explained elsewhere (Boschma & Lambooy, 1999) how and why evolutionary thinking may be useful to describe and explain the process of localised ‘collective’ learning in a regional context, and the adjustment problems regions may face when confronted with new variety. Camagni (1991), among others, claimed that spatial proximity may stimulate a process of collective learning, which leads to a comparative advantage that is hard to copy and difficult to transfer to other regions. This is achieved through: (1) the intra-regional mobility of human capital as the carrier of (often tacit) knowledge, (2) the transfer and feedback of information via (mainly informal) local networks, reinforced by the techno-industrial

specialisation in the area, and (3) a common local culture of trust, based on shared practices and rules. This view of cumulative and collective learning embedded in a regional context is echoed in notions like 'technology districts' (Storper, 1992) and 'learning regions' (Morgan, 1997; Asheim, 1997). Storper (1992) mentioned the possibility of technological lock-in effects, in which the historical accumulation of knowledge, skills and information in a region may become its weakness after some period. In this view, leading regions are considered to be too closely orientated towards their established industries, due to strong commitments of capital goods, management, R&D, labour, supplier linkages and infrastructure to the traditional technologies (Malecki, 1991). When this is the case, Grabher (1993) claims, old industrial regions may fall into the so-called 'trap of rigid specialisation'.

In this view, established industrial regions are regarded as rather homogenous entities that are characterised by a particular techno-industrial structure (knowledge, skills, markets, suppliers, inter-firm networks) and institutional environment (industry associations, R&D facilities, political institutions etc.) that are strongly geared towards their industrial past. This explains how path dependency may cause many problems of adjustment for old agglomerations to generate or adapt new basic technologies whose demands (in terms of knowledge, inputs, etc.) are hard to match by the specialised structure of the region (Boschma & Lambooy, 1999). In other words, "... a dense local milieu might, in addition to enhancing innovative behaviour and industry dynamics, create lock-in situations, i.e. situations where the local structure becomes so narrowly focussed on a particular type of economic activity (technology, organization, market behaviour) that it is unable to shift into a new development track if, for example, there is an overall change in the demand structure in that industry" (Malmberg & Maskell, 1997, p. 38). Here, once again, the impact of external shocks is taken into account, which confront old industrial regions with problems of adjustment because of their industrial past. In this view, the innovative and adaptive capacity of regions is regarded as a purely local phenomenon: successful flexibility is more likely to be guaranteed when it requires only minor adjustments along its established techno-industrial trajectory.

Old industrial regions may also become locked into rigid trajectories because their techno-industrial legacy of the past (in terms of resources, competences and socio-institutional structures) has eroded or weakened their learning capability. In other words, the initial strength of the region in the past may bear the seeds of its own demise. Therefore, "the commitments of previous centers of industry to their special technologies render them often less than more fit to pursue diverging lines of activity" (Storper & Walker, 1989, p. 123). This is because old industrial agglomerations may "... face increasing costs in getting rid of the experience and the externalities of the 'wrong' sort in acquiring the new ones" (Perez & Soete, 1988, p. 477). Maskell and Malmberg (1995) have again brought up this need to unlearn which would necessitate the removal of those institutions that may hinder new variety. They stress that regions differ considerably in

their ability to unlearn, although it remains unclear how.

A point of criticism on this evolutionary approach is that it assumes that the notions of 'routines' and 'path dependency', which are also heavily debated in evolutionary economics itself (Nelson, 1995), may easily be transferred to the field of economic geography. However, there may be some doubt whether it is possible to treat regions as entities that determine, select or influence the innovative behaviour or capabilities of firms, as suggested by this literature. For one thing, it is uncertain to what extent learning is actually enhanced by geographical proximity. There is still much work to be done on these matters, before we can come to any final conclusions (Boschma & Lambooy, 1999).

2.3 Conclusions

Although we found many differences between the various approaches, they all tend to be rather pessimistic and, to some extent, deterministic about the possibility of a successful adjustment process in old industrial regions that are confronted with a dramatic decline of their economic base. They either refer to their industrial decline as a natural and inevitable process, or they emphasise the huge problems of adjustment old industrial regions face. However, the approaches differ considerably when pointing out the reasons behind this. This may be illustrated by how they interpret this process of regional decline when they refer to the role of external shocks. The cumulative causation approach is mainly interested in how this might further damage the local economy through negative feedback mechanisms, but tends to overlook the impact of local indigenous factors. Krugman associates the persistence of the industrial decline in old industrial areas with the presence of high factor mobility, whereas the evolutionary approach refers to problems of adjustment due to path dependency, lock-in and a poor learning capability in those areas.

The following wide range of factors have been mentioned by the literature. These factors are primarily *endogenous* to the particular region. Of course, there are also *external* factors, such as political or technological 'shocks' from other regions, or general catastrophes like wars. These factors together, although general, have region-specific constellations. Certain declining agglomerations continue to decline, whereas others display a new vitality and develop an adaptive behaviour. The first factor refers to the decline of the mono-structure when the dominating sector is at the declining phase of the 'product life-cycle' (Norton, 1979) or at the end of its 'technology trajectory' (Swann et al., 1998). The second factor is traditionally connected with 'overcrowding' and 'congestion', or when the space is used by too many economic actors at the same time. In general: when negative external effects tend to become larger than the positive external effects, or the marginal social costs become larger than the marginal social benefits (Richardson, 1973). The third reason for decline is when a region is dominated by a group of economic activities with a closed market structure, probably a cartel or

monopoly. In that case, the region's dynamism can be slowed by entry barriers to the market. Moreover, the tendency of markets to become oligopolistic and vertically integrated further reduces the opportunities for new firms to benefit from external agglomeration economies. The fourth factor is indicated by Krugman (1995): in a region where an inelastic supply of production factors from other regions exist, the prices within that particular region will increase, with a concomitant loss of competitiveness of the firms. The fifth factor for the persistence of the industrial decline in old industrial areas has been associated by Krugman (1993) with the combination of external shocks, specialisation and high factor mobility. The sixth factor accounts for the particular structure of industrial organisation in a region (with hierarchical features), which has adverse impacts on the economic performance of regions. The seventh factor is institutional sclerosis or institutional 'lock-in': when ideologies and laws are so tightly constructed, and when the power of certain lobby groups are so embedded in decision-making, that entrepreneurial dynamism does not get a chance to foster new growth. The eighth and last reason for this decline has to do with path dependency, collective learning and lock-in, which affects the ability of old agglomerations to adapt.

Although valuable in their own way, we think these approaches tend to overestimate the poor ability of old agglomerations to come up with something new. For instance, it may be that new high-technology industries hardly need to establish specific linkages with their local environment in order to develop and expand. Therefore, we prefer to say that new industries provide opportunities for each type of region, including old industrial regions. To put it differently, new industries confront regions with problems of adjustment, regardless of their industrial past (Boschma, 1997). That is, new industries have to rely on their own ability to generate their own conditions of growth (such as investment capital, technology, qualified labour) because of the same reasons put forward by the evolutionary theory (Boschma & Van der Knaap, 1997).

The adaptability of leading regions may have hardly anything to do with previous local advantages related to a former leadership in (a) particular techno-industrial field(s). Scott (1988) has regularly observed a strategy of firms within new industries to circumvent the traditional male, unionised working force in core industrial regions through the use of two new labour segments, that is, skilled technical labour and unskilled ethnic and female workers. Storper & Walker (1989) provide the example of the resurgence of New England, in which there may be little (technological) continuity between the textile and machinery complex of the nineteenth century and (the rise of) the electronics complex of the twentieth century. This seems to be further supported by the spectacular rise of new activities specialised in environmental industries in the Ruhr area in Germany (Ache, 1998), despite the fact that there was not a particular tradition in this techno-industrial field in this local area (apart from a high rate of pollution). However, according to Heinze et al. (1998), "... the development of internal solutions for environmental problems in the research departments of the steel industry, the founding of

new specialized companies by engineers from these departments, different modes of outsourcing have been important origins of the rise of an environmental technology industry in North Rhine Westphalia” (p. 270). Whatever may be true, there is a need to differentiate between new industries because these differ in their dependency on the local environment in order to emerge and develop (Boschma, 1997). In Section 3, we elaborate on this point more in detail when we distinguish between types of regional adjustment.

3. Old industrial regions and agglomeration economies

We now focus more on the importance of the environment for the development of new variety. In Section 3.1, we present two theoretical views in this respect. The first view claims that agglomeration economies largely function as a selection mechanism, which determines which innovations will survive. The second view states that agglomeration economies provide opportunities for innovating firms. In Section 3.2, these two views are related to various types of variety and restructuring processes. That is, the first type mainly generates ‘path-dependent innovations’ rooted in ‘localisation economies’, which set in motion a process of ‘adaptive restructuring’. The second view regards the environment as the ‘locus of opportunities’, which is further associated with ‘pathless innovations’, ‘urbanisation economies’ and a process of ‘deep restructuring’.

3.1 Rising stars and failing regions

As described in Section 2, agglomeration advantages are not naturally everlasting. We can distinguish two basic approaches. First, we can compare the development of agglomerations with product life-cycles, as Norton (1979) did: decline can be considered a natural phenomenon. The second approach is to argue that agglomerations do not decline as such; they possibly contain declining sectors, but because of the strength of other advantages they always contain the seeds for revival. In general, authors tend to give more attention to ‘rising stars’, regions like Silicon Valley and Baden-Wuerttemberg, than to ‘failed agglomerations’, like the Ruhr-area, Wallonia, the Liverpool region, the Tyne and Wear region, and (possibly) the Pittsburgh and Detroit region. However, it is often overlooked that some of them show signs of restructuring. Many other ‘old’ agglomerations have displayed a strong vitality, when confronted with catastrophic changes in their regional specialisation, like the Boston region and the Birmingham region. Urban regions like New York, London and Paris have shown a very strong resistance to internal and external pressures; nevertheless they had to continuously adjust because certain agglomeration advantages changed into agglomeration disadvantages. This has happened even more to the ‘failing agglomerations’, but the difference is that in the ‘*successful adapter regions*’ economic differentiation enabled them to continuously

renovate their economic base.

Before dealing with these issues we first give our view on what agglomeration advantages are. In general, it can be argued that large urban regions display systematically certain economic advantages, like a higher innovation and more efficient production, than elsewhere. Economists from Adam Smith, Alfred Marshall, Alfred Weber until Paul Krugman have extensively published on this subject (Lambooy, 1998). Three perspectives are chosen to present our position: (1) the structure, (2) the processes and (3) the results of agglomeration advantages.

The theory of agglomeration advantages suggests that they exist because of three (or possibly four) basic *structural characteristics*: urban (regional) size of population and production, a strong internal division of labour (indicated by the composition of the regional production structure) and a clearly developed interregional specialisation. Authors like Lampard (1955), Storper (1997), Nelson (1995) and Ache (1998) emphasise a fourth factor: the institutional structure (for example the existence of growth-inducing institutions and the cultural and entrepreneurial attitudes) as a structural feature of regional agglomerations.

Size is undisputedly an important factor in explaining agglomeration advantages (Richardson 1973). Similarly, the importance of inter-regional specialisation for urban growth has been mentioned by Adam Smith. He also mentioned the internal division of labour as a base for higher efficiency. The basic hypothesis in this matter is that economic growth and the differentiation of the economic structure (the kind of firms, professional qualities and the technologies used) are strongly interrelated (Jacobs 1968, 1984; Warsh, 1984). Sometimes a city can display strong growth for a considerable time, based on the specialisation on a fast-growing sector, such as steel, textile, a port or the car industry. But, in the long term an urban region needs a more differentiated base, although the number of certain leading exporting sectors may be limited. The danger exists – and can be observed in reality – that regions develop path-dependency and develop more of the same, sustained by monopolies and cartels, even when the market needs entirely new technologies, organisational approaches and products. As described in Section 2, the ‘lock-in’ of old production structures exists in technologies, products, organisation, but also in the environment of firms: institutions, markets and physical structures. Regions like the Ruhr area and the Tyne and Wear region (Newcastle) in England are examples for this interrelation of the structural factors, which can be a major barrier for change.

Agglomeration advantages are also connected with the *process characteristics* such as increasing returns, path dependent development, cumulative causation and externalities (static and dynamic externalities). The theoretical expectation is that agglomerations are the locus for new ideas, new values, new technologies, new firms and new organisations and institutions. Agglomerations are hypothesised as continuously dynamic environments in which positive and negative externalities are quite common, which has been stressed by Marshall and Richardson (1973), who argued that cities ‘are riddled with externalities’.

The processes often work cumulatively (Myrdal 1957), more in particular when 'increasing returns' prevail (Arthur 1994).

The two basic *economic results* of agglomeration advantages are a higher *productivity* (of all production factors, but most clearly that of land, labour and knowledge) and *innovation* than in other regions, and a spatial *attraction* of workers/consumers.

The structural characteristics and the results can be measured more easily than the process characteristics. Most authors like Jacobs (1968; 1984), Krugman (1995) emphasise the structural characteristics. Others, like Myrdal (1957) and Arthur (1994) stress certain process characteristics. Scott (1988) focuses strongly on the organisation of the enterprises, both as a structural characteristic and as a process characteristic: vertical disintegration results from concentration and from externalities and learning effects; at the same time it creates opportunities for economic differentiation and further disintegration.

The idea of agglomeration economies is based on the expectation that people – and firms – are influenced by their environment. New firms, new variety, develop but need to prove their powers to survive. The entrepreneurs develop strategies to cope with various forces in order to survive. External forces influence the rate of survival: they 'select' the winners and losers. Three kinds of 'selection environment' can be distinguished: firstly, the most important one for economists, the market, secondly, the institutional context, and, thirdly, the physical environment (including buildings and infrastructure). The concept of environment in economic theory is diffuse, but here it can be used as a matter of location in a regional agglomeration where the three kinds of selection-environment are acting simultaneously: economic actors are influenced by other market participants, the institutional rules of the game, and physical structures. A broader concept of environment is used in Human Geography to indicate the area, in which people live and invest, where they share ideas and spaces. They meet people and receive information, they send their children to schools and meet entrepreneurs at parties, seminars, restaurants and sporting grounds. People – including entrepreneurs – are 'embedded' in these environments.

We can conclude that environments can be distinguished in three kinds: firstly, as a 'place to live', secondly, as a 'selection-environment', which selects which initiatives, new ideas or new firms will be sustained or referred, and, thirdly, as a 'locus of opportunities'. The opportunities can be, for instance, connected with a new technology or a new market. In certain areas these new elements will be realised, in other regions they will, possibly, be looked upon as strange and unrealistic ideas. Boschma (1994) showed that in a historical perspective it is impossible to predict which region will be the location for new developments. What can be shown, however, is that regions with a strong dominant sector have more difficulties to adjust to new technological and cultural developments.

3.2 Region-specific and industry-specific innovation

In this paper we focus on the issue of the adjustment of 'old agglomerations'. In evolutionary economics one of the issues is to whether new variety can be developed with or without 'creative destruction' of the incumbent structure. This relates to the issue of the sources of economic growth. In the neoclassical 'old normal growth model' of Solow and others, the principal sources are the increase of capital (investments) and labour; later, technology and learning effects have been added. More recently Nelson (1995) argued that even these supplements are insufficient to explain growth. Although Schumpeter already emphasised the role of social, political and psychological factors, Nelson stressed other factors like evolutionary and institutional factors more consistently.

Schumpeter argued that innovation is the main source of economic growth. Innovation leads to new variety: new technologies and firms. Two possible situations can be distinguished. This distinction is based on the fundamental question: are new technologies and firms combined with and built upon existing knowledge and existing markets, or are completely new technologies and firms necessary to create really new structures. These two views will be related to various restructuring processes. That is, the first type concerns 'path-dependent innovations' which set in motion a process of 'adaptive restructuring'. The second type involves 'pathless innovations' that result in a process of 'deep restructuring'.

The young 'Schumpeter' emphasised that innovation is based on the act of entrepreneurs using new opportunities, with the consequential loss of incumbent firms and technologies. This process was called 'creative destruction', because new firms and technologies opened the way to higher productivity and new or better products. During the transition period many incumbent firms had to exit the market, with the loss of 'old' jobs. Later on, the number of jobs in the new firms increases to a level that the redundancy in incumbent sectors is at least compensated. Innovation is one of the main sources of economic growth, but sometimes 'creative destruction' takes its time before the gains are larger than the losses. We call this process '*deep restructuring*'. Sometimes this kind of innovation is called Mark 1 innovation.

The 'old' Schumpeter argued differently: he argued that R&D had become so important for economic growth, but so very knowledge-intensive and expensive, that only large companies and governments could bear the costs. This kind of innovation (type Mark 2) is based on incumbent firms, which are strengthened in the process of innovation. They accumulate knowledge and this enables them to position themselves stronger in the market. Monopolies and cartels, but also co-operation with governments and labour unions are developed. This view of the 'older' Schumpeter adds institutional structures to his innovation perspective. Society and governments have an explicit role, although the main decision-makers are the corporations. They can purchase new firms and new ideas when there are processes and firms that are contesting their position. Mark

2 development can be found in sectors which are (1) capital-intensive (steel), (2) knowledge-intensive (software, pharmacy) or (3) distribution-channel dependent (software, cars, retailing, films). Agglomerations, faced with strong restructuring problems are the locations where the capital-intensive type prevails, together with labour-intensive activities, like textiles. Mature industries can innovate as well, by adapting new technologies from other sectors, like computer technology in the steel industry. In that case, the companies need a long transition to reach a new structure, in which process many fail. We call this process '*adaptive restructuring*'. In labour-intensive industries the choice is often to relocate (parts of) the production process to other, low-wage, regions. The headquarters can be retained in the 'old region', but the production factories have to be relocated.

According to Schumpeter, innovation is not only a matter of technology. He mentioned also organisation and strategic action to find new markets or new resources. Firms can relocate, find new inputs or they can find more efficient ways to organise the production, the distribution and the marketing processes. This kind of restructuring of firms can have serious impacts on the region where they are located. But, the region and its institutional and physical structures also have an impact on the way this restructuring occurs. In 'closed' regions with 'lock-in' it will be much more difficult to change than in 'open' regions, which have young and adaptable selection-environments.

The opportunities for innovation depend – apart from entrepreneur-related attributes - on *region-specific* and *sector-specific* configurations of the selection-environment, connected with its three elements: the institutional structure, the market structure and the physical structure. Old mature regions display the combination of the negative attributes of the three elements. Its institutions are sclerotic, its market structure is closed and its physical structure is unattractive. It needs heroes to innovate. New dynamic sectors are not often found to develop easily in these regions. The windows of locational opportunities are not favourable for them (Boschma 1994). New chains of process and product innovation usually happen in new regions (Silicon Valley) or in older but diversified and open metropolitan areas (Castell & Hall 1994). But it is possible to restructure old industrial regions, based on lessons learned by looking at new regions and early signs of adaptive restructuring. In a study of the innovation process in the Ruhr area, Ache (1998) found that new innovative sectors in environmental technology had developed, without direct connection with the old sectors (steel, coal mining). However, indirect connections did exist, like activities to solve the problems related to the pollution of the old sectors. The government and the universities were active, in order to recreate an attractive physical environment and to solve high unemployment.

The evolution of economic structures depends on the creation of new variety. Innovation is a basic process to ensure the continuous renewal and expansion of the set of economic activities. Broader concepts have been used for this process: Jacobs (1984) emphasises the need for continuous differentiation of activities. New technologies and

new trade relations offer opportunities for people to start something new. The number of different activities and professions increases with economic development, which in turn needs a stimulating environment. Jacobs argues that city-regions are the best locations to create new variety, due to their already rich variety of economic activities: it is a cumulative process based on a growing division of labour, within the region and between regions. City-regions are more important than nations to understand how economies evolve. She argues: 'Distinctions between city economies and the potpourris we call national economies are important not only for getting a grip on realities; they are the essence where particular attempts to reshape economic life are concerned' (Jacobs, 1984, p. 35). She argues that differentiation (new variety) of economic activities result in 'import-replacement', making products inside the region instead of importing. With that concept she emphasises the relevance of interregional trade for the expansion of city-regions, just as Adam Smith and other economists as Werner Sombart did. He argued that cities could expand only if they had opportunities to enlarge market areas. New variety can develop in regions where 'import replacement' opens opportunities for innovators. Jacobs contends that two processes are basic for the economic development of city-regions: Economic life *develops* by grace of innovating; it *expands* by grace of import-replacing. These two master economic processes are closely related, both functions of city economies.

4. Potential adjustment strategies of old agglomerations

We now devote brief attention to the possibilities of policy action that aims to deal with the process of structural adjustment in old industrial areas. To begin with, we discuss the policy implications of the Krugman model as an example taken from one of the traditional approaches described in Section 2.1. Then, we discuss the policy implications of the concept of learning regions as an example of a modern approach, as described in Section 2.2. We end our discussion with drawing some lessons from this discussion.

As explained in the introductory part, we begin with discussing the policy implications of the ideas of Krugman (1993) set out in Section 2.1. There, Krugman stressed the persistent, durable nature of recessions in old industrial regions due to high factor mobility. Krugman (1993) pledges for fiscal federalism (in the form of an automatic mechanism of inter-regional redistribution) to act as a major regional stabiliser (as already exists in the United States). This rather Keynesian approach has been criticised for many reasons (Martin & Sunley, 1998). For instance, Krugman largely overlooks the fact that this type of regional policy by national governments in European countries during the last decades has not been particularly successful. The greatest shortcoming of his analysis, however, is that Krugman completely neglects the importance of so-called 'untraded interdependencies' (such as norms, values and

institutions) for regional development in general, and for learning and innovation in particular (Storper, 1997; Morgan, 1997). In fact, it would be a prerequisite for such policy to account for the institutional and social context in regions in order to be effective, a point which Krugman fails to see (Storper, 1995).

It is exactly this point of remark that has been taken up by those who have stressed the importance of learning in order to overcome regional industrial decline (Morgan, 1997; Asheim, 1997). For example, Morgan views policies based on the learning region concept as the new generation of regional policy. One of the main advantages of such policy might be that it is based on a bottom-up strategy attuned to the resources of the regions. By doing so, such an approach accounts for the fact that the development potential may differ between old agglomerations. However, it depends, in part, to the region's network capacity whether such a renewal policy may become successful. But this is exactly one of the weakest features of old industrial regions, as explained in Section 2.2. There are others who are more optimistic in this respect. "With the strategy of the learning region at least a seedbed for innovative milieus can be created. Butzin considers the concept of the learning region as seedbed or context for a comprehensive innovation culture. Flanked with the right measures, this concept enables a region to enhance the probability of spontaneous development of local and regional creative milieus, both economically, socially and politically. The key resources of this strategy of the learning region are new learning concepts, a particular network architecture and regional self-regulation" (Hassink, 1998, p. 7).

Asheim (1997) has analysed the possibility of traditional industrial districts to turn into learning regions in order to avoid 'lock-in'. By doing so, he builds on the significance of the institutional and cultural context for a learning economy. He puts much effort to identify factors that may affect the formation of sufficient learning capacity. Nevertheless, he remains fairly unclear how to avoid a lock-in situation caused by localised path dependency. He leaves unanswered the question of when does a local system become a source of rigidity rather than dynamic efficiency. It is exactly this issue which is raised by Cunat & Thomas (1997). They describe how the old textile districts of Northern France have coped with heavy restructuring through the establishment of 'new socially based collective dynamics' between the main players. The interesting part of this contribution is that they give insight on how new theoretical insights with respect to relationships based on trust and co-operation may be applied in order to revitalise the traditional textile sector in an old industrial region which has long been characterised by rigid, hierarchical relationships. This experiment provides an interesting case of how to overcome a situation of negative lock-in. It remains to be seen if such a strategy offers a real possibility for this type of region to become a successful 'learning region'.

In Section 3.1, we emphasised the existence of three kinds of environment: first the environment of our daily life with physical features; and two kinds of 'selection environment': the institutional environment and the market environment. Transformation

of old industrial regions need a restructuring of all three kinds of environment, because the regional economic base has been influencing all aspects of the region's life. The three environments were connected with the reasons of decline and also with the new opportunities that the region will attempt to create.

The gradual development of a regional economic structure in old manufacturing regions evolved into an all encompassing structure. The domination of a set of interrelated activities influenced the entire structure, not only the sectoral composition, but also the institutional and even the spatial structures. In regions with a dominant set of steel/mining activities the nature of labour unions and regional governance, but also the composition of social groups (for instance: low wage immigrants, primarily male labour force) were largely responsible for a typical regional atmosphere determined by its economic base. This is one of the main reasons why transformation after the strong decline of this base is such a comprehensive endeavour. Even many years after the first attempts to stop the decline and to restore the vitality of such regions, this comprehensive nature of the necessary transformation may cause difficulties in many parts of daily life of these agglomerations. Not only regions such as the Ruhr area (steel, mining, machines) in Germany, but also Newcastle upon Tyne (mining, steel, shipbuilding), Manchester (textile) and Liverpool (port, shipbuilding) in England show how long the transformation may take. The Economist (June 26th, 1999) argued that even now there is still a striking contrast within England between these cities and the booming South East. These cities show a declining population, whereas the South-East needs to build millions of new houses to accommodate the growth of the population. In that report the differences in housing prices and vacancies are shown to be strikingly large. This reflects the burden of the past structure of these agglomerations, but also the difficult position of the governments.

The Economist emphasises the need to continue with the urban regeneration schemes, already started in the 1980s. What is not taken into consideration in this report is the institutional structure as such. In England, the agglomerations have much less power than in many other countries. Although the Ruhr area does not have a separate government, there are many institutional structures, designed to co-operate in order to recreate a viable economic base.

It seems that there is some logic in the programming of the transformation: we distinguish the following stages:

- (1) *physical environment;*
- (2) *unemployment and private investment;*
- (3) *institution building; and*
- (4) *searching for a new competitive advantage.*

In almost all regions in need of a comprehensive transformation, the start of the regeneration schemes is oriented towards the *physical aspects of the environment*. Derelict houses and industrial buildings, infrastructure and pollution are always very high on the

agenda of regional planning. The next focus will be the *unemployment and the lack of internal and external investment by the private sector*. Sometimes, this is difficult to do in the earlier stages of the transformation, due to the often 'anti-market' attitude of the local government and the labour unions. They fear that unemployment will rise when 'capitalism' has its way. In later years the problems are becoming so tense, and the observation of decline becomes so clear that it will be recognised that other ways to solve the problem are not available. Then some hesitant co-operation between governments, labour unions and investors can develop. *New institutions* that rest on co-operation can evolve, focusing on the developing of public-private partnerships between business and universities, sustained by the government, to foster innovation and new forms of education. Most often, this new attitude is combined with a stronger attention to the rest of the world and to inter-regional competition. This can result in the *search for new competitiveness and for a region-specific set of activities*. Quite often, a new regional identity and a new emphasis on culture is developed, due to the observation that the 'new economy' is a 'knowledge economy' with the concomitant need to offer an attractive and differentiated region, not only economically, but also culturally and physically. The transformation should embrace many aspects, not only finding a new economic base, although that is always the key to acquire new resources. Finally, one of the basic questions is whether local or national governments can influence the transformation with other means than investing in physical and educational restructuring. Recently, many regional and national authorities have devised policies to attract new innovative activities, both by fostering new locally developed new enterprises and by attracting 'high-tech activities' and 'knowledge-intensive activities' from elsewhere.

5. Conclusions

This paper has made an attempt to analyse the problems of industrial decline many old agglomerations have been confronted with in the past. More in particular, we were interested in exploring the potential impact of agglomeration (dis-) economies on the development of new variety in the old agglomerations.

First, we discussed the various theoretical approaches that have provided an explanatory framework for their industrial decline of old agglomerations. We came to the conclusion that, broadly speaking, both traditional and more modern approaches tend to share a rather pessimistic (and sometimes deterministic) view on the future well-being of old industrial regions. In fact, they either refer to their industrial decline as a natural and inevitable process, or they emphasise the huge problems of adjustment old industrial regions are often faced with. The approaches differed considerably when pointing out the reasons behind this. This may be illustrated by how they interpret this process of regional decline when they refer to the role of external shocks. The cumulative causation approach

is mainly interested in how this might further damage the local economy through negative feedback mechanisms, but tends to overlook the impact of local indigenous factors. Krugman associates the persistence of the industrial decline in old industrial areas with the presence of high factor mobility, whereas the evolutionary approach refers to problems of adjustment due to path dependency, lock-in and a poor learning capability in those areas.

Although valuable in their own way, we think these approaches tended to overestimate the poor ability of old agglomerations to come up with something new. For instance, they almost rule out the possibility that new high-technology industries hardly need to establish specific linkages with their local environment in order to develop and expand. Therefore, we prefer to say that new industries provide both opportunities and problems of adjustments for each type of region, including old industrial regions. Moreover, since the approaches tend to be pessimistic and, to some extent, deterministic about the possibility of a successful adjustment process in old industrial regions that are confronted with a dramatic decline of their economic base, they overlook the fact that there is a need to differentiate between old agglomerations in this respect.

Therefore, we examined the extent to which old agglomerations may fall back on their own local environment (economic, institutional, etc.) in order to adjust. We distinguished between two possible recovery paths. The first one concentrates on so-called 'path-dependent innovations', in which new technologies and firms built upon 'localisation economies' (such as existing knowledge and markets). This may set in motion a process of 'adaptive restructuring'. The second one involves 'pathless innovations' that result in a process of 'deep restructuring'. However, this is more a description of how these recovery paths may look like in reality. It is still unclear how to relate these two types of recovery paths to different types of old agglomerations. As noticed before, the vast literature on the subject does not give much clues either in this respect.

Finally, we discussed several policy options. We came to the conclusion that a inter-regional redistribution system, as proposed by Krugman, does not offer much solution to the problems of old industrial regions. This is because such a policy is not likely to be effective when the social and insitutional context in regions is not accounted for, as Krugman does. Policies based on the notion of the 'learning region' concept would therefore, in principle, offer better prospects in this respect, because of the bottum-up strategy approach, among other reasons. Nevertheless, a drawback of this latter approach is that a regional networking capacity, which is often lacking in old industrial areas, is regarded as a prerequisite for regional policy to become successful. In other words, the current literature has few to offer in this respect, which may not be surprising after all, because, as noted before, it tends to be rather pessimistic about the possibility of a successful adjustment process in old industrial regions. We would opt for a stage model of policy, which is much more realistic to realise. In a nutshell, it starts

with a regeneration scheme oriented towards the physical aspects of the local environment (concentrating on image-building), and ends up with institution building.

6. References

- Ache P (1998), *Lokale Innovative Milieus in Altindustriellen Regionen. Theoretische Konzepte und Empirische Befunde*, PhD thesis, University of Dortmund, Dortmund
- Amin A, Thrift N (eds.) (1994), *Globalization, Institutions and Regional Development in Europe*, Oxford University Press, Oxford
- Arthur B (1994), *Increasing Returns and Path Dependence in the Economy*, University of Michigan Press, Ann Arbor
- Asheim BT (1997), 'Learning regions' in a globalised world economy: towards a new competitive advantage of industrial districts?, In: M Taylor, S Conti (eds.), *Interdependent and Uneven Development. Global-local Perspectives*, Ashgate, Aldershot, 143-176
- Bianchi G (1994), *Requiem for the Third Italy? Spatial systems of small firms and multiregional differentiation of the Italian development*, paper presented at the XXXIV ERSA Conference, Groningen
- Boschma RA (1994), *Looking Through a Window of Locational Opportunity*, Thesis

Publishers, Amsterdam

Boschma RA (1997), New industries and windows of locational opportunity. A long-term analysis of Belgium, *Erdkunde* 51, 1: 1-19

Boschma RA, Van der Knaap GA (1997), New technology and windows of locational opportunity: indeterminacy, creativity and chance, In: Reynders J (ed.) *Economics and Evolution*, Edward Elgar, Cheltenham, 171-202

Boschma RA, Lambooy JG (forthcoming), Evolutionary economics and economic geography, *Journal of Evolutionary Economics*

Camagni R (ed.), (1991), *Innovation Networks: Spatial Perspectives*, Belhaven Press, London & New York

Castells M, Hall P (1994), *Technopoles of the World. The Making of the Twenty-first-century Industrial Complexes*, Routledge, London & New York

Chapman K, Walker D.F (1991), *Industrial Location. Principles and Policies*, 2nd edition, Basil Blackwell, Oxford

Chisholm M (1990), *Regions in Recession and Resurgence*, Unwin Hyman, London

Dosi G (1982), Technological Paradigms and Technological Trajectories. *Research Policy* 11: 147-162

Cunat F & Thomas B (1997), Globalisation and territorial economy: what future for the north of France as an old industrial area?, In: M Taylor, S Conti (eds.), *Interdependent and Uneven Development. Global-local Perspectives*, Ashgate, Aldershot, 177-194

Duyn JJ van, Lambooy JG (1982), *Technological innovation and regional economic growth: a meso-economic analysis*, Research Memorandum no. 8207, University of Amsterdam, Amsterdam

Grabher G (1993), The weakness of strong ties. The lock-in of regional development in the Ruhr area, In: G. Grabher (ed.), *The Embedded Firm. On the Socio-economics of Industrial Networks*, Routledge, London/New York, 255-277

Harrison B (1992), Industrial districts: old wine in new bottles, *Regional Studies* 26: 469-83

Hassink R (1997), What distinguishes 'good' from 'bad' industrial agglomerations?, *Erdkunde* 51: 2-11

Hassink R (1998), What does the learning region mean for economic geography?, paper presented at the RSA conference, Frankfurt, september 20-23, pp. 18

- Heinze, RG, Hilbert J, Nordhause-Janzen, J, Rehfeld D (1998), Industrial clusters and the governance of change. Lessons from North Rhine-Westphalia, In: HJ Braczyk, P Cooke, M Heidenreich (eds.), *Regional Innovation Systems. The Role of Governance in a Globalized World*, London/Bristol, 263-283
- Herrigel GB (1990), *Industrial Organization and the Politics of Industry: Centralized and Decentralized Production in Germany*, PhD thesis MIT, Massachusetts
- Hirst P, Zeitlin J (eds.) (1989), *Reversing Industrial Decline? Industrial Structure and Policy in Britain and her Competitors*, Berg, Oxford
- Hudson R (1994), Institutional change, cultural transformation, and economic regeneration. Myths and realities from Europe's old industrial areas, In: A Amin, N Thrift (eds.), *Globalization, Institutions and Regional Development in Europe*, Oxford University Press, Oxford, 196-216
- Jacobs J (1968), *The Economy of Cities*, Weidenfeld, London
- Jacobs J (1984), *Cities and the Wealth of Nations*, Penguin Books, London
- Krugman P (1993), The lessons of Massachusetts for EMU, In: F Torres and F Giavazzi (eds.), *Adjustment and Growth in the European Monetary Union*, Cambridge University Press, Cambridge, 241-269
- Krugman P (1995), *Development, Economic Geography and Economic Theory*. MIT-Press, Cambridge (Mass)
- Lambooy JG (1986), Locational Decisions and Regional Structure, in: Paelinck, JHP (ed.), *Human Behaviour in Geographical Space*, Gower, London, 149-165
- Lambooy JG (1998), *Agglomeratievoordelen en Ruimtelijke Ontwikkeling: Steden in het Tijdperk van de Kenniseconomie*, Oratie Universiteit Utrecht, Universiteit Utrecht, Utrecht
- Lampard, EE (1955), Histories of cities in the economically advanced areas, *Economic Development & Cultural Change* 3
- Malecki EJ (1991), *Technology and Economic Development*, Longman, Harlow
- Malmberg A, Maskell P (1997), Towards an explanation of regional specialization and industry agglomeration, *European Planning Studies* 5, 1: 25-41
- Markusen A (1985), *Profit Cycles, Oligopoly and Regional Development*, MacMillan, London
- Martin R, Rowthorn, B (eds.) (1986), *The Geography of De-industrialisation*,

MacMillan, London

Martin R, Sunley P (1996), Paul Krugman's geographical economics and its implications for regional development theory: a critical assessment, *Economic Geography* 72, 3: 259-292

Maskell P, Malmberg A (1995), *Localised learning and industrial competitiveness*, Berkeley Roundtable of International Economy Working Paper no. 80, University of California, Berkeley

Morgan K (1997), The learning region: institutions, innovation and regional renewal, *Regional Studies* 31, 5: 491-503

Myrdal G (1957), *Economic Theory and Underdeveloped Regions*. Duckworth, London

Nelson RR (1995), Recent evolutionary theorizing about economic change, *Journal of Economic Literature* 33: 48-90

Norton, R.D. (1979), *City life cycles and American urban policy*, Academic Press, New York

Olson M (1982), *The Rise and Decline of Nations. Economic Growth, Stagflation and Social Rigidities*, Yale University Press, New Haven

Perez C, Soete L (1988), Catching up in technology: entry barriers and windows of opportunity, in: Dosi G *et al.* (eds.), *Technical Change and Economic Theory*, Pinter Publishers, London, 458-479

Porter M (1990), *The Competitive Advantage of Nations*. Free Press, New York

Pred AR (1966), *The Spatial Dynamics of Urban-industrial Growth 1800-1914. Interpretive and Theoretical Essays*, MIT Press, Cambridge

Rees J (1979), Technological change and regional shifts in American manufacturing, *Professional Geographer* 31: 45-54

Richardson HW (1973) *The Economics of Urban Size*, Saxon House, Westmead

Rodwin L, Sazanami H (eds.) (1989), *Deindustrialization and Regional Economic Transformation. The Experience of the United States*, Unwin Hyman, Boston

Saxenian A (1994), *Regional Networks: Industrial Adaptation in Silicon Valley and Route 128*, Harvard University Press, Cambridge (Mass)

Scott AJ (1988), *New Industrial Spaces: Flexible Production Organization and Regional Development in North America and Europe*. Pion, London

Scott AJ (1993), *Technopolis. High Technology Industry and Regional Development in*

Southern California, University of California Press, Berkely

Steiner M (1985), Old industrial areas: a theoretical approach, *Urban Studies* 22: 387-398

Storper M (1992), The Limits to Globalization; Technology Districts and Industrial Growth. *Economic Geography* 68, 1: 60-93

Storper M (1995), Regional technology coalitions. An essential dimension of national technology policy, *Research Policy* 24: 895-911

Storper M (1997), *The Regional World: Territorial Development in a Global Economy*. Guilford Press, New York.

Storper M, Walker R (1989), *The Capitalist Imperative: Territory, Technology and Industrial Growth*. Basil Blackwell, New York

Swann P, Prevezer M, Stout D (eds.) (1998), *The Dynamics of Industrial Clustering*, Oxford University Press, Oxford

Vernon R (1966), International Investment and International Trade in the Product Cycle. *Quarterly Journal of Economics* 80: 190-207

Warsh D (1984), *The Idea of Economic Complexity*. Viking Penguin Books, New York