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Territorial servitization: Theoretical roots, feasibility and implications for the European Union

DOCTORAL DISSERTATION

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Abstract

Candidate: Krisztina Horváth
Title: Territorial servitization: Theoretical roots, feasibility and implications for the European Union
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Because of its potentially decisive role on regional development, the revitalization of manufacturing sectors has become a top priority for policy makers within the European Union. Recent scholarly contributions suggest that the interaction between manufacturing and knowledge-intensive business service (KIBS) businesses have the potential to generate positive outcomes, in terms of economic, employment and other social metrics in the focal territory. This process has been referred to as territorial servitization. The role of KIBS firms in promoting regional performance has been echoed by several supranational organizations and scientific studies; however, not all types of KIBS firms are equally important in facilitating regional manufacturing performance.

This work focuses on two elements related to territorial servitization processes. First, I analyze how regional manufacturing characteristics—i.e., specialization and size of new manufacturers—and the entrepreneurial ecosystem—contextual factors driving entrepreneurial actions—impact the creation of knowledge-intensive business service (KIBS) businesses at the regional level. Second, I scrutinize the potential impact of different types of KIBS businesses—distinguishing between technology-based (t-KIBS) and professional (p-KIBS) KIBS firms—on regional manufacturing productivity, measured as the gross value added of manufacturing businesses divided by employment in manufacturing businesses.

In the empirical analyses, I use a dataset of 121 regions located in 24 countries of the European Union. To account for the geographic embeddedness of the analyzed European regions, I employ spatial econometric methods. These methods allow to differentiate regional (local) and external effects (linked to adjacent territories), and to accurately test the proposed hypotheses. More concretely, I apply spatial Durbin cross-section models to quantify both spillover effects stemming from neighboring regions (diversity effects), and relationships between the dependent variable in the specific region and its adjacent regions.

The spatial analysis of the 121 regions suggests that regions with a solid manufacturing base attract new KIBS firms; however, this effect is conditioned by the prevalence of a healthy regional entrepreneurial ecosystem. Additionally, the results show a positive effect of KIBS sectors on the economic contribution of manufacturers; however, they reveal a stronger and positive relationship with the rate of technological KIBS businesses in the same region. The study offers valuable policy implications on how to implement policies that contribute to improve regional manufacturing performance.

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Chapter 1: Introduction

European governments have traditionally devoted considerable resources to support manufacturing sectors. Recently, the European Union has set explicit goals to increase the contribution of manufacturing to the economy to at least 20% of the EU's GDP by 2020 (European Commission, 2014). Although higher industrial activity—or reindustrialization—may resemble a sharp turnaround in the road to the innovation-driven status of the economy, EU policy makers expect higher employment rates and economic growth from this policy. In parallel with the call made by different public administrations (Bienkowska, 2015; European Commission, 2011, 2012a), scholars have suggested that manufacturers' competitiveness may depend on their ability to introduce value-adding services into their operations and offer advanced product-service systems (Baines and Lightfoot, 2014; Muller and Zenker, 2001; Visnjic and Van Looy, 2013).

Although service transition of manufacturing may provide important benefits to territories where manufacturers are located, few studies have sought for its territorial advantages. At the territorial level, these studies revealed that using more service inputs may result in, among other, higher productivity growth in manufacturing sectors (Ten Raa and Wolff, 2001), higher intraregional manufacturing demand is associated with higher regional specialization in business services in the same region (Meliciani and Savona, 2015), and relevant service reforms that may increase the output of the manufacturing industry (Arnold et al., 2016).

Recently, a research stream addresses the potential impact of service transition from a new point of view, in which the connection between knowledge-intensive business service (KIBS) and manufacturing businesses at the territorial level play a critical role. Lafuente et al. (2017, p. 20) propose that territorial servitization—more precisely knowledge-intensive territorial servitization—represents *"…the aggregate outcomes—e.g., economic, employment and other social outputs demanded by stakeholders—resulting from the various types of mutually dependent associations that manufacturing and knowledge-intensive service businesses create and/or develop within a focal territory"*. In this process, the instrumental role attributed to KIBS firms comes from knowledge as it constitutes the main product that they use to add value to their clients' processes and outputs. Also, their timely changing, often complex task setting is conducive to innovation (European Commission, 2011; Scarbrough et al., 2004; Tether and Hipp, 2002).

The literature on territorial servitization processes and their feasibility is still growing and calling for further research efforts. This is the primary aim of this study. More specifically, there are two main research questions I seek to answer. First, to extend the contribution by Lafuente et al. (2017) I am interested in addressing the question of how relevant characteristics of the regional manufacturing sector—i.e., specialization and the size of manufacturers—impact the creation of KIBS businesses, while acknowledging that the quality of the territorial entrepreneurial ecosystem—that is, contextual factors driving entrepreneurial actions—may affect this relationship. Second, I am interested in addressing the question of how KIBS businesses influence the economic contribution of manufacturing sectors from a territorial perspective. In this latter case I pay special attention to the potentially heterogeneous effect on manufacturing productivity of different types of KIBS businesses, namely technology-based and professional-based KIBS.

In my empirical analyses, I use a dataset of 121 regions located in 24 European countries. To account for the geographic embeddedness of the analyzed European regions, I employ spatial econometric methods (Anselin, 1988). These methods are especially suitable to achieve the aim (and scope) of the proposed analyses, as they allow to differentiate regional (local) and external effects (linked to adjacent territories), and permit to accurately test the hypotheses proposed in the empirical sections (Sections 4.1 and 4.2). By applying spatial Durbin cross-section models (SDM) I can quantify spillover effects stemming from neighboring regions (diversity effects), and relationships between the dependent variable in the specific region and its adjacent regions. In these models, spatial effects do not only spill over to the neighboring regions but also to the neighbors of the neighbors, and so on, that is global spatial spillovers prevail (LeSage and Pace, 2009). In the territorial servitization literature these methods were applied by Meliciani and Savona (2015).

The results emerging from the analysis suggest that regions with a solid manufacturing base attract new KIBS firms; however, this effect is conditioned by the prevalence of a healthy regional entrepreneurial ecosystem. Additionally, they reveal a positive effect of KIBS sectors on the economic contribution of manufacturers; however, the findings highlight that this relationship is statistically significant only when the focal region enjoys higher rates of technological KIBS businesses.

Overall, the contribution of this work to the existing scholarly literature is twofold. First, to the best of my knowledge, till now this is the first attempt to provide an extensive theoretical background on territorial servitization processes. Second, I analyze the role on territorial servitization processes of two unprecedented factors, 1) the entrepreneurial ecosystem as a moderating factor in the relationship between manufacturing and KIBS firms, and 2) the heterogeneity in the regional configuration of the stock of KIBS businesses and its impact on the feasibility of territorial servitization processes.

The dissertation is structured as follows. *Chapter 2* provides the theoretical basis for the empirical analyses of this work. After a short introduction of the general role of the main sectors in the economy, and the potential threats of the ongoing reindustrialization attempts in the European Union, I turn my attention to the potential synergies between industries, more specifically, manufacturing and service businesses. First, I review the general relevance of relatedness between industries, then in line with the recommendation made by McCann and Sheppard (2003), I move to the microeconomic foundations of territorial servitization processes by presenting the firm-level evolution of the (inter)relationships between services and manufacturing, and by revealing the potential economic advantages of these interactions. After this, I introduce some prominent actors, namely KIBS firms within the service sector. After a short description of their main characteristics, the literature on territorial servitization and the accumulated scholarly knowledge is presented. This section is followed by a greater consideration of general feasibility issues that may be conducive to territorial servitization processes. This covers the location decisions based on the changing development in technology and other globalization processes, including proximity, relatedness of industries and territorial disparities within the European Union. Finally, study hypotheses are developed. *Chapter 3* prepares the empirical chapter by presenting its data sources, variables and applied methodology. *Chapter 4* includes the results of the empirical analyses that motivated this dissertation. Finally, *Chapter 5* summarizes the theoretical background of this work, provides a discussion of the main empirical findings, presents the policy implications, and describes the limitations of the study.

Chapter 2: Background theory and hypotheses development

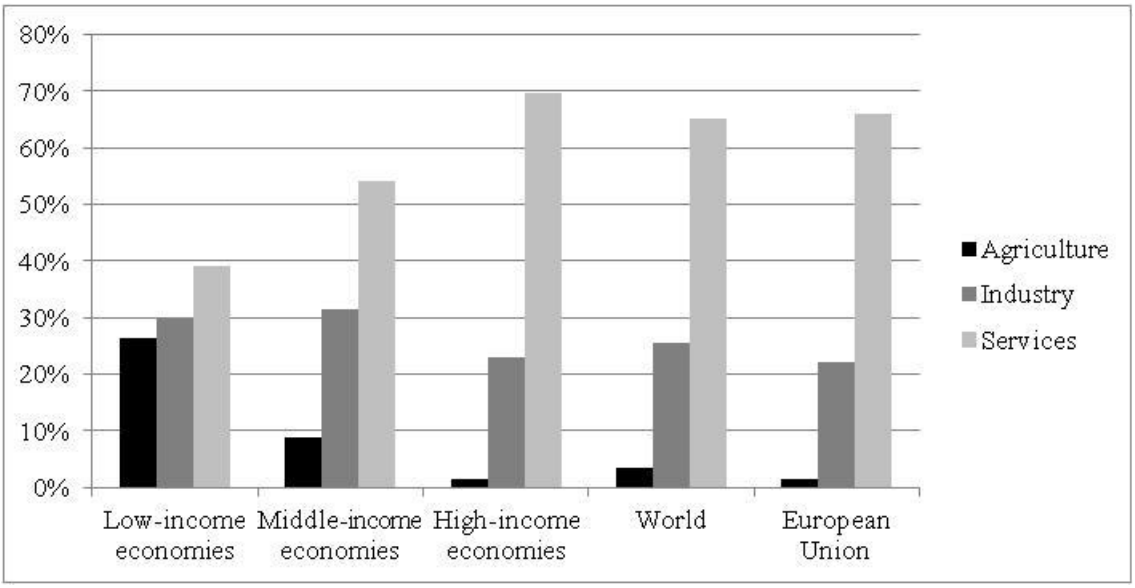
2.1. Introduction: The general role of main sectors in the economy and the reindustrialization attempt in the European Union

Before I take the plunge and introduce the main evolutionary processes related to the changing role of services in the manufacturing industry, it is important to provide a general overview on the role of services in the economy and more concretely, in the European Union.

As Marshall (1920) claims on the cover page of his famous work titled Principles of Economics, *"Natura non facit saltum"*, that is, "Nature makes no leaps". After reviewing a significant number of development theories, Cypher (2014) concluded that in most cases, growth and development require substantial changes in institutional patterns and organizational structures of economies. One way nations experience this upgrading is a structural change. A general manifestation of structural change is the **changing weight**—for instance, in terms of output or labor force—**of the main sectors in the national economy**. As a first stage of economic development, an economic shift takes place from the primary sector involved in the production and extraction of natural resources—such as agriculture, to the secondary sector—that transforms raw materials to products—namely, industrial, and mainly to manufacturing activities. As the economy becomes more developed, the tertiary sector represented by services takes over the dominant role of industry (Cypher, 2014).

These relationships become evident when we look at the share of value added in agriculture, industry and services in country groups with different income level even in our days. In *Figure 1*, income level—expressed as Gross National Income (GNI) per capita—represents the general standard of living, and it is closely and positively related to the level of development in a territory. Compared to the more balanced industry configuration in less developed economies such as Nepal and Ethiopia, one can observe a clear trade-off between agriculture and services as economies develop. The tendency of the changes in the share of the industrial activities is less evident. While middle-income countries (e.g., Albania, Brazil) increase the weight of industrial activities only to a small extent or keep it relatively stable and predominantly focus on services, high-income economies (e.g., Ireland, South Korea) seem to have **a priority of services** over industrial activities as well. A further scrutiny of income levels in 2016 reveals that the value added of the European Union's agriculture (1.39%) and industrial activities (21.97%) resemble to high-income economies (1.31% and 22.90%, respectively). However, the share of services is more than 3% lower in the European Union (66.04%) than in high-income countries (69.56%).

Figure 1. The share of value added by the main economic sectors in the world (% of GDP, 2016)



Source: World Bank (2017)

Note: Agriculture consists of agriculture, forestry and fishing activities too. The industry sector embraces mining and quarrying, manufacturing, construction, and public utilities (electricity, gas, and water). Data refers to group aggregates. Low-income economies are countries with less than 1,006$, middle-income economies between 1,006$ and 12,235$, and high-income economies are countries with 12,235$ or more GNI per capita for the year 2016.

Another indicator that characterizes the relevance of different industries in economies is the share in employment (*Table 1*). The generally dominant **role of services in the value added prevails in the employment rate as well**; the only exception is the low-income countries where the highest share—two thirds—of the employees work in agriculture. We can also see that the structure of the labor force changes by (higher) development level in favor of services. This is because the growing proportion of urban population increasingly chooses more human-capital intensive jobs such as working in offices or in skilled factory jobs in the hope of elevated exploitation of their extended and better-quality consumption opportunities. At this point, an interesting link is the gap between employment rate and value added that reflects the level of sectoral productivity. In agriculture, a general tendency is that a higher rate of employees produce less value added than their actual share from employment would explain. Besides, the gap between employment rate and value added decreases by economic development. For industrial activities and services, an interesting, opposite tendency can be observed, however, value added mostly corresponds to the share of the employment in the sector.

Table 1. Employment share of the main sectors in the world (2016)

Country group	**Agriculture**		**Industry**		**Services**	
	Employment	Value added	Employment	Value added	Employment	Value added
Low-income economies	67.67%	26.31%	10.34%	29.68%	21.99%	39.23%
Middle-income economies	27.75%	8.77%	23.89%	31.58%	48.36%	54.02%
High-income economies	3.06%	1.31%	22.71%	22.90%	74.24%	69.56%
World	26.76%	3.55%	22.49%	25.40%	50.74%	65.08%
European Union	**4.29%**	**1.39%**	**24.04%**	**21.97%**	**71.66%**	**66.04%**

Source: World Bank (2017)

Note: For the data on value added, agriculture includes agriculture, forestry and fishing activities too. Data refers to group aggregates. The industry sector embraces mining and quarrying, manufacturing, construction, and public utilities (electricity, gas, and water). Low-income economies are countries with less than 1,006$, middle-income economies between 1,006$ and 12,235$, and high-income economies are countries with 12,235$ or more GNI per capita for the year 2016. Employment is measured as a percentage of total employment; value added is expressed as a percentage of GDP.

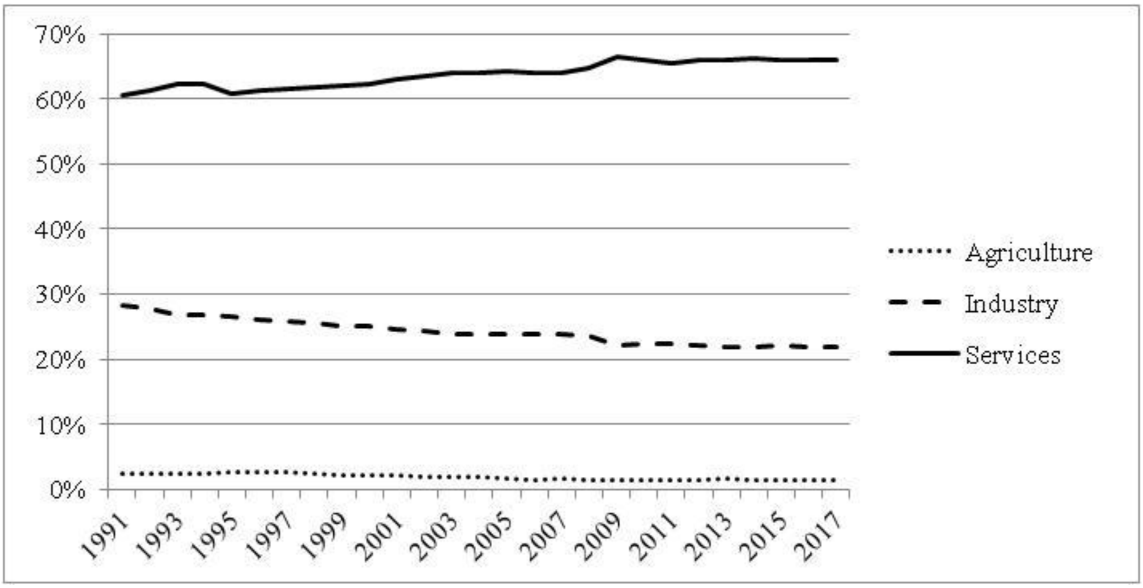
Scientific works underpin the long-term historical basis of these sectoral tendencies. For instance, Rostow (1960) reviewed how national economies developed throughout five development stages—more concretely, 1) traditional society, 2) preconditions to take off, 3) take off, 4) maturity, and 5) high mass consumption—during history. He confirmed that countries in different stages of development follow the previously described industry patterns. Based on the competitive strategies of nations in the global economy, Porter (1990) extended this work, and identified three stages of development: factor-driven, efficiency-driven and innovation-driven stages. A factor-driven economy typically focuses on natural resources and easily exploitable agricultural and manufactured goods. Efficiency-driven economies rely mostly on the exploitation of manufactured products. Innovation-driven economies are characterized by the expansion of (business) services relative to manufacturing, whose share generally decreases in these economies. To sum up, the factor exploitation focus seems to correspond with our previous empirical findings on the link between sectoral shares and development levels as well. (Acs et al., 2008; Porter, 1990).

Nevertheless, **increasing the share of services is just the tip of the iceberg** and per se does not tell much about the nature of development and growth that may be the result of quantitative or qualitative change. For example, one explanation to the rise of services in societies with higher (real) income per head is that a higher demand emerges for the type of consumption that transcends the population's basic needs. However, this quantitative increase is not enough to trigger economic development and growth. According to Rostow (1960), the underlying reasons are shifts towards more refined and advanced *technologies, their spread in the economy, and better entrepreneurial skills* that allow for higher efficiency in the economy. In addition, he highlighted the relevance of increased specialization in the business offering to their customers. The use of knowledge and physical capital also increases which induces higher production level and productivity per employee. As a result, the business is able to achieve higher income that leaks to employees as well. Higher income opportunities seduce workers from industry (e.g., manufacturing) sectors, and lead to the expansion of service sectors.

Thirty years later, incorporating the upcoming tendencies of globalization, rapid technological improvement, and increased international competition, Porter (1990) justified the need for additional qualitative business characteristics. The reason is that after World War II, the picture of internationally successful industries has been significantly redrawn due to national efforts to achieve more sophisticated sources of competitive advantage and higher productivity. Therefore, to be internationally competent, among others, he found important for businesses to revise and actively *seek new sources of sustainable competitive advantages, and combine the characteristics of their environment and their business strategy* effectively as well. Recent scientific work by Eichengreen and Gupta (2013) and Szerb et al. (2018) confirm the differentiating role of qualitative business characteristics in reaching increased territorial performance.

Although, the general relevance of services is the result of a transformation that started centuries ago, if we take a specific look at the last 27 years of the European Union in *Figure 2*, we see that these tendencies are still ongoing. Against some fluctuation over years, services were the only main sector that could increase their share in the GDP (+5.49%), while both agriculture (–1.03%) and industrial activities (–6.45%) experienced a decline in their value added.

Figure 2. Change of value added in the main economic sectors of the European Union (% of GDP, 1991-2017)



Source: World Bank (2017)

Note: Agriculture includes agriculture, forestry and fishing. The industry sector embraces mining and quarrying, manufacturing, construction, and public utilities (electricity, gas, and water). Data refers to the aggregate of the European Union.

Besides, if we look at Figure 2, from 2008 to 2009, right after the outbreak of the economic and financial crisis, we see a more pronounced decrease of the value added in industrial activities that came together with a lower rate of employment in the sector. According to the European Commission (2012b), as a result of the crisis, more than 3 million jobs in industrial activities disappeared, and the sector experienced a 10% decline in its production until October 2012. As a consequence, the **European Union** formulated a goal to increase one of its most important industrial sectors', that is, manufacturing's share in its overall GDP by 2020 that can be seen as a **reindustrialization attempt** in the economy. Invoking the reviewed sectoral trends in the development of economies, a plan like this requires responsible and long-term planning at community, national and regional levels to avoid taking a step back rather than forward.

Nevertheless, businesses are not isolated from each other and not necessarily mutually exclusive but their co-location may imply **synergistic complementarities that may generate positive territorial outcomes** as well. However, at this point, more logical questions arise. First, in general, which industries bring benefits to territories: the ones that are similar to or the ones that are distinct from each other? Second, related to the manufacturing renaissance proposed by EU policy makers, which industry promotes manufacturing performance? Third, do these processes have a positive effect on territorial performance, and under which conditions? The next section (*Section 2.2*) addresses these three emerging questions.

2.2. Synergistic complementarities among manufacturing and services: firm-level and territorial effects

2.2.1. The role and territorial benefits of related and unrelated variety

The roots of aggregate-level inter-firm relationships and its territorial effects originate in a literature that dates back around hundred years ago. The basic question in this regard was **whether the co-location of diversified or specialized industries brings benefits (and actually more benefits)** to territories. The emphasis on the word *more* may be decisive. As Visnjic et al. (2016) present it, promoting the appropriate industrial structure might be crucial to policy makers, as territories usually incorporate multiple, occasionally conflicting objectives of stakeholders.

On the one hand, as Marshall (1920, p. 221) defines it, localization or specialization of industries is *"…the concentration of many small businesses of a similar character in particular localithes [locations]"*. This territorial creature fostered the so called **specialization hypothesis** that states that knowledge spillovers are associated with specialized industry areas (Van der Panne and Van Beers, 2006). On the other hand, the **diversification hypothesis** assumes that *"…knowledge may spill over between complementary rather than similar industries (van der Panne, 2004, p. 595.)"*. The scholarly literature has differentiated **particular advantages related to the co-location of businesses**, and named them agglomeration economies. More specifically, agglomeration economies or externalities are *"…economies from which a firm can benefit by being located at the same place as one or more other firms (Frenken et al., 2007, p. 687)"*. Based on this definition, in the rest of the work, we refer to agglomeration economies related to the two basic industrial compositions of territories as Marshallian and Jacobs externalities.

For territories with specialized (localized) industries, Marshall (1920)'s pioneer work provides an insightful list of advantages. First, co-location of similar businesses leads to *prompt and extensive information stream*—e.g., to knowledge spillover—which is conducive to efficient problem solving in the community. Another benefit is that *with lower individual capital, large-scale investments* become collectively feasible due to the same type of production of businesses. Third, a subsidiary business with *highly specialized and rapidly depreciating machinery can operate* in this environment too, as it can reach many clients among its neighbors, and via the constant use of the machinery, it can pay the related expenses. Fourth, businesses in localized industries are *likely to find labor* with the required special skill more easily, since people naturally seek places where they can find a wide match among employers' requirements and their working attributes.

Concerning the arguments of the benefits of diversified industries, Marshall (1920) called attention to some disadvantages of localized industries that, in return, support the need for some variety in territories. For instance, highly specialized areas may provide job to one family member with specialized skill (e.g., for strong men), however, leave no *opportunity to work for the rest of the family* (e.g., women), resulting in a lower average household income. This argument points to the need of some sort of diversification even in these territories. As he explicitly confirms (Marshall, 1920, p. 226),

> *"The advantages of variety of employment are combined with those of localized industries in some of our manufacturing towns, and this is a chief cause of their continued growth."*

Another problem with overspecialized districts becomes evident in time of economic depression when the demand for their products typically goes down or the supply of its raw material is on a halt. Thus, for the focal area, it is safer to incorporate several distinct industries that *compensate for sector-specific shocks* (Marshall, 1920). This last argument is typically supported by recent empirical studies in the field (e.g., Boschma and Iammarino, 2009; Van der Panne and Van Beers, 2006). Despite the initial points proposed by Marshall (1920), Jacobs (1969) is the most recognized author for his contribution that emphasizes the relevance of diversified industries for territories. This author argues that the primary relevance of complementary knowledge lies in the diversification, in terms of economic agents and their production structure. More concretely, *in industries characterized by high level of local competition* knowledge might spill over among businesses with different industrial background, not among similar firms. These diversified industries likely appear in urbanized areas (Jacobs, 1969).

However, **empirical evidence is ambiguous on the territorial advantages** (e.g., regional innovation) of these two industrial formations. For instance, earlier work by Glaeser et al. (1992) sought the effect of specialization, competition and variety of industries (Jacobian externalities) on employment growth and wage growth in city industrialized cities. After analyzing large industries in 170 cities between 1956 and 1987, they concluded that lower industrial specialization of a city, more intense competition between businesses and higher variety of industries facilitate employment growth. Thus, they argued by the *higher benefit of Jacobs externalities*. Nevertheless, the work by Van der Panne (2004) sought whether Marshallian specialization or Jacobian diversification externalities facilitate regional innovativeness in the Netherlands, and this author found the opposite result. He found that a *positive relationship exists but only between Marshallian externalities and regional innovation*, that is, in case of the concentration of specialized businesses. Regional specialization proved to be more important for small firm innovation than for innovation among all the sampled firms and R&D intensive innovation. In his results, less intense competition facilitated a higher number of innovators per region as well.

Besides Marshallian and Jacobian externalities, **an alternative classification appeared in the literature**. Although this classification keeps the original specialization concept, it distinguishes different types of diversification based on the level of interrelatedness between industry sectors in a certain territory. According to Frenken et al. (2007), the godfathers of this new view, two levels of territorial variety should be distinguished. First, **related variety** refers to "*variety as a source of regional knowledge spillovers (Frenken et al., 2007, p. 685)".* As the term suggests, knowledge spillover takes place only if industries are closely related to each other in the sense that their competences are complementary. This implies that they may share their knowledge and skills (Frenken et al., 2007). Nevertheless, being exposed to demand shocks may constitute a serious weak point of this territorial composition. Second, **unrelated variety** is *“variety as a portfolio protecting a region from external shocks (Frenken et al., 2007, p. 685)”*. In this type, it is expected that knowledge spills over to an industry with highly different activities and skills to a less extent. For instance, a good illustrative example by Asheim et al. (2011) is the unrelatedness of a pig farmer and a steel company. However, in return, spreading risk over unrelated sectors should result in a more balanced regional performance including growth. This can be particularly important in periods when external shocks affect the economy (Frenken et al., 2007). Later on, Mameli et al. (2012) expanded the forms of diversification to variety (strong relatedness), related variety (middle relatedness) and unrelated variety (weak relatedness) based on the strength of the relatedness between industries. Similarly, Castaldi et al. (2015) developed the term semi-related variety that served to describe a state between related and unrelated variety. Though, most subsequent studies recline upon the categories of specialization, related variety and unrelated variety.

Therefore, several attempts came to light to test the supposed **territorial advantages of specialization and the different types of variety**. Concerning *employment and unemployment growth*, Frenken et al. (2007) found that related variety facilitates employment growth in terms of full time employees; while in general, a higher unrelated variety is associated with a lower unemployment growth in a territory. Other works took on this research interest supposing sector-specific differences in the effect on employment growth. In this manner, Bishop and Gripaios (2010) revealed quite diverse impacts dependent on the analyzed sectors. They found a mainly negative effect of specialization (except for financial intermediation services), a highly varying effect of unrelated and related variety (e.g., related variety does not affect employment growth of manufacturing). The empirical evidence provided in Mameli et al. (2012) showed that the different types of variety in one broader sector may influence employment growth in another sector. More concretely, they found that each level of variety in manufacturing positively affect employment growth in local services. However, they failed to find an effect of varieties in services.

The effect of variety on *regional innovation performance* was also in the interest of scholarly researchers. Initially, Frenken et al. (2007) assumed that a positive outcome of related variety and the accompanying Jacobian agglomeration economies is radical and product innovations from which the embedding territory can benefit as well. Another important contribution came from Castaldi et al. (2015), who—as opposed to Frenken et al. (2007)—found that both related variety and unrelated variety can prove helpful in enhancing regional innovation processes. Nonetheless, they do it for different reasons: while relatedness provides an easy way to recombine knowledge and create a new technology, unrelated variety may have an effect via radical innovation such as introducing technological breakthroughs. They used the number of patent applications to measure general innovation performance in a state and proxied the state's potential to generate breakthrough innovation by a share of superstar patents. Finally, *the survival rate* of new enterprises was a scholarly issue as well, analyzed by Tavassoli and Jienwatcharamongkhol (2016). Considering both Marshallian and Jacobian agglomeration economies, the center of their interest was the effect of specialization, related variety and unrelated variety on the survival rate of newly-established self-employed KIBS firms. The result of their analysis identified both related and unrelated varieties of a region as factors promoting firm survival, even though, related variety proved to have a stronger and more significant effect.

The **quantification approaches for specialization and the different types of variety** involve mainly *entropy-based methods* (e.g., Bishop and Gripaios, 2010; Castaldi et al., 2015; Frenken et al., 2007; Mameli et al., 2012). For instance, Frenken et al. (2007) used entropy-based methods to calculate the related variety and unrelated variety in regions, and defined the strength of these relationships in terms of the number of digits in the industry codes. Tavassoli and Jienwatcharamongkhol (2016) followed their definition for the different forms of variety. Although, the concept of using common digits in the industrial classifications was a catalyzing and useful choice to deem the level of relatedness in a region, yet, there is no common practice how to calculate these measures. For instance, a different entropy-based approach can be seen in Bishop and Gripaios (2010) and Castaldi et al. (2015), and when it comes to sector specialization, the use of *location quotients*—for example, in Bishop and Gripaios (2010) calculated as the proportion of local employment of a sector divided by the proportion of employment of the same sector nationally—also serves as an alternative measure.

Reviewing some relevant literature in this section, we can conclude that despite some notable classification and quantification attempts, there remains need for further clarification and specification. Even if the aforementioned concepts are not clearly defined, I agree with Porter (1990) in that territories may profit more from the co-location of and especially from the interaction among related industries. In the next subsection, the forms of firm-level relatedness between manufacturing and (business) service businesses are introduced.

2.2.2. Interrelatedness among manufacturing and service businesses: service transition of the manufacturing sector

Before to explore the different manifestations of manufacturing-service relationship it is important **to clearly define our two key study concepts**, that is, goods and services. In line with the goal of the study, this is done from the perspective of the manufacturing industry, disregarding the marketing-based debates on the differentiation of the two concepts (see for example, Vargo and Lusch, 2004). For this purpose, the study borrows a simple framing by Baines et al. (2009), who consider **a manufactured product** a material artifact, such as a car, a computer or a popcorn maker. To define **a service**, a similar, illustrative approach is applied that was actually proposed in an early work by a famous service marketing specialist and who considers it as *"a process or performance rather than a thing (Lovelock, 1991, p. 13)"*. Besides, Tether and Hipp (2002) list some particular, commonly accepted features of services such as strong intertwining of the production and consumption process, their intangible nature and a more pronounced dependence on human resources. These definitions presented above are obviously simple and do not provide a comprehensive analysis of the concept of product and service; however and to preserve the flow of the argument line of this work, I have decided to present a profound description of the more specific study concepts in Chapter 3.

In what follows I shortly introduce **the main forms of interactions between manufacturing and service businesses / services** which can be considered different *business models* in the manufacturing sector.[1] In essence, a business model embodies *"...the organizational and financial architecture of the business (Teece, 2010, p. 173)".* A business model articulates the logic to demonstrate how the business creates and delivers value to customers, and outlines the architecture of revenues, costs, and profits associated with the business enterprise delivering that value (Chesbrough and Rosenbloom, 2002). Business model choices define what elements constitute a source of value for the

[1] Note that even if these forms are separated for the sake of easier understanding, in practice, clear differentiation may be challenging because of the potential overlaps between the concepts. Similarly, the analysis of the evolutionary paths of the different business model formation processes does not fall within the scope of this dissertation.

organization and how they accommodate both the business' resources and capabilities and the stakeholders that interact with the business (Zott and Amit, 2008).

First, I deal with the more traditional type of interactions in which manufacturing businesses procure services from service businesses (*Section 2.2.2.1*). Second, a determining stage is discussed—a decision of manufacturing businesses to give up (outsource) some of their business functions or activities in favor of service businesses (*Section 2.2.2.2).* After these, I focus on the opposite trend which seeks to explain why businesses incorporate services as a solution to improve customer satisfaction (*Section 2.2.2.3)*. Finally, I provide a summary of the main firm-level interactions between manufacturing and service businesses discussed in this subsection, and I see across to the subsequent topic on the prominent role of some specific types of services facilitating manufacturing performance (*Section 2.2.2.4*).

2.2.2.1. Temporary demand from independent service providers

Although inherently, the main function of manufacturing businesses is to process raw material—just like firms in other industries do—and conduct all the phases of their value chain by themselves (Stigler, 1951) **so did they fulfill some service-related tasks**, such as processing data, arranging logistics and distribution, and ensuring product availability for their customers (McCarthy and Anagnostou, 2004). As Greenfield (1966, p. 5) recognizes, *"…all productive activities consist of services applied to pre-existing physical materials"*. Despite the initial internalization of services, by today a synergy between manufacturing and service businesses has formed (Daniels and Bryson, 2002), and its relevance is confirmed by a growing number of studies in the field (e.g., Gebauer, 2008; Gilley and Rasheed, 2000; Santamaría et al., 2012).

Probably the most traditional way of interaction occurred as **temporary or short-term purchases from independent service firms**. In this study we can call these inbound services. Inbound services can be everyday, operational services and services that aim at business (product) development or innovation. In the latter case, according to Menor et al. (2002) the degree to which manufacturing businesses may require internal development depends upon their prior technological level and product quality. Business development is a typical resource acquisition strategy that compensates for the lack of different skills of the company (Harrison et al., 2004). Good examples of business development services could be leasing equipment or providing marketing research.

2.2.2.2. Outsourcing business functions

Over time, the recognition that taking full control over marketable products and conducting a wide scope of activities lead to inefficient operation and uncompetitive transaction costs has brought about the need for promoting new business models (McCarthy and Anagnostou, 2004). Consequently, one significant evolutionary process that provided a solution was the **outsourcing** of manufacturing businesses.

The literature offers several definitions that give different purpose and therefore, contradictions related to the concept. As Gilley and Rasheed (2000, p. 764) define, outsourcing *"…represents the fundamental decision to reject the internalization of an activity"*. These authors stress the relevance of rejection: though the firm would have the necessary managerial and/or financial capability, it makes the strategic decision to procure certain—previously internalized or non-existing in the business—goods or services. Therefore, they deny that outsourcing equals to a simple purchase of goods and services that is actually done by every firm. According to Zhu et al. (2001, p. 374), outsourcing is *"…the process of transferring the responsibility for a specific business function from an employee group to a non-employee group"*. As opposed to Gilley and Rasheed (2000), this definition leaves space for the broad use of the phenomenon. Example to another understanding of the concept is provided by McCarthy and Anagnostou (2004, p. 63), who consider outsourcing as *"an agreement in which one company contracts-out a part of their existing internal activity to another company"*. Here, the authors restrict the previous description exclusively to already existing activities. After all, the question arises: Which definition gets the real core of the concept?

A theoretical argument that can be considered a good answer to this question is offered by Hätönen and Eriksson (2009), who wash away the doubts around having a right choice. As these authors explain, outsourcing is a **practice that has gone through an evolution by itself during the history** as well. They identify three waves—namely, traditional outsourcing, strategic outsourcing and transformational outsourcing, respectively—with different driving forces. However, in spite of the newly upcoming trends in outsourcing, still, recent empirical evidence (e.g., Di Gregorio et al., 2009; Everaert et al., 2010; McCarthy and Anagnostou, 2004) shows that all the motives coexist among businesses. The different sorts of outsourcing are presented as follows (Hätönen and Eriksson, 2009):

- *Traditional outsourcing*—typically used from the 1950s till the end of the 1980s—is about contracting out noncore business functions with the aim to reach cost efficiency by reducing, for example, manufacturing, service or labor costs. Therefore, this type of outsourcing is mainly domestic.
- *Strategic outsourcing*—that emerged in the early 1990s—mirrors a more developed, new management approach based on finding and concentrating on core competences. Consequently, firms turn to outsourcing business functions which are outside their expertise to gain external skills, competencies and knowledge. Although the role of cost motives is acknowledged, this view exceeds it by providing value to complex and key internal processes. Getting rid of sluggish services and focusing on the core competence (Porter, 1996) of the business may be a tool to reach superior productivity (Ten Raa and Wolff, 2001) and create a sustainable competitive edge. International market outsourcing also occurs.
- Finally, *transformational outsourcing* is the product of the latest trend, and seeks to change existing paradigms in the industry by setting up radically new business models and achieving competitive advantage. The realization of these goals result in blurry boundaries between businesses and flexible organizational forms made up of loose networks.

To conclude, considering all the above mentioned features I find **the extended definition proposed by Zhu et al. (2001, p. 374) the most suitable for this study**. That is, in this work I consistently use the conceptualization that defines outsourcing as *"…the process of transferring the responsibility for a specific business function from an employee group to a non-employee group"*. As for the relevance of the phenomenon, according to McCarthy and Anagnostou (2004), nowadays the highest rate of outsourcing businesses among industry sectors can be found in manufacturing. The feasibility of the practice has significantly improved over time as well, and has become a widely available strategy regardless the industry, geographical location or size of the businesses. This has been supported by the rapid development of information and communication technologies (ICT), lower interaction costs and easier access to global partners. Thus, international outsourcing is now accessible to a much larger proportion of businesses around the globe too (Hätönen and Eriksson, 2009).

2.2.2.3. Business servitization: offering services to customers

Alternatively, we can differentiate the above mentioned services from services that are offered by the manufacturing business or its service providers to (potential) customers—that we name here **outbound services**. Mathieu (2001) identifies three types of potential outbound services: customer services, product services and service as a product. *Customer services* aim to influence the quality of interactions among the manufacturing business and its customers. In this sense, an example of customer service can be the provision of online services to customers in addition to traditional contacts or an exclusively product-selling focus. *Product services* address the after-life of the product in the form of for instance geographical distribution, after-sale services and technical assistance. The third type of services covers the cases when the client *does not owe any company-related product* but uses the services provided by the manufacturing business or its contracted service provider. A good example of this type of relationship is servicing computers sold by competitors.

In the last decades, offering outbound services has become a popular phenomenon, commonly known as **servitization**, a term developed by Vandermerwe and Rada (1988). More precisely, servitization can be seen as *"…moving from the old and outdated focus on goods or services to integrated 'bundles' or systems, as they are sometimes referred to, with services in the lead role (Vandermerwe and Rada, 1988, p. 314)"*. Turunen and Finne (2014, p. 604) come up with a more moderate definition, as they state that *"servitization refers to the transition process of adding services into a goods-based offering, where the importance lies in the relationship between the corporation and the customer."* During the rest of the study, I favor the latter definition, as it gives more freedom to move in the goods–services continuum.

Integrating services into businesses' offerings has become a management strategy widely applied by manufacturing firms that it is going through continuous changes (e.g., Neely, 2008; Vandermerwe and Rada, 1988; Visnjic and Van Looy, 2013). **Mathieu (2001) identifies three organizational "maneuvers"** (p. 453) related to the application of services. These maneuvers may affect the company and bring about changes in the organization at different intensity. Starting from the least influential and going towards the more intense intervention, these maneuvers are the followings:

- *Tactic maneuver:* providing services is only a marketing issue and it is mostly related to the product policy of the firm.
- *Strategic maneuver:* the new service constitutes a key competence for the firm and it is aligned with the mission and basic values of the company.
- *Cultural maneuver:* the introduction of the service implies the rearrangement of the organization in terms of mission or other fundamental characteristics such as its values.

A different approach is presented by Oliva and Kallenberg (2003) who systematize the **main motives** that underlie the growing popularity of this mixed, product-service concept.

- First, they list its *economic advantages*. An important aspect is that product services can extend product life cycle and, therefore, generate substantial revenue to the business. Also, services can be sold with higher profit margins, and they can represent a more stable revenue source as they are less exposed to economic cycles than investments and equipment purchases (Oliva and Kallenberg, 2003).
- Second, *customer demand* is growing for services (Oliva and Kallenberg, 2003; Visnjic and Van Looy, 2013). In some cases, this calls for service outsourcing in order to ensure efficient business operations (Oliva and Kallenberg, 2003).
- Third, services are less tangible and thus, it is more *difficult to imitate* them than manufactured products. This characteristic can be useful for the company to gain a sustainable competitive advantage (Oliva and Kallenberg, 2003) and avoid commoditization (Visnjic and Van Looy, 2013). Despite of this, Baines et al. (2007) believe that servitization is not the only and necessary component of competitive strategy of the company, as it can be based on other factors such as product leadership or operational excellence as well.

It should be noted that *the successful realization of servitization may be challenging*, a process often referred to as the servitization paradox. However, empirical evidence already reveals some positive (e.g., Visnjic and Van Looy, 2013) and potentially positive (e.g., Neely, 2009) outcomes.

Finally, the use of the above mentioned servitization strategies is quite likely to be **conditioned by firm size**. Although Harrison et al. (2004) limit their interest to cash management techniques, they find that while *small firms favor business development practices over product development practices, large firms* tend to utilize these techniques *the opposite way*.

2.2.2.4. Knowledge-intensive business service (KIBS) firms, the "aces" of service businesses

As shown in Sections 2.2.2.1 to 2.2.2.3, **service firms have taken an organic role in the evolution of manufacturing businesses**. Outsourcing part of their internal activity to service firms may result in superior cost efficiency, allow concentration on core competencies, and create new, flexible business models (Hätönen and Eriksson, 2009). In addition, manufacturing firms are increasingly offering advanced product-service systems (PSS)—i.e., adopting business servitization models—to achieve new sources of profit, stable revenues, and a hard-to-replicate competitive advantage (e.g., Matthyssens and Vandenbempt, 2008; Oliva and Kallenberg, 2003; Vendrell-Herrero et al., 2017). Nevertheless, going through these potential advantages the reader may have a logical question in mind: *Do manufacturers benefit the same way from all services? For instance, do they gain as much from a transportation service as from an information technology (IT) service?*

In today's globalized market characterized by intense and extensive competition especially one form of service businesses may stand out and turn out to be of crucial importance for manufacturers. **Knowledge-intensive business service—henceforth KIBS businesses**—are a type of service firms that provide services to other businesses (B2B) and deal with *"…economic activities which are intended to result in the creation, accumulation or dissemination of knowledge (Miles et al., 1995, p. 18)"*. While KIBS firms share some general characteristics with other service businesses, in general what makes them exceptionally valuable for their interaction with manufacturers is their **service production process and innovation potential**. KIBS' primary input is their employees' knowledge and talent that are shaped by accumulated experiential knowledge resulting from the development of project-specific tasks (Boone and Ganeshan, 2001; Garicano and Wu, 2012). By capitalizing on this specific knowledge, KIBS can contribute to their clients' performance via the exploitation of existing knowledge or the coproduction of new knowledge. Also, KIBS use the knowledge gained from their timely changing, often complex task setting to engage in innovation processes (European Commission, 2011; Scarbrough et al., 2004; Tether and Hipp, 2002). As KIBS firms provide services exclusively to businesses, in this study I work under the premise that the effect of this group of KIBS on the economy via their relationship with businesses operating in the manufacturing industry is stronger than that of knowledge-intensive service (KIS) businesses with a mixed focus (serving both consumers and businesses).

Although the three types of service-manufacturing interactions (Sections 2.2.2.1 to 2.2.2.3) coexist in the market even with different motivations among businesses, evidence shows that at the firm level *the choice among them and their successful realization may be conditioned* by for instance, scarce resources, managerial capabilities and strategic preferences. In this sense, significant differences can be found between large and small enterprises. Another influencing factor appears when we extend our viewpoint to a more aggregate level such as local, subnational, national or supranational levels. In spite of this potentially key role played by both service and exclusively KIBS businesses in the development of the manufacturing sector, little has been said about the broader, aggregate effect of the phenomenon. Spatial embeddedness of these businesses may play a crucial role as well. Subsequently, *Section 2.2.3* introduces this relatively neglected, territorial development view of the interactions between manufacturers and service businesses with a special focus on KIBS businesses.

2.2.3. Territorial servitization: definition and the scholarly panorama

Notwithstanding the relevance of **service transitions for manufacturing businesses**, **only a few studies have assessed their territorial advantages**. For instance, using input-output analysis, ten Raa and Wolff (2001) found that from the 1980s to the 1990s increased use of service inputs contributed to higher productivity growth in the US manufacturing sector as a whole. Later, Meliciani and Savona (2015) analyzed the effect of the demand of manufacturing sectors which were intensive users of business services on the regional specialization level in business services in the EU. They found that the higher the intraregional manufacturing demand, the higher the regional specialization in business services is in the same region. Also, Arnold et al. (2016) showed that service reforms in the field of banking, telecommunications, insurance and transport contributed to the output of India's manufacturing sector and, consequently, to the rapid economic growth of the country.

An even more pronounced research gap emerges when it comes to the analysis of the territorial outcomes resulting from the interaction between manufacturing firms and KIBS businesses. Over the last three decades the number of KIBS firms has drastically risen in Europe, which has been nurtured by both increased inter-industry linkages and attempts of European economies to consolidate their knowledge-based economies in order to maintain their competitiveness (e.g., European Commission, 2011; Strambach, 2001). The instrumental role played by KIBS businesses in this process can be explained by their inherent function to offer specialized expertise to other businesses (e.g., Miles et al., 1995; Vendrell-Herrero et al., 2017).

In addition, based on the micro-level foundations of KIBS-manufacturing relationships, a high concentration of these sectors **can be seen as related variety in a territory**[2]. The interrelatedness of KIBS and manufacturing industries has been supported by a growing number of studies (e.g., Crozet and Milet, 2017; Czarnitzki and Spielkamp, 2003; Muller and Zenker, 2001). For instance, in the Netherlands, manufacturers proved to be the most important clients of KIBS firms specialized in computer services/IT and R&D—as opposed to other KIBS' clients in construction and agriculture sectors (Den Hertog, 2000). Also, according to Bienkowska (2015), a remarkable share—in 2015, 40%—of jobs in the manufacturing sector in Europe is related to high value added services. Thus, the KITS process becomes a case of interest when analyzing the potential effects of servitization on the local economic activity.

Recognizing the untapped potential in the scholarly literature, recently, a specific research stream addresses the impact of the connection between KIBS and manufacturing businesses from a novel, territorial perspective. Extrapolating from the servitization literature, Lafuente et al. (2017) introduced **the concept of territorial servitization**, which refers to the process of creating value at the territorial level by increasing interactions between manufacturers and KIBS businesses. More concretely, they propose that territorial servitization—more precisely knowledge-intensive territorial servitization—represents

[2] In this case, related variety is used in the meaning proposed by Frenken et al. (2007).

> *"…the aggregate outcomes—e.g., economic, employment and other social outputs demanded by stakeholders—resulting from the various types of mutually dependent associations that manufacturing and knowledge-intensive service businesses create and/or develop within a focal territory (p. 20)".*

Yet, territorial servitization is not limited to this particular case—that should actually be called knowledge-intensive territorial servitization (KITS)—or, as in the typical case of servitization, to local B2B relationships. The definition of territorial servitization includes service innovations and outsourcing that are tacitly incorporated in manufacturers' offering and, thus, reasonable extensions of the original business servitization concept. Therefore, in this study, **we will consistently use this extended definition of servitization** at the territorial level.

The potential connection between manufacturers and KIBS firms constitutes a clear case in point, and this gives the main focus of this work. At the meso level (e.g., in subnational regions), **territorial servitization may result in a more consolidated manufacturing sector** characterized by agglomeration economies (Rocha and Sternberg, 2005). Thus, the territorial servitization process may contribute to regional development via positive externalities, knowledge spillovers and positive effects on input-output markets (Tavassoli and Jienwatcharamongkhol, 2016). This process creates the conditions for entrepreneurial activity, thus enhancing the local development of service businesses, especially in knowledge-based sectors (Lafuente et al., 2010). For instance, manufacturing businesses with the suitable absorptive capacity as a market for KIBS may attract new KIBS firms to the territory (Visnjic et al., 2016).

2.2.4. Summary

In *Section 2.2,* I presented and analyzed the firm-level and aggregate, meso- and macro-level relationship between manufacturing and services. More concretely, in this relationship, we concentrated on the interaction with a specific segment of services, namely, knowledge-intensive business services (KIBS). The reason for adopting this focused approach lies in the arguably superior relevance of KIBS firms to contribute to the performance of manufacturers, such as productivity—a performance metric with increased importance in today's elevated competition (Porter, 1998)— and innovation potential.

To reveal the potential relevance of the co-location and interaction between these two sectors, Section 2.2.1 exhibited the different territorial outcomes of agglomeration economies related to *Marshallian specialization and Jacobian diversification* in general. A closely linked literature on *related and unrelated variety* in territories was also reviewed. All in all, I found that despite the theoretical usefulness of these categorizations, the definition and the measurement of these concepts require more refinement and unification. Therefore, to decide whether relatedness exists between these sectors and whether the aggregate inter-firm interactions might have territorial relevance, I reviewed both the firm-level and the territorial-level ongoing processes among manufacturers and service businesses.

At firm level (Section 2.2.2), the relationships between manufacturing and service businesses have gone through significant co-evolutionary processes over time, and this interconnectedness embodied in different business model formations of the manufacturing sector throughout the history. Although in some cases these business models overlap to certain—or sometimes to a great—extent, I attempted to capture the main forms and introduce their main differentiating characteristics. I considered three main streams of temporary relationships (customers), outsourcing, and business servitization of manufacturing. First, I presented a more traditional interaction between manufacturers and service firms which occurs via *temporary or short-term purchases* of manufacturers from independent service providers. These services, such as leasing or marketing research, may serve as a means to acquire resources that allow compensating for the lack of different skills in the company. Second, *a process of transferring a specific business function to service providers* was considered. Although outsourcing has turned to a common practice for manufacturers, it may be applied for very different reasons. Reaching cost efficiency, a more pronounced focus on core competencies of a business, and achieving competitive advantage may also explain the implementation of this strategy. Third, this section introduced a relatively new trend of manufacturers referred to as *servitization* which manifests in adding services to manufacturers' product offering and thus, creating an integrated, bundled offering. The type of servitization may affect the organizations to a different extent and may motivate the choice of this business model, ranging from marketing efforts to significant changes in the corporate culture. After considering the main forms of interactions, as services are heterogeneous, I detailed the general *operational characteristics of KIBS firms* which may be the most valuable service businesses in their interaction with manufacturers, because of their service production process and innovation potential.

Finally, I introduced the positive aggregate effects of service-manufacturing relationships that confirmed the strong relatedness of these sectors. Reviewing the existing literature, it pointed to *a research gap in the literature dealing with the analysis of the territorial outcomes* of the interaction between manufacturing firms and specifically KIBS firms. This gap is addressed by a recently upcoming research stream on territorial servitization, which refers to the process of creating value at the territorial level by increasing interactions between manufacturers and KIBS businesses (Lafuente et al., 2017). In this work, the term knowledge-intensive territorial servitization (KITS) was introduced to reflect better the focus on KIBS firms as key elements of these interactions.

Nevertheless, **positive territorial outcomes** in the presence of aggregate-level manufacturing-KIBS interactions **are not automatically gained by territories**. In *Section 2.3*, we will have a deeper insight into the feasibility factors of the relationship between manufacturing and service businesses at an aggregate, meso and macro level. First, in *Section 2.3.1*, general location factors and the role of proximity are introduced which determine what makes a business choose a specific place as its location. They are really important aspects for territories, and based on the operational characteristics of KIBS firms, they constitute increased relevance in this study. Second, in *Section 2.3.2,* I present the main sources of supra-national and national-level territorial heterogeneity within the European Union. Different countries may follow different economic strategies and provide different opportunities for businesses, in terms of the availability of locational advantages.

2.3. Feasibility issues

2.3.1. Influential location factors and the role of proximity in business interactions

For over a century, several scholarly works have attempted to analyze and understand the location choice of businesses. Within the economic geography framework, theoretical models for businesses' location decisions have evolved through different eras with changes in the dominant economic doctrines, real-world economic background, and the level of technology development. Over the history, three main location theory streams can be differentiated (McCann and Shepperd, 2003): classical location theory, neoclassical location theory, and market area analysis. Although both classical and neoclassical location theory approaches proved to be novel and useful to mitigate the scholarly hunger of their time, they failed to provide explanation to a real-world situation of why some economic activities concentrate in geographical space. Instead, they stated that the rational behavior of firms was to disperse in space, and not to tolerate higher local land and labor prices. They explained the **concentration of businesses only by topographical features and historical reasons**[3] (McCann and Sheppard, 2003). Traditionally this was probably the case, that is supported by several examples in Marshall (1920).

A significant change in this manner came along with the third wave of location theory approaches which date back to the first half of the 20th century, and it is called market area analysis. The pioneers of this research trend were Hotelling and Palanders, who sought the role of location and space for firms which both compete and mutually depend on each other. This apparent contradiction is a viable firm strategy called coopetition, that is, *"when two firms cooperate in some activities, such as in a strategic alliance, and at the same time compete with each other in other activities (Bengtsson and Kock, 2000, p. 412)"*. Also, they revealed that the spatial characteristics of the market, the type of industrial structure and business strategies are interrelated and they can change in time. Just like in the game theoretic approach, they explicitly defined the interrelationships among firms (McCann and Sheppard, 2003). Reviewing the stream of market area analysis, McCann and Sheppard (2003) derived two key aspects that explain industrial co-location**: 1) cost interrelationships between firms,** and **2) a non-dominant role of price competition among businesses, the dominance of product heterogeneity or the presence of transaction costs** as main features of the market that hinder efficient market competition.

Just like in the evolution depicted for the relationship between services and manufacturing, traditionally, **the goal of cost minimization (e.g., labor, land, capital) determined the locational choices** of businesses (e.g., McCann and Sheppard, 2003; Porter, 1994). Starting with his famous book and article, Krugman (1993, 1991) opened a new chapter in new economic geography and brought a more reasonable explanation on why

[3] According to McCann and Sheppard (2003), the only exceptions from this were Lösch and Christaller, who depicted an "ideal-landscape" for the firm.

some activities concentrate in space and why others do not. He differentiated two basic forces that influence geographic concentration. First, relying on Marshall (1920)'s work he identified so called **centripetal forces which** are sources of positive external economies and **promote the concentration of businesses** (Krugman, 1999). According to Marshall (1920, p. 221), external economies are

> *"…economies arising from an increase in the scale of production of any kind of goods…dependent on the general development of the industry".*

That is, if the overall output in the industry increases, it positively affects the individual firm too, as its average costs will decrease. Krugman (1999) considered *three main centripetal forces*:

1) *Large local market* that promotes backward and forward linkages;
2) *Specialized and skilled labor market* that makes it easier for businesses to find employees;
3) *Pure external economies* via knowledge (information) spillovers between the co-located actors.

In strict connection with these postulates, the *knowledge spillover* theory of entrepreneurship is central to the principles of endogenous economic growth and its core idea is that the increased knowledge stock generated by incumbent businesses—e.g., research laboratories in private businesses or universities—contributes to explain the formation of new businesses in the economy (Acs et al., 2009; Audretsch et al., 2006). That is, the formation of new businesses is an endogenous response to the efforts of incumbent organizations for creating new value-adding knowledge. Under the premise that the spillover of knowledge is spatially bounded, the knowledge spillover theory of entrepreneurship predicts that knowledge-driven entrepreneurial activity will be greater in territories where knowledge investments are higher, conditional on how efficiently new and incumbent firms channel the new knowledge to the market (Audretsch et al., 2006). In today's economy, competitiveness and excellence of territories lie to a great extent in their capacity to innovate and transfer knowledge to local businesses.

However, Marshall (1920) called attention to an opposite phenomenon as well. Factories with large areas cannot fully enjoy the gains of diversification, as ground rents are much higher in central areas, and they rather choose to move to the outskirt of large towns or manufacturing districts in the neighborhood. Krugman (1999) names **forces that work against concentration as centrifugal forces**. Similarly, three examples are provided:

1) *Immobile factors such as land, natural resources and skilled employees* that may be related to dispersed markets;
2) *Land rents* (described above with the example in Marshall (1920))
3) *Pure external diseconomies* such as congestion.

As **fast developing technologies revolutionized the ways of transportation and communication, and neoliberal policies reduced the barriers to the flow of labor, capital and businesses,** the picture of the global economy has radically changed. However, more open global markets—i.e., globalization—and faster transportation and communication did not only bring opportunities such as access to cheaper inputs via more efficient global markets and locating part of the business to locations with low-cost inputs but a more fierce competition. Therefore, for companies who want to keep up, the role of cost advantages has to take a rather back seat, while strategic thinking should come to the front (Porter, 1994).

Paradoxically, and despite the breakdown of geography and political boundaries, the **differences between the economic performance of countries and subnational regions remained and even amplified**. This happened in spite of the convergence expectations that *"...globalization-induced capital mobility leads to a 'race to the bottom' of wages, social standards, and corporate taxes (Bohle and Greskovits, 2009, p. 358)"*. The reason is that specific resources that provide competitive advantages in inter- and intranational competition can be found at national, more precisely, at subnational (e.g., local) level. Consequently, proximity to territories with these specific resources has gained an increased relevance (Porter, 1994).

Porter (1994, 1998) also claims that **centripetal forces** described by Krugman (1999) that provided competitive advantage in the past **became static sources of efficiency** which lost their distinctive value by today. In return, **what matters for the competitive advantage of a firm are the sources of dynamic improvement**, to *"...relentlessly innovate and upgrade its skill and technology (largely intangible assets)* *in competing (Porter, 1994, p. 37)".* According to Porter (1994, p. 37) dynamic location factors that facilitate continuous learning and innovation are:

- the presence of specialized, skilled and continually learning labor force,
- applied technology specialized to the particular firm,
- specialized infrastructure,
- experienced capital sources,
- additional business-specific factor inputs,
- sophisticated and demanding customers which/who are non-local, located outside the region or the country (i.e., "exporting" businesses in the territory),
- critical mass of local suppliers with specialized components, machinery and services that can significantly contribute to the business' product or process innovation,
- the presence of competitors that provoke development efforts in the business.

There is abundant empirical evidence that supports the crucial role of these factors. **For instance,** Neffke et al. (2011) sought the **relevance of technological relatedness on the industrial dynamics** in a region, that is, the probability that the industry is present in a region, enters or exits a region among manufacturers in Sweden. Their results provide generally applicable conclusions that should be taken account by policy makers in their attempt to promote regional development. Using different types of regression models the authors consistently found that if an industry is more *related to the regional portfolio*—measured by the number of closely related industries in the given region—the presence of the industry in a certain region is more likely. On the other hand, if more closely *related industries are missing from the given region (non-portfolio),* it is less likely that the industry is part of the regional industrial landscape.

The same tendencies apply to the entry of an industry, and logically, the opposite tendencies—negative relationship between portfolio closeness and the decision whether to exit (1) or not (0) and positive relationship between non-portfolio closeness and exit—prevail for the exit of an industry. They also found that the *country-wide size of an industry measured by the number of employees and the total employment in a region* also influence the regional industrial dynamics. Both of these size indicators have a positive relationship with the membership and entry of an industry to the region and they negatively associated with the exit of an industry from the region. Based on these findings, they concluded that in a long term, the industrial composition of a territory is conditioned by strong path dependencies (Neffke et al., 2011). Porter (1994) describes that the above mentioned dynamic factors mutually reinforce each other's effect that results in a *positive, cumulative self-regenerating process for the given territory*.

In order to gain competitive advantage based on dynamic locational factors, **geographical proximity to a critical mass of these resources may be crucial**. For instance, proximity to core suppliers and face-to-face relationships are important as they facilitate knowledge spillover, collaboration and reduce the risk of opportunistic (rent-seeking) behavior. Closeness to rivals may be beneficial as it provides an opportunity for comparison. Consequently, geographical closeness favors trust and coordination. An example to related territorial formations is the *cluster* (Porter, 1994). According to Porter (1998), a *cluster* is *"a geographic concentration of interconnected companies and institutions in a particular field (p. 78)"*. As Krugman (1999) states clusters are relevant sources of international trade and specialization. Though, clusters may take several forms as well. For instance, McCann and Sheppard (2003) identify ideal types of geography-firm-industry organizational relationships that may be present when firms are clustered or co-located. These are: 1) pure agglomeration model (e.g., financial services in the city of London), 2) industrial complex model, and 3) social network model, which mainly differ in their transaction cost and firm behavioral assumptions. Nevertheless, they acknowledge that real-life cluster formations may owe some mixed characteristics of these ideal types; there should be a dominant type for each region.

Despite his main focus on the role of physical proximity, Porter (1994) acknowledges **the relevance of other proximity forms between the company and its main stakeholders**. *Marshall (1890) revealed* some situations in which geographical proximity is less relevant or may be reassessed when channeling business relationships. For instance, he mentions the advantage of a business with unique and high value-added products over mass products. In this case, these product features may be worth the trouble of increased distance for customers. Also, he argues that lower transaction costs, such as improved or cheaper means of communication and lower transportation costs make it easier to reach industries from a distance, and thus, decrease the relevance of distance. Though *dramatic improvements which reduced spatial transaction costs* (i.e., information transmission and transportation costs, as opposed to transportation costs only that was dominant in the past) and therefore, enabled coordinating activities across space came with the 1980's. The main reason was the incredibly fast development in information technologies and their widespread use. These developments resulted in cost reduction of communicating across distance and allowed new coordination of spatial arrangements. Obviously, the dynamism of these changes is highly sector-specific. Therefore, the nature and behavior of spatial transaction costs should be clearly defined. Besides, some scientific opinions predict that over time, the cost of transmitting information in space or the opportunity cost of not having face-to-face contact will increase, as the quantity, variety and complexity of information grows. Therefore, doing business through large distances will be more expensive. Although transportation technologies have improved dramatically as well over the years, evidence also suggests that because of the growing customer demand, more frequent deliveries are needed, which have increased the spatial transaction costs of shipping (McCann and Sheppard, 2003).

Knowledge transfer and learning may contribute to the competitive advantage of firms and regions. After all, Boschma (2005) argues that per se geographical proximity, that is, spatial distance between economic actors, is not a sufficient condition for relationship learning to take place. Besides spatial distance, he differentiates **four further dimensions of proximity** that might be crucial in channeling inter-organizational knowledge:

1) *Cognitive proximity* refers to the extent to which economic actors share the same knowledge base and expertise.

2) *Organizational proximity* is the extent to which economic actors are similar to each other in terms of the space of relations, that is, the way interaction and coordination between actors is organized.

3) *Social proximity* is the extent to which interactions between actors are based on trust.

4) Finally, *institutional proximity* is the extent to which interactions between actors *"…are influenced, shaped and constrained by the institutional environment (p. 63)"*.

Boschma (2005) claims that these four proximity elements may play a coordination role and mediate the learning (or other) relationship without the need for close spatial distance between economic actors. On the other hand, the role of geographical proximity can be justified if it is accompanied by at least cognitive proximity. Per se, it is not sufficient as only other types of proximities may bridge long distances and transfer tacit knowledge in an effective manner. Though, it may play an important but indirect role in facilitating interactive learning and innovation, via stimulating other forms of proximity (e.g., the growth of cognitive proximity). In case of regional lock-in (e.g., in the skills of local businesses), geographical proximity may even constitute a problem (Boschma and Iammarino, 2009; Lux, 2009). It may be handled with geographical openness but fulfilling certain preconditions. Extreme values of different proximity types should be avoided as well. For instance, too much trust may result in an opportunistic behavior of the other party (Boschma, 2005).

As a result of Krugman's and Porter's synthesizing work, agglomerations are theoretically—at least, more—understood geographic formations which can be defined as businesses or business activities which are located geographically close to each other (Chung and Kalnins, 2001). Typically, the scholarly literature identifies three main formations that we can encounter as a result of **positive agglomeration economies** (Meliciani and Savona, 2015):

1) *Localization economies* (either internal or external economies of scale) that come *from sectoral concentration*;
2) *Urbanization economies* as a result of urban and population density and *independent from the sectoral distribution*;
3) *Jacobian externalities* stemming *from the variety of industries* in a territory, either related or unrelated to each other.

2.3.2. Territorial heterogeneity within the European Union

An important aspect to take into account when considering the extent (quality) of territorial servitization is the heterogeneity of the analyzed territory. Heterogeneity comes from the different development paths countries and even regions took in the past and are still taking, and influence their future development and growth prospects.

An interesting contribution from the field of comparative political economy **is the theory on varieties of capitalism (VoC).** From the different models, one of the most active scholarly topics emerges from the work by Hall and Soskice (2001). As depicted in Nölke and Vliegenhart (2009), the VoC approach is based on the assumption that *market economies follow different innovation patterns* that originates in firm behavior that adapts to peculiar characteristics of their basic capitalist institutions (e.g., industrial relations, transfer of innovation). This original VoC distinguishes two ideal types of market economies: *liberal market economies (LME)* such as the United Kingdom, and *coordinated market economies (CME)* such as Germany and Austria. The success of any market economy is attributed to its mutually reinforcing, complementing and balanced institutions, while incoherence between its elements leads to suboptimal outcomes (Nölke and Vliegenhart, 2009).

The original—though, holistic and easily understandable—approach has left space for further improvement. For instance, Nölke and Vliegenhart (2009) identified a third group of *dependent market economies (DME)* incorporating the Central and Eastern European (CEE) countries of Czech Republic, Hungary, Poland, and Slovakia. In their view, in spite of their similar past traits, these countries outperform other post-socialist European countries (e.g., Romania and Bulgaria) in several fields including the export of high-tech or human capital intensive industries. Nevertheless, the overall innovation capacity of these economies is limited and highly dependent on knowledge coming from more developed market economies. While the comparative advantage of LMEs lies in radical innovation by technology and service businesses, CMEs perform better incremental innovation of capital goods; based on their skilled but cheap labor DMEs prove themselves competitive in the assembly of semi-standardized industrial goods. Therefore, DMEs are seductive platforms for multinational enterprises (MNEs) from for example, the automotive and manufacturing industries, and extremely dependent on capital via foreign direct investment (FDI).

The reason is that for *medium-sized and large enterprises*[4]*, especially multinational enterprises* in more developed European countries—in other words, international businesses—the globalization wave typically promoted a twofold strategy. By disaggregating their value chain, they transferred their operation to territories offering low-cost (static) resources. However, these processes took place only to a limited extent, and not just among but within nations in which case, barriers such as differences in language,

[4] Later on, when we refer to small- and medium-sized enterprises (SMEs), we follow the classification proposed by the European Commission (2013).

law etc. were not even an issue. The common practice applied by these businesses is that they keep their most sophisticated, strategic activities (e.g., creating more advanced products, intangibles) where they can access dynamic efficiencies (typically in their home country or in one single country), while repetitive business processes are outsourced or offshored, that is, located abroad (Porter, 1994; Di Gregorio et al., 2009). In relation to this practice, a relevant term of home base appeared which refers to the area *"…where strategy is set, core product and process development takes place, and the essential and proprietary skills reside (Porter, 1990, p. 69)"*.

Albeit, Bohle and Greskovits (2009) support the need for a newly created category of DMEs, they reveal serious and well-founded conceptual *shortcomings around the theory of VoC* that question its future applicability. Just to mention some relevant ones:

- The VoC approach fails to predict whether an economy keeps its original membership in a type of market economy or changes in any direction over time.
- Looking at successful applications of mixed institutional setups in countries assumed to belong to one of the ideal types (e.g., Germany), the superiority of pure types is falsified.
- They refuse the convergence of all the countries towards either LMEs or CMEs. In spite of some country-specific differences, they rather find reasonable to expand these by additional country groups with specific institutional mix (e.g., Latin American countries, Central and Eastern Europe).

Despite the incompleteness of the theory, building on Nölke and Vliegenhart (2009)'s work, Bohle and Greskovits (2009) suggest that complementarities across countries—rather than complementarities among institutions or comparative advantages—may be a more valid focus of future research. According to the authors, CEE countries stand out in this regard since the development path of the institutions in post-socialist countries has been basically stoned by transnational influences. Quoting the authors this may imply that

> *"In this case, DME's institutions would foster specialization in low cost and relatively low-skilled segments of the production chain, allowing CMEs to deepen their own specialization in the high-skill and high cost production segments (p. 380)."*

In support of a hinterland relationship among post-socialist and more developed EU countries, one can read for instance, Nagy et al. (2012) and Medve-Bálint (2014) as well. Nagy et al. (2012) delineate that the embeddedness of post-socialist countries into the global economy occurred through realigning the division of labor, property and firms in Europe after the political transition. The uneven development was worsened by neoliberal policies of the European Union. *The development of regions changed* concerning all the three means that became the source of local conflicts. Permeable national borders allowed free flow between border regions that contributed to their uneven development, and role of urban centers appreciated due to their increased knowledge and information flow and enjoyed better policy support. Analyzing the average annual per capita access to foreign direct investments, Medve-Bálint (2014) confirms the positive role of EU in channeling FDI and facilitating economic restructuring in CEE economies. However, he also concludes that these processes did not reduce but deepened the gap between Western, and Central and Eastern Europe, as they favored the global competitiveness of the already developed countries.

Nevertheless, the full picture for the group of Central and Eastern European (CEE) countries is not as dark as suggested by some of the described FDI processes. Foreign-owned firms foster regional economic development in several ways. For instance, they employ thousands of workers in the host country (Hardy et al., 2011), increase its export potential (Gal, 2014) and may support structural change in regions as they tend to be less related to the skills of incumbent businesses (Elekes et al., 2018). Therefore, foreign-owned firms are undoubtedly crucial actors in any European economy.

It is also true that the **motivation and impact of foreign direct investments matter and may depend** on whether they aim at vertical or horizontal disintegration. In case of business services, this difference is well-presented in the work by Hardy et al. (2011) who analyzed two types of linkages, *horizontal disintegration*—i.e., a market-seeking strategy across territorial (e.g., national) boundaries—and *vertical disintegration*—i.e., an efficiency-seeking strategy which takes place via fragmenting business functions and locating them to territories which provide space for higher efficiency. From a historical point of view, the FDI related to business services in CEE countries took place in two streams. After the economic transition of most post-socialist countries, first, horizontal strategies emerged in the market, while vertical investments came after 2000 (Gal, 2014; Hardy et al., 2011). However, the characteristics and territorial outcome of *these* *two investments are quite dissimilar* for instance, in their operational goals, different skills sets required (Hardy et al., 2011):

1) Service subsidiaries established as a result of **horizontal disintegration** aim to provide customized such as—and dominantly—consultancy services. As this type of services is accompanied by complex interaction with customers and *requires spatial proximity,* they are strongly dependent on the quality of the host environment. They demand *high-level skills* which result in significant marketing efforts in the labor market. **Their services in general are more expansive and more standardized than domestic services and they target mostly large firms.**
2) **Vertical disintegration** is centered basically around cost-efficiency, in particular, accessing skilled and cheap labor. Some typical examples are offshoring customer care or IT support services. Compared to horizontal disintegration, vertical disintegration may encompass *a broader spectrum of skills*. This is the case for vertical investments in CEE countries too, where services may range from the less knowledge-based back-office services to services supporting corporate functions or call centre services in several languages. According to the findings by Hardy et al. (2011) in CEE countries **vertical investors export almost all their services to European or global markets,** which suggests that *proximity to their customers is not relevant*. In CEE countries, Hardy et al. (2011) point to the *strong dominance* of vertical investments over horizontal investments *in job creation*.

2.3.3. Summary

After considering related variety as a precondition of territorial servitization processes to occur, Section 2.3 provided a theoretical background on additional, however, essential factors (location, proximity, and territorial heterogeneity in the European Union) that influence the feasibility of KITS processes.

After introducing shortly the evolution of main location theory streams which serve as a theoretical ground for today's locational driving forces, I reviewed the *traditional and upcoming locational factors* that may guide the location choices of manufacturing and service, and most importantly, KIBS businesses (Section 2.3.1). Building on the prominent work by Krugman and Porter, static sources of efficiency (e.g., market size) which are losing their distinctive value by today, as well as the new, dynamic sources of competitive advantage (e.g., specialized infrastructure) were depicted. As a consequence of technological improvements in transportation and information technology (IT), a discussion about the *changing importance of geographical proximity* was also presented. Finally, in Section 2.3.2, I reviewed the *territorial disparities in the European Union* which may support or hinder KITS processes. From the literature on the varieties of capitalism (VoC) and foreign direct investment (FDI), it turned out that besides the virtuous circle related to entrance of multinational enterprises (MNEs) to the periphery of the EU, a vicious circle related to their investment practices also took place.

Based on the reviewed literature in *both Sections 2.2 and 2.3*, the following section (*Section 2.4*) attempts to open up (further) locational factors more related to territorial servitization processes in the European Union. This section will provide the basis for our research hypotheses tested in two empirical analyses, and organized as follows. In *Section 2.4.1,* I attempt to unveil the **determinants of KIBS formation in the regions of the European Union**. Knowledge-intensive business service (KIBS) firms have been recognized as key economic agents that not only are carriers of knowledge but also facilitate development and innovation processes of their clients. Nevertheless, territories do not realize the generally positive effects of the potential dynamics between KIBS and manufacturing sectors at the same intensity, in terms of increased KIBS formation rates. First, the role of the *characteristics of manufacturing in a territory* is considered. Second, following Porter (1994) and McCann and Sheppard (2003), I assess the role of the *quality of the business environment* including both entrepreneurial and institutional factors which interact and mutually reinforce each other. Additionally, the contradictory scholarly findings on the role of related variety in territorial performance may also call for the need of this analysis.

As suggested by Porter (1994), and similar to the case of firms, territories can gain competitive edge by relentless innovation efforts, skill and technology upgrading. Increasing the value added of manufacturing businesses via integrating valuable services by KIBS businesses in manufacturing operations may increase the regional level of innovation, and thus, enhance regional competitiveness and economic growth (Lafuente et al., 2017). Nevertheless, KIBS businesses are not homogeneous in their profile and innovation level, and a relevant question for this chapter is how KIBS' heterogeneity conditions their contribution to the performance of both manufacturing businesses and, indirectly or directly, of regions. Consequently, a separate section, *Section 2.4.2* will assess *the role of different KIBS businesses* on the potential realization of KITS, more concretely, in the **economic contribution of the regional manufacturing sector**.

In spite of the crucial importance of MNEs and large enterprises (e.g., investment and export potential) which account for less than one percent of businesses in across EU economies (European Commission, 2015), I argue that besides case studies on large businesses' practices, it is important to analyze aggregate outcomes of markets mainly populated by small businesses. There are at least two reasons that motivate this argument. First, *small businesses are relevant employers and contributors to the economic performance* of countries and subnational regions (European Commission, 2015). Second, even if *MNEs* generally show fast recovery and higher resistance to economic shocks, the less relevant role of geographical proximity—especially in case of vertical investments—may result in the *relocation of their activity* to more attractive territories (e.g., Coe et al., 2008; Sass and Szalavetz, 2014). Also, as Taleb (2010) describes, instead of extreme dependence on a few economic actors, territorial resistance would require *the presence of a kind of safety stock*.

Accounting for the specific characteristics of the KIBS-manufacturing interaction depicted in the literature, I also argue that for small firms in general, *geographical proximity* to certain resources still constitute an important decision factor in choosing their location. Therefore, despite the potential substitution (or support) offered by additional proximity types, especially, for territorial servitization processes, spatial closeness should remain as a mediating factor of business interactions. This argument is supported by previous studies (e.g., Lafuente et al., 2010; Porter, 1998).

2.4. Hypotheses development

2.4.1. Determinants of KIBS formation in the regions of the European Union

2.4.1.1. Knowledge-intensive territorial servitization (KITS) and the regional manufacturing characteristics

Because of the specific characteristics of their internal processes, the competitive advantage of KIBS firms heavily relies on external knowledge. As knowledge and talent constitute their most relevant inputs (Boone and Ganeshan, 2001; Garicano and Wu, 2012), the origins of their contextual dependence are twofold. First, the most important carriers of these inputs (knowledge and talent) are their employees, that is, to them the *quality of human resource* is essential. Second, *KIBS' knowledge stock basically grows with* the accumulated experience on customized and time-changing *problem solving for their business clients* (Scarbrough et al., 2004). These operational characteristics imply that KIBS firms face the potential challenge of dealing with unprecedented cases that require additional knowledge and also, of managing frequent interactions in an efficient way (Garicano and Wu, 2012). Therefore, and because knowledge acquisition requires proximity, *"…knowledge spillover entrepreneurship will tend to be spatially located within close geographic proximity to the source of knowledge actually producing that knowledge (Audretsch et al., 2006, p. 29)"*. Although spillover effects among KIBS businesses and other regional entities may often be mediated of other types of proximity such as cognitive or organizational proximity (Boschma, 2005), several empirical studies prove that geographic proximity plays an important role (e.g., Fernandes and Ferreira, 2013; Lafuente et al., 2016).

Enhanced value appropriation also depends on the characteristics of the territory's manufacturing industry (Kohtamäki and Partanen, 2016). Fritsch and Changoluisa (2017) find that the formation of new service businesses affects the productivity of incumbent manufacturers more positively than regional firm formation rates in general. Thus, the proposed knowledge-based territorial servitization constitutes a special case of service interactions that result from the complementarities between manufacturing and KIBS firms. Lafuente et al. (2017) propose a mutually reinforcing circle between the formation of new KIBS firms—that stimulates employment in new manufacturers—and the regions' manufacturing sector whose activity is conducive to greater rates of new KIBS firms. Following this theory and evidence, it seems logical to assume that existing manufacturing firms can stimulate the formation of KIBS firms or attract new KIBS businesses to the region. This is evidenced by prior scholarly work that showed that the demand of manufacturing firms can affect the location decision of business service firms (Gallego and Maroto, 2015; Guerrieri and Meliciani, 2005). Therefore, the first hypothesis emerges:

H1: A positive relationship exists between the manufacturing specialization of a region and the rate of new KIBS firms.

European markets are primarily populated by small businesses (European Commission, 2015), and manufacturing sectors are not the exception. Because of the generally positive effects of the increased provision of knowledge-based services on manufacturers' performance, it is relevant to question whether the benefits of territorial servitization are evenly accessible for all manufacturers. I argue that small manufacturers will demand knowledge-based services if they add value to the business' core products.

Servitization can be seen as a reaction to market pressures, and two scenarios emerge for manufacturing SMEs pursuing enhanced competitive advantage through this strategy. First, small manufacturers could integrate a portfolio of services into their product offering (e.g. after-sale maintenance). However, most SMEs are exposed to liabilities of smallness and/or newness as well as to resource constraints—i.e., operational, financial and organizational—that may limit their capacity to implement servitization strategies internally (Huikkola et al., 2016). Second, manufacturing SMEs could servitize via outsourcing the service to an external provider (Visnjic and Van Looy, 2013). Here, collaborations with local KIBS firms are critical to sustain the competitive advantage of manufacturing SMEs (Doloreux and Shearmur, 2013), and to support territorial servitization by restructuring the local industry (Lafuente et al., 2017).

The adoption of servitization strategies may well be conditioned by the intra-or inter-industry interactions between businesses in a focal region. Fritsch and Changoluisa (2017) find that incumbent manufacturers benefit more from interactions—i.e., input market competition—with businesses in other industries, which constitutes an example of Jacobian externalities. Servitization strategies may be especially attractive for new and small manufacturers often subject to severe resource constraints (Lafuente et al., 2017; Szerb et al., 2014). In this scenario, the positive effects of territorial servitization will become evident if new manufacturing SMEs have a greater possibility to introduce value-adding services provided by local KIBS. Thus, we hypothesize:

H2: A negative relationship exists between the average size of new manufacturing businesses in a region and the rate of new KIBS firms.

2.4.1.2. Knowledge-intensive territorial servitization and the role of the entrepreneurial ecosystem

So far, our arguments suggest that territories can achieve superior rates of new KIBS firms by supporting the renaissance of manufacturing sectors, regardless their significant economic presence in the territory. Nevertheless, specific support policies that prove themselves effective in some regions may not be so in other contexts. As Porter (1998, p. 88) argues, *"The mere colocation of companies, suppliers, and institutions creates the potential for economic value; it does not necessarily ensure its realization"*. Thus, McCann and Sheppard (2003) call attention to the need to integrate the effects and preferences for the environment in the production-location frameworks. Growing evidence shows that the complex interactions between entrepreneurial actions and place-based characteristics shape territorial performance (Acs et al., 2014; Autio et al., 2015). Therefore, between-industry interactions do not result solely from the presence of more businesses, and territories are heterogeneous in their capacity to attract KIBS firms. We argue that, among the different sources of territorial heterogeneity, the development of the entrepreneurial ecosystem is an important region-specific factor with relevant implications for KITS.

Since Schumpeter (1934), the role of entrepreneurship as a vital component of territorial development has increasingly drawn scholarly attention, and it has evolved in two main directions. On the one hand, the emphasis on the quality of new enterprises has started prevailing against the traditional quantity-based analysis of the role of entrepreneurship on territorial development (Qian et al., 2013). On the other hand, scholars acknowledge that environmental embeddedness influences the quality of entrepreneurship and have proposed a systemic view of entrepreneurship (Falck, 2007; Spigel, 2017). This systemic approach has led to develop the concepts of industrial districts (Marshall, 1920), clusters (Porter, 1998) and regional innovation systems (Cooke et al., 1997).

According to Acs et al. (2014, p. 479), the entrepreneurial ecosystem is defined as

> *"…the dynamic, institutionally embedded interaction between entrepreneurial attitudes, abilities, and aspirations by individuals, which drives the allocation of resources through the creation and operation of new ventures".*

Recent work emphasizes that a healthy entrepreneurial ecosystem yields to superior territorial performance (Acs et al., 2014; Lafuente et al., 2016).

The entrepreneurial ecosystem approach shares the characteristics of complexity and multidimensionality (Acs et al., 2014), and focuses on the systemic interactions between entrepreneurs and institutions. Entrepreneurs play an organic part in creating and maintaining a healthy ecosystem, while the ecosystem catalyses successful entrepreneurship to the economy in the form of new businesses (Acs et al., 2014). According to Szerb et al. (2014), the positive effects of the entrepreneurial ecosystem depend on how comprehensive and available its specialized resources are to entrepreneurs. Yet, some territorial impulses come from a broader, national level (e.g., regulation), while other factors (e.g., the quality of human capital, networking and innovation) carry specific characteristics below country level (Stam, 2007). Also, entrepreneurial ecosystems are territorially bounded, being Silicon Valley, Copenhagen and Cambridge one of the most well-known examples.

But, how can the entrepreneurial ecosystem contribute to the KITS process via new KIBS' formation rates? From a systemic perspective, entrepreneurship implies a resource mobilization process in which individuals pursue economic opportunities through entrepreneurial actions. At the territorial level, resource mobilization creates a process of 'entrepreneurial churn' that drives resource allocation to more productive activities (Reynolds et al., 2005). The capacity of an entrepreneurial ecosystem to facilitate this resource allocation process is evidence of its quality. Compared to other entrepreneurial ecosystems, a high-quality ecosystem is characterized by superior factors that are conducive to enhanced territorial performance, such as well-developed social networks and digital infrastructures. However, judgments about the potential feasibility of entrepreneurial actions can be influenced by contextual factors, such as support structures and local network availability (e.g., suppliers, customers). Also, related to the existing knowledge stock in the certain territory, *"...since the new firm will be started from knowledge that has spilled over from the source producing that new knowledge (Audretsch et al., 2006, p. 44)"*, more new KIBS businesses will be launched in spatial *"...contexts where investments in new knowledge are relatively high (Audretsch et al., 2006, p. 44)"*. Thus, the institutional framework acts as a regulator both of the feasibility of entrepreneurial projects and of the outcomes of entrepreneurial ventures (Acs et al., 2014). We, therefore, hypothesize:

H3: A positive relationship exists between the quality of the regional entrepreneurial ecosystem and the rate of new KIBS firms.

In the context of the proposed KITS process, a healthy entrepreneurial ecosystem will likely strengthen the connection between local manufacturers and KIBS businesses by nurturing the system with the appropriate mechanisms to create/develop this relationship. For example, developed network structures that facilitate the connection between manufacturers and KIBS are part of a solid entrepreneurial ecosystem that, in turn, may yield a stronger KITS (Arnold et al., 2016; Lafuente et al., 2017). Also, the entrepreneurial ecosystem may improve resource allocation processes by channeling new entrepreneurial ventures to productive areas, which will translate into increased incentives for entrepreneurs to create KIBS businesses in settings where manufacturing firms are mostly new and small, and demand knowledge-based services. Existing evidence justifies specific location advantages that manufacturers may seek in a territory, such as energy costs, concentration of employment (Carlton, 1983), lower level of corporate tax rate, and public infrastructure (Bartik, 1985). In this scenario, the entrepreneurial ecosystem provides the conditions to realize the economic potential of new KIBS businesses. Following this line of thought, we propose the following hypotheses linking the entrepreneurial ecosystem to the KITS process:

H4: At the regional level, the entrepreneurial ecosystem moderates the positive relationship between the manufacturing specialization and the rate of new KIBS firms.

H5: At the regional level, the entrepreneurial ecosystem moderates the negative relationship between the average size of new manufacturing businesses and the rate of new KIBS firms.

2.4.2. The differentiating role of technology-based and professional KIBS firms on the economic contribution of manufacturing businesses

Although there is no single definition of knowledge-intensive business service firms accepted in the literature (e.g., Windrum and Tomlinson, 1999; Bettencourt et al., 2002), the proposed definitions have a common understanding on the relevance of KIBS' knowledge potential which may manifest in own and other firm-level innovations (Wood et al., 1993). Therefore, KIBS businesses can play a twofold role as organic and catalyzing agents in territories' innovation system. First, as sources of internal innovations, they may constitute an essential part in the evolution of regional economies themselves. Second, KIBS can act as mediators of external innovations that they catalyze via co-evolutionary processes (Muller and Zenker, 2001).

The abilities of KIBS firms to shape regional innovation and facilitate economic development may stem from their unique operational characteristics such as sale of knowledge as product and high dependence on interactions with clients (Windrum and Tomlinson, 1999; Scarbrough et al., 2004). As Doloreux and Shearmur (2010) show, the main innovation efforts of KIBS firms reflect well their operational characteristics (customized solutions, information technology deepening, etc.).

Because of the capacity of KIBS firms to generate and channel value-added services both at firm and regional levels, EU policy makers have intensified their efforts to promote and develop a solid KIBS sector as part of their strategy for consolidating knowledge-based economies (European Commission, 2012a). At the business level, Muller and Zenker (2001) revealed that the rate of manufacturing firms introducing innovations can be significantly higher for interacting manufacturers, which are more willing to invest in innovation and cooperate with research institutions. The tendency to innovate also held true among interacting and non-interacting KIBS firms. However, more non-interacting KIBS firms invested in innovation and there was hardly any difference in their rate of interacting with research institutions. Considering the inherent characteristic of KIBS firms to facilitate innovation of their clients, I propose the following hypothesis:

H6: At the regional level, KIBS businesses have a positive impact on the contribution of manufacturing firms to the economy.

Regional innovation processes show an interesting similarity with chemical reactions: they require the right ingredients, in the right quantity interacting at a certain point in time and space. As we already presented, for positive inter-industry effects, one of the preconditions that should be met is connected with related variety (e.g., Ketelhöhn, 2006; Boschma and Iammarino, 2009; Tavassoli and Jienwatcharamongkhol, 2016). However, in spite of the generally proposed interconnectedness between KIBS and manufacturing businesses, both scholarly logic and findings call for a deeper analysis of the role of KIBS on regional innovation systems. The most popular academic approach to study KIBS is based on the proposal by Miles et al. (1995), who divided KIBS into two main groups: technology-based services (t-KIBS) and professional services (p-KIBS). The main difference between these groups lies in the intensity of use of new technology. Based on this classification, typical examples of t-KIBS are IT-related services, R&D consulting, while p-KIBS are mostly businesses dealing with management services or market research.

These two types of KIBS possess business-specific characteristics. Tether and Hipp (2002) found that technical service firms and especially knowledge-intensive technical service businesses may be more willing to introduce innovations. In addition, among innovative service firms knowledge-intensive technical service firms tend to do more research and development. According to Doloreux and Shearmur (2010), t-KIBS firms offer their clients more tangible products such as computer systems or programs that make them more replicable. Thus, in today's globalized world, innovation and distribution play a crucial role in their operations. As these businesses produce complex technologies, it is important that the invested financial capital turns over in the short term. On contrary, p-KIBS produce less identifiable services such as advice or design, thus they are less forced to engage in technological (product or process) innovation.

By studying servitization strategies of manufacturing firms in developed economies, including (among others) Belgium, Austria, Germany, Spain, Greece and Sweden, Neely (2008) found that while some types of services (e.g., design and development services) appear generally in all the analyzed economies, others like systems and solutions services can be attributed to countries like Sweden and Germany. He proposes that this result may be consequence of the "industrial heritage" (p. 109) of these economies. Additionally, Doloreux and Shearmur (2010) observed that computer service businesses are more likely to perform in house R&D and purchase electronic hardware than other technical and consulting service firms. They also use internal information sources, suppliers as information sources of innovation and they are the least willing to appeal to other external information sources. Product innovation, process innovation and marketing innovation are also more typical in these businesses.

Although Muller and Zenker (2001) proposed that cooperation and innovation willingness of businesses may include collaborations with different regional and national patterns, there is a limited number of studies analyzing the potential regional benefits of a heterogeneous KIBS industry from this point of view. In general for service businesses, Arnold et al. (2016) found that banking, telecommunications, insurance and transport reforms positively influenced the productivity of Indian manufacturers. At a firm level, Horváth and Szerb (2018) found that the use of digitization and IT-based cash management practices is positively related to the labor productivity of non knowledge-based SMEs including manufacturing businesses.

Based on the above mentioned operational and innovation related characteristics of different KIBS businesses, I propose the following hypothesis:

H7: At the regional level, the positive effect of KIBS on the contribution of manufacturing firms to the economy is stronger among technology-based KIBS firms, compared to professional-based KIBS firms.

After presenting all the seven hypotheses of this study, in the next chapter (*Chapter 3*), I introduce the data, variables, and method that underlie the empirical analyses.

Chapter 3: Data and method

To test the seven hypotheses proposed in Chapter 2, two main empirical analyses will be conducted. The first empirical analysis focuses on the determinants of KIBS formation in the regions of the European Union, and addresses hypotheses 1 to 5. The second analysis aims to analyze the potentially differentiating effect of specific knowledge-intensive business service firms on the economic contribution of manufacturing businesses, and deals with the rest, hypotheses 6 and 7. As these analyses partially share their underlying datasets, variables and apply the same method, these are handled together and presented in the same subchapters. First, *Section 3.1* introduces the sample characteristics, then *Section 3.2* describes the study variables, and finally, *Section 3.3* presents the method.

3.1. Sample

The data used in this study come from three sources. First, the data related to the KIBS' business formation rate and the size of new manufacturing businesses were collected from the annual population surveys available at the *Global Entrepreneurship Monitor (GEM) Regional databases*. GEM is one of the world's most extensive surveys on entrepreneurship with a database that includes information for more than 100 countries. The representativeness of the GEM's Adult Population Survey (APS) is ensured as insofar as it includes information for a minimum of 2000 adults per participating territory, thus yielding a representative picture of entrepreneurial activity in the sampled territories (Reynolds et al, 2005). Scholars and policy makers increasingly acknowledge the value of GEM data, and the vast stock of empirical studies based on GEM data includes, among others, Bosma and Schutjens (2011), Lafuente et al. (2007), Sternberg (2012). This source is **exclusively used in the first empirical analysis**.

Second, the variable measuring the quality of the entrepreneurial ecosystem across European regions was obtained from the *Regional Entrepreneurship and Development Index (REDI) databases*. In the context of this project—also called as the regional GEDI (Global Entrepreneurship and Development Index) (Lafuente et al., 2016)—the REDI score is an index number based on multiple data sources, including the GEM's APS, Eurostat, World Bank, World Economic Forum, and the Heritage Foundation. The

REDI index—which constitutes an accurate proxy to measure the quality of the regional entrepreneurial ecosystem—has been used in prior studies dealing with entrepreneurial ecosystems at the regional level (Acs et al., 2015; Audretsch and Belitski, 2017).

Third, the rest of our study variables, such as information on the rate of manufacturers, GDP per capita, and population density at the regional level, was obtained from the *statistical office of the EU (Eurostat)*.

To alleviate potential regional shocks, all the variables used in the analyses are expressed in terms of *average values between 2012 and 2014*. For both of the analyses, the unit of analysis is the region. The final sample includes information for *121 regions*, following the EU's official territorial classification system, namely the Nomenclature of Territorial Units for Statistics (NUTS). It should be noted that the final sample includes 67 NUTS-1 regions and 54 NUTS-2 regions. The proposed strategy based on the analysis of sub-national units is similar to prior work evaluating relevant economic problems and targeting economic policies (see, e.g., Meliciani and Savona, 2015; Porter, 1994). The choice to use mixed statistical regions is crucial in this study, and can be explained by both data availability and methodological issues.

First, the level of data aggregation in the GEM Regional and the REDI databases is heterogeneous among countries. For instance, in Germany data is available at NUTS-1 level, while in Hungary we have NUTS-2 level regions. Second, one could say that a separate analysis exclusively focused on NUTS-1 or NUTS-2 regions would yield a more elegant methodological approach. However, this argument is mistaken for at least two reasons. Including only NUTS-1 or NUTS-2 regions in the analysis would suffer from model specification problems (i.e., model misspecification) that arise from ignoring geographic proximity conditions of regions in each subsample. For instance, various regions in Spain and Hungary border France and Austria, respectively; and a spatial model on the subsample of NUTS-1 regions would yield inefficient (biased) and inconsistent estimators due to model misspecification arising from ignoring the spatial effects coming from all neighboring regions. In addition, even regions at the same statistical level might highly vary in terms of their geographical area (e.g., see Berlin and the Czech Republic).

The representativeness of the sample is ensured insofar as it includes regions from 24 European countries: Austria (3 regions), Belgium (3 regions), Croatia (2 regions), Czech Republic (1 region), Denmark (5 regions), Estonia (1 region), Finland (4 regions), France (8 regions), Germany (16 regions), Greece (3 regions), Hungary (7 regions), Ireland (2 regions), Italy (4 regions), Latvia (1 region), Lithuania (1 region), Netherlands (4 regions), Poland (6 regions), Portugal (5 regions), Romania (4 regions), Slovak Republic (4 regions), Slovenia (2 regions), Spain (15 regions), Sweden (8 regions), and the United Kingdom (12 regions). The list of the study regions is presented in *Table 2*.

Table 2. List of sampled regions used in the analysis

Country	**NUTS level**	**Regions**
Austria	NUTS 1	Eastern Austria, Southern Austria, Western Austria
Belgium	NUTS 1	Brussels-Capital Region, Flemish Region, Walloon Region
Croatia	NUTS 2	Continental Croatia, Adriatic Croatia
Czech Republic	NUTS 1	Czech Republic
Denmark	NUTS 2	Hovedstaden, Sjælland, Southern Denmark, Midtjylland, Nordjylland
Estonia	NUTS 1	Estonia
France	NUTS 1	Île-de-France, Bassin parisien, Nord, Est, Ouest, Sud-Ouest, Centre-Est, Méditerranée
Finland	NUTS 2	West Finland, Helsinki-Uusimaa, South Finland, North & East Finland
Germany	NUTS 1	Baden-Württemberg, Bayern, Berlin, Brandenburg, Bremen, Hamburg, Hessen, Mecklenburg-Vorpommern, Niedersachsen, Nordrhein-Westfalen, Rheinland-Pfalz, Saarland, Sachsen, Sachsen-Anhalt, Schleswig-Holstein, Thuringen
Greece	NUTS 1	Voreia Ellada, Kentriki Ellada, Attiki
Hungary	NUTS 2	Central Hungary, Central Transdanubia, Western Transdanubia, Southern Transdanubia, Northern Hungary, Northern Great Plain, Southern Great Plain
Ireland	NUTS 2	Border, Midland and Western NUTS-II Region, Southern and Eastern NUTS-II Region
Italy	NUTS 1	Northwest Italy, Northeast Italy, Central Italy, South Italy
Latvia	NUTS 1	Latvia
Lithuania	NUTS 1	Lithuania

Table 2. Continued

Country	NUTS level	Regions
Netherlands	NUTS 1	Northern Netherlands, Eastern Netherlands, Western Netherlands, Southern Netherlands
Poland	NUTS 1	Region Centralny, Region Południowy, Region Wschodni, Region Północno-Zachodni, Region Południowo-Zachodni, Region Północny
Portugal	NUTS 2	Norte Region, Algarve, Centro Region, Lisboa Region, Alentejo Region
Romania	NUTS 1	Macroregion one, Macroregion two, Macroregion three, Macroregion four
Slovak Republic	NUTS 2	Bratislava Region, Western Slovakia, Central Slovakia, Eastern Slovakia
Slovenia	NUTS 2	Eastern Slovenia, Western Slovenia
Spain	NUTS 2	Galicia, Asturias, Cantabria, Basque Community, Navarre, La Rioja, Aragon, Madrid, Castile-Leon, Castile-La Mancha, Extremadura, Catalonia, Valencian Community, Andalusia, Region of Murcia
Sweden	NUTS 2	Stockholm, East Middle Sweden, Småland and the islands, South Sweden, West Sweden, North Middle Sweden, Middle Norrland, Upper Norrland
United Kingdom	NUTS 1	North East, North West, Yorkshire and the Humber, East Midlands, West Midlands, East of England, London, South East, South West, Wales, Scotland, Northern Ireland

Note that 14 out of the 24 analyzed countries are located in Western Europe, while the remaining 10 countries are located in Central and Eastern Europe. Additionally, at the regional level our sample includes 92 Western European regions and 29 regions from Central and Eastern European countries.

3.2. Variable definition

3.2.1. Dependent variable

In the first analysis, the dependent variable is the **rate of new KIBS businesses**, measured as the number of new KIBS firms divided by the total number of new businesses in the region. In the context of our analysis, this variable helps to capture business formation rates and other relevant economic processes in highly heterogeneous regions, in terms of size. This measure allows us to analyze territorial servitization processes in our study regions that may be countries (e.g., Czech Republic) but also city regions (e.g., Berlin). Prior work has used similar variables to analyze various regional phenomena (Garofoli, 1994; Mason et al., 2011; Tabellini, 2010) and relationships associated with territorial servitization processes (Lafuente et al., 2017).

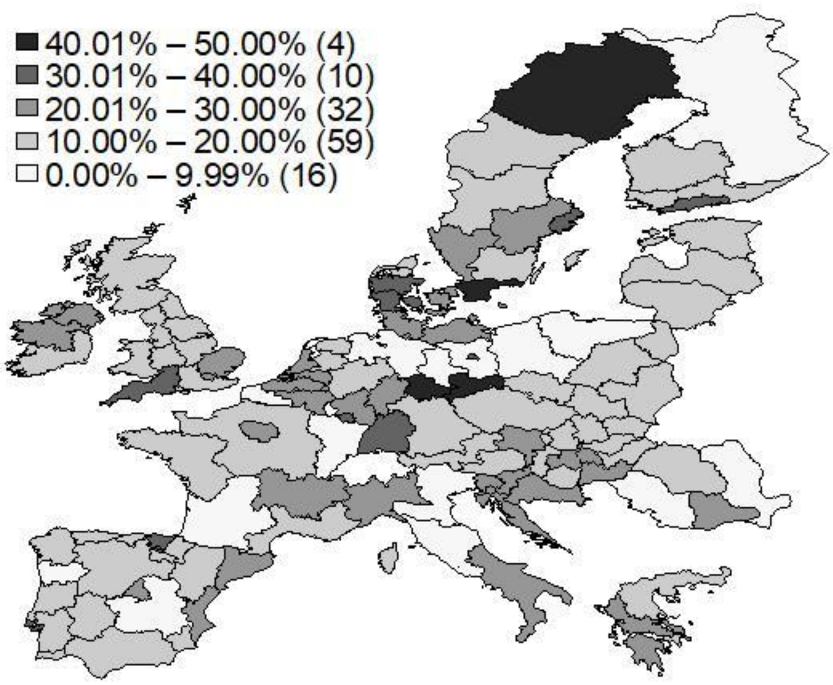
Additionally, the construction of this variable requires refinement in two aspects: the definition of KIBS firms, and the measurement of new businesses. First, *to accurately identify KIBS sectors*, and similar to Leydesdorff and Fritsch (2006), and Volgmann and Münter (2018), we use the classification of knowledge-intensive services (KIS) proposed by the Eurostat (2016) as our starting point, and narrow it to specifically B2B (business-to-business) sectors. As a result[5], we involve the following industrial sectors in our analysis: water transport (NACE Rev-2: 50), air transport (NACE Rev-2: 51), telecommunications (NACE Rev-2: 61), computer programming, consultancy and related services (NACE Rev-2: 62), information service activities (NACE Rev-2: 63), legal and accounting activities (NACE Rev-2: 69), activities of head offices; management consultancy activities (NACE Rev-2: 70), architectural and engineering activities; technical testing and analysis (NACE Rev-2: 71), scientific research and development (NACE Rev-2: 72), advertising and market research (NACE Rev-2: 73), other professional, scientific and technical activities (NACE Rev-2: 74), employment activities (NACE Rev-2: 78), and security and investigation activities (NACE Rev-2: 80).

Second, and following the GEM classification standards, *we identify new businesses as* firms up to 42 months of market experience (3.5 years). This can be a good choice for a borderline, as the market position of firms in their first 3-4 years is usually uncer-

[5] I also considered NACE Rev-2 codes, regional data in the Eurostat Regional Database, and included only those industries that had available data for the overall number of KIBS businesses in the analysed regions.

tain and most of them even stop their operations those years (Reynolds et al., 2005)[6]. *Figure 3* visually shows the distribution of new KIBS businesses for the study regions. Class breaks correspond to values that divide the distribution of the variable into five equal-width intervals. The number of regions belonging to a given interval is indicated in parenthesis[7]. As the map illustrates, EU regions are unevenly distributed in terms of their KIBS formation rate. In almost half of the study regions, the proportion of KIBS firms among new businesses is between 10% and 20%. Only four regions have more than 40% KIBS formation rate: two Swedish regions (Upper Norrland and South Sweden) and two German regions (Sachsen and Thuringen). Regions with the lowest KIBS formation rate are located in a more dispersed way, for instance, we can find some in Germany, Italy, Spain, and in Poland too.

Figure 3. Geographic distribution of the rate of new KIBS businesses across European regions



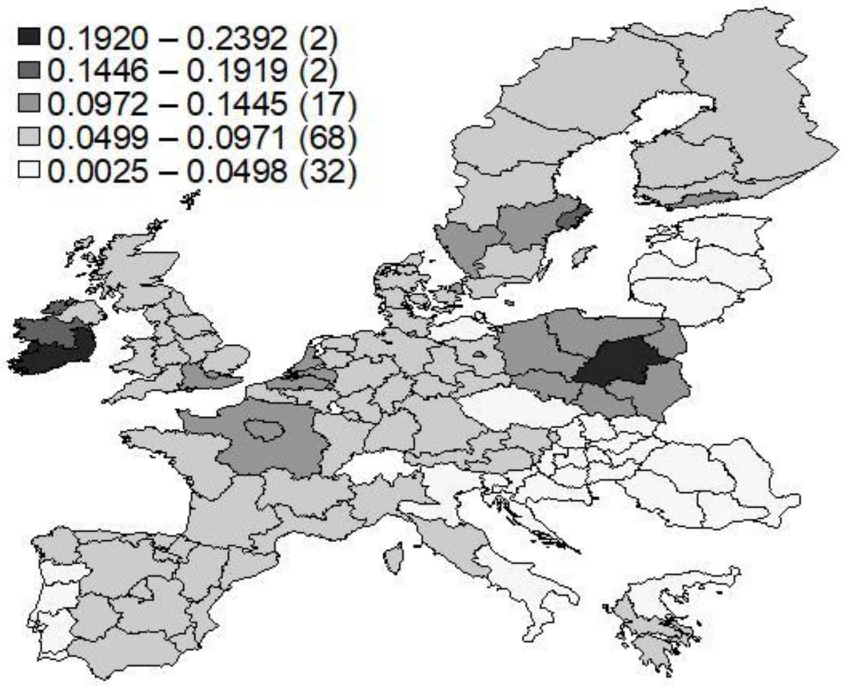
In the second analysis, the dependent variable is the **regional economic contribution of manufacturing businesses** operationalized via the average gross value added (GVA)

[6] The timing of the GEM annual population survey allows at distinguishing between businesses created in the same year of the survey (firms with less than 6 months of market experience) and firms created in the year prior to the survey. This criterion leads to define new business as those firms with less than 42 months of market experience.
[7] The same visualization technique is applied to the rest of the dependent and independent variables.

generated by manufacturing firms divided by manufacturing workers. Previous studies have applied this measure as the indicator of regional productivity (Esteban, 2000) and economic performance (Audretsch and Keilbach, 2004). The GVA measures the value of goods and services produced by the study sectors, which represents a good proxy of the contribution of manufacturing businesses to the regional economy.

Additionally, for illustrative purposes *Figure 4* displays the distribution of the GVA per worker expressed in million of Euros across the analyzed European regions. The map shows that distribution of the variable is strongly skewed to the right. CEE countries such as Hungary, Romania, Croatia, Slovakia and the Baltic countries typically have the least productive manufacturing sector per worker. Only two regions, Southern and Eastern (Ireland) and Region Centralny (Poland) fall into the top category, and two other regions have quite highly productive manufacturing industries on average, Stockholm and Border Midland and Western in Ireland as well.

Figure 4. Average manufacturing gross value added (GVA) per worker in the analyzed European regions (in million of Euros)



3.2.2. Independent variables

The first empirical analysis has three main independent variables: 1) the quality of the entrepreneurial ecosystem, and variables related to the manufacturing characteristics of a region, namely, 2) the rate of manufacturers and the average size of new manufacturers.

Entrepreneurial ecosystem. We employ the *REDI index developed by Szerb et al. (2014)* to measure the quality of the entrepreneurial ecosystem. Above the complexity that entrepreneurial ecosystem measures embrace, two reasons validate the choice of the REDI to measure this concept. First, a *strong theoretical background* supports the structure of the index (Szerb et al., 2014). The most important brick of the REDI concept is the notion of entrepreneurship as a systemic issue (Acs et al., 2014; Baumol, 1996) that manifests in the interaction of individual efforts with their institutional context, and the pillars of a region's ecosystem itself. More concretely, the composite index captures the key elements of entrepreneurial ecosystem in six levels: 1) 76 sub-indicators, 2) 36 indicators, 3) 28 variables, 4) 14 pillars, 5) 3 sub-indices and finally, the 6) REDI index. The structure of the index is depicted in *Table 3*.

Second, *the computation of the REDI index is aligned with the Organization for Economic Co-operation and Development (OECD)'s Handbook on constructing composite indicators* (Giovannini et al., 2008). In short, the main steps are the following (for a detailed description, see Szerb et al. (2017)). First, pillar values are derived from multiplying the individual variable with the respective institutional variable. Thus, they reflect the combined effect of these elements. The second step serves to select a reachable benchmark that lagging regions can rationally aim at. Outliers are handled by the use of capping at the 95 percentile. Then, pillars are arranged to the same [0, 1] magnitude. This is accomplished by distance normalization that preserves the relative differences amongst regional values. Fourth, to ensure that reaching the same performance by increasing pillar values requires the same resources, different averages of the 14 pillars are brought to the same level. The average equalization is conducted by the Newton-Raphson method. Although, bottleneck at pillar level hinders overall regional performance, its improvement enhances regional performance to a larger extent than policy interventions in other field. Thus, using a penalty for bottleneck (PFB) methodology in step 5, the value of each pillar in a region is penalized by linking it to the score of the weakest performing pillar in the same region. After these transformations, sub-indices are calculated as the arithmetic averages of pillar values, and multiplied by 100. Thus, as the further arithmetic average of the 3 sub-indices, REDI can range from the potential values of 0 to 100. The higher the regional REDI score, the better the quality of the entrepreneurial ecosystem is.

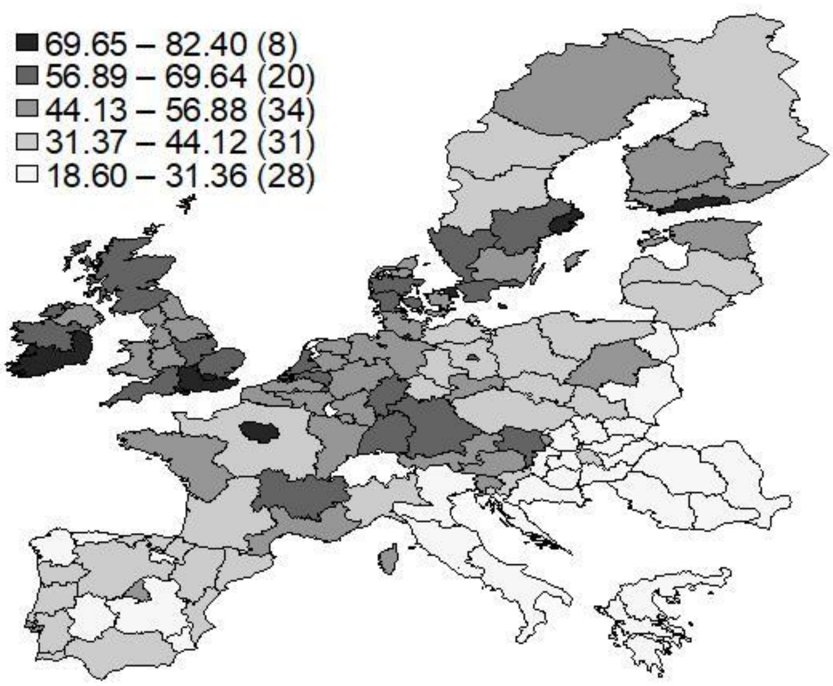
Table 3. Structure of the Regional Entrepreneurship and Development Index (REDI)

	Sub-indices	**Pillars**	**Variables** (individual/**institutional**)
Regional Entrepreneurship and Development Index (REDI)	Entrepreneurial Attitudes Sub-index	Opportunity perception	Opportunity recognition
			Market agglomeration
		Startup skills	Skill perception
			Quality of education
		Risk acceptance	Risk perception
			Business risk
		Networking	Knows entrepreneur
			Social capital
		Cultural support	Carrier status
			Open society
	Entrepreneurial Abilities Sub-index	Opportunity startup	Opportunity motivation
			Business environment
		Technology adoption	Technology level
			Absorptive capacity
		Human capital	Educational level
			Education and training
		Competition	Competitors
			Business strategy
	Entrepreneurial Aspirations Sub-index	Product innovation	New product
			Technology transfer
		Process innovation	New technology
			Technology development
		High growth	Gazelle
			Clustering
		Globalization	Export
			Connectivity
		Financing	Informal investment
			Financial institutions

Source: Szerb et al. (2017)

For illustrative purposes, *Figure 5* displays the distribution of the REDI index across the analyzed European regions. The figure shows that Helsinki-Uusimaa constitutes an example of a region with high-quality entrepreneurial ecosystem, while a region with one of the lowest-quality ecosystems is Voreia Ellada (Greece). Similar to the average manufacturing GVA per employee, many CEE regions are classified among the regions with the least developed entrepreneurial ecosystem.

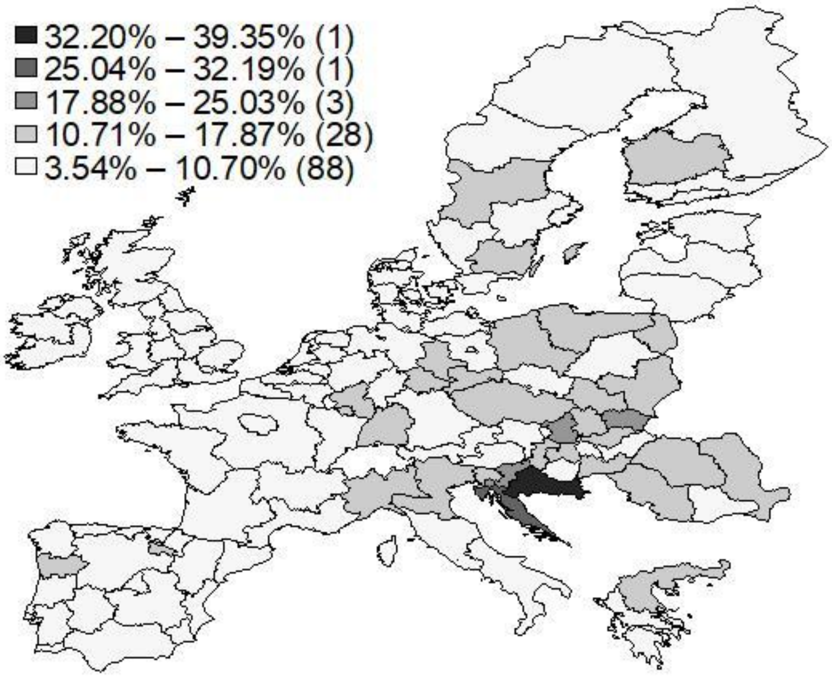
Figure 5. Entrepreneurial ecosystem (REDI) in the analyzed European regions



Manufacturing characteristics. We use two variables related to the regional industrial base. First, following the same logic behind the construction of the rate of new KIBS businesses in regions, we introduce the *rate of manufacturers*, calculated as the number of manufacturing units divided by the total business units in the region. This variable captures the regional specialization in manufacturing activities. Second, and similar to Lafuente et al. (2017), we include the *average size of new manufacturers* defined as the average number of employees of new manufacturers in the region. The number of employees reflects the employment state in June of a given year, adapted to timing of the GEM annual survey. We use the term "new business" consistently with the definition of new for the KIBS businesses detailed above. In all model specifications, these variables were logged to reduce skewness.

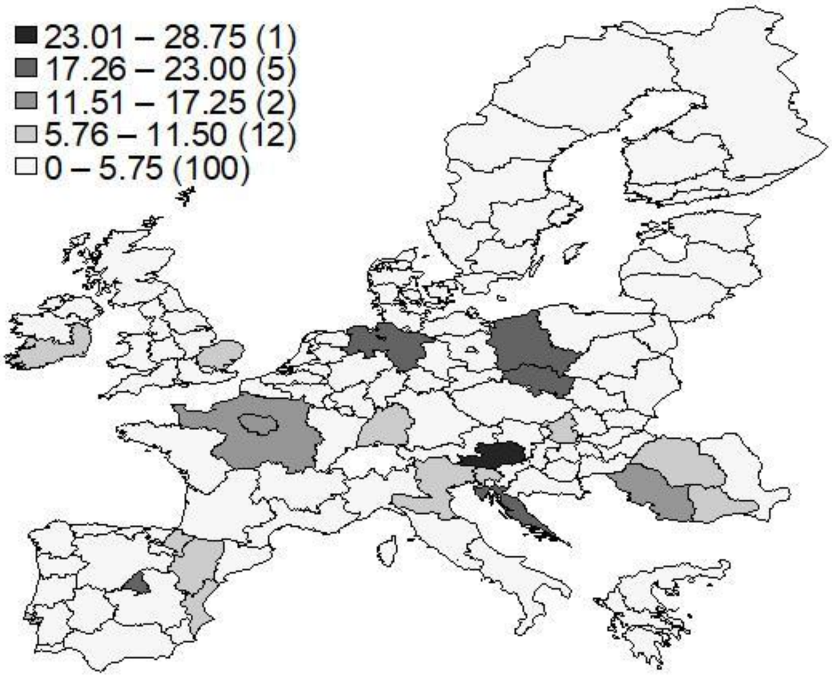
First, *Figure 6* depicts the rate of manufacturing in the context of the European Union. Compared to the previous variables, the map shows that the rate of manufacturers is even more strongly and clearly skewed to the right. In more than 70% of the regions, manufacturing firms give less than 10.71% of the total number of businesses. However, still the dominance of manufacturers can be observed in many CEE regions. Croatia has especially high specialization in manufacturing, as well as two regions in Slovakia, Eastern and Western Slovakia, and one in Slovenia, Eastern Slovenia also rank amongst the most specialized regions.

Figure 6. Geographic distribution of the rate of manufacturing sectors (specialization) in Europe



Second, *Figure 7* is the visualization of the distribution of the average size of new manufacturing businesses in EU regions. Note that in order to improve the usability of the map I excluded Berlin that was an outlier region with 94 employees per new manufacturing business on average. The previous tendency applies for this variable as well, as new manufacturers in most regions are very small; they have maximum 5.75 employees on average. Regions with larger new manufacturing firms are not concentrated in space. They can be found both in Austria, Poland, Germany and Croatia.

Figure 7. Average size of new manufacturing businesses in the analyzed European regions



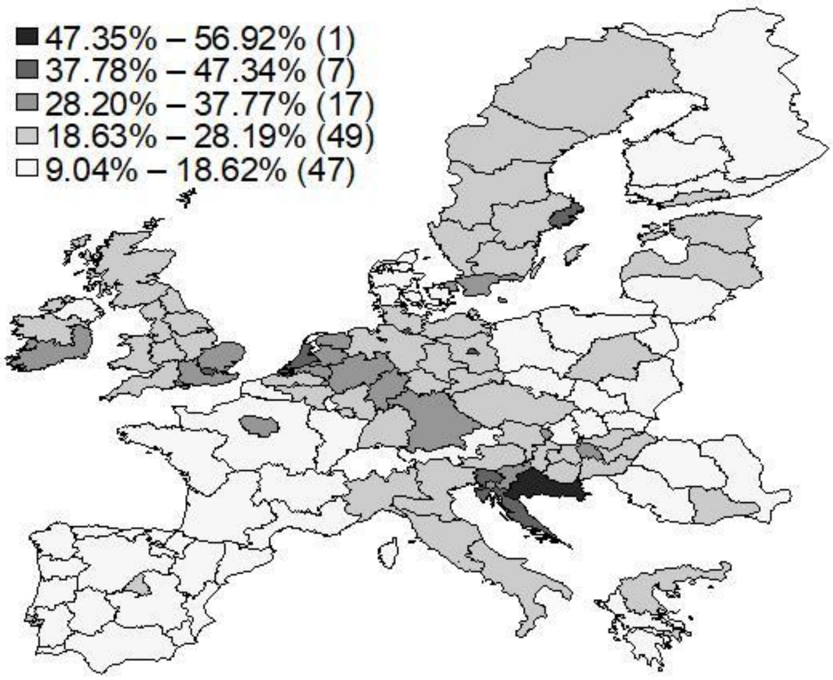
In the second empirical analysis, we apply the following independent variables: 1) KIBS rate and the rate of its specific subgroups, 2) technological KIBS rate (t-KIBS rate) and 3) professional-oriented KIBS rate (p-KIBS rate).

Variables linked to KIBS' share in a territory. Following the classification by Eurostat (2016) which we used to define the rate of new KIBS businesses—the dependent variable in our first analysis—, the main independent variables are the *rate of different types of KIBS at regional level*, measured as the proportions in the region's total number of businesses. We split the KIBS businesses according to whether they are more *technological- (t-KIBS) or professional-oriented (p-KIBS)* businesses and, for each region and each type of KIBS, we introduce in the regression models the rate of KIBS relative to the total number of firms. The overall *KIBS rate* is calculated based on the same logic. We consider t-KIBS as firms in the fields of telecommunications (NACE Rev-2: 61), computer programming, consultancy and related services (NACE Rev-2: 62), information service activities (NACE Rev-2: 63) and scientific research and development (NACE Rev-2: 72). The group of p-KIBS includes businesses whose main activity falls into the following categories: water transport (NACE Rev-2: 50), air transport (NACE Rev-2: 51), legal and accounting activities (NACE Rev-2: 69), activities of head offices;

management consultancy activities (NACE Rev-2: 70), architectural and engineering activities; technical testing and analysis (NACE Rev-2: 71), advertising and market research (NACE Rev-2: 73), other professional, scientific and technical activities (NACE Rev-2: 74), employment activities (NACE Rev-2: 78), and security and investigation activities (NACE Rev-2: 80). Similar categorization is applied in Miles et al. (1995), and Consoli and Elche-Hortelano (2010).

Figure 8 presents the distribution of the analyzed European regions in terms of the rate of KIBS businesses. Results show that Croatia is dominant in this aspect as well; Germany also has two regions, Hamburg and Berlin amongst regions with the high rate of KIBS firms. Besides, if we look at the figure, some countries that relatively excel in the rate of KIBS businesses are for instance, Germany, the United Kingdom, Hungary, and Italy. Some regions with capital cities also have a relatively high KIBS rate. To conclude, the relative weight of KIBS firms may reflect higher economic development level but the result of other economic processes as well.

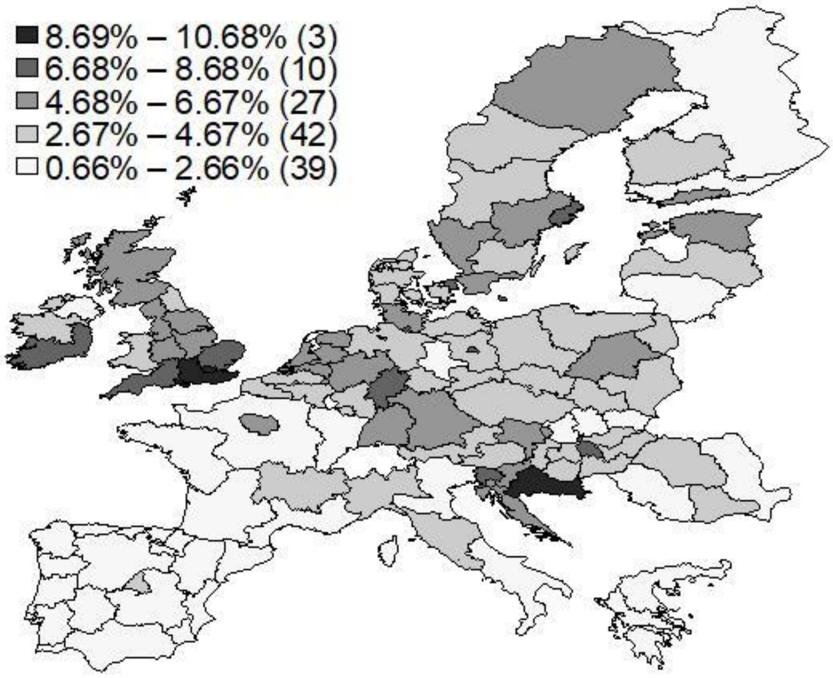
Figure 8. The rate of KIBS businesses in the analyzed European regions



In *Figure 9*, compared to the general distribution of KIBS businesses in a territory, one can observe a relatively higher proportion of t-KIBS in the United Kingdom, Germany and Sweden. Some examples to regions with small share of t-KIBS businesses are

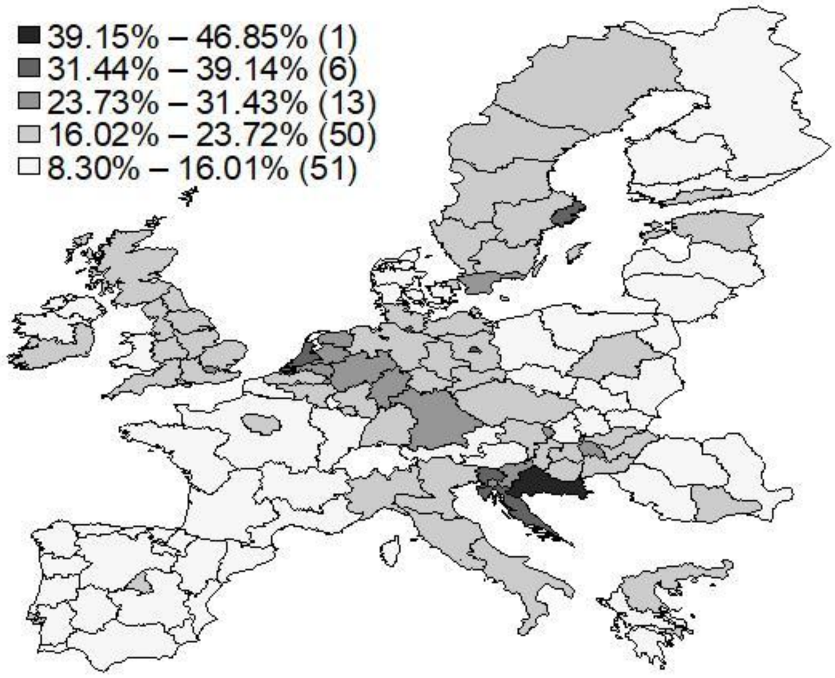
Andalusia, Lithuania, Catalonia, and Lisboa Region. Finally, *Figure 10* represents the values of p-KIBS rate in the study regions. Similarly, highest p-KIBS rates can be found in Croatia and Germany, and some regions with the lowest rates are located in Romania and Spain.

Figure 9. The rate of t-KIBS in the analyzed European regions



By comparing the rate of KIBS, t-KIBS and p-KIBS firm rate in the study regions, we can observe very similar patterns. For instance, for all the three variables, most regions have relatively low rate of KIBS or specific KIBS firms. Stockholm, London but also Continental Croatia are prominent examples with high rates of KIBS in all the three regards, while most Spanish and French regions have low proportion of these businesses. However, some differences are also present. Voreia Ellada in Greece constitutes a good example, as in terms of t-KIBS rate its regions belong to the lowest interval but its p-KIBS rate increases its relative position to the second lowest interval of regions.

Figure 10. The rate of p-KIBS in the analyzed European regions



3.2.3. Control variables

Finally, control variables are introduced. The first empirical analysis applies GDP per capita, population density, capital city dummy and CEE dummy as control variables. In the second analysis, we control for the same variables plus the size of manufacturing businesses, the weight of manufacturing sectors in the economy, and the quality of the regions' entrepreneurial ecosystem in the different model specifications. As the two empirical analyses share some variables, I describe these common variables first, then I move to the variables specific to the each analysis.

Variables used in both analyses. Similar to the first empirical analysis, the *REDI* score expresses the quality of regional entrepreneurial ecosystem, and we use the *rate of manufacturers* as the indicator for the specialization in manufacturing in the region. The benefits coming from knowledge spillovers (increased innovation and performance level) may result from a greater specialization in few industries (Glaeser et al., 1992; Ketelhöhn, 2006). The meaning and calculation of the REDI and the rate of manufacturers correspond with the same variables previously described among the independent variables.

Besides, we control for economic development and urbanization economies in the different model specifications. Similar to Fisman and Khanna (2004) and Lafuente et al.

(2017), *Gross Domestic Product (GDP) per capita* is the indicator of regional economic development and it is expressed in purchasing power parity (PPP). As Neely (2008) suggests, servitization strategies may be more prevalent in developed economies (regions), as they provide a better alternative compared to participating in a vivid cost-based competition. Besides, as Lafuente et al. (2017) observe average employment creation in manufacturing firms is higher in regions with higher GDP per head.

Urbanization economies are a type of agglomeration economies that may explain territorial outcomes by increasing local demand (Bottazzi and Gragnolati, 2015), access to skilled labor (Meliciani and Savona, 2015), knowledge spillovers (Glaeser et al., 1992), and higher efficiency of regional innovation systems (Fritsch and Slavtchev, 2010). However, other regional forces can divert new KIBS firms from densely populated areas. Polése and Shearmur (2006) highlight that related manufacturing firms may influence business service firms to locate closer to them, in less urbanized areas. Bottazzi and Gragnolati (2015) confirm empirically that urbanization externalities are important but they may play a secondary role after industrial linkages. Similar to Gallego and Maroto (2015), Meliciani and Savona (2015), and Smith and Florida (1994), we assess the role of urbanization by using *population density* in the region—measured as the number of inhabitants per square Km.—and a dummy that identifies *regions with a capital city*. Regions incorporating the national capital may be popular targets for business service firms (Lux, 2009) and preferred over non-metropolitan areas by their knowledge-intensive counterparts (Muller and Zenker, 2001).

In Chapter 2 the heterogeneity of the European Union territories became evident, being the territorial disparity among Western and CEE countries an outcome of this heterogeneity. The relevance of this regional development gap is justified by several studies (e.g., Ezcurra et al., 2007; Jindra et al., 2009). In their analysis of NUTS-2 level regions before the global economic crisis, Lengyel and Rechnitzer (2013) also reveal a quite clear borderline between CEE and other European countries, namely, Austria and Germany, in terms of their level of competitiveness and some of its constituents (e.g., quality of human capital). Thus, to account for the potential differences in terms of both KIBS' formation rate and the economic contribution of manufacturing between Central and Eastern European and Western European regions, we introduce a *CEE dummy* that at the same time is an efficient measure to capture potential country-specific effects. Following the recommendation of the OECD (OECD, 2000 quoted in OECD, 2001), Central and Eastern European countries comprise Albania, Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. From this list, our CEE dummy incorporates regions with the exception of Albania, which is not an EU member country and Bulgaria because of data availability reasons. Note that the variables GDP per capita and population density were logged to reduce skewness.

Variable used only in the second empirical analysis. As the last control variable, as a regional characteristic of the manufacturing industry, *average size of manufacturing businesses* in the region was calculated. Average size of manufacturers is an important indicator to measure how much manufacturing firms in a region can enjoy inner economies of scale and have access to additional resources. Following the long-standing stream of the literature (e.g., Hirsch and Adar, 1974; Neely, 2009; Swamidass and Kotha, 1998), we expect that larger businesses also have better financial performance.

Table 4 provides *descriptive statistics for the variables included in the empirical applications*. In case of new KIBS' rate (the average size of new manufacturers), the minimum value of zero means the lack of new KIBS firms (new manufacturers) in a focal region. In case of new KIBS firms, 6 regions—including Brandenburg, Bremen and Sachsen-Anhalt in Germany, Est and Sud-Ouest in France, and Central-Italy—and in terms of new manufacturers 25 regions—among others, 8 German regions and 5 Swedish regions—fall into this category. Note that these values do not refer to the whole population of businesses in the category, as they come from the GEM APS survey. On the other hand, the region with the highest *KIBS formation rate* is Upper Norrland in Sweden, and the region where we can find the largest new manufacturers on average is Berlin. The region with the lowest *rate of manufacturers* is London, while the highest rate can be found in Continental Croatia.

As for the rest of the main study variables, the region with the least developed *entrepreneurial ecosystem* among the analyzed regions is Macroregion two (Romania), and the most developed entrepreneurial ecosystem can be found in Stockholm. The highest rate of KIBS firms is in Continental Croatia, while the region with the least proportion of KIBS businesses is Castile-La Mancha (Spain). The same two regions constitute the extreme cases in terms of the rate of professional KIBS businesses. The picture is a little bit more diverse for the rate of technology-based KIBS firms: the highest share of KIBS businesses can be found in London, while the lowest share is still in Spain, however, in the region of Extremadura.

Table 4. Descriptive statistics for the selected study variables

Variable name	Mean	Standard deviation	Minimum	Maximum
Rate of new KIBS	0.1876	0.0981	0	0.5
Average manuf. GVA per manufacturing worker*	0.0723	0.0380	0.0025	0.2392
REDI**	44.5727	14.8444	18.6	82.4
Rate of manufacturers**	0.0981	0.0458	0.0354	0.3935
Size of new manufacturers	4.3142	9.5308	0	94
KIBS rate*	21.9880	8.4647	9.04	56.92
t-KIBS rate*	3.9450	2.1923	0.66	10.68
p-KIBS rate*	18.0431	6.5989	8.30	46.85
GDP per capita**	25,957.85	9,154.13	10,350	56,775
Population density**	349.80	907.56	3.37	7,322.17
Capital city dummy**	0.1983	0.4004	0	1
CEE dummy**	0.2397	0.4287	0	1

Source: Horváth and Rabetino (2018)

Note: Sample size: 121 observations. Variables without star are used only in the first analysis, variables with one star in the second analysis, and variables with two stars appear in both analyses.

3.3. Method

Finally, the two empirical analyses previously referred to in this chapter (Chapter 3) are presented. In the first empirical analysis, I analyze how relevant regional characteristics—that I link to manufacturing specialization, size of new manufacturers and the quality of the entrepreneurial ecosystem—affect KIBS' business formation rates in 121 EU regions. In the second empirical analysis, I seek to analyze how different types of KIBS businesses—namely, t-KIBS and p-KIBS firms—influence the average gross value added generated by manufacturing employee among the same study regions. However, from a methodological perspective the *potential regional interactions within* *and between countries that may exist in the EU bring about important considerations with relevant estimation implications*.

In models where spatial interactions do not influence our two dependent variables, KIBS' formation rate or the average GVA per manufacturing employee, at the regional level—e.g., the rate of new KIBS in Île-de-France is not affected by the characteristics of its surrounding regions—canonical OLS models can be used to test the study hypotheses. However, the presence of spatial interactions—which become evident via, for example, economic relationships, positive or negative externalities or knowledge spillovers—render OLS estimates inefficient and may obscure the true effects of the analyzed regional characteristics on KIBS' business formation rates (Anselin, 1988; Elhorst, 2014).

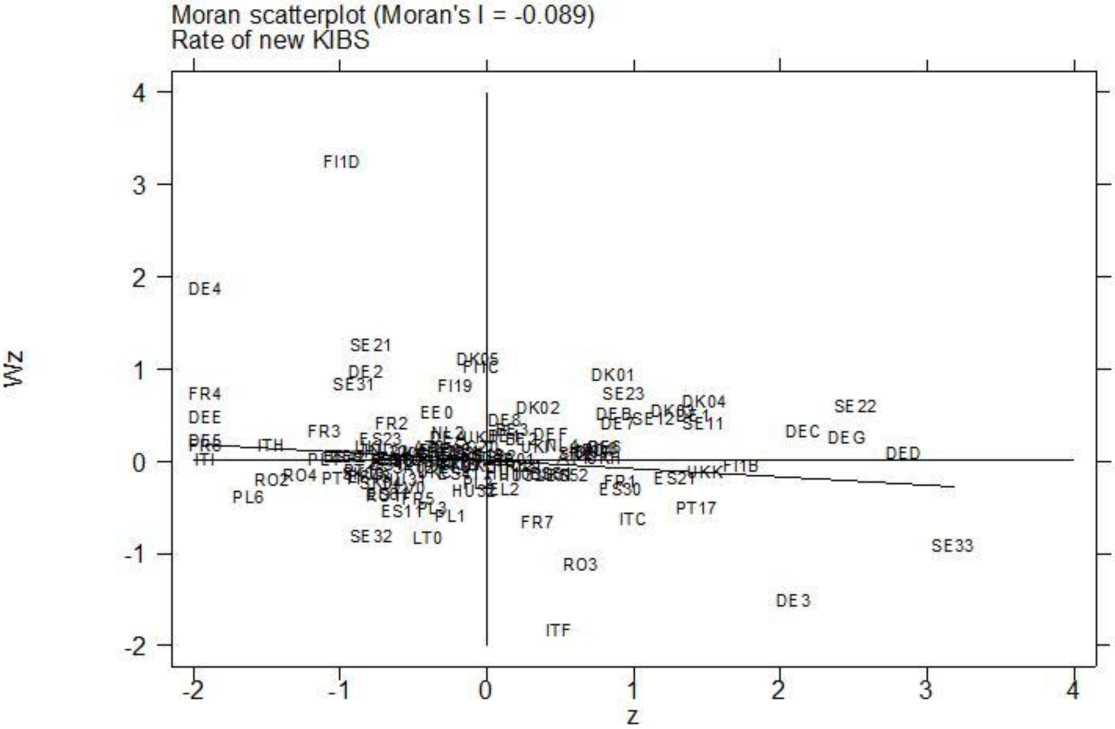
Although Figures 3 to 10 already suggest the existence of spatial dependence among EU regions located in close proximity, we should have a look at the similarity or difference among territories by measuring spatial correlation between them. Similar to Ertur and Koch (2006) and Meliciani and Savona (2015), to analyze *global spatial autocorrelation*, I calculated the global Moran's I statistic for all the dependent and main independent variables. Compared to linear correlation coefficients, this statistic incorporates the spatial location of regions, and measures the correlation between the vector of the observed values (z) and the vector of the spatially weighted average of their neighboring values (W*z), also called as spatially lagged vector. If values of I_r—that is, the Moran's I coefficient in region r—are larger than the expected values [$E(I_r)$], a positive spatial autocorrelation takes place, whereas values of I_r smaller than the expected value [$E(I_r)$] indicate a negative spatial autocorrelation (Meliciani and Savona, 2015).

Based on this overall measure, I found that the highest degree of spatial correlation is for the REDI variable (Moran's I= 0.604, $p<0.01$). In case of the REDI it means that regions with relatively developed (undeveloped) entrepreneurial ecosystem are localized close to other regions with relatively developed (undeveloped) entrepreneurial ecosystem. Similarly, most variables indicated the presence of positive global spatial autocorrelation at 1% significance level, namely, the t-KIBS rate (Moran's I= 0.483), the average manufacturing GVA per employee (Moran's I= 0.444), the KIBS rate (Moran's I= 0.375), and the p-KIBS rate (Moran's I= 0.355). Only two variables, the rate of new KIBS and the size of new manufacturers evidenced quite weak and non-significant spatial correlation coefficient, –0.089 and 0.019, respectively.

In addition, local spatial instability can also be illustrated for each dependent and independent variable in each region by the means of the Moran scatterplot (Anselin, 1996; Ertur and Koch, 2006). Figure 11 to 18 depict the original z values and their computed W*z values and plots them in four quadrants of the scatterplot. A region in the upper right quadrant has a high value in terms of the given variable, and it is surrounded by regions with high values as well. Using a similar logic, low-value regions with low-value neighbors are indicated in the bottom left quadrant, high-value regions with low-value neighbors in the bottom right quadrant, and low-value regions with high-value neighbors in the upper left quadrant. Implicitly, the upper right and the bottom left quadrants indicate spatial concentration of similar values, while the rest two quadrants illustrate the concentration of regions with dissimilar values. Besides, to assess the *local structure of spatial autocorrelations* in the EU, I calculated the Moran local indicator of spatial association (LISA) (Anselin, 1995) as well. In case local Moran's I values (I_r) take positive (negative) values, they indicate spatial clustering of similar values (spatial clustering of dissimilar values) between a region and its neighbors. Local Moran's I statistics are available in *Appendix 1*, and in the analysis of Moran scatterplots only significant values are considered.

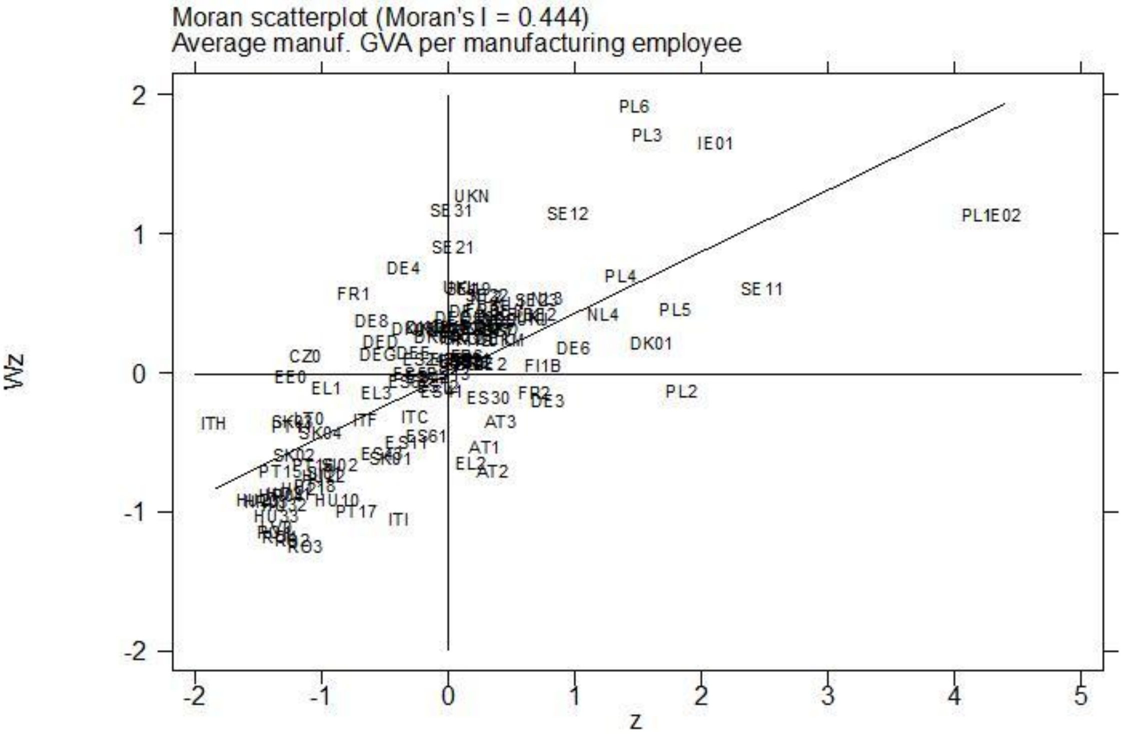
Figure 11 and 12 plots the spatial correlation coefficients for the dependent variables of the study. In *Figure 11*, we can see that in terms of KIBS formation rate, mostly a spatial concentration of dissimilar regions takes place, nevertheless, several regions show positive spatial autocorrelation as well. Examples include many German (Baden-Württemberg, Hessen, Rheinland-Pfalz, Saarland, and Thuringen) and Danish (Hovedstaden, Southern Denmark, and Midtjylland) regions. Germany constitutes an interesting example for the coexistence of positive and negative spatial clustering as well, as many regions, more concretely, Bayern, Berlin, Brandenburg, and Sachsen-Anhalt are also very different from their neighbors in terms of KIBS formation rate. In case of the economic contribution per manufacturing employee, *Figure 12* indicates that regions locating close to each other are mostly similar. Clusters with low manufacturing GVA per employee on average can be found in Croatia, Hungary, Portugal, Romania, Slovenia and Slovakia. On the other hand, examples to positive spatial autocorrelation come from Poland (except for Region Południowy) and Ireland. The only example to a dissimilar spatial cluster with a significant Local Moran's I value is Region Południowy.

Figure 11. Moran scatterplot of KIBS formation rate



Note: Spatial weights are calculated using the row-standardized inverse distance weight matrix.

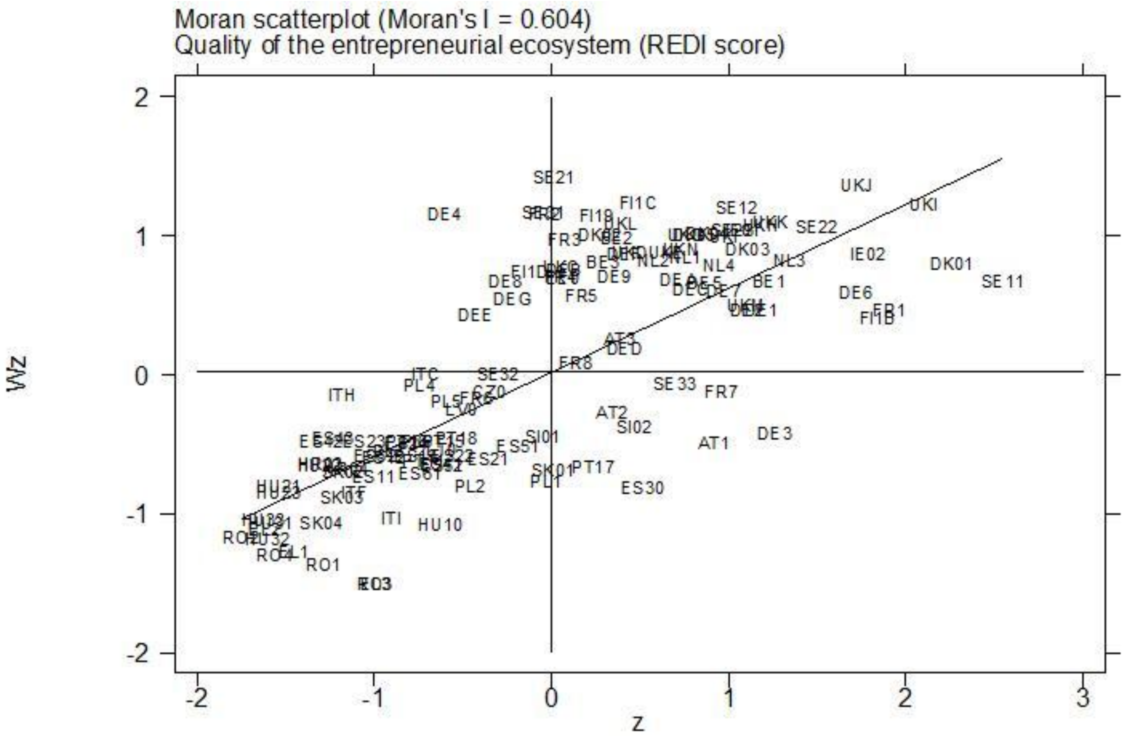
Figure 12. Moran scatterplot of average manufacturing GVA per manufacturing employee



Note: Spatial weights are calculated using the row-standardized inverse distance weight matrix.

With respect to the quality of entrepreneurial ecosystem in EU regions (*Figure 13*), the majority of regions falls into either the high-high (for instance, the Netherlands) or the low-low (for instance, Greece) region-neighbor categories. While many regions with a capital city are located in the upper right quadrant, and thus, can be characterized by entrepreneurially developed neighbors, some capital regions such as Berlin, Madrid and Eastern Austria are surrounded by regions with low-quality ecosystems.

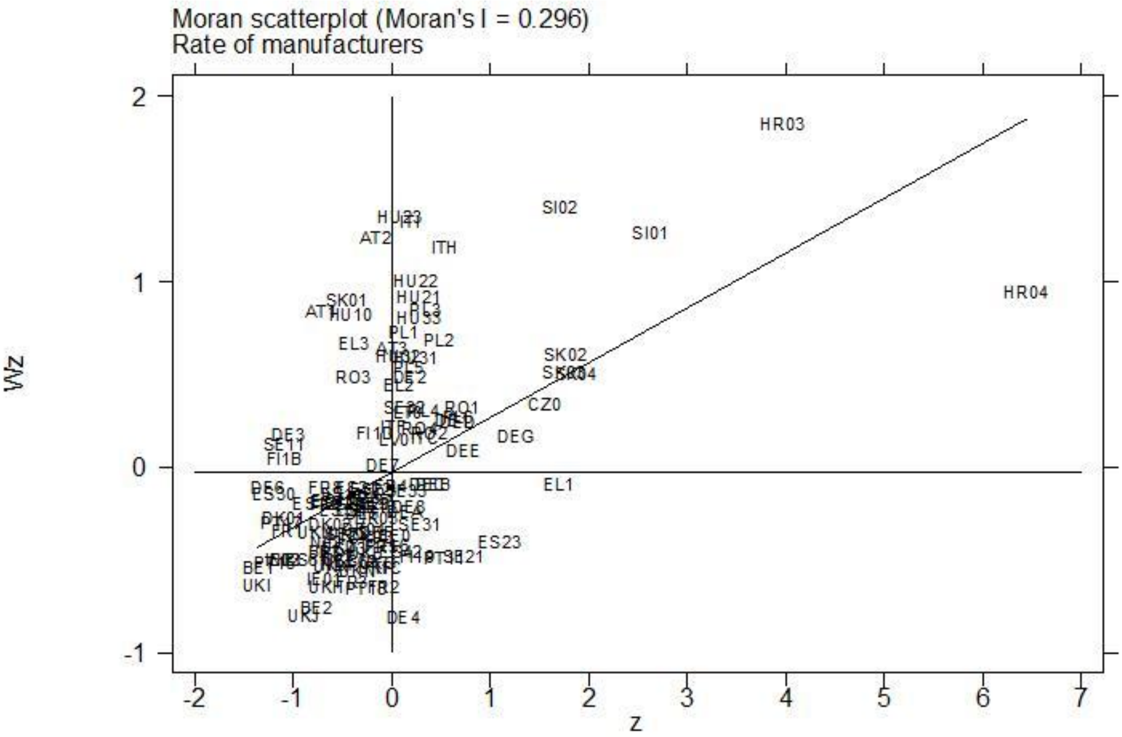
Figure 13. Moran scatterplot of the REDI score



Note: Spatial weights are calculated using the row-standardized inverse distance weight matrix.

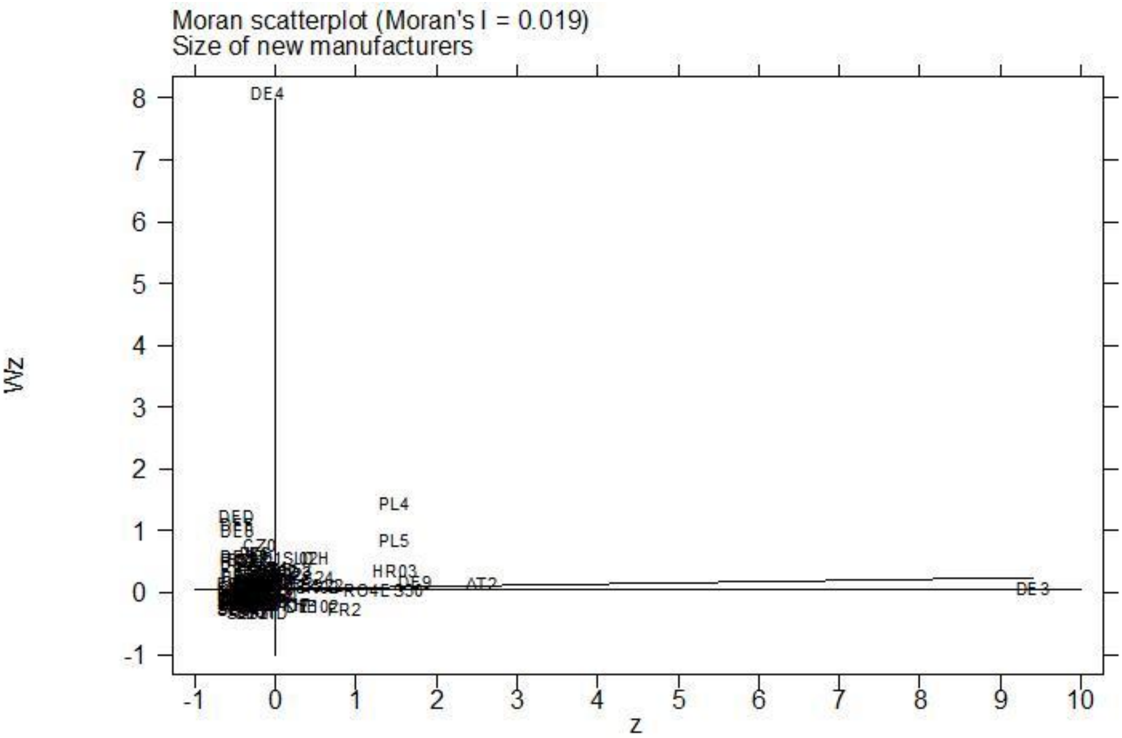
Figure 14 depicts the clustering behavior of EU regions in terms of specialization in manufacturing activities. At first glance, one can see that most regions have a low rate of manufacturers, and their neighbors follow a similar economic strategy. However, in some capital regions such as Central Hungary, Eastern Austria, and Bratislava Region against the low rate of manufacturing businesses, neighboring regions are relatively abundant in manufacturers. In case of the size of new manufacturers (*Figure 15*), some examples to positive local Moran values are two Polish regions (Region Północno-Zachodni and Region Południowo-Zachodni), whereas negative values are found for two German regions (Sachsen, Sachsen-Anhalt).

Figure 14. Moran scatterplot of the rate of manufacturers



Note: Spatial weights are calculated using the row-standardized inverse distance weight matrix.

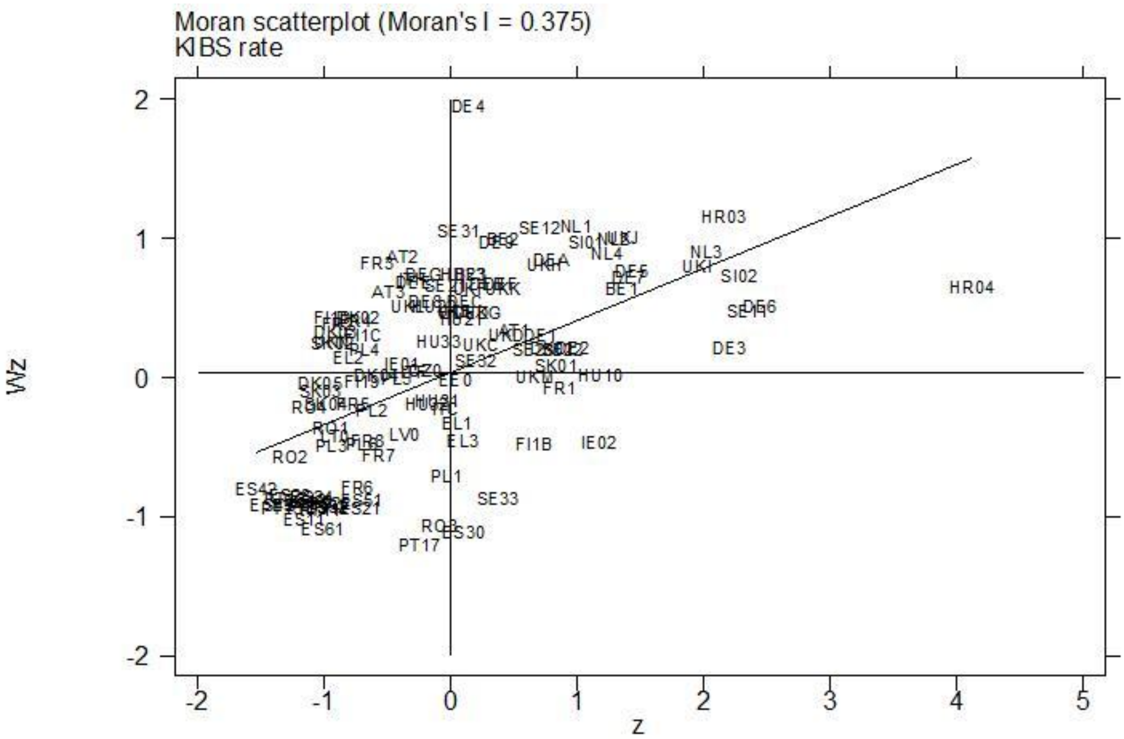
Figure 15. Moran scatterplot of the size of new manufacturers



Note: Spatial weights are calculated using the row-standardized inverse distance weight matrix.

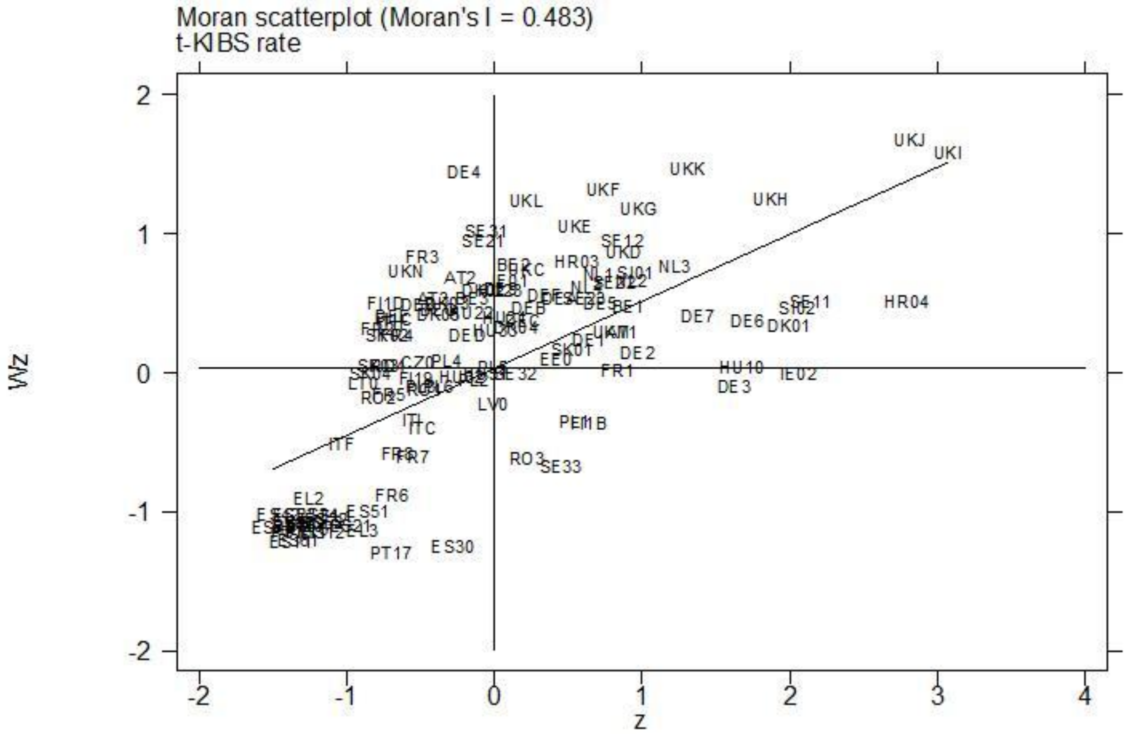
As for KIBS rate in the European Union (*Figure 16*), clusters of regions with high KIBS rate are London and its two surrounding regions (East of England and South East), the two Slovenian regions, and Brussels-Capital Region, etc.. Clusters with low specialization in KIBS typically include Spanish regions (except for Madrid). Although regions with dissimilar neighbors appear mainly in the upper left quadrant, with the exception of Nord (France), none of the local Moran values are significant. Very similar patterns can be observed for the distribution of technology-based (*Figure 17*) and professional KIBS businesses (*Figure 18*). For instance, Hamburg (Germany) and Continental Croatia are characterized by the spatial concentration of all the three classifications of KIBS businesses. However, differences are also present: some UK regions and their neighbors (Yorkshire and The Humber, East Midlands) have a high rate of t-KIBS firms but this does not prevail in terms of their p-KIBS rates.

Figure 16. Moran scatterplot of KIBS rate



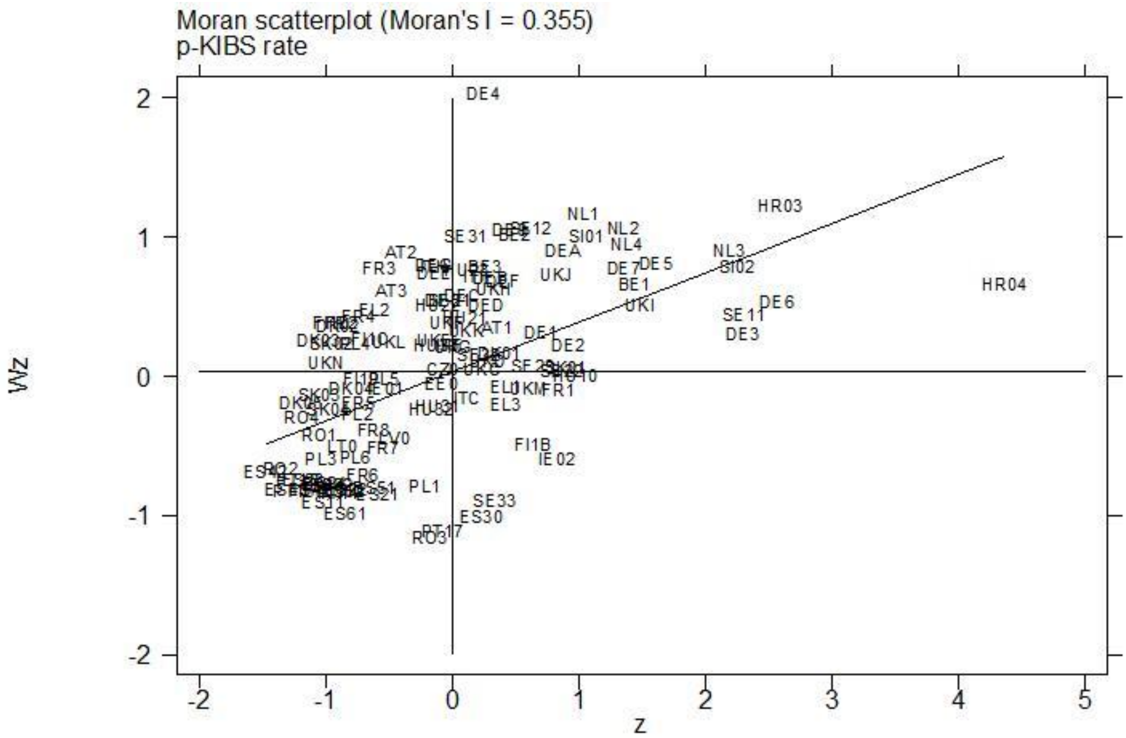
Note: Spatial weights are calculated using the row-standardized inverse distance weight matrix.

Figure 17. Moran scatterplot of t-KIBS rate



Note: Spatial weights are calculated using the row-standardized inverse distance weight matrix.

Figure 18. Moran scatterplot of p-KIBS rate



Note: Spatial weights are calculated using the row-standardized inverse distance weight matrix.

As a result of the confirmed spatial dependencies among closely located territories, we employ spatial econometric techniques to account for the geographic embeddedness of the analyzed European regions. This method allows us to differentiate regional (local) and external effects (linked to adjacent territories), and accurately test the proposed hypotheses dealing with internal effects of interest for policy makers. More concretely, we apply *spatial Durbin cross-section models (SDM)* that quantify spillover effects stemming from neighboring regions (diversity effects), and relationships between the rates of new KIBS firms / average GVA per manufacturing employee in the specific region and its adjacent regions. In our models, these spatial effects do not only spill over to the neighboring regions but also to the neighbors of the neighbors, and so on, that is global spatial spillovers prevail (LeSage and Pace, 2009).

The meaning of adjacent territories and their effects on the specific region depend on the assumed connections between regions. In the spatial econometric literature, two main connections are differentiated based on spatial proximity: contiguity- and distance-based (e.g., Meliciani and Savona, 2015; Varga and Sebestyén, 2017). A good example for contiguity-based connections is queen contiguity (two regions are neighbors if they share common borders), while inverse distance is an example for distance-based connections (localized knowledge spills over to a certain distant, supposing decreasing effect with growing distance). The potential spatial connections between regions are defined by a spatial weight matrix (W) in the models.

In the first empirical analysis, I run the following two spatial models, where *Equation (1)* is the baseline model and *Equation (2)* incorporates interaction terms between REDI and the key independent variables:

Base model: (1)

$$\begin{aligned}\text{Rate of new KIBS}_r = {} & \rho \text{W Rate of new KIBS}_r + \beta_0 + \beta_1 \text{REDI} + \beta_2 \text{Rate of manufacturers}_r \\ & + \beta_3 \text{Size of new manufacturers}_r + \beta_4 \text{Controls}_r + \theta_1 \text{W REDI}_r \\ & + \theta_2 \text{W Rate of manufacturers}_r + \theta_3 \text{W Size of new manufacturers}_r \\ & + \theta_4 \text{W Controls}_r + \varepsilon_r\end{aligned}$$

Full model: (2)

$$\begin{aligned}\text{Rate of new KIBS}_r = {} & \rho \text{W Rate of new KIBS}_r + \beta_0 + \beta_1 \text{REDI} + \beta_2 \text{Rate of manufacturers}_r \\ & + \beta_3 \text{Size of new manufacturers}_r + \beta_{12} \text{Rate of manufacturers}_r \times \text{REDI}_r \\ & + \beta_{13} \text{Size of new manufacturers}_r \times \text{REDI}_r + \beta_4 \text{Controls}_r + \theta_1 \text{W REDI}_r \\ & + \theta_2 \text{W Rate of manufacturers}_r + \theta_3 \text{W Size of new manufacturers}_r \\ & + \theta_{12} \text{W Rate of manufacturers}_r \times \text{REDI}_r \\ & + \theta_{13} \text{W Size of new manufacturers}_r \times \text{REDI}_r + \theta_4 \text{W Controls}_r + \varepsilon_r\end{aligned}$$

In the second empirical analysis, two models, a base model with KIBS rate in general (*Equation 3*) and a full model that incorporate the differentiating effect of t-KIBS and p-KIBS are proposed (*Equation 4*):

Base model: (3)

$$\begin{aligned}\text{Average manufacturing GVA}_r = {} & \rho \text{W Average manufacturing GVA}_r + \beta_0 + \beta_1 \text{KIBS rate}_r \\ & + \beta_2 \text{Controls}_r + \theta_1 \text{W KIBS rate}_r + \theta_2 \text{W Controls}_r + \varepsilon_r\end{aligned}$$

Full model: (4)

$$\begin{aligned}\text{Average manufacturing GVA}_r = {} & \rho \text{W Average manufacturing GVA}_r + \beta_0 + \beta_1 \text{t-KIBS rate}_r \\ & + \beta_2 \text{p-KIBS rate}_r + \beta_3 \text{Controls}_r + \theta_1 \text{W t-KIBS rate}_r \\ & + \theta_2 \text{W p-KIBS rate}_r + \theta_3 \text{W Controls}_r + \varepsilon_r\end{aligned}$$

In both models, β_0 represents the constant term, while β_j are coefficients for the *jth* independent variables in region *r*. Variables with W—meaning weighted—are the spatially lagged terms of the dependent (with ρ regression parameter) and independent (with Θ regression parameter) variables, that is, the average values in the adjacent regions of region *r* (Anselin and Rey, 2014). The term ε is the normally distributed error. *In the first empirical analysis,* control variables include GDP per capita, population density, the capital city dummy and the CEE dummy. *In the second empirical analysis,* the REDI score of the regions, the rate of manufacturers, and the average size of manufacturers serve as control variables together with GDP per capita, population density, capital city and CEE dummy.

To corroborate the robustness of our model specifications, we first apply a specific-to-general-approach and test whether a spatial model is better than a non-spatial model

(Elhorst, 2014). In the first round, two spatial models are considered: a spatial autoregressive model (SAR), where the only spatial dependence between regions is in the dependent variable, and a spatial error model (SEM), where the spatial dependence appears in the error terms.

While Moran's I statistics were helpful in detecting spatial dependence, we will need additional information about which model specification best fits our data. Therefore, following Anselin and Rey (2014), *we use Lagrange Multiplier (LM) and robust LM tests* to verify whether a non-spatial, a spatial autoregressive or a spatial error model describes best the data. In case the presence of spatial effects cannot be rejected, we estimate a spatial Durbin model, and test whether it is a better choice than the SAR and SEM models (general-to-specific approach) (Elhorst, 2014). As SAR and SEM are nested in the SDM, *we apply a common factor analysis* that supports decision between nested models. If H0: $\theta = 0$ is supported, we should simplify our model to SAR, while if H0: $\theta + \rho\beta = 0$ is supported, a SEM model should be applied (Burridge, 1981; Anselin, 1988). We employ *four spatial weight matrices* to define the type of connection between regions (queen contiguity, binary distance, inverse distance, and squared inverse distance). *Wald tests* were used to corroborate the hypotheses (Elhorst, 2014).

The results of the model selection tests are presented in *Table 5* and *6*. *For the first empirical analysis (Table 5)*, the squared inverse matrix yields the highest result for the robust LM test; however, and similar to Melicani and Savona (2015), we employ the inverse weight matrix in the analysis based on both the results of the LM test and the superior goodness of fit statistics of the regression models. To verify that the SDM best describes the analyzed spatial relationship, we look at the Wald test statistic for both SAR and SEM models. The significance levels of the tests indicate that SAR and SEM should be rejected in favor of the SDM.

Table 5. Test for model selection in the first empirical analysis

	Equation (1)		Equation (2)	
	χ^2	p-value	χ^2	p-value
LM lag (QUEEN)	5.048	0.025	4.740	0.029
Robust LM lag (QUEEN)	12.079	0.001	13.211	0.000
LM error (QUEEN)	1.434	0.231	1.062	0.303
Robust LM error (QUEEN)	8.466	0.004	9.533	0.002
LM lag (BIN)	7.438	0.006	7.386	0.007
Robust LM lag (BIN)	8.472	0.004	9.770	0.002
LM error (BIN)	2.916	0.088	2.516	0.113
Robust LM error (BIN)	3.951	0.047	4.900	0.027
LM lag (INV)	**10.408**	**0.001**	**10.747**	**0.001**
Robust LM lag (INV)	**14.234**	**0.000**	**16.237**	**0.000**
LM error (INV)	3.527	0.060	3.341	0.068
Robust LM error (INV)	7.353	0.007	8.831	0.003
LM lag (INV2)	7.391	0.007	7.707	0.006
Robust LM lag (INV2)	15.54	0.000	18.275	0.000
LM error (INV2)	1.804	0.179	1.668	0.197
Robust LM error (INV2)	9.954	0.002	12.236	0.000
Wald test: SDM vs SAR	37.51	0.0000	47.94	0.0000
Wald test: SDM vs SEM	44.34	0.0000	55.52	0.0000

Note: Spatial weight matrices are row-standardized. QUEEN- queen contiguity matrix; BIN- binary distance matrix, threshold distance: 377.95 km; INV- inverse distance matrix, threshold distance: 377.95 km; INV2- inverse distance squared matrix, threshold distance: 377.95 km.

Source: Horváth and Rabetino (2018)

In the second empirical analysis (*Table 6*), after testing the OLS models with the previously defined four spatial weight matrices, the decision by the models with or without spatial effects seems quite clear. For both specifications—first, with only KIBS and second, using t-KIBS/p-KIBS sector—the LM and robust LM tests point to a stronger spatial dependence with the use of the inverse weight matrix, in line with the results for the first analysis. Although the results of the selection tests indicate a spatial error relationship between the analyzed regions, we run a spatial Durbin model and test whether it describes better the data than the SAR or SEM model. The adoption of this spatial model is in accordance with Lesage and Pace (2009), and this kind of practice is applied in Elhorst (2014). Given that all the results of the Wald tests indicate the superiority of the SDM model, I rely on this model specification in my subsequent analyses.

Table 6. Test for model selection in the second empirical analysis

	Equation (3)		**Equation (4)**	
	χ^2	**p-value**	χ^2	**p-value**
LM lag (QUEEN)	40.167	0.000	41.694	0.000
Robust LM lag (QUEEN)	1.473	0.225	0.234	0.629
LM error (QUEEN)	39.987	0.000	45.048	0.000
Robust LM error (QUEEN)	1.293	0.256	3.588	0.058
LM lag (BIN)	25.326	0.000	26.18	0.000
Robust LM lag (BIN)	0.685	0.408	1.378	0.240
LM error (BIN)	37.157	0.000	40.366	0.000
Robust LM error (BIN)	12.516	0.000	15.565	0.000
LM lag (INV)	32.405	0.000	33.778	0.000
Robust LM lag (INV)	0.188	0.664	0.889	0.346
LM error (INV)	**42.644**	**0.000**	**46.957**	**0.000**
Robust LM error (INV)	**10.427**	**0.001**	**14.068**	**0.000**
LM lag (INV2)	32.383	0.000	33.778	0.000
Robust LM lag (INV2)	0.004	0.953	0.464	0.496
LM error (INV2)	38.797	0.000	43.174	0.000
Robust LM error (INV2)	6.418	0.011	9.859	0.002
Wald test: SDM vs SAR	35.06	0.0000	55.11	0.0000
Wald test: SDM vs SEM	24.78	0.0017	29.55	0.0005

Note: Spatial weight matrices are row-standardized. QUEEN- queen contiguity matrix; BIN- binary distance matrix, threshold distance: 377.95 km; INV- inverse distance matrix, threshold distance: 377.95 km; INV2- inverse distance squared matrix, threshold distance: 377.95 km.

The following section introduces the results of two main empirical analyses. First, the regional driving forces and the role of the entrepreneurial ecosystem are analyzed in potential territorial servitization processes, more concretely, in KIBS formation rate in the regions of the European Union (*Section 4.1*). Second, the differentiating role of technology-based and professional KIBS firms on the economic contribution of manufacturing will be in the centre of analysis (*Section 4.2*).

Chapter 4: Results

The structure of the two empirical sections (Sections 4.1 and 4.2) is the following. After presenting the basic correlation analysis, the baseline OLS models and the results of the main non-spatial diagnostic tests are presented. Finally, I present the final results of the suggested spatial Durbin regression models.

4.1. First empirical analysis: determinants of KIBS formation in the regions of the European Union

Before analyzing the influential factors of regional KIBS formation rates in the European Union, it is worth looking at the **correlations** among the study variables. As *Table 7* shows, correlations are generally in the low to moderate range. *Table 8* presents the results of both the baseline model (Equation (1)) and the full model (Equation (2)) using OLS and the spatial Durbin model as estimation technique, as well as the results of the non-spatial diagnostic tests.

To address **the threat of collinearity**, I computed the average variance inflation factor (VIF) for all variables (*Table 8*). The average VIF value for the full model (Model 2) is 7.73 and the only VIF values that exceed 10—a generally accepted rule of thumb for assessing collinearity—were observed for the variables included in the interaction terms, that is, the characteristics of the manufacturing sector and the entrepreneurial ecosystem. By construction, these terms are correlated and—even if computationally correct—this explains the VIF results (Greene, 2003). I computed VIFs for the variables used in Model 1, and the resulting average VIF is 2.14 and ranges between 1.14 and 3.89. Consequently, the results for this diagnostic test do not raise collinearity concerns.

I also ran the **Jarque-Bera test** to verify whether the errors computed from the different regression models are normally distributed (Jarque and Bera, 1987). In case of the OLS models, results in Table 8 show that error terms are not normally distributed which violates one of the assumptions and questions the reliability of OLS estimates. The spatial Durbin models brought similar results (Model 1: $\chi2=12.77$, $p<0.01$, Model 2: $\chi2=15.11$, $p<0.01$). Consequently, I estimated equations (1) and (2) using the more general Weibull distribution.

Table 7. Correlation matrix

		1	2	3	4	5	6	7	8
1	Rate of new KIBS	1							
2	REDI	0.4666***	1						
3	Rate of manufacturers	–0.0798	–0.4547***	1					
4	Size of new manufacturers (ln)	0.0147	–0.1635*	0.0806	1				
5	GDP per capita (ln)	0.3503***	0.7919***	–0.4492***	–0.0922	1			
6	Population density (ln)	0.2127**	0.4308***	–0.3123***	0.0600	0.4620***	1		
7	Capital city dummy	0.1945**	0.2572***	–0.0960	0.2400***	0.3287***	0.3602***	1	
8	CEE dummy	–0.1651*	–0.5046***	0.4959***	0.0537	–0.4937***	–0.1456	0.2062**	1

Note: *, **, *** indicate significance at the 10%, 5% and 1% levels, respectively.

Source: Horváth and Rabetino (2018)

I also employed the **Breusch-Pagan test** to check the homoskedasticity of the error term (Breusch and Pagan, 1979). As the results for the OLS models indicate, the Breusch-Pagan test reveals that heteroskedasticity is not a problem. However, as opposed to the Koenker-Bassett test, the Breusch-Pagan test does not handle non-normality issues of the residuals that call for a careful approach to use standard errors adjusted by potential heteroskedasticity.

Given the results of both the spatial and non-spatial diagnostic tests, I ran the **OLS equivalents of the proposed spatial models** only as benchmarks to the final results of my work. As Table 8 indicates, the sign of regression parameters remains unchanged except for the size of new manufacturers in Model 1. Nevertheless, differences are noticeable in terms of the significance of the main independent variables.

Results in Model 1 of *Table 8* show that, at the regional level, the rate of new KIBS firms is associated with both a higher specialization in manufacturing and smaller manufacturing businesses. These results *give support to hypothesis 1* that proposes a positive relationship between manufacturing specialization and the rate of new KIBS firms, *and to our second hypothesis* that proposes a negative relationship between the average size of new manufacturing businesses in a region and the business formation rate of KIBS firms.

The findings in *Table 8* reveal that the rate of new KIBS firms is negatively associated with GDP per capita, thus suggesting that the rate of new KIBS is greater in regions with lower levels of GDP per capita. This result is in line with Gallego and Maroto (2015) who point out that the rapid improvements in less economically developed European regions contribute to explain the higher employment growth rate of KIBS firms. A possible explanation could be that *"the more efficiently incumbents exploit knowledge flows, the smaller the effect of new knowledge on entrepreneurship (Acs et al., 2009, p. 17)".* In the context of this work, this implies that KIBS formation rates may be greater in territories with higher need for new KIBS businesses. Also, the findings in *Table 8* indicate that the REDI is consistently positive and significant in both models (Model 1: $p<0.01$, Model 2: $p<0.05$). This underlines the relevance of the entrepreneurial ecosystem as an engine to increase KIBS firms' formation rate. *These results confirm our hypothesis 3* that states that the more developed the region's entrepreneurial ecosystem, the higher its new KIBS' formation rate is.

Table 8. Spatial Durbin Model: Regression results

Dependent variable: Rate of new KIBS	**Model 1**		**Model 2**	
	OLS	**ML spatial Durbin model (SDM)**	**OLS**	**ML spatial Durbin model (SDM)**
REDI	0.0037 (0.0009)***	0.0060 (0.0015)***	0.0030 (0.0016)*	0.0034 (0.0016)**
Rate of manufacturers	0.3637 (0.2132)*	0.4847 (0.2890)*	–0.1484 (0.5582)	–1.1705 (0.4871)**
Rate of manufacturers X REDI			0.0152 (0.0154)	0.0508 (0.0172)***
Size of new manufacturers (ln)	0.0087 (0.0097)	–0.0248 (0.0091)***	0.0266 (0.0353)	0.0183 (0.0244)
Size of new manufacturers (ln) X REDI			–0.0004 (0.0007)	–0.0008 (0.0005)
GDP per capita (ln)	–0.0172 (0.0448)	–0.1093 (0.0431)***	–0.0311 (0.0476)	–0.1446 (0.0404)***
Population density (ln)	0.0014 (0.0078)	0.0030 (0.0112)	0.0035 (0.0081)	0.0110 (0.0099)
Capital city dummy	0.0164 (0.0259)	0.0231 (0.0327)	0.0282 (0.0288)	0.0480 (0.0296)
CEE dummy	–0.0067 (0.0291)	–0.0565 (0.0659)	–0.0143 (0.0308)	–0.0788 (0.0682)
W * REDI		–0.0032 (0.0023)		–0.0015 (0.0047)
W * Rate of manufacturers		1.4387 (0.6412)**		3.3375 (1.6866)**
W * Rate of manufacturers X REDI				–0.0545 (0.0405)
W * Size of new manufacturers (ln)		0.0084 (0.0332)		–0.0743 (0.0911)
W * Size of new manufacturers (ln) X REDI				0.0015 (0.0017)
W * GDP per capita (ln)		0.2104 (0.1027)**		0.2713 (0.0954)***
W * Population density (ln)		–0.0153 (0.0136)		–0.0224 (0.0132)*
W * Capital city dummy		–0.1108 (0.0458)**		–0.1270 (0.0412)***

Table 8. Continued.

Dependent variable: Rate of new KIBS	Model 1		Model 2	
	OLS	**ML spatial Durbin model (SDM)**	**OLS**	**ML spatial Durbin model (SDM)**
W * CEE dummy		0.0003 (0.0692)		0.0268 (0.0811)
W * Rate of new KIBS (Spatial Rho)		–0.4340 (0.1595)***		–0.4678 (0.1571)***
Constant	0.1400 (0.4256)	0.0700 (0.0043)	0.2881 (0.4516)	–1.1327 (0.7742)
Variance Inflation Factor (VIF)	2.14		7.73	
Jarque-Bera	14.02***		10.48***	
Breusch-Pagan	0.97		1.82	
(Pseudo) R2	0.2515	0.5946	0.2588	0.7171
Adjusted (pseudo) R2	0.2052	0.5453	0.1987	0.6705
Log likelihood value	127.2581	131.2514	127.8515	139.2700
F test	5.4200***	11.2076***	4.3100***	14.5074***
Observations	121	121	121	121

Note: For the OLS models standard errors, for the SDM models robust standard errors adjusted by heteroskedasticity are presented in brackets. W * indicates the spatially lagged (dependent and independent) variables, calculated with row-standardized inverse distance weight matrix. *, **, *** indicate significance at the 10%, 5% and 1% levels, respectively.

Source: Horváth and Rabetino (2018)

When we evaluate the interaction between industry-specific characteristics and the quality of regional entrepreneurial ecosystem, different results emerge. The findings in Model 1 indicate that manufacturing specialization attracts a higher rate of new KIBS firms (H1). However, in Model 2 we see that territorial servitization processes are conditioned by the quality of the regional entrepreneurial ecosystem, that is, regions with a higher rate of manufacturers show higher rates of new KIBS firms only if the region enjoys a healthy entrepreneurial ecosystem ($p<0.01$). Therefore, *we give support to our hypothesis 4* that states that, at the regional level, the entrepreneurial ecosystem moderates the positive relationship between manufacturing specialization and the formation rate of KIBS firms.

The interaction term between the average size of new manufacturers in the region and the REDI variable is not statistically significant. This indicates that the REDI variable does not moderate the relationship between the average size of new manufacturers and the rate of new KIBS' firms. *We, therefore, cannot support our hypothesis 5* that states that the entrepreneurial ecosystem moderates the negative relationship between the average size of new manufacturing businesses and the business formation rate of KIBS firms. This can be explained with other moderating factors such as population density which may matter for rent preferences.

We can also observe spatial effects stemming from the structure of regions and their adjacent territories. In Model 1, both REDI and the manufacturing rate in the neighboring regions are important factors influencing the rate of new KIBS firms. While the neighbors' more developed entrepreneurial ecosystem negatively affects new KIBS formation in the focal region, manufacturing specialization in the neighbors positively influence KIBS' business formation rate. The findings in Model 2 show that the only spillover effect related to KITS processes results from the joint effect of the average size of new manufacturers and the quality of the entrepreneurial ecosystem in neighboring regions. Finally, the results for the spatially lagged dependent variable (Rho) corroborate that significant differences exist in the rate of new KIBS between a region and its neighbors, that is, the rate of new KIBS firms in a focal region is negatively affected by the capacity of neighboring regions to attract new KIBS firms.

As a robustness check, I re-ran Models 1 and 2 with robust standard errors clustered at country level. The econometric intuition of this exercise is that the estimates in *Table 8* may be affected by country-specific elements that condition the variance of residual.

The results of this robustness check are presented in *Table 9* below. Compared to our main results presented in *Table 8*, the coefficients do not qualitatively vary, that is, the sign and significance of the main effects under analysis remain unchanged. Looking at the results of the F-test for the generated models, we can conclude that these models do not significantly explain the patterns of KIBS' business formation rates, that is, using the spatial econometrics terminology, the spatial models do not exist.

Table 9. Robustness check: Regression results with robust country-clustered standard errors

Dependent variable: Rate of new KIBS	**Model 1b** Coefficient (Std error)	**Model 2b** Coefficient (Std error)
REDI	0.0060 (0.0016)***	0.0034 (0.0020)*
Rate of manufacturers	0.4847 (0.3797)	–1.1705 (0.5677)**
Rate of manufacturers X REDI		0.0508 (0.0200)***
Size of new manufacturers (ln)	–0.0248 (0.0114)**	0.0183 (0.0244)
Size of new manufacturers (ln) X REDI		–0.0008 (0.0005)
GDP per capita (ln)	–0.1093 (0.0585)*	–0.1446 (0.0559)***
Population density (ln)	0.0030 (0.0119)	0.0110 (0.0114)
Capital city dummy	0.0231 (0.0376)	0.0480 (0.0315)
CEE dummy	–0.0565 (0.0901)	–0.0788 (0.0933)
W * REDI	–0.0032 (0.0024)	–0.0015 (0.0038)
W * Rate of manufacturers	1.4387 (0.5976)**	3.3375 (1.4165)**
W * Rate of manufacturers X REDI		–0.0545 (0.0307)*
W * Size of new manufacturers (ln)	0.0084 (0.0332)	–0.0743 (0.0813)
W * Size of new manufacturers (ln) X REDI		0.0015 (0.0015)
W * GDP per capita (ln)	0.2104 (0.1117)*	0.2713 (0.0780)***
W * Population density (ln)	–0.0153 (0.0122)	–0.0224 (0.0123)*
W * Capital city dummy	–0.1108 (0.0423)***	–0.1270 (0.0384)***
W * CEE dummy	0.0003 (0.0936)	0.0268 (0.1076)
W * Rate of new KIBS (Spatial Rho)	–0.4340 (0.1832)**	–0.4678 (0.1772)***
Constant	–0.9072 (0.8579)	–1.1327 (0.7147)

Table 9. Continued.

Dependent variable: Rate of new KIBS	**Model 1b** Coefficient (Std error)	**Model 2b** Coefficient (Std error)
R2	0.0935	0.1125
Adjusted R2	–0.0167	–0.0340
Log likelihood value	131.2514	139.2700
F test	0.7806	0.7184
Observations	121	121

Note: Robust standard errors adjusted by heteroskedasticity are presented in brackets. W * indicates the spatially lagged (dependent and independent) variables, calculated with row-standardized inverse distance weight matrix. *, **, *** indicate significance at the 10%, 5% and 1% levels, respectively.

4.2. Second empirical analysis: The differentiating role of technology-based and professional KIBS firms on the economic contribution of manufacturing businesses

Similar to the econometric strategy applied in Section 4.1, *Table 10* presents the **pairwise correlation** between the study variables. In most cases, the values reflect low to moderate correlations, with the exception of the correlation between the three KIBS-related variables. This latter result is reasonable because, by construction, the rates of t-KIBS and p-KIBS are the components of the regions' KIBS formation rates, which explains the high correlation between the two. However, this should not constitute a problem because, as Greene (2003) states, correlation is a property of data and never a problem itself. Also, VIF values were computed to assess the **threat of collinearity** (see *Table 11*). The results confirm the soundness of the proposed model specification. The average VIF for the baseline model (Model 3) is 2.51 and ranges between 1.38 and 4.26, while the average VIF for the full model (Model 4) is 3.52 (range: 1.41–6.15). As the VIF values do not exceed 10, the results for this diagnostic test do not raise collinearity concerns either.

The results of the **Jarque-Bera normality test** for the OLS models show a strong non-normality of the errors, which is still observed in case of the spatial Durbin models (Model 1: $\chi 2=23.28$, $p<0.01$, Model 2: $\chi 2=13.36$, $p<0.01$). Therefore, equations (3) and (4) are also estimated with the more general Weibull distribution.

Table 10. Correlation matrix

		1	2	3	4	5	6	7	8	9	10
1	Average manuf. GVA per employee	1									
2	KIBS rate	0.2058**	1								
3	t-KIBS rate	0.3448***	0.8870***	1							
4	p-KIBS rate	0.1494*	0.9882***	0.8057***	1						
5	REDI (ln)	0.5634***	0.4788***	0.6059***	0.4129***	1					
6	Size of manufacturers (ln)	0.2361***	0.2252***	0.3376***	0.1768**	0.3679***	1				
7	Rate of manufacturers	–0.3803***	0.1375	–0.0196	0.1828**	–0.4434***	–0.0792	1			
8	Capital city dummy	0.0956	0.4337***	0.4118***	0.4195***	0.2283***	–0.1593*	–0.0960	1		
9	CEE dummy	–0.2801***	0.0060	0.0465	–0.0077	–0.5343***	–0.1058	0.4959***	0.2062**	1	
10	Population density (ln)	0.1755*	0.4822***	0.4489***	0.4695***	0.3963***	0.1862**	–0.3123***	0.3602***	–0.1559*	1
11	GDP per capita (ln)	0.4458***	0.4746***	0.4619***	0.4554***	0.8050***	0.2340***	–0.4492***	0.3287***	–0.5921***	0.4620***

Note: *, **, *** indicate significance at the 10%, 5% and 1% levels, respectively.

Unlike our **Breusch-Pagan statistics** for the previous two OLS models (section 4.1), here we can clearly detect non-constant error variance (heteroskedasticity) which calls for the use of robust standard errors in our model estimates.

Results of the two regression analyses are presented in *Table 11*. Model 3 is the base model incorporating the overall KIBS rate, while Model 4 analyzes the potentially differentiating effect of technological (t-KIBS rate) and professional (p-KIBS rate) KIBS businesses. Note that the t-KIBS rate and p-KIBS rate are jointly introduced in Model 4 to accurately compute the effect of t-KIBS on GVA per employee from that of the rate of p-KIBS, while acknowledging a common reference group, that is, the rate of non-KIBS businesses in the region.[8] **Non-spatial estimates** for both the baseline and the full models report positive and significant effect of the quality of the entrepreneurial ecosystem. Besides, they suggest a negative and significant effect of regional manufacturing specialization on the economic contribution of manufacturing businesses per employee.

Findings in Model 3 show that KIBS rate at the regional level is positively associated with the level of the average manufacturing GVA per employee in the same region. Although this result is not strongly significant ($p<0.1$) *we can still confirm our hypothesis 6*. A more diverse relationship emerges, when we separate KIBS businesses based on their economic profile. According to Model 4 and meeting our expectations, a higher t-KIBS rate in a region contributes to a higher economic contribution per employee—that can be seen as a productivity measure—of the manufacturing sector in the region. Nevertheless, this effect cannot be observed in case of the p-KIBS rate variable. As opposed to the theoretical relevance attributed to professional KIBS businesses, the relationship between regional p-KIBS rate and the average manufacturing GVA per worker is negative. This suggests that a higher p-KIBS rate in a territory may result in less efficient manufacturing firms in the same region. These results provide *support to hypothesis 7*.

[8] Keep in mind that the individual inclusion of the variables related to the rate of KIBS (t-KIBS and p-KIBS) would produce biased results that would reflect the effect of a focal KIBS variable (either rate of t-KIBS or rate of p-KIBS) on the GVA per employee, relative to the effect of both the omitted KIBS variable and the group of non-KIBS businesses in the region.

Table 11. Spatial Durbin Model: Regression results

Dependent variable: Average manuf. GVA per employee	**Model 3**		**Model 4**	
	OLS	**ML spatial Durbin model (SDM)**	**OLS**	**ML spatial Durbin model (SDM)**
KIBS rate	0.0002 (0.0005)	0.0010 (0.0006)*		
t-KIBS rate			0.0034 (0.0033)	0.0150 (0.0044)***
p-KIBS rate			–0.0007 (0.0010)	–0.0022 (0.0010)**
REDI (ln)	0.0565 (0.0156)***	0.0426 (0.0258)*	0.0458 (0.0188)**	0.0307 (0.0242)
Size of manufacturers (ln)	0.0020 (0.0062)	0.0116 (0.0072)	0.0010 (0.0063)	0.0064 (0.0069)
Rate of manufacturers	–0.2009 (0.0895)**	–0.3104 (0.0723)***	–0.1724 (0.0938)*	–0.1991 (0.0754)***
Capital city dummy	–0.0066 (0.0100)	0.0217 (0.0133)*	–0.0062 (0.0100)	0.0054 (0.0125)
CEE dummy	0.0134 (0.0109)	0.0312 (0.0239)	0.0084 (0.0120)	–0.0021 (0.0230)
Population density (ln)	–0.0033 (0.0030)	–0.0124 (0.0040)***	–0.0030 (0.0031)	–0.0046 (0.0038)
GDP per capita (ln)	0.0056 (0.0169)	0.0164 (0.0197)	0.0099 (0.0174)	–0.0045 (0.0170)
W * KIBS rate		–0.0042 (0.0009)***		
W * t-KIBS rate				–0.0323 (0.0065)***
W * p-KIBS rate				0.0033 (0.0017)**
W * REDI (ln)		0.0512 (0.0338)		0.1365 (0.0452)***
W * Size of manufacturers (ln)		–0.0205 (0.0116)*		–0.0182 (0.0105)*
W * Rate of manufacturers		0.6705 (0.1869)***		0.4813 (0.1683)***
W * Capital city dummy		0.0083 (0.0187)		0.0038 (0.0172)
W * CEE dummy		–0.0016 (0.0274)		0.0502 (0.0284)*

Table 11. Continued.

Dependent variable: Average manuf. GVA per employee	**Model 3**		**Model 4**	
	OLS	**ML spatial Durbin model (SDM)**	**OLS**	**ML spatial Durbin model (SDM)**
W * Population density (ln)		0.0178 (0.0045)***		0.0095 (0.0044)**
W * GDP per capita (ln)		–0.0161 (0.0298)		–0.0528 (0.0316)*
W * Average manuf. GVA per employee (Spatial Rho)		0.6582 (0.0979)***		0.7067 (0.0949)***
Constant	–0.1702 (0.1491)	–0.2970 (0.2167)	–0.1716 (0.1491)	0.0023 (0.2119)
Variance Inflation Factor (VIF)	2.51		3.52	
Jarque-Bera	315.00***		281.6***	
Breusch-Pagan	4.17**		5.38**	
R2	0.3576	0.5791	0.3634	0.6246
Adjusted R2	0.3117	0.5190	0.3118	0.5626
Log likelihood value	251.2695	256.9697	251.8195	268.0305
F test	7.7900***	9.0285***	7.04***	9.5203***
Observations	121	121	121	121

Note: For the OLS models standard errors, for the SDM models robust standard errors adjusted by heteroskedasticity are presented in brackets. W * indicates the spatially lagged (dependent and independent) variables, calculated with row-standardized inverse distance weight matrix. *, **, *** indicate significance at the 10%, 5% and 1% levels, respectively.

It is also important to consider the cross-regional, neighboring effects that may influence the regional productivity of manufacturing businesses. In this case, results suggest a seemingly opposite relationship between KIBS, t-KIBS, and p-KIBS rate and the dependent variable. As for the influence of KIBS rate and t-KIBS rate in the neighboring regions, a negative relationship is found, while the impact of p-KIBS rate in adjacent territories turns positive. So for instance, if the average p-KIBS rate in the surrounding regions of Catalonia is higher, the average manufacturing GVA in Catalonia is supposed to be higher as well. A potential explanation of these findings is that t-KIBS and this way KIBS businesses—incorporating t-KIBS—are concentrated in specific areas which potentially drain (attract) better performing manufacturers from neighboring territories. On one hand, p-KIBS industry is likely to have less magnetic power, while on the other hand, regional lock-in in terms of skills (e.g., Boschma and Iammarino, 2009; Lux, 2009) may happen as well.

Regarding control variables, influence from the quality of entrepreneurial ecosystem is positive, however, only significant in Model 3. An interesting finding is that the size of manufacturers does not play a role that much either that may come from some aggregate level inefficiency in terms of their GVA per employee. Consistently with our finding in Section 4.1, a higher manufacturing rate per se in a region does not induce but rather hinders beneficial processes in terms of average manufacturing GVA. Even if a labor-saving productivity is associated with large businesses located in less populated areas (Frenken et al., 2007) the effect of both the capital regions and population density (urbanization economies) disappear when disaggregating KIBS industry that may be explained by the size of the study regions. Also, it must be noted that the explanatory variables have the opposite effect on the dependent variable than the spatially weighted explanatory variables. This likely stems from the capacity of regions to attract high-performing manufacturers from less attractive neighboring territories.

Chapter 5. Discussion, implications and concluding remarks

5.1. Summary and discussion of the empirical findings

In this doctoral dissertation, I aimed to offer a further understanding and contribute to a novel research stream that analyzes the aggregate economic, employment and other outcomes of the mutually dependent relationship between manufacturing and knowledge-intensive business service firms. Although the *territorial servitization*—as first defined by Lafuente et al. (2017)—or more precisely knowledge-intensive territorial servitization literature counts a limited number of scholarly studies, its theoretical roots can be found 1) in the firm-level literature on the relationship between manufacturing and knowledge-intensive service (KIBS) firms, and 2) in different territorial studies for instance, in the field of economic geography. Besides, an additional motivation of this work was to reflect on the ongoing reindustrialization calls made in the European Union.

To reveal whether territories benefit from interactions between the manufacturing and service sector, first, I described the general findings of the literature on two specific types of agglomeration economies (*Marshallian specialization and Jacobian diversification*), and considered an alternative classification involving specialization, *related variety and unrelated variety* within territories. After a short review on the potential manifestations of *firm-level manufacturing-KIBS interactions*—more specifically, temporary demand from independent service providers, oursourcing, and servitization of manufacturing—that indicated the related nature of these industries, I called attention to the outstanding *relevance of KIBS businesses*, and reviewed the scholarly panorama on the potential territorial outcomes of service-manufacturing interconnectedness called *territorial servitization*.

I also presented an exhaustive description of relevant feasibility issues that may be related to territorial servitization processes. After going through *the evolution of the location theories*, based on McCann and Sheppard (2003), I explained the changing relevance of *static and dynamic location factors* including different types of *agglomeration economies* (e.g., urbanization economies), which may constitute relevant sources of competitive edge to businesses. The subsequent theoretical section focused on territorial disparities mainly among countries and country groups within the EU, which fueled the usefulness of the *varieties of capitalism* approach, and introduced the role of *MNE investments (horizontal and vertical)* on the emergence of these disparities, especially between Western and CEE countries. Therefore, scientific literature related to the knowledge spillovers among businesses, entrepreneurial ecosystem, and differentiation among KIBS businesses was introduced.

Based on an extensive literature review, two empirical sections were developed in which I analyzed the driving forces of knowledge-intensive territorial servitization processes using 121 NUTS-1 and NUTS-2 level EU regions. Supported by common spatial econometric diagnostic tools, I proposed a spatial analysis to evaluate the connection between manufacturing and KIBS businesses. More concretely, in Section 4.1, I studied how **territorial heterogeneity associated with differences in the quality of the entrepreneurial ecosystem** conditions the relationship between the characteristics of regions' manufacturing sectors and the creation of KIBS businesses. The proposed spatial econometric model offers a compelling view of how the entrepreneurial ecosystem affects the rate of new KIBS firms.

The results suggest that *the quality of the entrepreneurial ecosystem positively influences* the rate of new KIBS, and enhances the positive relationship between manufacturing specialization and the rate of new KIBS. This result reinforces the territorial servitization loop proposed by Lafuente et al. (2017), which emphasizes that a resilient local industrial base may stimulate the development of a dense KIBS sector, thus contributing to revitalize both manufacturing sectors and territorial outcomes. However, *manufacturing specialization by itself is not enough* to attract more KIBS firms and a healthy entrepreneurial ecosystem is essential for an effective territorial servitization. This may be especially true in declining industrial areas (e.g., some Old Industrial Regions in post-socialist CEE countries), in which overspecialization, lack of innovation, and institutional problems are frequent causes of failure (Lux, 2009). The negative correlation between the rate of manufacturers and the REDI score of a region also suggest the existence of this problem that may manifest in lower demand for and attraction of KIBS services. Thus, efforts to develop a competitive KIBS sector in regions with a high manufacturing specialization may turn sterile if they do not have a healthy entrepreneurial ecosystem that channels entrepreneurial resources to the economy.

In Section 4.2, following the theoretical intuition, I hypothesized that KIBS firms positively impact the economic contribution of manufacturing businesses per employee at the regional level, however, I proposed that this **catalyzing effect may be different for certain types of—more specifically, for technology-based and professional—KIBS businesses**. The results of this section confirmed that at the regional level KIBS firms contribute to the gross value-added per head in manufacturing sectors, which suggests that in general, the proximity of KIBS businesses pays off for manufacturing businesses. However, according to my results, the regional benefits of this relationship can be limited to the higher presence of only technology-oriented KIBS businesses, and surprisingly, the effect of KIBS-manufacturing co-location turns negative when it comes to the relationship between p-KIBS rate and manufacturing GVA per employee in the same region.

The elevated productivity of regional manufacturing sector attributed to higher regional t-KIBS rate and the negative impact of higher p-KIBS rate can be explained by multiple reasons. First, it provides a clear example of Porter's (1994) conceptualization of the changing competitive advantage of firms which, as described before, comes from relentless innovation and skill upgrading in today's increased competition. On the one hand, offering more technological solutions, t-KIBS firms might be more related to the value-generation process of manufacturers (related variety) and, via higher engagement in innovation activities, they provide more dynamic sources of competitive advantage to manufacturers. On the other hand, their high investment in technology and innovation requires that the outputs of t-KIBS are spread among a lot of manufacturing clients, compared to the more customized output generated by p-KIBS businesses. Therefore, as opposed to their generally lower rate in regional economies, they can trigger territorial servitization processes via elevated level of knowledge spillovers. These results also demonstrate Bell's (1976) prescient vision that although agriculture and industrial activities continue to coexist with services, there will be an increasing role of the combination of services, knowledge and innovation in economies.

In addition, based on the empirical results of the study, we can derive **some connections between influencing factors of knowledge-intensive territorial servitization processes** in European Union. There is a relatively strong, positive correlation between the *quality of a region's entrepreneurial ecosystem and its technology-based KIBS rate* which on the one hand, suggests that similar to new KIBS businesses, t-KIBS firms may concentrate more in areas with high-quality entrepreneurial ecosystem. While this might be the case for p-KIBS businesses as well, we can observe its less strong correlation with the REDI score which refers to their more even distribution in space. Therefore, territories that offer for instance, better networking opportunities (e.g., with research centers and universities as knowledge providers themselves), higher innovation potential, and generally increased demand for t-KIBS' innovative services may enjoy a higher rate of t-KIBS firms. They may also attract technology-based KIBS firms from entrepreneurially less developed neighboring territories as a further source of their self-reinforcing growth. On the other hand, and linked to the results presented in Sections 4.1 and 4.2, this may also imply that t-KIBS firms contribute to develop a better-quality entrepreneurial ecosystem. Because t-KIBS are conducive to knowledge spillover and can generate value added to manufacturers, they further enhance the quality of the entrepreneurial climate that will serve as a breeding ground for new KIBS firms.

Besides, as it was found in both Models 1 and 2, *economically less developed regions tend to have higher KIBS formation rate*. This may refer to promising changes towards territorial cohesion and followers' advantages in applying already existing knowledge and technology. However, this result may also reflect that incumbents may not be efficient; therefore, new firms entering the market take their place. Szerb et al. (2018) analyzed similar concerns, and revealed the differentiating effect of quantity- and quality-based—i.e., innovation-related—business dynamics dependent on the quality of the regional entrepreneurial ecosystem. Data on the rate of exiting KIBS firms and some quality measures of new KIBS businesses would be necessary to address this doubt.

5.2. Policy implications

The findings of this work offer various implications for policy makers interested in increasing the competitiveness and productivity of manufacturing sectors, and in improving the less developed manufacturing base of regions via interactions with KIBS firms. As a precondition for territorial servitization to occur**, the creation of a flourishing KIBS sector seems to call for** the *development of both resilient manufacturing firms and high quality local entrepreneurial ecosystems*. Thus, besides bringing manufacturing and KIBS firms together, policy makers should focus on the design of specific actions that might facilitate quality enhancement of the local conditions. In particular, *specific elements that are important for manufacturers* might foster the creation of new KIBS firms and, in turn, enhance territorial servitization. In line with Gallego and Maroto (2015), these policies should target the promotion of both traditional technological developments—e.g., digital infrastructures—and other forms of innovation linked to organizational change—e.g., integration of digital technologies into production processes, crowdsourcing—that may contribute to generate effective networks with implications for territorial servitization.

Regarding the entrepreneurial ecosystem, a few central attributes have shown to be relevant to explain the higher creation rates of KIBS firms in a region. Besides the key role of agglomeration economies (e.g., the presence of MNEs and other KIBS) and market size, the opportunities for networking (Makun and MacPherson, 1997) and gaining access to relevant knowledge from different local actors seem key determinants of KIBS business start-up rate. Also, knowledge resources and soft factors that attract talent and qualified people have shown a positive effect on the rate of new KIBS firms. Public policy must support the introduction of mechanisms for attracting talent and knowledge resources (human capital), and promoting networking (social capital) and connectivity to increase the proximity advantage for KIBS in activities, where client-provider face-to-face interactions are still relevant and occur mostly within localized business networks (Makun and MacPherson, 1997). In addition, the author of this work recognizes that the attraction of KIBS sectors with various types of knowledge (e.g., architectural and engineering activities and scientific R&D) and different level of capital investment (e.g., air transport and consultancy services) might require different, more sector-specific policy approach.

However, *policies should accommodate regional development level and receptivity*. For example, some regions may require a higher level of industry-specific support, while for other regions the development of strong networks and enhanced local connectivity seem relevant to bring manufacturing and KIBS businesses together. Although the mutually reinforcing processes in a region constitute a hard-to-disentangle task (Porter, 1994), the REDI index constitutes a valuable tool to start the improvement process by identifying the existing bottlenecks that hinder ecosystem factors that are potentially conducive to regional development (Szerb et al., 2017). *For regions with a healthy entrepreneurial ecosystem* (e.g., London or Helsinki-Uusimaa) a more sector-neutral policy may be applied with the objective to improve general framework conditions which are important for the whole regional economy. *However, in regions with a low-quality entrepreneurial ecosystem* (e.g., Attiki in Greece or Macroregion four in Romania), a further scrutiny of the REDI pillars and variables would reveal improvement areas that can contribute to increase business formation rates (e.g., KIBS) as well as the regions' entrepreneurial ecosystem.

Most CEE regions have low-quality ecosystem which limits the attractiveness of the territory—as it was presented in Section 2.3.2: territorial inequalities within the European Union—and preserves their economic status quo as (almost) peripheries. For instance, as Lengyel et al. (2017) describe, Hungary is a living example of international restructuring processes that contribute to the "natural", low value-added reindustrialization—mostly including assembly activities—of some of its regions, including, for example, Western Transdanubia and Southern Great Plain. Therefore, EU policy makers should be careful about the way of implementing reindustrialization strategies, especially in regions with less developed entrepreneurial ecosystem. It is important that these strategies contribute to the *knowledge-based development and competitive advantage* of a region, and do not result in the feared turnaround in the stages of competitive development. For example, as it was suggested by the results presented in this work, rather than merely increasing the number of manufacturers in a region, policy makers should encourage and equip manufacturing businesses with customized technology solutions that might be relevant to improve their performance. Policy makers should concentrate on building a healthy technology-based KIBS sector and support their networking with manufacturing businesses. As the average productivity of manufacturers is lower in Central and Eastern European regions, this process may require long-term policy efforts to change the business culture and disseminate knowledge on the advantages and risk management of cooperative business behavior. *Smart specialization strategies* proposed by the EU may provide more specific, path-dependent guidance to find the future competitive advantage of regions (see, e.g., Foray, 2016 or McCann and Ortega-Argilés, 2015). This analysis is worth developing in future research.

5.3. Limitations and future research avenues

Just like every scientific work, this dissertation has a number of limitations that, in turn, offer space for future research studies. This last section first summarizes the limitations of the empirical analyses, and then provides some additional ideas on future research avenues:

- *Data availability issues:* Although prior studies show that economic activities tend to concentrate in large or capital cities (e.g., Hardy et al., 2011), the analysis was conditioned by the regional aggregation level used for one of the key variables, the REDI index. Also, the borders of artificially created statistical regions may not match with the borders of the real concentrations of firms. Future research could analyze the study phenomena employing for instance, labor market areas.
- *Potential endogeneity issues:* By using spatial Durbin model (SDM) estimates, I handle endogeneity problems related to the potential presence of omitted spatially dependent variables. However, as Fingleton and Le Gallo (2010) suggest, SDM is not exempt from criticism. Future work should address additional types of endogeneity when evaluating the territorial servitization hypotheses. For example, future studies may include in the analysis time-lags in order to control for endogeneity resulting from reverse causality issues (first endogeneity problem). Additionally, future research should analyze the territorial servitization hypotheses using longitudinal data to control for the potential correlation between time-invariant unobserved heterogeneity and the explanatory variables (second endogeneity problem) (Wooldridge, 2002, p. 118-120).
- *Lower aggregation level of both manufacturing and KIBS industries:* In Section 4.1, I used data available on the whole population of manufacturing and KIBS businesses, while Section 4.2 split KIBS firms in technological (t-KIBS) and professional-based (p-KIBS) businesses. However, to verify the existence and the outcomes of related variety between manufacturing and KIBS, both of these industries may be also split based on 1) the different levels of knowledge intensity (low, medium, high), 2) the level of technological intensity or newness (for manufacturers) or 3) other industry (NACE or SIC) classifications.

- *The use of additional control variables:* Future studies may analyze additional sources of territorial heterogeneity which are hard to quantify, such as unrelated variety in a territory or EU funding. Within the territorial servitization frame, this analysis may yield better understanding of the relevance of KITS processes.
- *Firm-level data with characteristics of clearly identifiable interacting actors:* Researchers never stop dreaming about the ideal dataset to conduct their research ideas. In this sense, the current work could be significantly improved with the use of a relatively large sample that includes specific interactions between manufacturing and KIBS businesses. Firm-level and detailed location characteristics would be desirable. This point is supported by, for example, Deavers (1997) who warns about the challenging evaluation of the "blurry" aggregate level data for some specific types of analysis.
- *Considering other types of territorial disparities within the EU:* In this study, I concentrated on the more pronounced gap between Western (centre) and Central and Eastern European (periphery) countries. However, a comparison with semi-periphery countries (e.g., Spain) may bring some further understanding.
- *Analyzing additional sources of territorial servitization:* The chosen performance measures for the analyzed regions were 1) new KIBS rates and 2) average gross value added per employee in manufacturing sectors. Future research could use other territorial performance indicators, such as employment growth or innovation-related outcomes, and analyze the role of the interactions between manufacturing and KIBS firms on these output variables.

References

Acs, Z. J. – Desai, S. – Hessels, J. (2008): Entrepreneurship, economic development and institutions. *Small Business Economics*, 31(3), pp. 219–234.

Acs, Z. J. – Autio, E. – Szerb, L. (2014): National Systems of Entrepreneurship: Measurement issues and policy implications. *Research Policy,* 43(3), pp. 476–494.

Acs, Z. J. – Braunerhjelm, P. – Audretsch, D. B. – Carlsson, B. (2009): The knowledge spillover theory of entrepreneurship. *Small Business Economics,* 32(1), pp. 15–30.

Acs, Z. J. – Szerb, L. – Ortega-Argilés, R. – Aidis, R. – Coduras, A. (2015): The regional application of the global entrepreneurship and development index (GEDI): the case of Spain. *Regional Studies*, 49(12), pp. 1977–1994.

Anselin, L. (1988): *Spatial Econometrics: Methods and Models.* Dordrecht: Kluwer Academic, p. 284.

Anselin, L. (1995): Local indicators of spatial association—LISA. *Geographical Analysis,* 27(2), pp. 93–115.

Anselin, L. (1996): The Moran scatterplot as an ESDA tool to assess local instability in spatial association. In: M. Fisher, H. J. Scholten, & D. Unwin (Eds.), *Spatial analytical perspectives on GIS*, (pp. 111–125). London: Taylor & Francis.

Anselin, L. – Rey, S. J. (2014): *Modern Spatial Econometrics in Practice: A Guide to GeoDa, GeoDaSpace and PySAL.* Chicago, IL: GeoDa Press, p. 394.

Arnold, J. M. – Javorcik, B. – Lipscomb, M. – Mattoo, A. (2016): Services reform and manufacturing performance: Evidence from India. *The Economic Journal*, 126(590), pp. 1–39.

Asheim, B. T. – Boschma, R. – Cooke, P. (2011): Constructing regional advantage: Platform policies based on related variety and differentiated knowledge bases. *Regional Studies,* 45(7), pp. 893–904.

Audretsch, D. B. – Belitski, M. (2017): Entrepreneurial ecosystems in cities: establishing the framework conditions. *The Journal of Technology Transfer,* 42(5), pp. 1030–1051.

Audretsch, D. – Keilbach, M. (2004): Entrepreneurship capital and economic performance. *Regional Studies,* 38(8), pp. 949–959.

Audretsch, D. B. – Keilbach, M. C. – Lehmann, E. E. (2006): *Entrepreneurship and economic growth*. Oxford: Oxford University Press, p. 240.

Autio, E. – Kenney, M. – Mustar, P. – Siegel, D. – Wright, M. (2015): Entrepreneurial innovation: The importance of context. *Research Policy,* 43(7), pp. 1097–1108.

Baines, T. – Lightfoot, H. W. (2014): Servitization of the manufacturing firm: exploring the operations practices and technologies that deliver advanced services. *International Journal of Operations and Product Management*, 34(1), pp. 2–35.

Baines, T. S. – Lightfoot, H. W. – Benedettini, O. – Kay, J. M. (2009): The servitization of manufacturing: A review of literature and reflection on future challenges. *Journal of Manufacturing Technology Management*, 20(5), pp. 547–567.

Baines, T. S. – Lightfoot, H. W. – Evans, S. – Neely, A. – Greenough, R. – Peppard, J. – Roy, R. – Shehab, E. – Braganza, A. – Tiwari, A. – Alcock, J. R. – Angus, J. P. – Bastl, M. – Cousens, A. – Irving, P. – Johnson, M. – Kingston, J. – Lockett, H. – Martinez, V. – Michele, P. – Tranfield, D. – Walton, I. M. – Wilson, H. (2007): State-of-the-art in product-service systems. *Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture*, 221(10), pp. 1543–1552.

Bartik, T. J. (1985): Business location decisions in the United States: Estimates of the effects of unionization, taxes, and other characteristics of states. *Journal of Business & Economic Statistics*, 3(1), pp. 14–22.

Baumol, W. J. (1996): Entrepreneurship: Productive, unproductive, and destructive. *Journal of Business Venturing,* 11(1), pp. 3–22.

Bell, D. (1976): *The Coming of Post-Industrial Society: A Venture in Social Forecasting*. New York, NY: Basic Books, p. 616.

Bengtsson, M. – Kock, S. (2000): “Coopetition” in business networks—to cooperate and compete simultaneously. *Industrial Marketing Management,* 29(5), pp. 411–426.

Bettencourt, L. A. – Ostrom, A. L. – Brown, S. W. – Roundtree, R. I. (2002): Client co-production in knowledge-intensive business services. *California Management Review*, 44(4), pp. 100–128.

Bienkowska, E. (2015): Reindustrialization of Europe: Industry 4.0 – Innovation, growth and jobs, Forum Europe conference [Speech]. Retrieved from European Commission, https://ec.europa.eu/commission/commissioners/2014-2019/bienkowska/announcements/reindustrialisation-europe-industry-40-innovation-growth-and-jobs-forum-europe-conference_en (18/08/2017)

Bishop, P. – Gripaios, P. (2010): Spatial externalities, relatedness and sector employment growth in Great Britain. *Regional Studies*, 44(4), pp. 443–454.

Bohle, D. – Greskovits, B. (2009): Varieties of Capitalism and Capitalism «tout court». *European Journal of Sociology*, 50(3), pp. 355–386.

Boone, T. – Ganeshan, R. (2001): The effect of information technology on learning in professional service organizations. *Journal of Operations Management*, 19(4), pp. 485–495.

Boschma, R. (2005): Proximity and innovation: a critical assessment. *Regional Studies*, 39(1), pp. 61–74.

Boschma, R. – Iammarino, S. (2009): Related variety, trade linkages, and regional growth in Italy. *Economic Geography*, 85(3), pp. 289–311.

Bosma, N. – Schutjens, V. (2011): Understanding regional variation in entrepreneurial activity and entrepreneurial attitude in Europe. *The Annals of Regional Science*, 47(3), pp. 711–742.

Bottazzi, G. – Gragnolati, U. (2015): Cities and clusters: economy-wide and sector-specific effects in corporate location. *Regional Studies*, 49(1), pp. 113–129.

Breusch, T. S. – Pagan, A. R. (1979): A simple test for heteroscedasticity and random coefficient variation. *Econometrica: Journal of the Econometric Society*, 47(5), pp. 1287–1294.

Burridge, P. (1981): Testing for a common factor in a spatial autoregression model. *Environment and Planning A*, 13(7), pp. 795–400.

Carlton, D. W. (1983): The location and employment choices of new firms: An econometric model with discrete and continuous endogenous variables. *The Review of Economics and Statistics*, 65(3), pp. 440–449.

Castaldi, C. – Frenken, K. – Los, B. (2015): Related Variety, Unrelated Variety and Technological Breakthroughs: An Analysis of US State-level Patenting. *Regional Studies,* 49(5), pp. 767–781.

Chung, W. – Kalnins, A. (2001): Agglomeration effects and performance: A test of the Texas lodging industry. *Strategic Management Journal*, 22(10), pp. 969–988.

Coe, N. M. – Dicken, P. – Hess, M. (2008): Global production networks: realizing the potential. *Journal of Economic Geography*, 8(3), pp. 271–295.

Consoli, D. – Elche-Hortelano, D. (2010): Variety in the knowledge base of Knowledge Intensive Business Services. *Research Policy,* 39(10), pp. 1303–1310.

Cooke, P. – Gomez, M. – Etxebarria, G. (1997): Regional innovation systems: Institutional and organizational dimensions. *Research Policy,* 26(4–5), pp. 475–491.

Crozet, M. – Milet, E. (2017): Should everybody be in services? The effect of servitization on manufacturing firm performance. *Journal of Economics & Management Strategy*, 26(4), pp. 820–841.

Cypher, J. M. (2014): *The Process of Economic Development (4th Ed.).* Abingdon: Routledge, p. 736.

Czarnitzki, D. – Spielkamp, A. (2003): Business services in Germany: bridges for innovation. *The Service Industries Journal*, 23(2), pp. 1–30.

Daniels, P. W. – Bryson, J. R. (2002): Manufacturing services and servicing manufacturing: knowledge-based cities and changing forms of production. *Urban Studies*, 39(5-6), pp. 977–991.

Deavers, K. L. (1997): Outsourcing: a corporate competitiveness strategy, not a search for low wages. *Journal of Labor Research*, 18(4), pp. 503–519.

Den Hertog, P. (2000): Knowledge-intensive business services as co-producers of innovation. *International Journal of Innovation Management,* 4(4), pp. 491–528.

Di Gregorio, D. – Musteen, M. – Thomas, D. E. (2009): Offshore outsourcing as a source of international competitiveness for SMEs. *Journal of International Business Studies*, 40(6), pp. 969–988.

Doloreux, D. – Shearmur, R. (2010): Exploring and comparing innovation patterns across different knowledge intensive business services. *Economics of Innovation and New Technology*, 19(7), pp. 605–625.

Doloreux, D. – Shearmur, R. (2013): Innovation strategies: Are knowledge-intensive business services just another source of information? *Industry and Innovation*, 20(8), pp. 719–738.

Eichengreen, B. – Gupta, P. (2013): The two waves of service-sector growth. *Oxford Economic Papers*, 65(1), pp. 96–123.

Elekes, Z. – Boschma, R. – Lengyel, B. (2018): *Foreign-owned firms as agents of structural change in regions: the case of Hungary 2000-2009*. Working Paper. Utrecht, (Utrecht University, Department of Human Geography and Spatial Planning), p. 35.

Elhorst, J. P. (2014): Matlab Software for Spatial Panels. *International Regional_Science Review,* 37(3), pp. 389–405.

Ertur, C. – Koch, W. (2006): Regional disparities in the European Union and the enlargement process: an exploratory spatial data analysis, 1995–2000. *The Annals of Regional Science*, 40(4), pp. 723–765.

Esteban, J. (2000): Regional convergence in Europe and the industry mix: a shift-share analysis. *Regional Science and Urban Economics*, 30(3), pp. 353–364.

European Commission (2003): *Commission Recommendation of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises* [Online]. Retrieved from EUR-Lex, http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32003H0361 (07/10/2017)

European Commission (2011): *Meeting the Challenge of Europe 2020: The Transformative Power of Service Innovation, Report on the expert panel on service innovation in the EU.* Luxembourg: Publications Office of the European Union.

European Commission (2012a): *Knowledge-Intensive (Business) Services in Europe. Publications Office of the European Union.* Luxembourg: Publications Office of the European Union.

European Commission (2012b): Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: A Stronger European Industry for Growth and Economic

Recovery- Industrial Policy Communication Update [Online]. Retrieved from EUR-Lex, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52012DC0582 (07/07/2018)

European Commission (2014): Commission calls for immediate action for a European Industrial Renaissance [Press release]. Retrieved from European Commission, http://europa.eu/rapid/press-release_IP-14-42_en.htm 28/11/2016 (19/07/2017)

European Commission (2015): 2015 SBA Fact Sheet Hungary [Annual report]. Retrieved from European Commission, http://ec.europa.eu/growth/smes/business-friendly-environment/performance-review/ (12/01/2017)

Eurostat (2016). Glossary: Knowledge-intensive services (KIS) [Glossary]. Retrieved from European Commission, http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Knowledge-intensive_services_(KIS) (12/01/2017)

Everaert, P. – Sarens, G. – Rommel, J. (2010): Using Transaction Cost Economics to explain outsourcing of accounting. *Small Business Economics*, 35(1), pp. 93–112.

Ezcurra, R. – Pascual, P. – Rapún, M. (2007): The dynamics of regional disparities in Central and Eastern Europe during transition. *European Planning Studies*, 15(10), pp. 1397–1421.

Falck, O. (2007): Survival Chances of New Businesses: Do Regional Conditions Matter? *Applied Economics*, 39(16), pp. 2039–2048.

Fernandes, C. I. – Ferreira, J. J. (2013): Knowledge spillovers: cooperation between universities and KIBS. *R&D Management*, 43(5), pp. 461–472.

Fingleton, V. – Le Gallo, J. (2010): Endogeneity in a Spatial Context: Properties of Estimators. In: A. Páez, J. Le Gallo, R. Buliung, S. Dall'erba (Eds.), *Progress in Spatial Analysis. Methods and Applications* (pp. 58–73). Heidelberg: Springer.

Fisman, R. – Khanna, T. (2004): Facilitating development: The role of business groups. *World Development*, 32(4), pp. 609–628.

Foray, D. (2016): On the policy space of smart specialization strategies. *European Planning Studies*, 24(8), pp. 1428–1437.

Frenken, K. – Van Oort, F. – Verburg, T. (2007): Related variety, unrelated variety and regional economic growth. *Regional Studies*, 41(5), pp. 685–697.

Fritsch, M. – Changoluisa, J. (2017): New business formation and the productivity of manufacturing incumbents: Effects and mechanisms. *Journal of Business Venturing,* 32(3), pp. 237–259.

Fritsch, M. – Slavtchev, V. (2010): How does industry specialization affect the efficiency of regional innovation systems? *The Annals of Regional Science,* 45(1), pp. 87–108.

Gallego, J. – Maroto, A. (2015): The specialization in knowledge-intensive business services (KIBS) across Europe: permanent co-localization to debate. *Regional Studies*, 49(4), pp. 644–664.

Garicano, L. – Wu, Y. (2012): Knowledge, communication, and organizational capabilities. *Organization Science*, 23(5), pp. 1382–1397.

Garofoli, G. (1994): New firm formation and regional development: the Italian case. *Regional Studies*, 28(4), pp. 381–393.

Gebauer, H. (2008): Identifying service strategies in product manufacturing companies by exploring environment–strategy configurations. *Industrial Marketing Management*, 37(3), pp. 278–291.

Gilley, K. M. – Rasheed, A. (2000): Making more by doing less: an analysis of outsourcing and its effects on firm performance. *Journal of Management*, 26(4), pp. 763–790.

Giovannini, E. – Nardo, M. – Saisana, M. – Saltelli, A. – Tarantola, A. – Hoffman, A. (2008): *Handbook on constructing composite indicators: methodology and user guide.* Paris: Organisation for Economic Co-operation and Development (OECD).

Glaeser, E. – Kallal, H. – Scheinkman, J. – Shleifer, A. (1992): Growth in Cities. *Journal of Political Economy,* 100(6), pp. 1126–1152.

Greene, W. (2003): *Econometric Analysis* (5th ed.). Upper Saddle River, NJ: Pearson Education, p. 1026.

Greenfield, H. I. (1966): *Manpower and the Growth of Producer Services*. New York: Columbia University Press, p. 160.

Guerrieri, P. – Meliciani, V. (2005): Technology and international competitiveness: the interdependence between manufacturing and producer services. *Structural Change and Economic Dynamics*, 16(4), pp. 489–502.

Hall, P. – Soskice, D. 2001: An Introduction to Varieties of Capitalism. In P. Hall, D. Soskice (Eds.), *Varieties of Capitalism: The Institutional Foundations of Comparative Advantage* (pp. 1–68.). Oxford: Oxford University Press.

Hardy, J. – Sass, M. – Fifekova, M. P. (2011): Impacts of horizontal and vertical foreign investment in business services: the experience of Hungary, Slovakia and the Czech Republic. *European Urban and Regional Studies*, 18(4), pp. 427–443.

Harrison, R. T. – Mason, C. M. – Girling, P. (2004): Financial bootstrapping and venture development in the software industry. *Entrepreneurship & Regional Development*, 16(4), pp. 307–333.

Hätönen, J. – Eriksson, T. (2009): 30+ years of research and practice of outsourcing–Exploring the past and anticipating the future. *Journal of International Management*, 15(2), pp. 142–155.

Hirsch, S. – Adar, Z. (1974): Firm size and export performance. *World Development*, 2(7), pp. 41–46.

Horváth, K. – Szerb, L. (2018): Managerial practices and the productivity of knowledge-intensive service businesses: An analysis of digital/IT and cash management practices. *Strategic Change*, 27(2), pp. 161–172.

Horváth, K. – Rabetino, R. (2018): Knowledge-intensive territorial servitisation: regional driving forces and the role of the entrepreneurial ecosystem. *Regional Studies*, in press. doi: https://doi.org/10.1080/00343404.2018.1469741

Huikkola, T. – Kohtamäki, M. – Rabetino, R. (2016): Resource realignment in servitization. *Research-Technology Management*, 59(4), pp. 30–39.

Jarque, C. M. – Bera, A. K. (1987): A test for normality of observations and regression residuals. *International Statistical Review*, 55(2), pp. 163–172.

Jindra, B. – Giroud, A. – Scott-Kennel, J. (2009): Subsidiary roles, vertical linkages and economic development: Lessons from transition economies. *Journal of World Business*, 44(2), pp. 167–179.

Ketelhöhn, N. W. (2006): The role of clusters as sources of dynamic externalities in the US semiconductor industry. *Journal of Economic Geography*, 6(5), pp. 679–699.

Kohtamäki, M. – Partanen, J. (2016): Co-creating value from knowledge-intensive business services in manufacturing firms: the moderating role of relationship learning in supplier–customer interactions. *Journal of Business Research,* 69(7), pp. 2498–2506.

Krugman, P. (1991): Increasing returns and economic geography. *Journal of Political Economy*, 99(3), pp. 483–499.

Krugman, P. (1993): *Geography and trade (1st MIT Press Paperback Ed.)*. Cambridge: MIT Press, p. 145.

Krugman, P. (1999): The role of geography in development. *International Regional Science Review,* 22(2), pp. 142–161.

Lafuente, E. – Szerb, L. – Acs, Z. J. (2016): Country level efficiency and national systems of entrepreneurship: A data envelopment analysis approach. *Journal of Technology Transfer,* 41(6), pp. 1260–1283.

Lafuente, E. – Vaillant, Y. – Rialp, J. (2007): Regional differences in the influence of role models: Comparing the entrepreneurial process of rural Catalonia. *Regional Studies*, 41(6), pp. 779–796.

Lafuente, E. – Vaillant, Y. – Serarols, C. (2010): Location decisions of knowledge-based entrepreneurs: why some Catalan KISAs choose to be rural? *Technovation,* 30(11–12), 590–600.

Lafuente, E. – Vaillant, Y. – Vendrell-Herrero, F. (2017): Territorial servitization: Exploring the virtuous circle connecting knowledge-intensive services and new manufacturing businesses. *International Journal of Production Economics,* 192, pp. 19–28.

Lengyel, I. – Rechnitzer, J. (2013): Drivers of regional competitiveness in the Central European countries. *Transition Studies Review*, 20(3), pp. 421–435.

Lengyel, I. – Vas, Z. – Szakalne Kano, I. – Lengyel, B. (2017): Spatial differences of reindustrialization in a post-socialist economy: manufacturing in the Hungarian counties. *European Planning Studies*, 25(8), pp. 1416–1434.

LeSage, J. P. – Pace, R. K. (2009): *Introduction to Spatial Econometrics.* Boca Raton, FL: Taylor & Francis.

Leydesdorff, L. – Fritsch, M. (2006): Measuring the knowledge base of regional innovation systems in Germany in terms of a Triple Helix dynamics. *Research Policy*, 35(10), pp. 1538–1553.

Lovelock, C. (1991): *Services Marketing (2nd Edition).* Englewood Cliffs, NJ: Prentice Hall.

Lux, G. (2009): Divergent patterns of adaptation among Central European old industrial regions. *European Spatial Research and Policy*, 16(1), pp. 145–157.

Makun, A. – Macpherson, D. (1997): Externally-assisted product innovation in the manufacturing sector: The role of location, in-house R&D and outside technical support. *Regional Studies*, 31(7), pp. 659–668.

Mameli, F. – Iammarino, S. – Boschma, R. (2012): *Regional variety and employment growth in Italian labour market areas: services versus manufacturing industries.* Working Paper. London, (Birkbeck College, University of London), p. 23.

Marshall, A. (1920): *The Principles of Economics (8th Ed.).* London: MacMillan, p. 731.

Mason, C. M. – Carter, S. – Tagg, S. (2011): Invisible businesses: The characteristics of home-based businesses in the United Kingdom. *Regional Studies*, 45(5), pp. 625–639.

Mathieu, V. (2001): Service strategies within the manufacturing sector: benefits, costs and partnership. *International Journal of Service Industry Management*, 12(5), pp. 451–475.

Matthyssens, P. – Vandenbempt, K. (2008): Moving from basic offerings to value-added solutions: strategies, barriers and alignment. *Industrial Marketing Management*, 37(3), pp. 316–328.

McCann, P. – Ortega-Argilés, R. (2015): Smart specialization, regional growth and applications to European Union cohesion policy. *Regional Studies*, 49(8), pp. 1291–1302.

McCann, P. – Sheppard, S. (2003): The rise, fall and rise again of industrial location theory. *Regional Studies*, 37(6–7), pp. 649–663.

McCarthy, I. – Anagnostou, A. (2004): The impact of outsourcing on the transaction costs and boundaries of manufacturing. *International Journal of Production Economics*, 88(1), pp. 61–71.

Medve-Bálint, G. (2014): The role of the EU in shaping FDI flows to East Central Europe. *JCMS: Journal of Common Market Studies*, 52(1), pp. 35–51.

Meliciani, V. – Savona, M. (2015): The determinants of regional specialisation in business services: agglomeration economies, vertical linkages and innovation. *Journal of Economic Geography*, 15(2), pp. 387–416.

Menor, L. J. – Tatikonda, M. V. – Sampson, S. E. (2002): New service development: areas for exploitation and exploration. *Journal of Operations Management*, 20(2), pp. 135–157.

Miles, I. – Kastrinos, N. – Bilderbeek, R. – Den Hertog, P. – Flanagan, K. – Huntink, W. – Bouman, M. (1995): Knowledge-intensive business services: users, carriers and sources of innovation. Report. Brussels, (European Commission), p. 117.

Muller, E. – Zenker, A. (2001): Business services as actors of knowledge transformation: the role of KIBS in regional and national innovation systems. *Research Policy*, 30(9), pp. 1501–1516.

Nagy, G. – Nagy, E. – Timár, J. (2012): The changing meaning of core–periphery relations in a non-metropolitan "urban region" at the Hungarian–Romanian border. *DISP-The Planning Review*, 48(2), pp. 93–105.

Neely, A. (2008): Exploring the financial consequences of the servitization of manufacturing. *Operations Management Research*, 1(2), pp. 103–118.

Neffke, F. – Henning, M. – Boschma, R. (2011): How do regions diversify over time? Industry relatedness and the development of new growth paths in regions. *Economic Geography*, 87(3), pp. 237–265.

Nölke, A. – Vliegenthart, A. (2009): Enlarging the varieties of capitalism: The emergence of dependent market economies in East Central Europe. *World Politics*, 61(4), pp. 670–702.

Oliva, R. – Kallenberg, R. (2003): Managing the transition from products to services. *International Journal of Service Industry Management,* 14(2), pp. 160–172.

OECD (2001): *Glossary and Statistical Terms: Central and Eastern European Countries (CEECs)* [Online]. Retrieved from OECD, https://stats.oecd.org/glossary/detail.asp?ID=303 (02/04/2018)

Polése, M. – Shearmur, R. (2006): Growth and location of economic activity: the spatial dynamics of industries in Canada, 1971-2001. *Growth and Change,* 37(3), pp. 362–395.

Porter, M. E. (1990): *The Competitive Advantage of Nations*. MacMillan: London.

Porter, M. E. (1994): The role of location in competition. *Journal of the Economics of Business*, 1(1), pp. 35–40.

Porter, M. E. (1996): What is strategy? *Harvard Business Review*, November-December, pp. 61–79.

Porter, M. E. (1998): Clusters and the New Economics of Competition. *Harvard Business Review*, November-December, pp. 77–90.

Qian, H. – Acs, Z. J. – Stough, R. (2013): Regional Systems of Entrepreneurship: The Nexus of Human Capital, Knowledge, and New Firm Formation. *Journal of Economic Geography*, 13(4), pp. 559–587.

Reynolds, P. – Bosma, N. – Autio, E. – Hunt, S. – De Bono, N. – Servais, I. – Lopez-Garcia, P. – Chin, N. (2005): Global entrepreneurship monitor: data collection design and implementation 1998–2003. *Small Business Economics*, 24(3), pp. 205–231.

Rocha, H. – Sternberg, R. (2005): Entrepreneurship: the role of clusters, theoretical perspectives and empirical evidence from Germany. *Small Business Economics,* 24(3), pp. 267–292.

Rostow, W. W. (1960): *The Stages of Economic Growth: A Non-Communist Manifesto*. Cambridge: Cambridge University.

Santamaría, L. – Nieto, M. J. – Miles, I. (2012): Service innovation in manufacturing firms: Evidence from Spain. *Technovation*, 32(2), pp. 144–155.

Sass, M. – Szalavetz, A. (2014): Crisis-related changes in the specialization of advanced economies in global value chains. *Competition & Change,* 18(1), pp. 54–69.

Scarbrough, H. – Swan, J. – Laurent, S. – Bresnen, M. – Edelman, L. – Newell, S. (2004): Project-based learning and the role of learning boundaries. *Organization Studies,* 25(9), pp. 1579–1600.

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

Smith, D. F. Jr. – Florida, R. (1994): Agglomeration and industrial location: An econometric analysis of Japanese-affiliated manufacturing establishments in automotive-related industries. *Journal of Urban Economics,* 36(1), pp. 23–41.

Spigel, B. (2017): The relational organization of entrepreneurial ecosystems. *Entrepreneurship Theory and Practice,* 41(1), pp. 49–72.

Stam, E. (2007): Why Butterflies Don't Leave: Locational Behavior of Entrepreneurial Firms. *Economic Geography,* 83(1), pp. 27–50.

Sternberg, R. (2012): Do EU regional policies favour regional entrepreneurship? Empirical evidence from Spain and Germany. *European Planning Studies,* 20(4), pp. 583–608.

Stigler, G. J. (1951): The division of labor is limited by the extent of the market. *Journal of Political Economy*, 59 (2), pp. 185–193.

Strambach, S. (2001): Innovation processes and the role of knowledge-intensive business services (KIBS). In K. Koschatzky, M. Kulicke, & A. Zenker (Eds.), *Innovation Networks: Vol. 12. Technology, Innovation and Policy (Series of the Fraunhofer Institute for Systems and Innovation Research (ISI))* (pp. 53–68). Heidelberg: Physica.

Swamidass, P. M. – Kotha, S. (1998): Explaining manufacturing technology use, firm size and performance using a multidimensional view of technology. *Journal of Operations Management,* 17(1), pp. 23–37.

Szerb, L. – Lafuente, E. – Horváth, K. – Páger, B. (2018): The relevance of quantity and quality entrepreneurship for regional performance: The moderating role of the entrepreneurial ecosystem. *Regional Studies,* in press.

Szerb, L. – Acs, Z. J. – Autio, E. – Ortega-Argilés, R. – Komlósi, É. (2014): REDI: The Regional Entrepreneurship and Development Index- Measuring regional entrepreneurship. Retrieved from https://thegedi.org/regional-gedi/

Szerb, L. – Vörös, Zs. – Komlósi, É. – Acs, Z. J. – Páger, B. – Rappai, G. (2017): The Regional Entrepreneurship and Development Index: Structure, Data, Methodology and Policy Applications. Retrieved from http://www.projectfires.eu/publications/reports/

Tabellini, G. (2010): Culture and institutions: economic development in the regions of Europe. *Journal of the European Economic Association*, 8(4), pp. 677–716.

Taleb, N. N. (2010): *The Black Swan: The Impact of the Highly Improbable (2nd Ed.)*. New York: Random House, p. 444.

Tavassoli, S. – Carbonara, N. (2014): The Role of Knowledge Variety and Intensity for Regional Innovative Capability. *Small Business Economics*, 43(2), pp. 493–509.

Tavassoli, S. – Jienwatcharamongkhol, V. (2016): Survival of entrepreneurial firms: the role of agglomeration externalities. *Entrepreneurship & Regional Development*, 28(9–10), pp. 746–767.

Teece, D. J. (2010): Business models, business strategy and innovation. *Long Range Planning*, 43(2-3), pp. 172–194.

Ten Raa, T. – Wolff, E. N. (2001): Outsourcing of Services and the Productivity Recovery in US Manufacturing in the 1980s and 1990s. *Journal of Productivity Analysis*, 16(2), pp. 149–165.

Tether, B.S. – Hipp, C. (2002): Knowledge intensive, technical and other services: patterns of competitiveness and innovation compared. *Technology Analysis & Strategic Management*, 14(2), pp. 163–182.

Turunen, T. – Finne, M. (2014): The organisational environment's impact on the servitization of manufacturers. *European Management Journal*, 32(4), pp. 603–615.

Vandermerwe, S. – Rada, J. (1988): Servitization of business: adding value by adding services. *European Management Journal*, 6(4), pp. 314–324.

Van der Panne, G. (2004): Agglomeration externalities: Marshall versus Jacobs. *Journal of Evolutionary Economics*, *14*(5), pp. 593–604.

Van der Panne, G. – Van Beers, C. (2006): On the Marshall–Jacobs controversy: it takes two to tango. *Industrial and Corporate Change*, 15(5), pp. 877–890.

Varga, A. – Sebestyén, T. (2017): Does EU Framework Program participation affect regional innovation? The differentiating role of economic development. *International Regional Science Review,* 40(4), pp. 405–439.

Vargo, S. L. – Lusch, R. F. (2004): The four service marketing myths: remnants of a goods-based, manufacturing model. *Journal of Service Research*, 6(4), pp. 324–335.

Vendrell-Herrero, F. – Bustinza, O. F. – Parry, G. – Georgantzis, N. (2017): Servitization, digitization and supply chain interdependency. *Industrial Marketing Management*, 60, pp. 69–81.

Visnjic, I. – Van Looy, B. (2013): Servitization: disentangling the impact of service business model innovation on manufacturing firm performance. *Journal of Operations Management*, 31(4), pp. 169–180.

Visnjic, I. – Neely, A. – Cennamo, C. – Visnjic, N. (2016): Governing the city: Unleashing value from the business ecosystem. *California Management Review*, 59(1), pp. 109–140.

Volgmann, K. – Münter, A. (2018): Specialization of and complementarities between (new) knowledge clusters in the Frankfurt/Rhine-Main urban region. *Regional Studies, Regional Science*, 5(1), pp. 125–148.

Windrum, P. – Tomlinson, M. (1999): Knowledge-intensive services and international competitiveness: a four country comparison. *Technology Analysis & Strategic Management*, 11(3), pp. 391–408.

Wood, P. A. – Bryson, J. – Keeble, D. (1993): Regional patterns of small firm development in the business services: evidence from the United Kingdom. *Environment and Planning A*, 25(5), pp. 677–700.

Wooldridge, J. M. (2002): *Econometric Analysis of Cross Section and Panel Data*. Cambridge, MA: The MIT Press.

Zhu, Z. – Hsu, K. – Lillie, J. (2001): Outsourcing–a strategic move: the process and the ingredients for success. *Management Decision*, 39(5), pp. 373–378.

Appendix

Appendix 1. Local Moran's I statistics for the dependent and independent variables

No.	NUTS code	Rate of new KIBS	Average manufacturing GVA per employee	REDI	Rate of manufacturers	Size of new manufacturers	KIBS rate	t–KIBS rate	p–KIBS rate
1	AT1	–0.020	–0.174	–0.496**	–0.576***	–0.012	0.149	0.214	0.106
2	AT2	–0.031	–0.273	–0.113	–0.190	0.043	–0.307	–0.145	–0.340*
3	AT3	–0.006	–0.173	0.081	0.006	–0.121	–0.277	–0.205	–0.275
4	BE1	0.027	0.063	0.768**	0.794***	0.096	0.799**	0.385	0.884***
5	BE2	0.043	0.267	0.345	0.608**	0.068	0.397	0.095	0.482*
6	BE3	0.048	0.183	0.224	0.339*	0.044	0.115	–0.073	0.192
7	CZ0	–0.002	–0.083	0.061	0.468**	–0.130	–0.001	–0.015	0.000
8	DE1	0.610**	0.073	0.502**	0.136	–0.122	0.186	0.119	0.192
9	DE2	–0.741***	0.005	0.458*	0.088	0.011	0.158	0.091	0.164
10	DE3	–3.359***	–0.205	–0.606	–0.144	–0.620	0.351	–0.254	0.587
11	DE4	–3.459***	–0.238	–0.665	–0.109	–0.686	0.284	–0.278	0.511
12	DE5	–0.275	0.103	0.539**	0.084	–0.209	1.035***	0.329	1.238***
13	DE6	0.064	0.132	0.943***	0.181	–0.165	1.144***	0.563***	1.260***
14	DE7	0.299*	0.105	0.548***	0.002	–0.068	0.950	0.508***	1.003***
15	DE8	0.047	–0.190	–0.159	–0.046	–0.407**	–0.092	–0.224	–0.034
16	DE9	0.018	0.079	0.240	0.046	0.109	0.348*	0.026	0.468**
17	DEA	–0.049	0.060	0.455**	–0.037	0.021	0.636***	0.215	0.755***
18	DEB	0.388*	0.131	0.049	–0.057	0.072	0.187	0.101	0.201
19	DEC	0.545**	0.019	0.451**	–0.051	0.101	0.062	0.066	0.049
20	DED	0.047	–0.090	0.060	0.144	–0.511***	0.075	–0.038	0.133
21	DEE	–0.783***	–0.023	–0.165	0.036	–0.452***	–0.18	–0.242	–0.094
22	DEF	0.096	0.010	0.339*	0.053	–0.032	0.253	0.174	0.257
23	DEG	0.444**	–0.048	–0.107	0.165	–0.093	–0.141	–0.148	–0.106
24	DK01	0.761***	0.257	1.700***	0.343	–0.030	0.132	0.582**	0.042
25	DK02	0.178	0.096	0.267	0.213	0.013	–0.279	–0.036	–0.285
26	DK03	0.612**	–0.042	0.960***	0.084	0.041	–0.255	–0.143	–0.223
27	DK04	0.861***	–0.019	0.863***	0.101	0.062	0.019	0.042	0.106
28	DK05	–0.062	–0.071	0.785**	0.046	0.085	0.095	–0.139	0.289
29	EE0	–0.151	0.098	0.041	–0.015	–0.010	–0.003	0.018	0.009

Appendix 1. Continued.

No.	NUTS code	Rate of new KIBS	Average manufacturing GVA per employee	REDI	Rate of manufacturers	Size of new manufacturers	KIBS rate	t–KIBS rate	p–KIBS rate
30	EL1	0.019	0.150	1.934***	–0.221	0.068	–0.024	1.156**	–0.055
31	EL2	–0.047	–0.132	1.888***	0.033	0.053	–0.072	1.197**	–0.263
32	EL3	0.028	0.111	1.553**	–0.237	0.039	–0.054	1.060*	–0.110
33	ES11	0.354	0.179	0.793**	0.095	0.035	1.247***	1.760***	0.984**
34	ES12	0.065	0.012	0.616**	0.186	–0.014	0.972***	1.403***	0.760**
35	ES13	0.000	0.000	0.488*	0.132	–0.014	1.084***	1.546***	0.853***
36	ES21	–0.330	0.007	0.236	0.053	–0.017	0.710**	1.124***	0.528*
37	ES22	–0.001	0.003	0.358	0.033	–0.003	0.917***	1.275***	0.728**
38	ES23	–0.121	0.001	0.565**	–0.488*	–0.034	1.143***	1.469***	0.937***
39	ES24	–0.001	–0.010	0.448*	0.110	0.057	1.009***	1.292***	0.830***
40	ES30	–0.347	–0.073	–0.449**	0.221	–0.129	–0.124	0.369*	–0.244
41	ES41	0.038	0.009	0.438*	0.098	–0.007	1.205***	1.585***	0.979***
42	ES42	0.023	0.012	0.700**	–0.046	–0.142	1.315***	1.586***	1.096***
43	ES43	0.197	0.335	0.636**	0.231	–0.001	1.381***	1.752***	1.138***
44	ES51	–0.095	0.001	0.106	0.141	–0.001	0.657**	0.900***	0.525*
45	ES52	–0.124	0.014	0.434	0.139	0.047	0.960***	1.332***	0.764**
46	ES61	0.292	0.085	0.564*	0.467*	0.001	1.150***	1.684***	0.887***
47	ES62	0.029	0.034	0.631*	0.199	0.000	1.042**	1.544***	0.803**
48	FI19	–0.161	0.117	0.284	–0.135	0.086	0.056	0.049	0.051
49	FI1B	–0.228	0.002	0.669	–0.011	0.009	–0.360	–0.272	–0.354
50	FI1C	–0.033	0.117	0.592	0.044	0.036	–0.175	–0.231	–0.140
51	FI1D	–3.163***	0.041	–0.084	–0.024	0.027	–0.352	–0.330	–0.319
52	FR1	–0.277	–0.391	0.789**	0.402	–0.062	–0.110	–0.033	–0.124
53	FR2	–0.216	–0.134	–0.043	0.055	–0.327	–0.299	–0.216	–0.298
54	FR3	–0.277	0.110	0.071	0.268	0.071	–0.447**	–0.383*	–0.424**
55	FR4	–1.273***	0.066	0.032	0.001	0.077	–0.269	–0.148	–0.287
56	FR5	0.222	0.002	0.088	0.050	–0.013	0.186	0.149	0.180
57	FR6	–0.184	0.011	0.093	0.055	–0.005	0.617**	0.655**	0.544**
58	FR7	–0.261	0.013	–0.164	0.022	0.015	0.350	0.363	0.311

Appendix 1. Continued.

No.	NUTS code	Rate of new KIBS	Average manufacturing GVA per employee	REDI	Rate of manufacturers	Size of new manufacturers	KIBS rate	t–KIBS rate	p–KIBS rate
59	FR8	–0.016	0.005	0.005	0.101	0.050	0.332	0.414	0.275
60	HR03	–0.022	1.409***	0.908***	7.273***	0.333*	2.421***	0.425*	3.066***
61	HR04	0.037	1.234***	0.843***	5.864***	–0.033	2.491***	1.289***	2.710***
62	HU10	–0.032	0.840***	0.709***	–0.323*	0.003	–0.045	–0.015	–0.044
63	HU21	–0.030	1.019***	1.317***	0.256	–0.011	0.037	0.024	0.038
64	HU22	–0.024	0.780***	0.919***	0.247	–0.023	–0.057	–0.059	–0.050
65	HU23	–0.008	1.458***	1.396***	0.119	–0.002	0.072	0.024	0.084
66	HU31	0.153	1.160***	1.776***	0.142	0.031	0.022	0.003	0.029
67	HU32	0.035	1.300***	1.998***	0.043	0.009	0.044	0.017	0.045
68	HU33	–0.051	1.474***	1.795***	0.219	0.007	–0.018	0.002	–0.021
69	IE01	–0.011	3.429***	1.084**	0.439	0.018	–0.020	0.066	0.072
70	IE02	–0.009	4.791***	1.471***	0.604	–0.187	–0.620	–0.131	–0.541
71	ITC	–0.698**	0.090	0.035	0.042	0.000	0.008	0.213	–0.025
72	ITF	–0.938	0.255	1.008	0.004	0.008	0.004	0.580	–0.004
73	ITH	–0.149	0.772**	0.233	0.635**	0.230	–0.192	–0.215	–0.103
74	ITI	0.090	0.437	0.989**	0.238	–0.126	–0.005	0.220	0.113
75	LT0	0.359	0.421	0.363	0.046	0.012	0.424	0.114	0.484
76	LV0	0.193	1.576***	0.150	0.004	0.001	0.163	0.001	0.226
77	NL1	–0.006	0.225	0.604**	0.288	0.014	1.046***	0.470**	1.175***
78	NL2	–0.062	0.155	0.452**	0.298*	0.030	1.234***	0.569***	1.379***
79	NL3	0.048	0.388*	1.054***	0.586***	–0.008	1.737***	0.888***	1.885***
80	NL4	0.054	0.463**	0.705***	0.314*	0.043	1.054***	0.355*	1.247***
81	PL1	0.163	4.588***	0.021	0.091	–0.013	0.015	–0.221	0.178
82	PL2	0.018	–0.342*	0.393*	0.324*	0.009	0.175	0.015	0.245
83	PL3	0.213	2.651***	0.554	0.288	0.070	0.512	0.076	0.675*
84	PL4	0.066	0.899***	0.094	0.090	2.002***	–0.102	–0.012	–0.138
85	PL5	0.000	0.728***	0.144	0.090	1.104***	0.025	0.000	0.039
86	PL6	0.749**	2.780***	0.400	0.159	–0.124	0.370	0.055	0.487
87	PT11	0.250	0.538**	0.482*	–0.288	0.006	1.032***	1.535***	0.795***

Appendix 1. Continued.

No.	NUTS code	Rate of new KIBS	Average manufacturing GVA per employee	REDI	Rate of manufacturers	Size of new manufacturers	KIBS rate	t–KIBS rate	p–KIBS rate
88	PT15	0.040	1.014***	0.322	0.665*	0.068	1.332***	1.664***	1.102***
89	PT16	0.143	0.761**	0.435	0.018	0.001	1.092***	1.504***	0.870***
90	PT17	–0.829**	0.763**	–0.172	0.378	–0.056	0.305	0.953**	0.089
91	PT18	0.021	0.907**	0.272	0.184	0.046	1.209***	1.579***	0.980***
92	RO1	0.318	1.657***	1.836***	0.205	0.006	0.392	0.082	0.499*
93	RO2	0.398	1.558***	2.165***	0.058	–0.187	0.785*	0.187	0.974**
94	RO3	–0.761*	1.479***	1.561***	–0.174	0.048	0.092	–0.150	0.218
95	RO4	0.295	1.645***	2.12***	0.048	–0.084	0.297	–0.002	0.408
96	SE11	0.500	1.376***	1.603***	–0.090	0.106	1.018**	0.993**	0.925**
97	SE12	0.448	1.043**	1.221***	0.041	0.161	0.734*	0.787*	0.638*
98	SE21	–0.935***	0.035	0.021	–0.382	0.114	–0.022	–0.068	–0.010
99	SE22	1.334***	0.156	1.538***	0.184	0.114	0.129	0.491*	–0.012
100	SE23	0.635**	0.337	1.013***	0.054	0.139	0.096	0.294	0.017
101	SE31	–0.683*	0.031	–0.051	–0.099	0.172	0.066	–0.056	0.099
102	SE32	0.701	0.005	0.014	0.037	0.159	0.013	–0.008	0.022
103	SE33	–3.163***	0.041	–0.084	–0.024	0.027	–0.352	–0.330	–0.319
104	SI01	0.018	0.761***	0.023	3.262***	–0.052	0.995***	0.650***	1.020***
105	SI02	0.010	0.616**	–0.201	2.357***	0.141	1.568***	0.861***	1.666***
106	SK01	0.017	0.307*	–0.006	–0.396**	–0.003	0.032	0.063	0.008
107	SK02	0.066	0.787***	0.889***	1.013***	–0.016	–0.184	–0.158	–0.173
108	SK03	0.172	0.492**	1.112***	0.845***	0.018	0.151	–0.001	0.201
109	SK04	0.219	0.489**	1.457***	0.883***	0.040	0.239	0.051	0.287
110	UKC	0.066	0.024	0.046	0.182	0.144	0.046	0.161	0.000
111	UKD	0.021	0.112	0.380*	0.242	0.141	0.119	0.735***	0.017
112	UKE	0.007	–0.004	0.542**	0.129	0.113	0.015	0.563**	–0.029
113	UKF	–0.009	0.013	0.944***	0.092	0.108	0.095	0.945***	–0.013
114	UKG	–0.005	–0.029	0.735***	0.075	0.074	0.113	1.129***	0.003
115	UKH	–0.025	0.162	1.223***	0.440**	–0.053	0.584***	2.281***	0.204
116	UKI	0.025	0.233	2.487***	0.926***	0.041	1.489***	4.742***	0.691**

Appendix 1. Continued.

No.	NUTS code	Rate of new KIBS	Average manufacturing GVA per employee	REDI	Rate of manufacturers	Size of new manufacturers	KIBS rate	t–KIBS rate	p–KIBS rate
117	UKJ	–0.008	0.231	2.278***	0.750**	0.094	1.32***	4.608***	0.570*
118	UKK	–0.285	0.024	1.309***	0.358	0.067	0.250	1.873***	0.031
119	UKL	–0.068	0.057	0.417*	0.277	0.068	–0.151	0.264	–0.098
120	UKM	0.029	0.088	0.495	0.302	0.099	–0.030	0.193	–0.083
121	UKN	–0.108	0.249	0.635**	0.198	0.079	–0.194	–0.399	–0.043