

The «resourceful region». A new conceptualisation of regional development strategies

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ABSTRACT: After decades of regional policy experiences in many countries, with varying degrees of success, there is a need for a critical assessment and an exploration of new pathways. This paper provides first an overview of various regional development concepts that have emerged over the course of several decades, like industrial districts, growth centres or regional clusters. We point out similarities and differences in these concepts. The main emphasis of the paper is on the design and relevance of a new conditional framework for regional development, leading to the formulation of a new integrating policy concept, termed «*resourceful region*».

This concept takes for granted that each region has a portfolio of development possibilities and conditions (resources or capabilities) which should be combined and optimized so as to ensure the highest regional economic and social performance.

We offer an illustration of the relevance of this notion on the basis of the Aviation Valley in South-East Poland, and conclude with some policy and research lessons.

JEL Classification: O1; R11; R12; R58.

Keywords: regional development; industrial districts; growth centres; regional clusters; resourceful region; economic and social performance

RESUMEN: Tras décadas de experiencias de políticas regionales en muchos países, con diversos grados de éxito, se plantea la necesidad de aproximaciones más críticas y de explorar nuevos caminos. Este artículo proporciona, en primer lugar, una visión de conjunto de varios conceptos de desarrollo regional que han surgido durante las últimas décadas, como los distritos industriales, los centros de crecimiento o los clusters regionales. Nosotros subrayamos algunas coincidencias y diferencias que existen en estos conceptos. El principal énfasis del artículo radica en el diseño y la relevancia de un nuevo marco condicional del desarrollo regional, lo que nos conduce a formular un nuevo concepto de políticas integradoras, que aquí definimos como «*región ingeniosa; región inteligente*». Este concepto da por hecho que cada región tiene un conjunto de posibilidades

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y condiciones de desarrollo (recursos o capacidades) que deben combinarse y optimizarse con objeto de asegurar los resultados económicos y sociales más altos para una región. Se ofrece como ilustración de la relevancia de esta noción el caso del «Aviation Valley» en el Sud-Este de Polonia, y sea concluye con algunas lecciones tanto desde la óptica de la investigación como de las políticas.

Clasificación JEL: O1; R11; R12; R58.

Palabras clave: desarrollo regional; distritos industriales; centros de crecimiento; clusters regionales; región «*resourceful*» - región inteligente; logros económicos y sociales.

1. Regions as a Work Platform

Since Adam Smith highlighted the importance of geography in creating the «wealth of nations» —as a result of natural conditions, transport accessibility, and geographic location near sea routes or navigable rivers—, much attention has been paid in the economics literature to the creation and distribution of economic wealth. People, groups and countries were apparently unable —as a result of many controllable and uncontrollable factors— to share the available resources —and the income accruing from these resources— in a balanced way. This has led to unequal or unbalanced economic development and in many cases —in particular from a global perspective— to a sharp cleavage between poverty and richness, not only between people but also between nations.

The study of economic inequalities has particularly addressed two strands of socio-economic concern, viz. individual income differences and international income differences, in particular between countries. It is noteworthy that the intermediate layer of *regional* or *urban* inequalities, i.e. the spatial economic level of analysis, has received far less attention. In this context, Isard (2003) claimed: «Most [Anglo-Saxon] (if not all) were living in a world that geographers would say is a wonderland of no dimensions» (p. 25). It ought to be recognized however, that also in the nineteenth century already at least some economists have explicitly addressed the importance of geography in shaping the economic development of nations or regions (see e.g., Van Thünen, Palander, Weber and Marshall). Especially Marshall (1890) in his «Principles of Economics» made an explicit reference to the notion of *industrial district* as a growth vehicle, be it more from the perspective of the causes of spatially concentrated industrial location driven by external economies, and less by the integrated planning conceptualisation of regions as a policy platform for action and progress. Nevertheless, Marshall's concept of industrial district has ever since played a central role in many regional development debates. It has prompted an avalanche of applied studies. A more policy-relevant and integrative conceptualisation of industrial districts can inter alia be found in the later

work of Becattini (1979). See for a critical overview also Markusen (2003) and Sforzi (2015).

From reading the extant literature on regional development and regional inequality, the variety in conceptualisations and definitions of regional entities as spearheads of accelerated regional growth is striking. We will provide in our paper a brief overview of this panorama of concepts. In the present study we will next introduce the notion of a «resourceful region» as an umbrella concept to cover and encapsulate various regional development notions and strategies. A resourceful region is a functionally and spatially demarcated geographical area which combines its assets (skills, physical resources, technology, social capital, institutional support systems, geographical connectivity etc.) in order to maximize its capabilities to achieve accelerated economic progress and a more sustainable socio-economic performance. This concept will be highlighted and advocated against the background of our concise historical literature review, followed by an exposition on smart spatial specialisation, opportunity-seeking innovative regional strategies, spatial-industrial cluster initiatives, social and spatial proximity analysis, and the importance of cognitive and creative abilities. A reference will also be made to an empirical case study—the aviation cluster in Poland—to illustrate the meaning and relevance of the «resourceful region» idea.

2. Regions as Spearheads of Polarisation and Agglomeration

2.1. Preface

More than a nation as a whole, regions tend to be particularly effective, efficient and tailor-made spatial units for coping with socio-economic imbalances in a country. The history of economic development has clearly demonstrated that regional growth and spatial policy are of critical importance for the welfare of a nation and its constituent regions. However, regional development is not a static or deterministic phenomenon, but emerges in a dynamic force field, with emerging new perspectives and many actors and stakeholders. Regional development policy seeks to offer support mechanisms for less developed or less privileged areas, which need an above average, outside stimulus for growth. In the past decades, most regional development efforts have focused the attention on supporting infrastructures that would favour the economic basis of a region, without excluding particular sectors of the industry. Consequently, the emphasis was mostly placed on hard infrastructure (e.g., roads, ports, airports, railways, communication infrastructure, resource infrastructure etc.) which would improve the competitive position of a region by improving the quality of indirectly productive inputs, so that the overall efficiency or productivity of the regional system at hand could be significantly improved. Regional export orientation strategies—through improved transport, communication and trade infrastructure—were receiving prominent attention in these days. More recently, the awareness has grown that in an open, globalizing and networked system of regions particularly the quality

of the knowledge and innovation system is of critical importance. And therefore, we witness nowadays a drastic shift from «hardware» initiatives to «innoware» initiatives, through which public expenditures for regional development are in particular oriented towards those investments that stimulate creative and knowledge-based development in a global competition. Also the «new European regional development policy» has made a turn by more emphasis on knowledge, innovation and social capital, especially in an urban or metropolitan context. These are the effective ingredients for smart regional specialization.

Smart specialization is a pivotal concept for accelerated economic growth. This concept has both an economic and a spatial meaning; the question is: *what* is the economic focus of growth initiatives and *where* this growth should be realized (see Boschma, 2016). Consequently, regional development is an integrated initiative to exploit the benefits of a smart spatial-economic specialization. Smart regional specialization seeks to combine the economic benefits of comparative advantages with the place-specific benefits of agglomeration advantages.

Regional development brings both a challenge and an opportunity to both policy-makers and researchers. It originates at the cross-roads of two driving mechanisms for economic progress and productivity rise in a given area. These two major mechanisms may be distinguished into polarization and agglomeration forces. Clearly, these two concepts are often used interchangeably, but essentially they are totally different. Failure to make a clear distinction lies at the heart of many confusing debates on growth centres versus growth poles, or on industrial clusters versus spatial clusters. This issue will first be clarified.

2.2. Polarisation

We will first pay attention to economic polarization effects. The polarisation concept refers to economic advantages as a result of increasing returns caused by economic interactions among specific sectors or agents in an economy. The following classification for these effects can be made (see also an earlier study by Nijkamp, 1972):

a. *Static*:

- *multiplier* effects resulting from intersectoral input-output linkages among incumbent firms.
- *(inter)sectoral response* effects as a consequence of the entrance of a new industrial firm or sector in an interdependent economic system.
- *indirect income multiplier* effects caused by employment and efficiency impacts resulting from the two abovementioned combined effects.
- *factor cost* effects emerging from the abovementioned productivity growth and affecting the allocation of resources in an interlinked economic system.
- *spill-over* effects of a change in sectoral composition caused by an efficiency change in the composition of industries in the economic system concerned.

b. *Dynamic:*

- *investment accelerator* effects emerging from the structure effects described above, which next feedback as growth effects in the final demand sector of a multi-sector input-output system representing an interdependent economy.
- *derived investments* related to (public) overhead investments (e.g., infrastructure) favoring economic growth and fed by economic competitiveness.
- *innovation and market* effects associated with the introduction and acceptance of new knowledge for producing and developing novel products or services.
- *upgrading* effects in the labour force inducing an efficiency rise and emerging from the rise of creative sectors or creative classes.

It is clear that polarization effects take place in a complex web in a multi-level economic system, without any direct geographic linkage connotation. Such effects are mainly meso-economic in nature. The obvious question is now: where do such effects show up? This question addresses the geography of growth.

2.3. Agglomeration

Agglomeration is a typical geographical phenomenon. This concept refers to the presence of spatial-economic advantages related to a geographic (regional or local) concentration of economic activities. These effects manifest themselves within a geographically demarcated territory, whereas the above mentioned polarization effects are in principle a-spatial in nature. The theory of agglomeration effects has already a long history in regional economics, dating back to classical economists like Weber or Hotelling. A wealth of literature has emerged after WW II, in particular by Lösch, Hoover, Alonso and Klaassen. A very brief summary of their contributions will be offered here (see also Nijkamp, 1972). A major milestone was provided by Lösch (1954) who presented a series of industrial agglomeration effects, in particular, external economies, positive demand effects, advantages of site and of source of supply, industrial interconnectivity, availability of industrial services etc. This has prompted a wealth of research on regional development in the post-WW II period.

These various effects were systematically categorized into three classes by Hoover (1968):

- *Large-scale* economies relating to a single firm, as a result of the enlargement of the firm's scale of production at one point.
- *Localization* economies for all firms within a single industry at the same location, as a consequence of the enlargement of total output of the industry settled at that location.
- *Urbanization* economies relating to all firms in all industries, resulting from the enlargement of the social-economic size (population, income, output or wealth) of that location, taken together for all industries.

Another factor reinforcing industrial agglomeration tendencies was introduced by Alonso (1968), who pointed out that better known economic conditions in large agglomerations tend to attract more new investors, if they seek to minimize the risk of new investment decisions. This tendency is further intensified on account of the need for reliable communication systems in a regional or local economy (see also Caragliu *et al.*, 2016).

Alonso's framework forms also a cornerstone for the ideas of Klaassen (1967), who stresses the importance of communication costs as stimulators of industrial concentration. These communication costs are a very broad concept; they include also a risk-element, viz. the costs of a stagnation in communication (e.g., postponement of a machine repair because of the absence of the related service apparatus in the vicinity).

The previous sample of earlier agglomeration theories shows that there is no uniform theoretical conception —and certainly not an operational one— concerning the various causes of agglomerative forces; some of these conceptions are not of a purely economic nature, but also of a social and psychological nature. On the other hand, there is a broad agreement on the very existence of agglomeration forces, which stimulate industrial concentration. Therefore, it seems pertinent that agglomeration economies exert a positive influence on industrial clustering, and that these agglomeration economies give rise to a decrease in communication costs between industries at the same locations. This decrease in costs is supposed to induce industrial bundles or clusters, this effect being greater for industries with higher interconnectivity.

Agglomeration advantages do not only favour city formation, but induce also industrial co-location. This concentration of economic activity benefits from proximity conditions, indivisibilities of large-scale plants, knowledge creation and spill-overs, and geographic image effects. According to standard location analysis, spatial co-location thus tends to generate efficiency increases of various kind, either of a Marshall-Arrow-Romer (MAR) type of externality (related to increasing returns to scale) or of a Jacobs type of externality (related to benefits from local social capital, including communication and knowledge spill-overs). There is a vast amount of literature on these effects and on the driving forces and impacts of socio-territorial proximity in relation to industrial agglomeration (see also Caragliu, 2015).

Many regional development studies focus the attention on the backgrounds of industrial location and concentration. This has had big impacts on regional development policy, as it was often (too) easily accepted that attracting new industries was an effective panacea. However, we will argue that regional development is a conditional strategy; specific location conditions may be necessary, but by no means sufficient conditions for attracting new business. Against this background we will introduce later on the notion of a «resourceful region».

The remainder of the present paper will offer an overview of (several notions of) industrial agglomerations on the basis of various contributions in the literature. They range from concepts of industrial districts (à la Marshall) to creative clusters (à la Florida). We will demonstrate that —despite the great variation in interpretation and

origin— external economies related to size, connectivity and local synergy are the critical factors that favour territorial concentration of firms.

3. Industrial Districts

The notion of an industrial district has already a long history in the development literature and dates mainly back to Marshall (1890), who may be seen as the founding father of the notion of external economies in relation to plant size and indivisibilities. This may lead to vertical integration and increasing firm size. The industrial districts conceptualization by Marshall was mainly instigated by the Industrial Revolution in the 19th century, which laid the foundation for territorially integrated industrial agglomerations (e.g. coal mining, steel production).

Industrial districts have played a pivotal role in engineering sciences and in the industrial organisation literature for decades in the last century. The existence of economies of scale of large plants (including indivisible equipment) has always been a major signpost for a better understanding of spatial concentration of industrial activity. Well-known examples include steel industries and oil refineries. But in the second part of the 20th century adjusted industrial concentration models came into being, not only in manufacturing industries, but also in the service sector (see for an overview also Bellandi and De Propris, 2015).

A contemporaneous illustrative representation of the industrial district notion can be found in the so-called «Third Italy» phenomenon, in which a conglomerate of small and medium size enterprises creates a joint and focused pool of competitive knowledge and innovation resources, while scale advantages could be reached through cultural synergy and geographical proximity (see Bagnosco, 1977; Becattini *et al.*, 2009; Camagni, 1991; Goodman and Bamford, 1989). Spatial networks play an important role in this industrial model, in particular among SMEs.

The clear success of the latter developmental strategies prompted complementary views, as advocated amongst others by the *New Industrial Spaces* literature (see Scott 1988), the *Milieu Innovateur* literature (see Aydalot, 1984), and the *Learning Region* literature (see Storper, 1997). In these classes of contributions, the notions of cultural proximity, spatial innovation and collective learning mechanisms, and institutional support systems, respectively, are seen as a critical flanking suprastructure favouring efficiency and high performance and leading to spatial-economic accumulation effects that induce a geographic concentration of firms in a region or locality.

It should be noted that the industrial districts literature contains also feeble elements: it does not show which type of specialisation is the most favourable; it does not make a convincing case for the geographical emergence and location of competing industrial districts, and it does not provide operational policy guidelines on the creation and management of such districts from a regional development perspective.

Clearly, the industrial district literature has meant a continuous source of inspiration for dedicated regional industrial growth strategies and it has prompted a rich lit-

erature on focussed regional economic policy, not only in Europe, but also elsewhere. Spatial symbiosis turns out to be the major ingredient for the emergence of such districts and has offered many useful handles for effective industrial cluster policy (see also Nijkamp and Ratajczak, 2015). This will be further addressed in our concept of «resourceful regions», but first we will critically review some other regional development concepts.

4. Growth Poles and Growth Centres

The post-war regional development debate in Europe has mainly centred on two complementary —but often competitive— concepts, viz. growth poles and growth centres. These find their genesis in the abovementioned distinction into polarisation and agglomeration forces. The concept of *growth poles* —in the spirit of polarisation effects— relates mainly to abstract topological economic spaces and not to geonomic spaces, i.e. it has a predominantly functional economic meaning. A growth pole is conceived of as existing in a field of centrifugal and centripetal forces with repulsion and attraction effects in an interdependent economic system (see Perroux, 1955).

In general, most literature about growth poles assigns a major role to *interaction* with other industries or bundles of industries. Technical and economic interdependencies are considered as a *conditio sine qua non* for the realization of regional growth; the latter may be conceived of as a process of interdependent transformations which are realized within a certain period. In terms of conventional input-output analysis, one may state that interdependent growth effects become, in a sense, «broader», as the matrix of interindustrial relations becomes less diagonal (or block-diagonal).

Over the course of time the scope of the theory and the concept of a growth pole have been expanded and reoriented, so that a growth pole is often considered as an ensemble of economic forces with high interlinkages, which are able to transmit growth impulses to all economic sectors in an interdependent economy, without much emphasis on spatial dimensions.

When geographical positions are also taken into account, the notion of «growth centres», defined as geographical locations of growth poles and resulting industrial concentrations in geographical space, is often used instead of «growth poles», where the latter is related to an abstract economic space. Clearly, both concepts are inter-related.

The growth centre theory originates from a spatial growth theory that may be viewed as a development theory in a simultaneous sectoral-temporal-spatial context and that is based on a territorial clustering of economic activities. The concept of a growth centre can be considered as a very useful one, particularly since it is an analytical tool for studying accelerated regional growth. A particularly important contribution to growth centre theory in a more elaborated geographical framework has been presented by Boudeville (1961), with his well-known tripartite division into homogeneous, polarized and planning spaces.

Generally speaking, growth centre policy can be considered as a process of decentralized concentration of development activities in order to accelerate the process of regional or local growth. It should take into account industrial interactions, external economies caused by agglomeration effects, and intertemporal locational interrelations. The dynamic effects, resulting from the attraction of new investments, assign a high superiority to sequential development strategies.

The growth pole and growth centre theory have assumed a prominent role in the 1960s and 1970s, as these concepts were regarded as strategic vehicles for accelerated regional economic growth. Interesting examples can be found in Italy, Spain, France and Brasil, and in many other countries.

A related concept has also often been employed, viz. «development axis». This notion regards connectivity and infrastructure as the main key toward economic success of regions. Consequently, location and network mechanisms are interwoven in this concept. The notion of «industrial corridor» is rather akin to the previous concept (see Gibson *et al.*, 2013).

In the course of time, new elements were added to these concepts, in particular, knowledge and innovation infrastructure. This is sometimes reflected in more recently emerging French planning concepts, such as a «*pôle de compétitivité*», in which high-tech knowledge orientation offers the basis for a globally competitive industrial agglomeration. In conclusion, the growth pole literature has created a wealth of policy strategies for regions in less privileged circumstances. Against this background, also the notion of spatial convergence strategies has found an interesting culmination point in the growth pole concept which may be seen as a balanced strategy aiming at a «decentralized concentration».

A modern variant on the growth pole-growth centre discussion can be found in the popular concepts of National Innovation Systems (NIS) vs. Regional Innovation Systems (RIS). NIS refers to innovation specialisation in a national —largely a-spatial— context, while RIS refers to the geographic context of a given innovation strategy (see for more details Asheim and Coenen, 2005, Asheim and Gertler, 2005, Cooke *et al.*, 2000, 2004, Lundvall, 1992, Nelson, 1993, and Tödting and Trippel, 2005). In a way, these concepts bear some resemblance to the above mentioned distinction into polarization and agglomeration forces, or into growth poles and growth centres, as the focus on innovative ability has also a clear geographical connotation. Open RIS is based on flexible public and private initiatives, regional synergy and symbiosis, a strong knowledge base, and creative and learning actors (see Kourtit, 2015). In this context, a «resourceful region» uses spatial capital and entrepreneurial capital as key constituents, as will be outlined in Section 8.

5. Industrial Complexes

A blend of polarization and agglomeration effects can be found in the *industrial complex* literature. This concept started to flourish in the post WW II re-develop-

ment and re-construction period, when large industrial agglomerations were built. Such geographical concentrations of industries —very often, heavy industries— comprised a collection of industrial activities, settled at given locations, which were inter-connected by mutual technical and/or economic relations. In terms of input-output linkages, an industrial complex is composed of those industrial sectors that have a block-diagonal structure of rows and columns in a national or regional matrix of inter-industrial relations; block-diagonality of a matrix implies a high degree of interlinkages (both forward and backward) between certain sectors. Bundles of industries selected in this way show mutual interrelations, while they possess relatively low interrelations with respect to extra-complex activities. The interrelations are of such a nature and degree that a spatial juxtaposition of industrial units in a given region or country can lead to substantial external economies (scale economies, density economies etc.). Industrial complex analysis deals with spatial schemes of incidence and development of grouped industrial units. It can be considered as a valuable application and extension of traditional input-output analysis at a micro scale of large plants. Additionally, it is a useful instrument for implementing concentrated industrial development in a local setting. It is concerned with the economic feasibility of developing certain types of industrial activities at a given, economically favourable location and with the estimation of the order of magnitude of locational advantages of such combinations compared to other types of locational structures. Industrial complex analysis, is therefore, a functional technique within the framework of a planned regional growth, since it allows one to identify and to evaluate combinations of industrial activities (see Nijkamp, 1972).

A classical example of industrial complex analysis can be found in Isard and Schooler (1957) and Isard *et al.* (1959), who applied a comparative-cost assessment to a large-scale industrial complex in Puerto Rico. The analysis identifies and evaluates desirable bundles of industrial expansion for Puerto Rico. None of the existing selection techniques in regional analysis (general economic development approach, individual comparative-cost analysis, location quotients, labour coefficients, coefficients of localization, analysis of commodity flows and balances of payments, interregional input-output approach, linear programming, and gravity techniques) appeared to be appropriate or conclusive, although most of them were valid in certain respects.

The first stage was the choice of relevant industrial complexes based upon an identification of sets of industrial units which might profitably locate in the region concerned. A criterion might be availability of resources, like various types of labour, natural resources (or proximity of the latter) and an advantageous geographical site. For example, in the case of Puerto Rico, the economic proximity of Venezuela and the availability of cheap labour led to a consideration of production processes related to crude oil and natural gas, thus giving rise to refinery, petrochemical and synthetic fiber activities, so that the actual complexes to be focused on seem to be the latter set of activities. The enormous number of possible combinations of products and by-products in a large-scale plant is reduced by consideration of flow sheets of commodities related to the production processes mentioned above. This allows the identi-

fication of a number of relevant complexes, each of them based on different technical combinations of refinery-petrochemical-synthetic-fiber activities.

The second stage was a technological representation of all individual and inter-industrial production activities (i.e. all physical inputs and outputs of diverse production activities) which are relevant for the general type of complex envisaged, based on an activity matrix and engineering (or technical) functions.

The third and last step centred around the calculation of total inputs and outputs required for each production program and their associated costs and revenues, followed by a differential cost revenue comparison with identical complexes settled on the mainland.

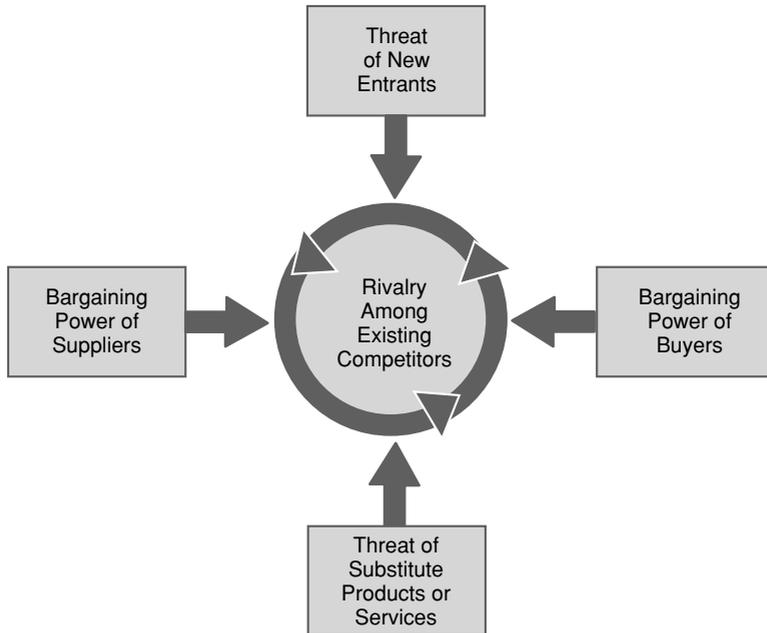
It is clear that geographic co-location in an industrial complex emerges from scale advantages and spatial vicinity advantages. Industrial symbiosis however, has to be embedded in a broader spatial development strategy, and consequently, we have observed in the past decades the rise of other, complementary types of concentrated spatial development policy, one of them being industrial clusters. We will focus on this notion in the next section.

6. Industrial Clusters

In the past decades, the cluster concept has become a fashionable approach in the industrial growth literature. It found its origin in Porter's (1990) cluster concept which aimed to identify and assess the critical success conditions for a coherent portfolio of industrial activities in a given branch of the economy. The horticulture business in the western part of the Netherlands is a good example of a strong, internationally recognized and mutually interwoven sector. The producers in the horticulture sector may partly be each other's competitors, but they share a common infrastructure and suprastructure, and hence reinforce each other on international markets. The geographical dimension was not strongly present in this initial cluster concept, but was added later on. According to a subsequent publication of Porter (1998): «Clusters are geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions (for example, universities, standards agencies, and trade associations) in particular fields that compete but also cooperate» (pp. 197-198). Clearly, the spatial dimension was gradually added to Porter's conceptualization of clusters.

The critical conditions of a successful operation of an industrial cluster are summarized by Porter in his so-called *diamond* model which seeks to present the drivers of competitive performance of industries (see Figure 1).

It should be added that strict spatial juxtaposition (or co-location) is not a necessary condition for an industrial cluster, in contrast to an industrial complex. But the existence of synergy relationships is a clear necessary condition for a competitive advantage of firms or industries belonging to —or associated with— a cluster.

Figure 1. Porter's diamond

«The Five Competitive Forces That Shape Strategy»

Source: Michael E. Porter, *Harvard Business Review*, January 2008.

Thus, the «pure» geography —in terms of minimum physical distance friction— plays a less important role here. Synergy among industries can also be achieved by network linkages, e.g. direct connectivity among industrial firms in a cluster, or indirect connectivity through intermediate agents (e.g., information centres, educational support systems etc.). Clearly, the focus of clusters on either generic economic-technological dimensions or on local economic-geographical dimensions is not always very transparent in the prevailing extant literature on clusters (see also Porter and Ketels, 2009)

Cluster policy —with a focus on industrial agglomerations— has become an important strategic handle for regional and industrial policy in many countries and regions, not only in the western world but also in developing countries (see also Asheim *et al.*, 2006, and Gordon and McCann, 2006). It has in recent years also obtained new conceptual orientations, e.g., in the form of creative cluster policy (including a combination of creative industries and of creativity-enhancing urban environments), which are seen as a key stimulus for accelerated and competitive growth of cities or regions. In the course of time, network linkages —both tangible and intangible— have become an increasingly important feature of advanced clusters. This has also prompted new thinking on so-called proximity relations. This will be discussed in the next section.

7. Proximity Centres

Spatial symbiosis lies at the heart of industrial clusters. This symbiosis does not only refer to industrial interdependencies at a given place, but also to indirect linkages to e.g. the labour force, public amenities, social institutions, ecological amenities, and so forth. As mentioned in the previous sections, industrial agglomeration manifests itself at the interface of socio-economic synergy and geographic co-location. These two forces have been the historical dividing lines between national industrial policy and regional growth policy. In the past decades, these two features have received renewed attention as a result of the increasing popularity of proximity patterns among industries. Proximity has both a spatial and a relational dimension in a network configuration of various actors or firms (see also Boschma, 2005).

Proximity is the reverse concept of distance friction, but it is much broader in nature. It does not only refer to Euclidean closeness (or distance), but incorporates also social science oriented interactions related to similarity in culture, values, traditions, technologies, entrepreneurial styles, information handling, and so forth (see for a broad exposition, Torre and Wallet, 2015). In the proximity literature (see e.g. Caragliu and Nijkamp, 2014) the following subdivision of proximity concepts is sometimes made:

- Geographical proximity.
- Social-cultural proximity.
- Technological proximity.
- Cognitive proximity.
- Relational proximity.

An extensive set of contributions to the study of proximity in regional science is contained in Torre and Wallet (2014). We will briefly discuss here two types of proximity that are critical for industrial agglomerations, viz. cognitive and social proximity.

The notion of *cognitive* proximity plays an important role in the present proximity literature. This popularity is largely caused by modern communication technology, in particular digital technology. The share of physical transport costs in the total cost portfolio is rapidly declining and has even led to the «death of distance» hypothesis (see Cairncross, 2002). Knowledge and information have become substantial parts of inter-actor connectivity patterns. They form the blood circulation of spatial networks and are regarded as critical for industrial-spatial symbiosis.

Social capital is another important driver of economic progress. This notion is not necessarily based on altruism, but presupposes deliberate and rational motives to achieve certain personal or business objectives. This also holds for effective clusters in the context of regional development strategies (see e.g. Bochniarz, 2014, and Westlund, 2014).

An example of a study on proximity relations —based on social and cognitive capital in a spatial network— can be found in a case study by Kourtit *et al.* (2014),

where the authors analyse the complementary and mutually reinforcing possibilities of bringing the research and R&D efforts of three university clusters in the Netherlands together in once cooperative model of alliance proximities. The leading sectors in this proximity network —based on the five previous proximity relations— are called «nova stars».

It is clear that proximity conditions are important stimuli for regional development, as they offer competitive conditions through e.g. a decline in transaction costs. Proximity is often used in combination with connectivity, as both concepts are facilitators of learning behaviour.

It goes without saying that the measurement of proximity relations is fraught with many problems. Appropriate network indicators for proximity are rather rare. But recent research efforts have shown a remarkable progress in data analysis and analytical rigour (see for a broad and quantitatively-oriented study Caragliu, 2015).

The next section will be devoted to our new integrative conceptualization of regional development strategy based on the «resourceful region» concept.

8. The Concept of «Resourceful Regions»

The economic fate of nations, cities and regions exhibits an enormous variety across our planet. In various cases, it may be the physical geography (e.g., desert areas, mountainous areas, peripheral areas, etc.) that may explain a poor performance of these areas. In other cases, it may be cultural inertia, religious beliefs or lack of entrepreneurial spirit that drag a region into poverty. The economist's response to such dismal phenomena is rather straightforward: productivity enhancement is the way to a better performance. And salient spatial inequalities can then be coped with through spatial mobility of capital and workers, or other resources. This simple lesson does not provide many useful policy handles. The ratio of output to input is of course a good measure for efficiency of a region, but there are multiple outputs and multiple inputs, so that an unambiguous efficiency indicator is hard to obtain. In addition, some inputs or outputs are not flexible to adjust, so that regional development is a process fraught with inert responses and complex space-time dynamics.

An appropriate tool to measure and rank the efficiency of actors (e.g., regions or cities) can be found in the industrial organization literature known as Data Envelopment Analysis (DEA). This is an increasingly popular tool for benchmarking studies among regions or cities (see e.g., Kourtit, 2015; Suzuki and Nijkamp, 2017).

In the recent past, the notion of «territorial capital» (mainly introduced and popularized by Camagni, 2009) has provided an interesting analytical tool to understand the hurdles and opportunities of regional dynamics. The basic idea is that various types of capital in a region form the conditions that shape regional growth. The clear advantage of this approach is that it widens the regional growth horizon beyond standard neo-classical arguments of capital and labour as inputs to enhance a region's efficiency or productivity. Elements of «territorial capital» are inter alia: technology,

social capital, resources, or human capital. This conceptualization means no doubt a significant enrichment of conventional regional growth theory.

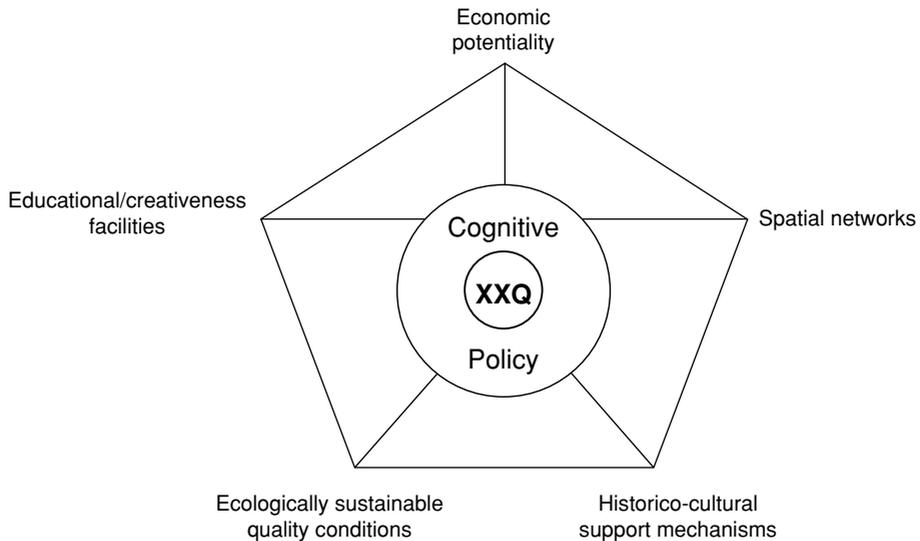
Clearly, the empirical test of this new concept still needs further elaboration. One of the less convincing elements in the «territorial capital» concept is the fact that not all constituents of regional growth may be regarded as a capital or asset (e.g., entrepreneurial spirit, creative attitudes, risk-avoiding behaviour). In addition, the distinction between necessary, sufficient and desirable conditions for a better regional performance is not always conclusive. Our attempt will now address the latter challenges by introducing the «resourceful region» concept.

We take our departure point in an older theoretical framework developed by the French geographer Vidal de la Blache (1903), often called «possibilism». This notion states that any region has a bundle of options or opportunities from which proper ones may have to be selected in order to enhance social economic achievement levels of the region concerned. Different regions may choose different options (depending on their physical-geographical position, cultural backgrounds, or social attitudes). The French historian Lucien Febvre (2000) described the «possibilism» approach as follows: «There are no necessities, but everywhere possibilities; and man as a master of the possibilities, is the judge of their use» (quoted in Johnston *et al.*, 2000, p. 609). Regional economic dynamics becomes thus an evolutionary process influenced by internal and external mechanisms, based on a learning model. The human agency is thus the critical factor in a «possibilistic» regional development strategy. In modern social science, this is sometimes also referred to as the «capabilities» approach (see e.g. Basta, 2015, van Geenhuizen and Nijkamp, 2000, Sen, 1980, and Nussbaum, 2003).

The main idea behind the «resourceful region» concept is that ingenuity and cognitive response to challenges are assets of a region that decide on success or failure of development policy of the region at hand. Every region has a portfolio of growth opportunities, ranging from physical-geographical conditions to human-social abilities. The key mechanism in using these inputs is an intelligent management, exploitation and combination of these scarce assets, a process driven by smart, cognitive and skillful insights and decisions. Consequently, a resourceful region is an area that is pro-actively driven by a smart combination of *economic potentiality* (e.g., capital provision), *spatial networks in terms of accessibility and connectivity* (e.g. locational conditions, cyberspace access), *historico-cultural support mechanisms* (e.g., entrepreneurial spirit), *ecologically sustainable quality conditions*, and *educational and creativeness facilities* (e.g., institutions of higher education). The balanced mix of these supporting conditions for successful regional development can be represented in a so-called «Pentagon» model, sketched in Figure 2. The principles of the Pentagon approach and various modelling applications can be found in Nijkamp *et al.* (1994) and Capello *et al.* (1999). The main idea is that the desired performance conditions of actors or institutions can normally be summarized in five key factors. In the centre of Figure 2, the acronym XXQ stands for the highest possible quality performance to be achieved for the socio-economic position of the region concerned (see for de-

tails also Nijkamp, 2008). It goes without saying that the notion of a «resourceful region» is strongly akin to the concept of a smart region, the main difference being that resources are a portfolio of options, while smartness refers more to cognitive-technological abilities. This also means that a resourceful region may be high-tech oriented, but this is not a necessary nor sufficient condition. Regional development is based on a multidimensional package of performance facilitators including technology, culture, networks, entrepreneurship and education (see Tubadji *et al.*, 2015).

Figure 2. A Pentagon prism of regional development conditions in a resourceful region



It should be noted that the management of a «resourceful region» presupposes an alert policy driven by competent foresight and innovative skills of all actors involved. The man vision should be that regions are not areas «in troubled water», but sources of unforeseen opportunities, provided all resources are properly exploited. A resourceful region may not be based on a policy of «backing the losers» or even not on «picking the winners», but «optimizing all promising opportunities». Clearly, productivity —interpreted in a broad socio-economic sense— is a key parameter in regional development, as this means a rise in efficient use of scarce resources. Regional development policy does not take place in a «wonderland of no spatial dimensions», but exploits the opportunities provided by agglomeration advantages and density economies in a region, complemented with accessibility conditions, network connectivity, multidimensional proximity, and —last but not least— human capital and entrepreneurial spirit.

Finally, a resourceful region is thus not only based on education, research and creativity, but also on smart learning conditions, stimulated by open creative knowl-

edge, innovative and open interactions and flexible networking, shared consensus building in social capital relations, and strategic and forward-looking knowledge management. A regional system's performance is clearly decisively determined by a creative and cognitive strategy for combining the region's resources in an intelligent way.

9. Flying High: an Illustration

The overview of various strategic regional growth concepts and vehicles in the previous sections has shown a surprising variety of complementary development concepts. In all cases, the existence of external economies as a catalyst for regional growth appears to play an important role. A region is essentially a seedbed of resources, which have to be uncovered, released and exploited. The intelligent combination of such resources is the core challenge of regional development policy.

This «resource» interpretation also applies to the development of the aviation sector. This sector is an advanced multi-product sector with specialized products that need strong network linkages and geographical linkages. From this perspective, modern cluster thinking appears to offer meaningful ingredients for accelerated regional growth strategies. The aviation sector is a complex high-tech sector based on a functional specialization and a geographic —often regional— concentration of activities. This refers to both the physical production of airplanes and particles, as well as to the logistics of the airplane movements (and related transport and hospitality activities), and also to the management and design of airport facilities. In many countries, the aviation sector is a rapidly developing sector, with clear features of a growth centre, an industrial cluster and a proximity hub. And therefore, the operational strategic development of a given aviation activity can best be favoured through the use of operational cluster strategies in the form of a «resourceful region».

Aviation has in the past decades indeed become a major industry in many countries. The aviation industry comprises many elements: airline activities for a broad tourist and business market, cargo transport, logistic management activities for flight scheduling and catering, airport construction and management, and airplane building industries (including airplane parts). In various countries, the development of the aviation sector is also linked to the space industry (e.g., satellites). Consequently, the aviation sector has in recent decades turned into a dynamic industrial cluster of a major strategic importance in many countries.

The aviation industry is thus clearly a high-tech sector, with many linkages to other industrial sectors. And of course, this cluster has strong intra-industry linkages with many specific branches and firms, up to the level of even SMEs. Consequently, such sectors tend to be non-footloose: they enjoy in many cases the benefits of industrial agglomerations. And therefore, the aviation industry is often found in geographic clusters. Such clusters offer the seedbeds for innovation spirit and communication

access for firms participating in such a cluster, leave aside the standard input-output linkages among firms in the same cluster and the overhead advantages offered by the region concerned (e.g., infrastructure, highly-skilled labour).

Clearly, an aviation cluster is also a great example of a Regional Innovation System. This is an organized set of activities at a given place which seeks to enhance efficiency and growth through private and institutional support systems directed towards the development of innovative activities based on synergy. Such innovative activities may include a diverse portfolio of novel technological actions, in particular: radical innovation (an entirely new successful application of new knowledge), creativity (original ways of applying knowledge), inventions (development of new ideas or products without immediate market success), and «standard» innovation (successful commercialization of new products or services). Clearly, despite different categories of innovative activities, a common feature is always that these new activities seek to find a new or better match between market needs and firm solutions. This is in compliance with Schumpeter (1942): «The interaction of technological innovation with the competitive marketplace is the fundamental driving force in capitals» industrial progress».

An aviation cluster in a given region is not the result of coincidental economic or technological forces. It requires a careful orchestration of deliberate and skillful development initiatives, based on cognitive-technological and cognitive-managerial skills and expertise. Consequently, a successful aviation cluster can only be found in a «resourceful region». We will briefly illustrate this on the basis of the aviation cluster in the Podkarpackie region in South-East Poland (see for more details Nijkamp and Kourtit, 2014; Kourtit *et al.*, 2016).

The notion of effective technological cluster in a «resourceful region» is instrumental in the strategic interpretation and the appropriate implementation of the Aviation Valley project in South-East Poland. As said above, an aviation cluster may in principle refer to a broad set of mutually interlinked and regionally concentrated activities in the aviation sector. In general, the sector may comprise the airline sector, the infrastructure sector (in particular, airports), the logistic operations (supporting transport connectivity, such as airport train connections, security operations), the supporting operations (e.g. shops, catering), and the manufacturing sector (products and product development, integrated supply chains, marketing operations). All these components may relate to both civil and military sectors. The Podkarpackie region in Poland has historically been a seedbed for a multiplicity of aviation activities, often international in nature.

The manufacturing part of the Aviation Valley is not an independent part of the aviation sector as a whole. The production of equipment and airplanes is largely influenced by the market of users (passengers, cargo). A significant share of the airline market is determined by the tourist market (at present approx. 9 percent of global GDP). But not only is the size of the demand, but also the organization of the market an important driver for the supply side of the aviation sector. Increasing trends in short-haul holiday visits, the emergence of global tourist flows (e.g., China, emerging

economies), and the fierce competition in the tourism market (both carriers and tour operators) will have a great impact on the future of the airline industry, and hence on the manufacturing side of the aviation industry. The Podkarpackie region is essentially an example of a promising «resourceful region» for the aviation sector, where historical-cultural conditions, environmental quality conditions, innovative seedbed conditions, economic key conditions and connectivity conditions shape a business environment with manifold options and capabilities for a significant performance rise («possibilism»).

In recent years, this region has attracted through the smart use of all its resources a broad portfolio of international aviation activities (aircraft particles, helicopters, small aircraft, and a host of supplementary services and products). This has led to a rapidly growing high-tech cluster, with more than 100 firms. Geographic co-location in such clusters seems to be a realistic strategy for an appropriate regional development strategy, especially for clusters of a medium size. It is based on a blend of spatial capital, human capital, entrepreneurial capital, social capital and technological capital, and is supported by cognitive skills in both the public sector and private sector in the area. This area meets all the conditions incorporated in the resourceful region scheme, as presented in the Pentagon prism in Figure 2. From this perspective, the Aviation Valley in Poland may be regarded as a potentially promising initiative for an upgrading of the regional economy concerned. For more details and a quantitative analysis, the reader is referred to Kourtit *et al.* (2016). Clearly, such a dedicated growth strategy has to be positioned in a broader aviation policy context. Finally, a further and general exposition on the relevance of aviation clusters for regional developments, based on cognitive and proximity principles, can be found in Levy and Talbot (2015).

10. Epilogue

The concept of a «resourceful region» may be instrumental in developing a new perspective on regional policy. Regional development has a long standing history. It has not only become a scientific and policy issue since the political and economic reconstruction strategies after WW II, but it has also played a significant role in the entire economic history of the world. Even the ancient age used already infrastructure as a critical instrument for the development of the space-economy, because of differences in locational conditions (e.g., physical geography), in local attitudes and behaviour (e.g., cultural or political characteristics), and in regulatory systems (e.g., taxation or market entry conditions). The main challenge is of course to favour regional development in a balanced way, so that economic growth (in relation to efficiency and productivity rise) can be stimulated in combination with a desirable or acceptable level of distribution of welfare (the equity motive). In this context, Europe has a long tradition in regional policy, in which the support for less developed or less privileged areas was a central policy objective. Clearly, the success rate of such a policy was often not overwhelming.

As mentioned before, knowledge and cognitive skills are a *sine qua non* for a balanced and operational policy in which advanced regional industrial clusters are the key forces of a «resourceful region» policy concept. Knowledge is increasingly seen as the engine of regional growth. In recent years we have witnessed a heightened interest in the region as a focal point of innovation policy (see van Geenhuizen and Nijkamp, 1998; Ratti *et al.*, 1997). The region is increasingly conceived of as a dynamic, promising and self-organizing spatial unit which is able to achieve a competitive position in an open international networked economy through creative technology design, proper land use policy and management of human resources. The region has become a focal point for the creation of a portfolio of locational opportunities (cf. Cheshire and Gordon, 1995). This is in agreement with our «resourceful region» conceptualization of spatial development.

It is also increasingly recognized that a region will not be able to pave a road towards a promising future through a process of top-down blueprint planning. Rather, we know that a learning process instigated by the effective use of tacit knowledge on uncertainty reduction is a *sine qua non* for competitive survival strategies (cf. Nijkamp and Reggiani, 1998). Thus, the use of the regional knowledge capability is a critical success factor for regional development. The exploitation of this capability presupposes the fulfillment of the following institutional support conditions of a «resourceful region», in particular:

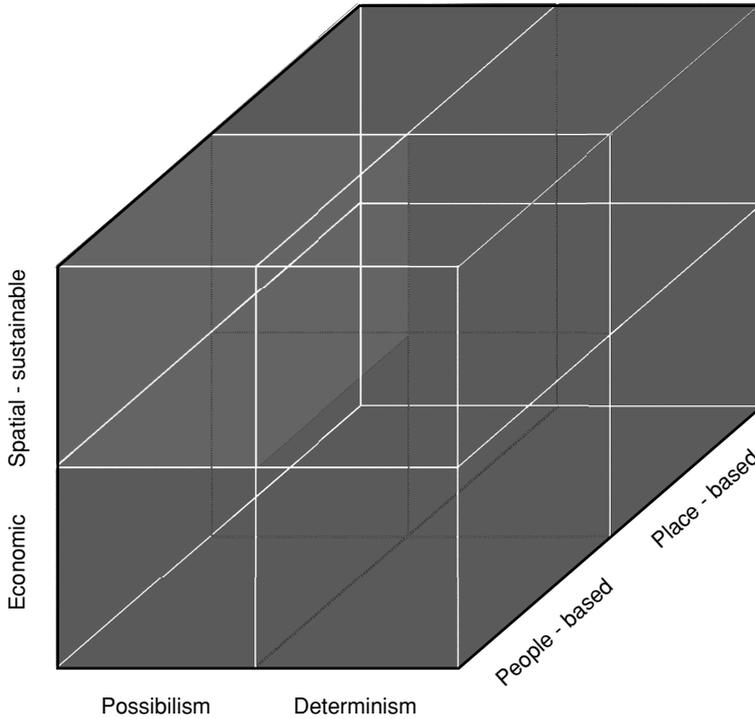
- consensus among regional stakeholders and institutions;
- networking in order to advance information diffusion and knowledge creation;
- appropriate channels for the transformation of knowledge and technology;
- management and development of human capital and of stocks of knowledge.

It may now be helpful to position the new concept of a «resourceful region» against the background of a triple force field of regional policy:

- *determinism* (concepts of makeable society, blueprint planning, command and control measures) versus *possibilism* (emphasis on opportunities, management of capabilities, open-ended planning);
- *place-based* policy (emphasis on geography, such as infrastructure, land use, housing etc.) versus *people-based* policy (emphasis on creativeness, cognitive abilities, entrepreneurship and innovation, etc.);
- *economic objectives* (measured through Gross Value Added, investments, public finance versus *spatial-sustainable* objectives (employment, quality of life and health, welfare programmes, etc.).

From the previous exposition in this paper, it is evident that the focus of a «resourceful region» strategy is on a mix of 3 components: possibilism culture, people-based policy and spatial-sustainable objectives. From the combinational set of 8 possible orientations, we can map out the cornerstones of a «resourceful region» through the following cubic (see Figure 3).

Figure 3. The «Resourceful Region» cubic



Regional development policy is indeed an ambitious cognitive managerial activity. In this context, regional clusters may be regarded as the cornerstones of innovation initiatives and the seedbeds for sustainable regional development. It will be an important challenge to assess the performance of the various clusters that have emerged all over the world, with a particular view to the identification of the strength-weakness factors in these clusters. The Aviation Valley in Poland is a great example of such a promising regional high-tech cluster, and deserves a careful learning evaluation of all important ingredients of this cluster initiative. This cluster takes for granted the importance of social capital in the region in combination with high-tech specialization as a *sine qua non* for a high cluster performance. Such conditions provide the network advantages that are generated by cooperation within or among groups, and they underscore and highlight the relevance of the «resourceful region» concept.

In conclusion, regional development strategies will in the future be critically dependent on the self-organizing capabilities of regions, which through smart combination of their resources will have to develop a sustainable, forward-looking and operational action programme, in which cognitive activities will play a central role. The novel perspective on resources as critical supporting conditions for regional growth will no doubt become a source of new research at the frontiers of regional science.

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