

University of Pécs
Faculty of Business and Economics
Doctoral School of Regional Policy and Economics

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

Theses of a doctoral dissertation

Candidate: Krisztina Horváth

Supervisors: Dr. László Szerb
Professor

Dr. Tamás Sebestyén
Assistant Professor

Pécs, 2018

Content

1. Relevance of the topic.....	1
2. Research objectives, hypotheses and structure	3
3. Methodology	5
4. Results and implications	9
5. Future research avenues.....	18
6. References.....	20
7. Publication list	23

Abstract

Candidate: Krisztina Horváth

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

Supervisors: Dr. László Szerb, Dr. Tamás Sebastyén

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.

JEL classification:

L26; L60; L80; O14; O52; R58

1. Relevance of the topic

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, 2012), 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. These studies revealed that at the territorial level 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 the dissertation.

2. Research objectives, hypotheses and structure

There are two more specific goals of this study. The first one is to extend the contribution by Lafuente et al. (2017). I am interested in how relevant characteristics of the regional manufacturing sector—i.e., specialization and the size of manufacturers—impact KIBS business formation rates, while acknowledging that the quality of the entrepreneurial ecosystem—that is, contextual factors driving entrepreneurial actions—of regions may affect this relationship. Second, I seek how KIBS businesses influence the economic contribution of manufacturing sectors from a territorial perspective, acknowledging the potentially heterogeneous effect of different types of KIBS businesses, namely technology-based and professional-based KIBS.

Based on these goals, I use seven research hypotheses. The first five are related to the first, while the last two hypotheses are related to the second goal of the study:

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

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

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

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.

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

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.

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.

3. Methodology

To test the seven hypotheses proposed in Chapter 2, two main analyses are conducted. The first empirical analysis (Section 4.1) focuses on the determinants of KIBS formation in the regions of the European Union, and addresses hypotheses 1 to 5. The second analysis (Section 4.2) 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.

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*. 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. 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).

For both main empirical 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 choice to use mixed statistical regions is crucial in this study, and can be explained by both data availability and methodological issues. All the variables used in the analysis are expressed in terms of average values between 2012 and 2014. Note that the representativeness of the sample is ensured insofar as it includes regions from 24 European countries. Figure 1 and 2 depict the distribution of regions in terms of the two dependent variables of the study, KIBS business formation rate and the average manufacturing gross value added (GVA) per worker.

Figure 1. Geographic distribution of the rate of new KIBS businesses across European regions

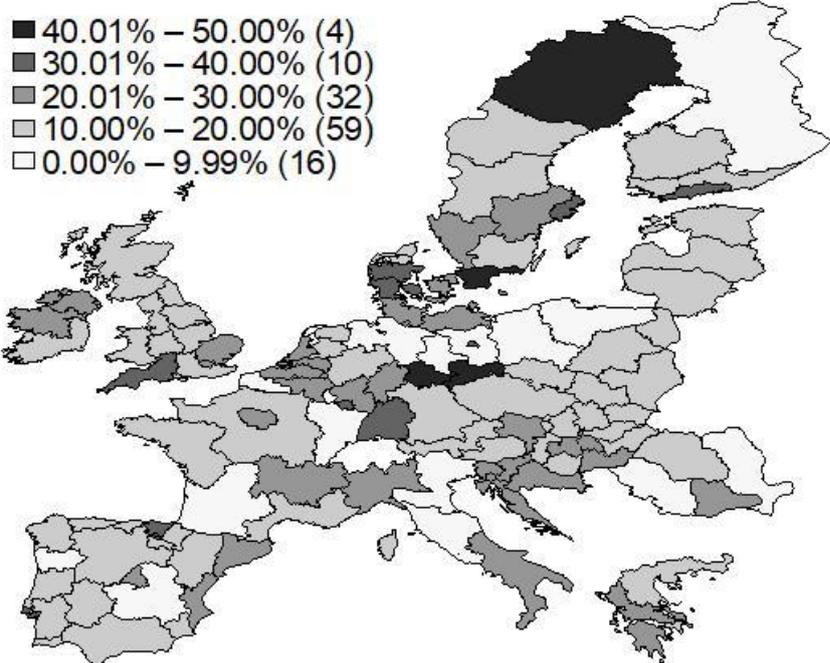
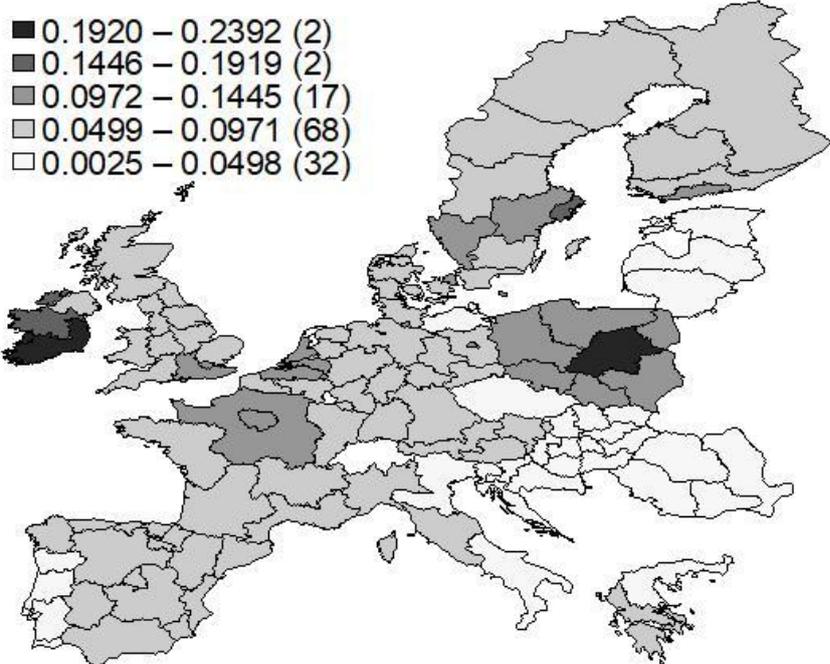


Figure 2. Average manufacturing gross value added (GVA) per worker in the analyzed European regions (in million of Euros)



To account for the geographic embeddedness of the analyzed European regions, I employed spatial econometric methods (Anselin, 1988). These methods suit the aim (and scope) of the analyses as they allow to differentiate regional (local) and external effects (linked to adjacent territories), and accurately test the hypotheses proposed in Sections 4.1 and 4.2. More concretely, I apply spatial Durbin cross-section models (SDM) that 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 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)

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

Full model: (2)

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

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)

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

Full model: (4)

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

In both models, β_0 represents the constant term, while β_j are coefficients for the j th 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.

4. Results and implications

The regression results of the dissertation are presented in *Table 1* and *Table 2*. First, *Table 1* depicts the results related to 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.

Results in Model 1 of *Table 1* 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. Therefore, *I give support to hypothesis 1* that proposes a positive relationship between manufacturing specialization and the rate of new KIBS firms, *and to the 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 1* 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 regions in Europe 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)*”. That is, in the context of this work, KIBS formation may be greater in territories with higher need for new KIBS businesses. Also, the findings in *Table 6* 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 hypothesis 3* that states that the more developed the region's entrepreneurial ecosystem, the higher its new KIBS' formation rate is.

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, *I give support to*

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. *I, therefore, cannot support 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.

Table 1. SDM: Regression results (dependent variable: rate of new KIBS)

	Model 1	Model 2
	Coefficient (Std error)	Coefficient (Std error)
REDI	0.0060 (0.0015)***	0.0034 (0.0016)**
Rate of manufacturers	0.4847 (0.2890)*	-1.1705 (0.4871)**
Rate of manufacturers X REDI		0.0508 (0.0172)***
Size of new manufacturers (ln)	-0.0248 (0.0091)***	0.0183 (0.0244)
Size of new manufacturers (ln) X REDI		-0.0008 (0.0005)
GDP per capita (ln)	-0.1093 (0.0431)***	-0.1446 (0.0404)***
Population density (ln)	0.0030 (0.0112)	0.0110 (0.0099)
Capital city dummy	0.0231 (0.0327)	0.0480 (0.0296)
CEE dummy	-0.0565 (0.0659)	-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)***
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	0.0700 (0.0043)	-1.1327 (0.7742)

Table 1. Continued.

R2	0.5946	0.7171
Adjusted R2	0.5453	0.6705
Log likelihood value	131.2514	139.2700
F test	11.2076***	14.5074***
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.

Second, findings in *Section 4.2* are included in *Table 2*. This chapter seeks 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 in Europe. Findings in Model 1 of *Table 2* 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 ($p < 0.1$) *I can accept hypothesis 6*. A more diverse relationship emerges, when we separate KIBS businesses based on their economic profile. According to Model 2 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 manufacturing sector in the region. Nevertheless, this effect cannot be found in case of the p-KIBS rate variable. What's more, relationship between the regional p-KIBS rate and the average manufacturing GVA is negative which suggests that a higher p-KIBS rate in a territory may result in on average less efficient manufacturing firms in the same region. Therefore, *I support hypothesis 7*.

Table 2. SDM: Regression results (dependent variable: avg. manuf. GVA per employee)

	Model 1	Model 2
	Coefficient (Std error)	Coefficient (Std error)
KIBS rate	0.0010 (0.0006)*	
t-KIBS rate		0.0150 (0.0044)***
p-KIBS rate		-0.0022 (0.0010)**
REDI (ln)	0.0426 (0.0258)*	0.0307 (0.0242)
Size of manufacturers (ln)	0.0116 (0.0072)	0.0064 (0.0069)
Rate of manufacturers	-0.3104 (0.0723)***	-0.1991 (0.0754)***
Capital city dummy	0.0217 (0.0133)*	0.0054 (0.0125)
CEE dummy	0.0312 (0.0239)	-0.0021 (0.0230)
Population density (ln)	-0.0124 (0.0040)***	-0.0046 (0.0038)
GDP per capita (ln)	0.0164 (0.0197)	-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)*
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	-0.2970 (0.2167)	0.0023 (0.2119)
R2	0.5791	0.6246
Adjusted R2	0.5190	0.5626
Log likelihood value	256.9697	268.0305
F test	9.0285***	9.5203***
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.

The results in Section 4.1 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, the results confirm 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.

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 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.

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. Future research avenues

Just like every scientific work, this dissertation has a number of limitations too 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 these 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.

6. References

- 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.
- Anselin, L. (1988): *Spatial Econometrics: Methods and Models*. Dordrecht: Kluwer Academic, p. 284.
- 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.
- 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.
- 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)
- Deavers, K. L. (1997): Outsourcing: a corporate competitiveness strategy, not a search for low wages. *Journal of Labor Research*, 18(4), pp. 503–519.
- 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 (2012): *Knowledge-Intensive (Business) Services in Europe*. Publications Office of the European Union. Luxembourg: Publications Office of the European Union.
- 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)

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

- 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.
- Porter, M. E. (1994): The role of location in competition. *Journal of the Economics of Business*, 1(1), pp. 35–40.
- 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.
- 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*. Paper accepted for publication in *Regional Studies*.
- 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/>
- 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.
- 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.
- Wooldridge, J. M. (2002): *Econometric Analysis of Cross Section and Panel Data*. Cambridge, MA: The MIT Press.

7. Publication list

Published work:

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.

Szerb, L. – Lafuente, E. – Horváth, K. – Páger, B. – Sanders, M. – Stam, E. (2017): *Cross-sectional analysis of REDI and regional growth performance measures* [Online]. FIRES research report. Utrecht (Utrecht University), p. 40. Available at FIRES, <http://www.projectfires.eu/publications/reports/>

Horváth, K. (2017): The adoption of management practices in Hungarian SMEs: An analysis of the role of financial and IT bootstrapping practices on productivity. In: Gelei, A. (ed.): *Sokszínű gazdálkodástudomány. A 2016. év Tudomány Napja alkalmából szervezett PhD konferencia előadásai*. Budapest: MTA IX. Osztály, Gazdálkodástudományi Bizottság, pp. 30–51.

Horváth, K. (2016): A spatial analysis of the territorial servitization process in European regions. In: Kleschné Csapi, V. – Bedő, Zs. (eds.): *ICUBERD 2016 Book of Papers*. Pécs: University of Pécs, pp. 234–247.

Horváth, K. – Szerb, L. (2016): *GEM 2015 Magyarország: Vállalkozások és vállalkozói ökoszisztéma helyzete 2015-ben* [GEM Hungary Report 2015: Enterprises and the state of the entrepreneurial ecosystem in 2015] [Online]. Globális Vállalkozói Monitor Magyarország Jelentések, p. 52. Available at GEM, <http://www.gemconsortium.org/report/49625>

Horváth, K. (2016): Szimbiotikus és parazita pénzkímélő technikák a hazai kkv-k körében [Symbiotic and parasitic financial bootstrapping among Hungarian small firms]. *Marketing és Menedzsment*, 50(1), pp. 36–52.

Work accepted for publication:

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

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

Conferences:

Horváth, K. – Rabetino, R. (2017): *Knowledge-intensive territorial servitization: regional driving forces and the role of the entrepreneurial ecosystem*. Working paper presented at the 6th International Conference on Business Servitization (ICBS), Barcelona, Spain (November, 16th-17th).

Horváth, K. (2016): *A spatial analysis of the territorial servitization process in European regions*. Working paper presented at the International Conference on University-Based Entrepreneurship and Regional Development (ICUBERD), University of Pécs, Hungary (December 1st-2nd).

Horváth, K. (2016): *The adoption of management practices in Hungarian SMEs: An analysis of the role of financial and IT bootstrapping practices on productivity*. Working paper presented at the Tudomány Napi PhD Konferencia, Magyar Tudományos Akadémia, Budapest, Hungary (November 15th).