

INDUSTRIAL AGGLOMERATION: A THEORETICAL BACKGROUND

RAUL LOIOLA COELHO DIAS

ESCOLA BRASILEIRA DE ADMINISTRAÇÃO PÚBLICA E DE EMPRESAS (EBAPE)

FILIPPO SCELZA

ESCOLA BRASILEIRA DE ADMINISTRAÇÃO PÚBLICA E DE EMPRESAS (EBAPE)

Agradecimento à órgão de fomento:

This research was supported by the Program “EXCELLENCE INITIATIVES” from the Università Degli Studi di Bergamo (UNIBG) and the Escola Brasileira de Administração Pública e de Empresas - Fundação Getulio Vargas (EBAPE/FGV) in the project “Re-discovering the Sources of Territorial Sustainability. Institutions for Development and Advanced Human Welfare.”

INDUSTRIAL AGGLOMERATION: A THEORETICAL BACKGROUND

INTRODUCTION

In order to better understand the phenomenon of industrial agglomeration in specific geographic territories, it is essential to introduce the topic by reflecting about some correlated elements. Industrial policies, migration of labor forces, the formation of cities and the development of geographic spaces play an important role on the agglomeration processes, being essential features, as the literature explains.

Historically, the migration of the labor forces from the rural to urban areas was not only a result of an expressive rural poverty. Actually this migration was promoted through an increase of the economic development of urban areas, which was an important element for the increase of the demand for manufactured goods and services. As many authors point out, the drive of urban area's economic development is the labor market (VERMA, 1986; HARRIS, 1990; TAYLOR, 1998; O'SULLIVAN, 2000; BAI; ZHANG, 2005; CHANG, 2009).

It can be sustained that there is a relation between economic development and urbanization (CHANG, 2009), however regional localization and individual country characteristics play an important role on the economic development patterns (TOLLEY; THOMAS, 1987). From this point, the debate about the urban concentration emerges, as a critic element: are the urban concentrations needed to promote development?

Tolley and Thomas (1987) said there is a different relation between urban concentration and economic development, in developed and developing countries; in matter of fact, several studies stressed the distinctive paths assumed by those countries (DURANTON, 2008; 2014; BUCK *et al.*, 2004; GLAESER, 2011), highlighting that, while developing countries as Mexico, China and India put the city in the center of the development processes, developed countries are living a 'disurbanization era'. In this perspective, the Spatial Development Theory was created by Desmet and Rossi-Hansberg (2014), and led to the movement called "development of firm" (DURANTON; KERR, 2015), which was important to better understand the agglomeration of firms.

All of those cited features are directly related to the industrial policies adopted in order to promote development (KRUGMAN; OBSTFELD, 2003; AIGINGER, 2007). As the literature points out, there are two main perspectives: the vertical and the horizontal industrial policies. The first one targets particular sectors and clusters. According to Martin *et al.* (2011) vertical policies focused on clusters are able to improve the performance of the firms in two ways: (i) increasing the size of existing small clusters; and (ii) the policies could focus on improving the externalities of Marshall (input-output externality, labor pooling externality and innovative externality); While the second one focus on general conditions that could enact industry. Nathan and Overman (2013) suggested that the adoption of horizontal policies could be more effective than the vertical policies, in order to help firms to grow by aiming to make cities work better, what they called 'agglomeration policy'.

It can be observed that the topic of industrial agglomeration and territorial development is a rich and complex matter, permeating the literature for many decades. Therefore, the present article proposes to stress this topic, bringing the literature's main discussions

RESEARCH PROBLEM AND OBJECTIVE

The discussion about local development has been strengthened in the past few years, especially after the 2008 crisis. Therefore, the socioeconomic debate has been trying to formulate answers to development matters, in order to promote social and economic growth and to avoid new crises scenarios.

As noticed in the introduction of this article, the literature about industrial agglomeration is vast, since the concept has a strong interdisciplinary characteristic, being studied by economists, sociologists and even political scientists; it is, also, very rich, since it is always associated with parallel concepts, as industrial policies, labor markets, territorial development and so on. Hence, a question emerges: What the literature discusses about industrial agglomeration?

To answer this question, the present article aims to deepen the discussion about the economic phenomenon of industrial agglomeration, bringing many authors and their points of view; methodologically, the traditional literature review was used (CRONIN *et al.*, 2007). Furthermore, it is important to highlight that the present study is a theoretical one, according to the observations of Sutton and Staw (1995). As stated by the authors, a strong theory “delves into underlying processes so as to understand the systematic reasons for a particular occurrence or nonoccurrence”.

INDUSTRIAL AGGLOMERATION

Concepts and Characteristics

Zysman (1994) and Malmberg and Maskell (1997) exposed that regions develop a pattern of specialization. This territorial specialization is characterized by the agglomeration of companies in one industrial sector or in one specific geographic area. However, different types of agglomeration represent different scales of specialization.

The original formulation of Marshall (1920) of industrial agglomeration was expressed by benefits that were outcome three main factors: customer-supplier's relations; labor pooling and knowledge exchange. In the beginning, the Marshall's externalities showed that “industrial districts” tend to be more productive than disperse companies. The author showed three main aspects that the collective action was more efficient: (A) businesses have a chance to focus in one specific stage or phase of the production; (B) the agglomeration of companies tend to take suppliers and specialized labor force to the region; and (C) information is better trade and shared and this knowledge spillover can be done through formal and informal channels.

More recently, Porter (1990; 2000) developed the Cluster academic perspective. A cluster is characterized by the geographic concentration of interconnected companies, suppliers, associated institutions and service provider that works around one similar industry that compete and cooperate. According to the author, the role of clusters is to promote competitiveness and productivity; and, to promote that, it is crucial, in his point of view, to stimulate university-industry partnerships, to improve local infrastructure, to elaborate free trade zones, to build industrial parks, focused on exports and to create a synergy between companies and government. Porter's perspective of a cluster, therefore, is based on deep collaborative networks between economical, social and political players and a local supply chain, strongly established (PORTER, 2003).

Dirzu (2012) argues that literature tends to conceptualize clusters and agglomeration as synonymous: “they represent geographical and sectorial concentrations of enterprises and firms (...) a region shows agglomeration when it specializes in a certain industrial sector compared to other regions in economy.” (p. 318). In addition, the author sustains that agglomeration economies are adopted as a way to improve the performance of regions. On this route, Glaeser *et al.* (2010, p.1) affirm that agglomeration economies are: “the benefits that come when firms and people locate near one another together in cities and industrial clusters”.

Another wave of theorists characterizes businesses agglomeration as being part of learning-innovative-knowledge process. This perspective of agglomeration as being as a result of a path-dependent process is also highly studied. The path-dependence and interactivity of knowledge creation and dynamics are elements essential for the stability of one specialized region (STORPER, 1995; MALMBERG; MASKELL, 1997). Krugman and Obstfeld (2003)

sustained that feedback loops are a characteristic of cluster and, due to that, the first movers are usually in advantage. The success of an agglomeration depends on the positive feedbacks that are seen with the implementation of the strategy (DIRZU, 2012). Finally, Duranton and Puga (2004) had a mindset of agglomeration more toward the sharing, matching and learning processes of cities.

On another perspective, agglomeration is seen as a competitive strategy. For Duranton and Kerr (2015) agglomeration is: “an equilibrium outcome where firms and workers weigh benefits against costs” (p.13). These authors add that agglomeration economies are: “where cities and clusters of activities boost the productivity of firms located within them” (p.2).

There are some characteristics of agglomeration that can be highlighted. According to Martin and Sunley (2011) clusters are open complex adaptive system with different parts and actors. Economic agglomeration is characterized by a high velocity of labor markets. In the beginning of the agglomeration, many smalls businesses are built and the winning ones hire the employees of the losers (FALLICK *et al.*, 2006). There is an equilibrium in the advantage of labor supply in the region and the costs of the same region and this equilibrium is responsible for the sustainability of the firms (DURANTON, 2014; DURANTON; KERR, 2015).

Glaeser *et al.* (2010) cite some features that could reflect the success of one agglomeration. If one region presents successful patterns, there should be seen: (A) the increase on the price of properties; (B) the increase of population; (C) employers are willing to pay more; (D) people pays more to live and have access to the region; (E) increase of overall prices; and (F) it may result in the increase of employment rates. With that, it is highlighted that agglomeration may be measured by the productivity levels, prices and population levels; hence, the direct correlation between population density and increase of salaries is another characteristic of clusters.

Socioeconomic and territorial frameworks

A group of elements have influence in agglomeration economies. The development of a cluster is influenced by the migration process of labor forces. There may be some constraints on the migration processes in some regions and this may result on no-qualified labor force and on the existence of a “secondary labor market” (GLAESER, 2008; DURANTON; KERR, 2015; MUKIM, 2015). On the other hand, some companies strategic go toward regions with specialized labor force offer. For example, some companies in the USA install themselves on border regions in order to use Mexican labor forces; giving them working visas (KERR; LINCOLN, 2010; RUIZ *et al.*, 2012).

The literature also focus on understanding the role of geographic and historical elements on the funding of specialized economies (BOSCHMA; LAMBOOY 1999; BOSCHMA; FRENKEN 2011). When analyzing businesses’ agglomeration, there must be taken into account the place where the agglomeration is being formed. It is obvious that the scaling of production plants in developed countries are higher than in developing countries. The economic development is an element that must be seen when analyzing the limited scale of production. In the USA, this scaling is much more viable than in India e Mexico (HSIEH; KLENOW, 2014). In this geographic-based perspective, some studies show that the location-choice of a company has direct impact on its performance. Mainly because companies from different segments extract different benefits from different geographic locations; costs are more generic and variable depending on the different regions; and managers usually have knowledge of business in specific regions (KERR *et al.*, 2011). Local infrastructure is also an element of analysis when looking toward economic agglomeration. This infrastructure is determinant for the investment in one region (REDDING; TURNER, 2015). Some other studies analyze the impact of proximity with supplier for the choice of the location of settlement (CHINITZ, 1961; GLAESER; KERR, 2009).

The size of a cluster is also a fundamental element to understand how it works. Technological-based agglomerations are usually more concentrated while manufactured and highly-labor force dependent agglomeration tend to be bigger and spreader (ROSENTHAL; STANGE, 2001; 2003; ELLISON *et al.*, 2010). Malmberg and Maskell (1997) show that the size of the industry is essential to understand agglomeration. Small sectors (with not many players) tend to be less concentrated. Venables (2006) present a perspective in which variation of sectors in one region may lead to production jumps in the region, from higher to lower cost production.

The phenomenon of decentralization is related to some particular industries (MALMBERG; MASKELL, 1997). Glaeser *et al.* (2010) show that manufacturing industries tend to less agglomeration than services industries. This is justified because the price to transport services are higher than to transport goods. Proving this perspective, several authors found out that clusters of services and Medical Care present better performance than those in manufacturing industries.

It is essential to highlight that knowledge is a key element in competitive performance of firms (SCOTT, 1995) and the learning process is interactive and uncertain (MALMBERG *et al.*, 1996). From the point that innovation is related to knowledge and learning processes, geography plays an essential role because innovation is less from individual firms and more related to resources, knowledge and capabilities specific of some regions (FELDMAN; FLORIDA, 1994). Zucker *et al.* (1998), while studying the biotechnology industry in the USA identified that the existence of actors and crucial structures were essential for the funding of a localization economy. They highlighted, mainly, the existence of researchers and scientists, universities and research institutions previously than the institution of the specialization.

Amin and Cohendet (2004) affirm that organizational and institutional actors that are part of a system are essential to promote learning processes and for the well operating of the agglomeration. This outcome of these networks represent, therefore, the depth of the cluster. Additionally, Schmitz (1995) concludes that what drives the growth of an agglomeration is the fact that companies create deliberative cooperation inside the territory, mainly with suppliers. With that, this collective action helps to improve the competitiveness of the whole cluster.

With a mix of economic and network perspectives of sources of agglomeration, there are authors that believe that the elements that justify the agglomeration of companies is more “social-cultural” than purely economic. The sustainability of a specialized territory depends on the ability to enhance learning and innovation. The concentration of companies in one region will result in cultural and social changes in which the community will adapt itself in order to fit inside the new economic-industrial system. Political, institutional and socio-cultural actors are, with that and also, responsible for the competitive regional advantages (SAXENIAN, 1999; AYDALOT, 1986).

Types of Agglomeration

Nathan and Overman (2013) affirmed that there is a difference between “localization economies” and “urbanization economies”. The first refers to the outcome from the practice of similar activities, while the second one is the result of concentration of diverse activities. “Localization economies” promote the clustering of industries and to more specialized cities; on the other hand, “urbanization economies” tend to promote diversified cities. The authors also highlight that the type of the segment is crucial for the decision of which type of economy will be practiced. The localization economies can be driven by shared amenities, linkages between producers and knowledge spillovers.

On the 70's the strategy of “growth pole”, “growth center” and “industrial complex” became famous for promoting the geographic concentration of related and interdependent companies. Further studied by Porter (1990), these strategies were shown as positive to increase

entrepreneurial and innovative activities. The wave of theoretical thought that came after Marshall was the one that centered their studies toward the strategies of “growth pole”, “growth center” and “industrial complex”. Growth pole was related to the geographic agglomeration of clusters of industries in, at least, one central economy segment that was believed that would tend to fast develop a large-scale production (CHAPMAN; WALKERS, 1987). The main benefits of these strategies, in the 60’s and 70’s, was increase of employment, purchase of power, and the attraction of related economic activities. But, even though, there was a focus on innovation, these strategies basically were focused on the input-output analysis in large industries. The growth centers were focus on infrastructure. It was an industrial policy to improve infrastructure toward concentrating businesses in one specific region. While an industrial complex was much more toward developing internal relationship among players and actors. It was related to the interconnections among these and the importance of each part in the operationalization of the complex. (CHAPMAN; WALKER, 1987; WHEELER *et al.*, 1998; ROCHA, 2004).

Another issue that is addressed is the difference between agglomeration and specialization. When dealing with agglomeration, usually is characterized by one region being more agglomerated than another region. Agglomeration are usually the concentration of economic activity in one specific region; while specialization is the concentration of specific industries in specific regions (BRULHART, 1998; HALLET, 2000).

When dealing with the difference between agglomeration and clusters. Both concepts of agglomeration and clusters are related to relations inside one specific region. Even though clusters are characterized by much more network among players and actors, agglomeration economies, as a whole, have networks as a central idea. This way, it is essential to understand the existence of territorial network (SPRENGER, 2001). A territorial network is one instrument in which actors work together toward a common goal with a shared vision. Territorial network is characterized by permanent relationship among banks, government chambers, high education universities, research institutions, associative of producers and employees, local firms and the social context as a whole (MAILLAT, 1990; CAPPELLINI, 2002; SPRENGER, 2001). These territorial network systems are full of shared values that build, over time, relationships; and the strength of these relationships turn the system in a collaborative, interdependent and full of communication among actors. And these reflects are not seen just in the business system, the social norm and cultural elements are also influenced by the territorial network (FISHER, 2006).

According to Iacono and Nagano (2010, p. 173) industrial agglomeration are: *“Agrupamentos de empresas concentradas geografica e setorialmente, com capacidade relacionadas ou afins, de portes variados, mas geralmente com um conjunto expressivo de pequenos e médias empresas não-integradas verticalmente”* (Grouping of businesses concentrated geographic and sectorial-wise, with related capabilities or related, of various sizes, but usually with an expressive amount of small and medium firms not-integrated vertically).

Another strategy that focus on the territorial agglomeration of companies is the Cluster strategy of Porter (1990; 2000). For Porter (2000, p. 16), this strategy consists of the promotion of: “a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities.”

Originally defined by Freeman (1987), innovation systems are now viewed broadly as including social institutions, education and communications infrastructures and the norms and rules that regulate economic and social interaction (Lundvall *et al.*, 2009). ‘Regional innovation systems’ models (RIS) apply these frameworks to specific regions and clusters (SAXENIAN, 1994; COOKE, 2002). The basic argument is that given the existence of agglomeration economies, area-level institutions and networks substantially influence firms’ capabilities. Developing this insight, Storper (1997) suggests that regional outcomes are governed by three

‘spaces’ – territory, organizations and technologies and the local ‘untraded interdependencies’ that regulate agents’ behavior. Given the emphasis on institutions and interactions, RIS studies pay close attention to describing the key agents in a cluster and their relationships, which are seen as governing the evolution of the cluster. These include universities and public agencies, networks (e.g. public-private partnerships) and social institutions (rules, customs and norms). Beyond this, national-level institutions (such as legal frameworks or spending programs) and sectoral factors (industry-specific conditions or technological trends/shocks) are argued to set underlying operating conditions.

Benefits of Agglomeration

Once analyzed the frameworks and characteristics of the agglomeration, it is important, now, to observe its benefits. That debate begins with the work of Marshall (1920) and the benefits generated from the externalities of Marshall. The author affirms that agglomeration allows the reduction of three types of transportation costs: goods, people and ideas. The first one is related to suppliers and customers, the second to labor pooling and the third to knowledge spillover. Based on the Marshall (1920), for Krugman (1991) the benefits of an agglomeration can be seen when there is the reduction of good and services transportation. However, with globalization, these costs decreased and the focused of reducing costs became reducing costs of transporting people. Additionally, besides monetary costs, the transportation of people costs time and agglomeration allows firms and, consequently, people to be closer.

Complementarily, agglomeration of companies facilitates the matches between companies and workers (HELSLEY; STANGE, 1990) and the new comers may install themselves inside the cluster due to an already specialized labour force. This happens because workers can move across firms and industries with related activities (ELLISON *et al.*, 2010). When dealing with knowledge, Scherer (1984) affirms that Research and Development activities in one sector spill to help other related industries.

Ellison *et al.* (2010) study the evidences from the processes of coagglomeration in the United States of America manufacturing sector as a way to understand what are the causes of industrial agglomeration. They analyze the importance of the three Marshallian transportation benefits as well as natural advantages. They conclude that natural advantages are the main explanation for the coagglomeration of these companies. While out of Marshall’s externalities, the input-output (related with suppliers) is the most explained on this specific phenomenon, followed by labor pooling. In the sample, knowledge spillover shows the weaker explanation. Although the authors found significant explanation in all four variables. However, it is important to highlight that this study was done with manufacturing industries and, as explained before, agglomeration tends to be more attractive to services industries.

Among other benefits of territorial specialization, there can be highlighted the benefits from asset sharing, common labor pooling, better access to intermediate inputs, increase of face-to-face communication and knowledge spillover on related technologies (MARSHALL, 1920; ROSENTHAL; STANGE, 2003).

In a competitive perspective, the comparative advantages theoretical proposal of Ricardo (1821) is also applied in a sub-national level when understanding territorial specialization. By specializing one region in one type of good or one group of related goods, in which there is a relative advantage, agglomerations tend to be more effective and productive. It is important to highlight that regional advantages may change throughout the development of the region. The initial advantages from one region may not be the same when the regional specialization grows (ENRIGHT, 1994).

Regional advantages are not just related to human and physical characteristics. The existence of industrial and institutional structures that are full of knowledge elements that are a part of the advantages from one region (BARNEY, 1991; ENRIGHT, 1994). Authors studied

the effect of innovation and knowledge transfer in clusters and how can these two elements may influence agglomeration: (ELLISON; GLAESER 1997; DURANTON; PUGA 2004) have considered the scope of such spillovers and specifically whether diverse or specialized environments lead to faster growth. Therefore, researches diverge when concluding if agglomeration generates benefits toward production and/or innovation. There is an approach that affirms that specialization is good for production but bad for innovation.

There are two elements that might be highlighted when understanding learning process: (i) history matters; and (ii) proximity matters (MALMBERG; MASKELL, 1997). Companies tend to develop process and routines in order to decrease the dangers of uncertainty in the learning process. These exceptional practices tend to become practices and to stablish learning trajectories. These learning trajectories are key for the maintenance of the sector and of the company; showing, therefore, that history matters (DOSI, 1982; MASKELL; MALMBERG, 1995). Complementarily, even with technology advantages and transportation development, some information demand face-to-face and frequent contact. It is essential to highlight that the more tacit knowledge is, more proximity matters. The decrease of costs to provide interpersonal knowledge transfers and the trust that is built when communication and knowledge transfer is made; reaffirm that proximity matters (MALMBERG; MASKELL, 1997). The advantages relating knowledge and learning for spatial agglomeration are due two elements: knowledge and information inputs and uncertain outputs. These elements require frequent communication and fast decision-making; therefore, the existence of agglomeration helps these elements (MALMBERG; MASKELL, 1997).

For urban economics, the logic of agglomeration is based on the following process: spatial concentration has as result agglomeration of economies and this agglomeration helps firms to be more productive. Among the main benefits are: infrastructural benefits, mass work force and migration process, the facilitation of knowledge transfer and learning processes and a structured network of suppliers and buyers. But there are also costs from this movement, the increase in land prices and the congestion of companies can result in high costs. In conclusion, the benefits must be higher than the costs, otherwise agglomerations will become dispersion. And, in practice, little is seen from the movement of “desagglomeration” (COMBES *et al.*, 2008; OVERMAN; LEUNIG, 2008).

Duranton and Kerr (2015) show that the agglomeration of the movie industry around Hollywood was responsible for an increase in productivity of the companies of the segment. They highlight three fundamental elements that helped this process: the concentration of artists in one region that allowed the best combinations for the productions; the development of laws that controlled, promoted and supported the industry; and the creation of schools in the area that were responsible for the training and preparation of actors.

Literature's criticism

Nathan and Overman (2013) highlighted that difference among sectors, functions and areas turn agglomeration-spatial studies complex. This complexity may lead to unpredictable shocks, therefore, the results of the government intervention cannot be predicted. Some studies toward entrepreneurship and the development of clusters have find out that the relation between them depends on the segment in which the company is inserted. High technological companies may need more daily-life operations entrepreneur process and, therefore, entrepreneurial structures of the region will help the development of the cluster. While in more natural resources companies this process may not be so demanded (DURANTON; KERR, 2015).

Duranton (2011) argue that Porter, in his studies, lack of some key elements. For instance, the main criticism is that cluster does not solve any specific problem. The dispersion of companies does not show to present any problem. Other elements that Porter does not address answers is to what is labor and businesses mobility, and the possibilities of the increase of land

prices in specialized areas. Martin and Sunley (2003) also criticize Porter's approach by showing that this perspective is too simple to provide the amount of information and knowledge that is necessary to develop an effective and sustainable cluster policy. Another wave of critics shows that the perspective that industrial sectors are not important for the success of the cluster is also weak. There are empirical evidences, for instance, on media, biotechnology and information-based industries.

Nathan and Overman (2013) studied the example of a Tech City cluster in the UK, mainly to show the limitations city-based policies to promote clustering. The authors characterized the cluster as a wider creative economy and as a localisation economy. The main goal of the government was to accelerate the growth of the cluster and to put in practice the new government industrial goal, the high-tech approach. They conclude that the strategy of the government was confused and generated tensions among the companies and there were shown unintended distribution effects. The authors than proved that Porter's clustering model was not the ideal and had no real effects on the Tech City cluster.

More object criticism can be seen in literature. But there are some evidences that the agglomeration of companies in one territory may be responsible for the increase of costs. The increase on the rental princes, the prices of goods and services of consumption and the environmental degradation (air pollution) are some of the costs that may be paid when inserted in an agglomeration (DURANTON, 2014; DURANTON; KERR, 2015). Other challenges developing countries face when taking into account economic agglomeration is dual housing markets; inefficient migration and city favoritism (DURANTON, 2008; 2014). On the same perspective, pollution, congestion and competition encourage dispersion (KRUGMAN; VENABLES, 1995). Social problems can also develop, such as the increase of crimes (GLAESER *et al.*, 2010).

Desrochers and Sautet (2008) pointed out that policies toward territorial specialization tend to inhibit innovation and entrepreneurship. The authors argued that: a 'successful' policy push toward specialization might contain the seeds of its own demise by leaving regional economies more vulnerable to cyclical downturns and less likely to support the emergence of innovative practices and behavior, such as the development of interindustry linkages and new combinations of existing technologies and materials ("Jacobs externalities")... a diverse environment is often a necessary precondition for the spontaneous emergence of diverse local specializations." (p. 814). There are some challenges that clusters may face such as lock-in. The companies in the specialized region may be so much dependent on regional networks and sources that this reliance may generate competitive disadvantages, as well as, inhibit innovation (BOSCHMA, 2005; MARTIN; SUNLEY 2011).

Duranton *et al.* (2001) showed two main negative effects from the implementation of clusters policies: (A) the first one deals with the political economy where companies "choose" governments and the effects of this choice on preferential governmental actions; and (B) the specialization of a territory turns it into a more vulnerable region when relating to external shocks. Chiu (2002) argued that investors in China complain that they cannot choose the city in which they want to install their plants and they are not allowed to plan their funding in places in which they can plan the adequate industrial mix.

Another challenge that specialized regions may face is the possibilities of the decrease of demand or prices of the goods or group of goods produced in the region (CHAPMAN, 2005). The possibilities of extreme depression or the crash of the suppliers may lead to the failure of the region (MARSHALL, 1920). Crisis hit harder territories in which there is a concentration of production in one group of goods. When dealing with competition in agglomerative economies, it is visible that in clustering economies the companies less productive tend to leave the market (MELITZ; OTTAVIANO 2008).

CONCLUSIONS

After analyzing what the literature discuss about the topic of industrial agglomeration, this article can, finally, reach its conclusions:

- As pointed out by Dirzu (2012), part of the literature tends to associate the concepts of agglomeration and cluster as if they meant the same thing, since both represent geographical and sectorial concentrations of enterprises and firms. However, it is important to highlight that agglomeration involves, also, a specialization in a determined sector;
- Agglomeration can be seen in many ways: as being part of learning-innovative-knowledge process; as a competitive strategy; by its dynamics of the labor markets;
- There is a tendency to industrial agglomeration to be more successful in some specific regions, situations and industries;
- Even though a group of benefits can be seen from the processes of industrial agglomeration, such as: common labor pooling, increase of face-to-face communication, better relationship among companies and increase of public investments; many challenges are discussed in those processes, such as: limitation of policies, increase of costs, this movement does not solve any specific problem and investments toward industrial agglomeration tend to be made in downwards industries and regions;
- Literature has discussed deeply and in a longitudinal perspective industrial agglomeration, and it is a topic studied globally.

This paper exposed the main ideas about industrial agglomeration based on literature review. Therefore, it is important to deep in the topic of industrial agglomeration. Further studies can be made to investigate how Brazilian literature has discussed the topic of Industrial Agglomeration; as well as, the study of empirical cases in Brazil.

REFERENCES

- AINGGER, K. Industrial Policy: A Dying Breed or A Re-emerging Phoenix. *Journal of Industry, Competition and Trade*, v. 7, n. 3, p. 297-323, 2007.
- AMIN, A., COHENDET, P. *Architectures of Knowledge: Firms, Capabilities, and Communities*. Oxford: Oxford University Press, 2004.
- AYDALOT, P. (Ed.) *Milieux innovateurs en Europe*. Paris: GREMI, 1986).
- BAI, Y.; ZHANG, Z. Aggregate cigarette demand and regional differences in China. *Applied Economics*, v. 37, p. 2523–2528, 2005.
- BARNEY, J. Firm resources and sustained competitive advantage. *Journal of Management*, v. 17, p. 99-120, 1991.
- BOSCHMA, R. (2005) Proximity and innovation. A critical assessment. *Regional Studies*, v. 39, n. 1, p. 61–74, 2005
- BOSCHMA, R.; FRENKEN, K. The emerging empirics of evolutionary economic geography. Working Paper 10.10. *Eindhoven Centre for Innovation Studies (ECIS)*, 2011.
- BOSCHMA, R.; LAMBOOY, J. Evolutionary economics and economic geography. *Journal of Evolutionary Economics*, v. 9, p. 411–429, 1999.
- BRULHART, M. Economic Geography, Industry, Location and Trade: the Evidence, *The World Economy*, Vol. 21, 1998.

- BUCK, N. *et al.* (Ed.). *Changing Cities: Rethinking urban competitiveness, cohesion and governance*. London: Palgrave Macmillan, 2004.
- CAPPELINI, R. Regional Industry Policy and the new economy. IN: FISCHER, M. (Ed.) *Regional Development Reconsidered*. Berlin, 2002.
- CHANG, S. Productivity and territorial specialization. *Applied Economics*, v. 41, n. 8, p. 941-945, 2009.
- CHAPMAN, K. From “growth centre” to “cluster”: Reconstructing, regional development, and the teesside chemical industry. *Environment and Planning A*, v. 37, n. 4, p. 597-615, 2005.
- CHAPMAN, K.; WALKER, D. *Industrial location*. Oxford: Basil Blackwell, 1987.
- CHINITZ, B. Contrasts in agglomeration: New York and Pittsburgh. *American Economic Review*, v. 51, n. 2, p. 279-289, 1961.
- CHIU, A. Ecology, Systems, and networking. Walking the talk in Asia. *Journal of Industrial Ecology*, v. 5, n. 2, p. 6-8, 2002.
- COMBES, P. *et al.* Estimating Agglomeration Economies with History, Geography, and Worker Effects. IN: GLAESER, E. (Ed.), *The Economics of Agglomeration*. Cambridge: National Bureau of Economic Research, 2010.
- COOKE, P. Regional Innovation Systems: General Findings and some new evidence from biotechnology clusters. *Journal of Technology Transfer*, v. 27, p. 133-145, 2002.
- CRONIN, P. *et al.* Undertaking a literature review: a step-by-step approach. *British Journal of Nursing*, v. 17, n. 1, p. 38-43, 2008.
- DESMET, K; ROSSI-HANSBERG, E. Spatial Development. *American Economic Review*. v. 104, n. 4, p. 1211–1243, 2014.
- DESROCHERS, P.; SAUTET, F. Entrepreneurial Policy: The Case of Regional Specialization vs. Spontaneous Industrial Diversity. *ET&P*, 1042-2587. 2008.
- DIRZU, M. A conceptual approach to economic agglomerations. [CES Working Papers](#), *Centre for European Studies*, Alexandru Ioan Cuza University, v. 4, n. 3, p. 316-322, 2012.
- DOSI, G. Technological paradigms and technological trajectories. *Research Policy*, v. 11, p. 147-162, 1982.
- DURANTON, G. Viewpoint: From Cities to Productivity and Growth in Developing Countries. *Canadian Journal of Economics*, v. 41, n. 3, p. 689–736, 2008.
- _____ California Dreamin: The feeble case for cluster policies. *Review of Economic Analysis*, v. 3, n. 1, p. 3-45, 2011.
- _____ Growing through Cities in Developing Countries. *The World Bank Research Observer*, v. 30, p. 39–73, 2014.
- DURANTON, G. *et al.* Nursery Cities. *A.E.R.*, v. 91, p. 1454–77, 2011
- DURANTON, G; KERR, W. The Logic of Agglomeration. *Harvard Business School*, Working Paper 16, n. 37, 2015.

DURANTON, G.; PUGA, D. Micro-foundations of urban agglomeration economies. IN: HENDERSON, J.; THISSE, J. (Ed.) *Handbook of Urban and Regional Economics*, 4 ed. Amsterdam: North-Holland, 2004.

ELLISON, G.; GLAESER, E. Geographic Concentration in U.S. Manufacturing Industries: A Dartboard Approach. *Journal of Political Economy*, v. 105, n. 5, p. 889-927, 1997.

ELLISON, G. *et al.* What causes industry agglomeration? Evidence from coagglomeration patterns. *American Economic Review*, v. 100, n. 3, p. 1195-1213, 2010.

ENRIGHT, M. Regional Clusters and Firm Strategy. *Prince Bertil Symposium on 'The dynamic firm: the role of regions, technology, strategy and organization'*, Stockholm, 12-15 June, 1994.

FALLICK, B. *et al.* Job-hopping in Silicon Valley: some evidence concerning the microfoundations of a high-technology cluster. *Review of Economics and Statistics*, v. 88, n. 3, p. 472-481, 2006.

FELDMAN, M.; FLORIDA, R. The geographic sources of innovation: technological infrastructure and product innovation in the United States. *Annals of the Association of American Geographers*, v. 84, p. 210-229, 1994.

FISCHER, M. The New Economy and Networking. IN: FISCHER, M. (Ed.), *Innovation, networks and knowledge spillovers*. Berlin: Springer Verlag, 2006.

FREEMAN, C. *Technology Policy and Economic Policy: Lessons from Japan*. London: Pinter, 1987.

GLAESER, E. *Cities, Agglomeration and Spatial Equilibrium*. Oxford: Oxford University Press, 2008.

_____ *The Triumph of the City*. London: Pan Macmillan, 2011.

GLAESER, E. *et al.* Clusters of entrepreneurship. *Journal of Urban Economics*, v. 67, n. 1, p. 150-168, 2010.

GLAESER, E.; KERR, W. Local industrial conditions and entrepreneurship: how much of the spatial distribution can we explain? *Journal of Economics and Management Strategy*, v. 18, n. 3, p. 623-663, 2009.

HALLET, M. (2000) Regional Specialisation and Concentration in the EU. *Economic papers, European Commission, Brussels*, v. 141, 2000.

HELSLEY, R.; STRANGE, W. Agglomeration Economies and Matching in a System of Cities. *Regional Sci. and Urban Econ.*, v. 20, p. 189-212, 1990.

HARRIS, N. *Urbanisation, economic development and policy in developing countries*. Working Paper 19, *UCL Press*, 1990

HSIEH, C.; KLENOW, P. The Life Cycle Of Plants In India And Mexico. *The Quarterly Journal Of Economics*, v. 129, n. 3, p. 1035-1084, 2014.

IACONO, A.; NAGANO, M. Cooperação, Interação e Aprendizagem no Arranjo Produtivo Local de Equipamentos e Implementos Agrícolas do Paraná. *INTERAÇÕES*, Campo Grande, v. 11, n. 2 p. 171-185, 2010.

KERR, W. *et al.* Location choice for new ventures: cities. Background Note 811-106, *Harvard Business School*, 2011.

- KERR, W., LINCOLN, W. The supply side of innovation: H-1B visa reforms and U.S. ethnic invention. *Journal of Labor Economics*, v. 28, n. 3, p. 473-508, 2010.
- KRUGMAN, P. Increasing Returns and Economic Geography. *Journal of Political Economy*, v. 99, 1991.
- KRUGMAN, P.; OBSTFELD, M. *International Economics: Theory and Policy*. Boston: Addison Wesley, 2003.
- KRUGMAN, P.; VENABLES, A. Globalization and the inequality of nations. *Quarterly Journal of Economics*, v. 110, n. 4, p. 857–880, 1995.
- LUNDEVALL, B. et al., (Ed.) Handbook of innovation systems and developing countries: building domestic capabilities in a global setting. Cheltenham: Edward Elgar, 2009.
- MAILLAT, D. SMEs, Innovation and Territorial Development. IN: CAPPELIN, R.; NIJKAMP, P. (Ed.) *The Spatial Context of Technological Development*. Avebury: Elsevier, 1990.
- MALMBERG, A; MASKELL, P. Towards an explanation of regional specialization and industry agglomeration. *European Planning Studies*, v. 5, n. 1, p. 25-41, 1997.
- MALMBERG, A. et al. Spatial Clustering, Local Accumulation of Knowledge and Firm Competitiveness. *Geogr. Ann.*, v. 78, n. 2, 1996.
- MARSHALL, A. *Principles of Economics*. London: MacMillan, 1920.
- MARTIN, P. et al. Public support to clusters: A firm level study of French “Local Productive Systems”. *Regional Science and Urban Economics*, v. 41, n. 2, p. 108-123. 2011.
- MARTIN, R.; SUNLEY, P. Deconstructing clusters: chaotic concept or policy panacea? *Journal of Economic Geography*, v. 3, n. 1, p. 5-35, 2003.
- _____ Conceptualizing Cluster Evolution: Beyond the Life Cycle Model? *Regional Studies*, v. 45, n. 10, p. 1299-1318, 2011.
- MASKELL, P.; MALMBERG, A. Localised Learning and Industrial Competitiveness. BRIE Working Paper 80, *Berkeley Roundtable on the International Economy*, 1995.
- MELITZ, M.; OTTAVIANO, G. Market Size, Trade, and Productivity. *The Review of Economic Studies*, v. 75, n. 1, p. 295-316. 2008.
- MUKIM, M. Coagglomeration of formal and informal industry: evidence from India. *Journal of Economic Geography*, v.15, n. 2, p. 329-351, 2015.
- NATHAN, M.; OVERMAN, H. Agglomeration, clusters, and industrial policy. *Oxford Review of Economic Policy*, v. 29, n. 2, p. 383-404, 2013.
- O’SULLIVAN, A. *Urban Economies*. USA: The McGraw Hill Company, 2000.
- OVERMAN, H.; LEUNIG, T. Spatial Patterns of Development and the British Housing Market. *Oxford Review of Economic Policy*, v. 24, n. 1, p. 59-78, 2008.
- PORTER, M. *The Competitive Advantage of Nations*. New York: Free Press, 1990.
- _____ Location, competition, and economic development: Local clusters in a global economy. *Economic Development Quarterly*, v. 14, n. 1, p. 15-34, 2000.

_____ The Economic Performance of Regions. *Regional Studies*, v. 37, n. 6-7, p. 545-546, 2003.

REDDING, S.; TURNER, M. Transportation costs and the spatial organization of economic activity. IN: HENDERSON, J. *et al.* (Ed.). *Handbook of Regional and Urban Economics*. 5 ed. Amsterdam: North Holland, 2014.

RICARDO, D. The principles of political economy and taxation. 3 ed. London: John Murray, 1821.

ROCHA, H. Entrepreneurship and development: The role of clusters. *Small Business Economy*, v. 23, n. 5, p. 363-400, 2004.

ROSENTHAL, S., STRANGE, W. The determinants of agglomeration. *Journal of Urban Economics*, v. 50, p. 191-229, 2001.

_____ Geography, industrial organization, and agglomeration. *Review of Economics and Statistics*, v. 85, n. 2, p. 377-393, 2003.

RUIZ, N. *et al.* *Geography of H-1B workers: demand for high-skilled foreign labor in U.S. metropolitan areas*. New York: Brookings Institute Report, 2012.

SAXENIAN, A. *Regional Advantage: Culture and Competition in Silicon Valley and Route 128*. Cambridge: Harvard University Press, 1994.

_____ *Silicon Valley's New Immigrant Entrepreneurs*. San Francisco: Public Policy Institute of California, 1999

SCHMITZ, H. Collective efficiency: Growth path for small-scale industry. *Journal of Development Studies*, v. 31, n. 4, p. 529-566, 1995.

SCOTT, A. The geographic foundations of industrial performance. *Competition & Change*, v. 1, p. 51-66, 1995.

SPRENGER, R. *Inter-Firm Networks and Regional Networks*. Bonn: NSS ADAPT, 2001.

STORPER, M. The resurgence of regional economies, ten years later: the region as a nexus of untraded interdependencies. *European Urban and Regional Studies*, v. 2, p. 191-221, 1995.

_____ *The Regional World: Territorial Development in a Global Economy*. New York: Guilford, 1997.

SUTTON, R.; STAW, B. What Theory is Not. *Administrative Science Quarterly*, v. 40, p. 371-384, 1995.

TAYLOR, M. *Public Policy in the Community*. London: Routledge, 1994.

TOLLEY, G.; THOMAS, V. An overview of urban growth: problem, policies, and evaluation. The Economics of Urbanization and Urban Countries, *World Bank*, 1987.

VENABLES, A. Shifts in Economic Geography and Their Causes. CEP Discussion Paper 767, *LSE*, 2006.

VERMA, R. *External economies, in Readings in Urban Economics*. Edel, M.; Rotherberg, J. (Ed.). USA: Macmillan, 1986

WHEELER, J. *et al.* *Economic geography*. Hoboken, NJ: John Wiley & Sons, Inc, 1998.

ZUCKER, L., *et al.* Intellectual capital and the birth of U.S. biotechnology enterprises. *Amer. Econom. Rev.*, v. 88, n. 1, p. 290–306, 1998.

ZYSMAN, J. *National Roots of a 'Global Economy'*. University of California: Berkeley, 1994.