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Editorial

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Editorial

Territorial servitization: Conceptualization, quantification and research agenda

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ABSTRACT:

Territorial servitization is the analysis of how manufacturing firms and knowledge-intensive business service (KIBS) sectors collaborate in working towards a renaissance of manufacturing competitiveness within regions of developed economies. This editorial note provides four insights. First, it sums up the existing body of knowledge on the topic. Second, it quantifies and maps the territorial servitization activity in Spanish regions. Third, it presents and reflects on the collection of five papers in this special issue, which bring new insights into how geographical proximity, innovation systems, and KIBS heterogeneity benefit our understanding of territorial servitization. Finally, the study provides a number of yet unresolved topics that deserve further academic attention.

KEYWORDS: Territorial servitization; knowledge-intensive business services (KIBS); manufacturing; regional development.
JEL CLASSIFICATION: L26; O14; R58.

Servitización territorial: Conceptualización, cuantificación y agenda de investigación

RESUMEN:

La servitización territorial es el análisis de cómo las empresas manufactureras y de servicios intensivos en conocimiento (KIBS) colaboran para el desarrollo de nuevos modelos de negocio basados en el servicio que llevan al renacimiento de la competitividad industrial de las regiones ubicadas en países desarrollados. Esta nota editorial proporciona cuatro ideas. Primero, resume el cuerpo de conocimiento existente sobre la servitización territorial. En segundo lugar, cuantifica y mapea la actividad de servitización territorial en las comunidades autónomas españolas. En tercer lugar, presenta los cinco trabajos originales publicados en este número especial. Dichos trabajos aportan nuevos conocimientos sobre cómo la proximidad geográfica, los sistemas de innovación y la heterogeneidad de KIBS benefician nuestra comprensión de la servitización territorial. Finalmente, el estudio proporciona una serie de temas aún no resueltos que merecen más atención académica.

PALABRAS CLAVE: Servitización territorial; servicios intensivos en conocimiento; manufactura; desarrollo regional.
CLASIFICACIÓN JEL: L26; O14; R58.

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1. Introduction

Since the 1980s, multinationals have changed production processes. Manufacturing processes have gradually gone from being a local occurrence to a global phenomenon. These changes have increased the productive capacities of manufacturing firms from emerging countries, making it necessary to reinvent the competitive advantage of manufacturing firms in developed countries (Baldwin, 2016). A recent study by Buckley et al. (2020) shows that emerging countries have been able to replicate manufacturing capabilities, but have not yet been able to imitate higher value-added activities related to the use of digital technologies to add value-generating services to the product offering. This process of reinventing the business model of manufacturing firms has been extensively studied in the literature as the servitization of manufacturing (Bustinza et al., 2017; Crozet and Millet, 2017).

As in other European economies, the productive fabric in Spain is dominated by small and medium enterprises (SMEs). SMEs do not have the internal capabilities to develop service-based business models, so they need to collaborate with other firms within the economy. Territorial servitization is the outcome of the symbiotic relation between knowledge-intensive service (KIBS) sectors and manufacturing firms which, in turn, generates superior territorial resilience, manufacturing renaissance and competitiveness, as well as regional development (Lafuente et al., 2017, 2019).

The literature on territorial servitization has great relevance for the regional studies community on two fronts. Firstly, it has important connotations towards the development of cluster policy (or industrial districts), so popular in Spanish regions such as the Basque Country (Aranguen et al., 2014). The introduction of KIBS companies in the environment of such industrial clusters seems inevitable, with an obvious consequence: the creation of multi-industry clusters and local hybrid value-chains (Bellandi and Santini, 2019; Lafuente et al., 2019; Sforzi and Boix, 2019). Second, the literature on territorial servitization contributes to an increase in the literature on how knowledge-based sectors are determining factors in the creation of employment (Lafuente et al., 2017) and the economic and social development of cities and regions (De Propris and Storai, 2019).

Our knowledge on territorial servitization is currently limited. In the present monograph, we offer new research to uncover new nuances on territorial servitization with a focus on the cases of Spain, Italy and Latin America. In the selection of papers, we uncover important issues such as the importance of geographical proximity between manufacturing companies and KIBS, the role of regional manufacturing strength and territorial economic systems in developing the KIBS sector, and existing heterogeneities in KIBS.

The remaining of this introductory paper is as follows. Next section will summarize the key papers in the literature. Section 3 will quantify the phenomenon of territorial servitization in Spain, so we can visualize its recent evolution. Section 4 provides a summary of the contributions published in this monograph. Section 5 finalizes with some unresolved issues that remain as avenues for future research.

2. Background literature

The provision of knowledge-intensive services is recognized as a driver of highly innovative economies (Horváth and Rabetino, 2019). This is sustained on a process of servitization were manufacturing firms implement value-adding services into their operations (Bustinza et al., 2017), shifting product-oriented systems towards outcome-oriented product-service systems. The implementation of services is heterogeneous across servitized manufacturers, but is increasingly popular throughout most developed economies (Buckley et al., 2020; Crozet and Milet, 2017).

The presence of a dynamic KIBS sector results in the renaissance of local manufacturing industry (Sforzi and Boix, 2019). KIBS firms are both sources and carriers of knowledge that inject advanced services across manufacturing firms. KIBS firms therefore positively influence territories by enhancing the

TABLE 1.
Key papers on territorial servitization

Authors & (year)	Journal	Key result	Key focus		
			KIBS Focus	Manuf. Focus	System Focus
PANEL A. BEFORE THIS SPECIAL ISSUE					
Lafuente, Vaillant & Vendrell-Herrero (2017)	*International Journal of Production Economics*	There is a virtuous circle between manufacturing and KIBS activity that generate employment			X
Vendrell-Herrero & Wilson (2017)	*Competitiveness Review*	Detect a growing relevance of KIBS in mainstream servitization literature	X		
Kamp & Ruiz de Apodaca (2017)	*Competitiveness Review*	Industry-level collaboration with KIBS associated with larger exports		X	
Lafuente, Vaillant & Vendrell-Herrero (2019)	*Regional Studies*	Integrative model of territorial servitization			X
Bellandi & Santini (2019)	*Regional Studies*	Territorial servitization analysis based on multiplicity of know-hows, transaction costs and the entrepreneurial drive			X
Gebauer and Binz (2019)	*Regional Studies*	Servitization generates employment and improves technology allocation in regions.			X
Sforzi & Boix (2019)	*Regional Studies*	Uses territorial servitization to conceptually reframe Marshallian districts		X	
De Propris & Storai (2019)	*Regional Studies*	Product-service spatial proximity shapes the value chains of manufacturing activities		X	
Liu, Lattemann, Xing & Dorawa	*Regional Studies*	Framework explains how manufacturing multinationals collaborate with KIBS		X	
Horváth & Rabetino (2019)	*Regional Studies*	Regions with an entrepreneurial ecosystem have higher KIBS formation rates.	X		
Wyrwich (2019)	*Regional Studies*	Strengthening the industrial base in peripheral regions could induce KIBS activity.	X		
Gomes, Bustinza, Tarba, Khan, Ahammad (2019)	*Regional Studies*	There is a connection between larger levels of KIBS deepening and the percentage of servitized manufacturers.		X	

TABLE 1. cont.
Key papers on territorial servitization

Authors & (year)	Journal	Key result	Key focus		
			KIBS Focus	Manuf. Focus	System Focus
PANEL A. BEFORE THIS SPECIAL ISSUE					
Castellón-Orozco, Jaría-Chacón & Guitart-Tarrés (2019)	*Journal of Regional Research*	Most profitable firms tend to servitize more		X	
Bustinza, Gomes, Vendrell-Herrero, Baines (2019)	*R&D Management*	Collaboration with KIBS increase firm performance for servitized manufacturing firms		X	
Bellandi & Santini (2020)	*International Journal of Business Environment*	Place leadership key factor to establish product-service system			X
Vendrell-Herrero, Darko & Ghauri (2020)	*Journal of Knowledge Management*	In developing economies, collaboration with KIBS generates productivity gains for exporters but has the opposite effect for non-exporters.		X	
PANEL B. PUBLISHED IN THIS ISSUE					
Araya, Horváth & Leiva (this issue)	*Journal of Regional Research*	Quality of the local environment is positively associated with KIBS creation.	X		
Seclen-Luna & Moya-Fernandez (this issue)	*Journal of Regional Research*	KIBS proximity increases probability of achieving product innovation in manufacturing firms.	X		
Opazo-Basáez, Narvaiza Cantín & Campos (this issue)	*Journal of Regional Research*	Manufacturer-KIBS relationships more efficient when both companies are geographically closed		X	
Marino & Trapasso (this issue)	*Journal of Regional Research*	There is a path dependency in territorial servitization and therefore policies in lagging regions need to be focusing on developing manufacturing fabric first.		X	
Zubiaurre-Goena & Sisti	*Journal of Regional Research*	Differentiates among technical (T-KIBS), computer-related (C-KIBS), and the professional (P-KIBS) services. Stronger regional innovation system enhances the creation of T-KIBS and P-KIBS.	X		

value of manufacturers' supply of product-service bundles (Lafuente et al., 2017). The presence of KIBS firms in the territory reduces the manufacturer's internal cost of offering advanced services (Vendrell-Herrero and Wilson, 2017). Besides, it alleviates operational weaknesses linked to their liability of both newness and smallness (Gebauer and Binz, 2019) and expands international competitiveness (Kamp and Ruiz de Apodaca, 2017). As such, the territorial servitization domain refers to the meso-level territorial benefits of the co-location between manufacturing companies and KIBS firms within the same territory. KIBS firms tend to agglomerate together with manufactures, developing informal networks and formal strategic partnerships, opening up a virtuous entrepreneurial circle, which in turn positively influence the renaissance of manufacturing (Lafuente et al., 2017). The literature of territorial servitization is emerging. Table 1 provides an up-to-date and exhaustive list of the studies analysing the phenomenon. Table 1 divides those studies published before the present monograph and studies published in the current special issue. It also divides studies based on their focus. Some studies within this domain analyse KIBS deepening within regions, some other studies analyse territorial servitization from a manufacturing perspective.

Finally, most conceptually-based studies have a more integrated and systemic view of territorial servitization, analysing the mechanisms behind manufacturing-KIBS' economic enhancement. The servitization of regions is expected to relaunch growth and sustain long-term competitiveness. As such, placed-based territorial servitization not only enables the upgrading of traditional manufacturing competences, it intrinsically brings new technological capabilities within regions (De Propris and Storai, 2019), enhancing industrial resilience and more sustainable economic growth and prosperity (Bellandi and Santini, 2019).

3. Quantification: the case of Spain

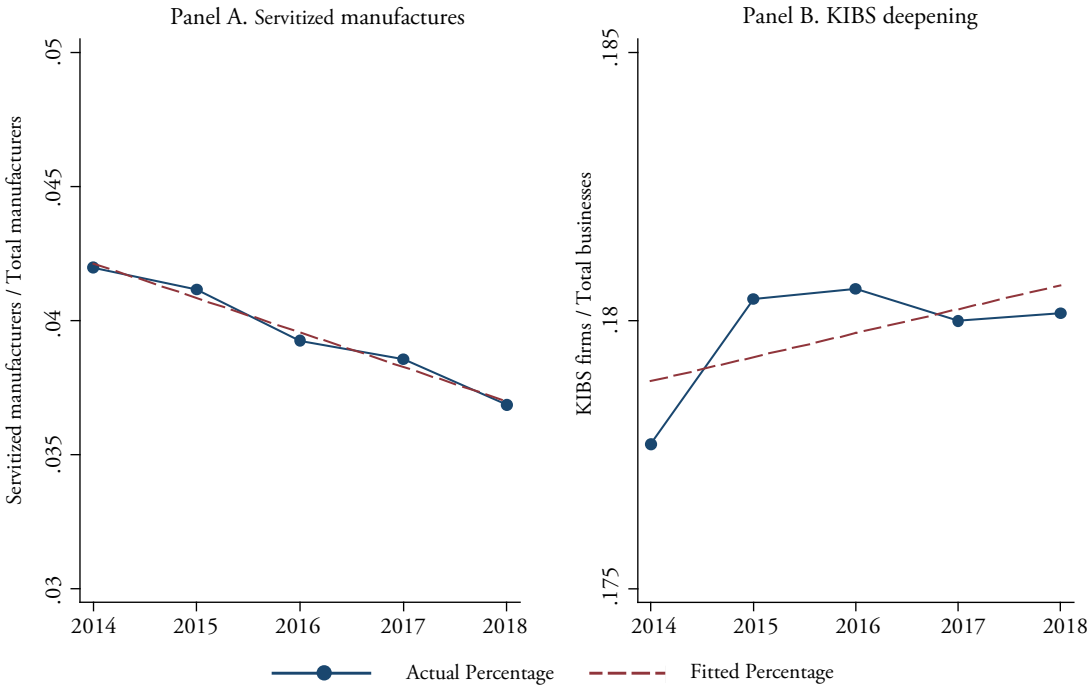
To analyse the Spanish geography of servitized manufacturers and KIBS deepening we construct a database using ORBIS (BvD). The data contains information for the 17 Autonomous communities for the period 2014-2018.

We follow the approach of Gomes et al. (2019) to compute relevant variables: *percentage of servitized manufacturers* and *percentage of KIBS deepening*. The former consists of identifying the number of manufacturing firms in a region/year and the number servitized manufacturers as those firms with secondary sector in the knowledge-based service sector.[1] With this information, we compute the percentage of servitized manufacturers as the ratio of those variables (i.e. servitized manufacturers over total manufacturers). The later consists of identifying the number of KIBS firms as the ones with primary sector in the knowledge-based service sector, and dividing them by the total number of firms in the region/year (i.e. number of KIBS over total businesses in the region). With these two variables, we derive three stylized facts on the development of the Spanish service-based economy.

1. The number of servitized manufacturers is gradually decreasing over time, moving from 4.2% in 2014 to 3.7% in 2018 (see Panel A Figure 1), whereas the number of KIBS deepening is increasing; reaching 18% of total businesses in 2018. The decrease of servitized manufacturers can be caused by many reasons that go beyond the aim of this research. However, taking both results together, one could argue that manufacturing companies are outsourcing the service function to more specialized companies, being consistent with the rise in KIBS, and the postulates of territorial servitization.

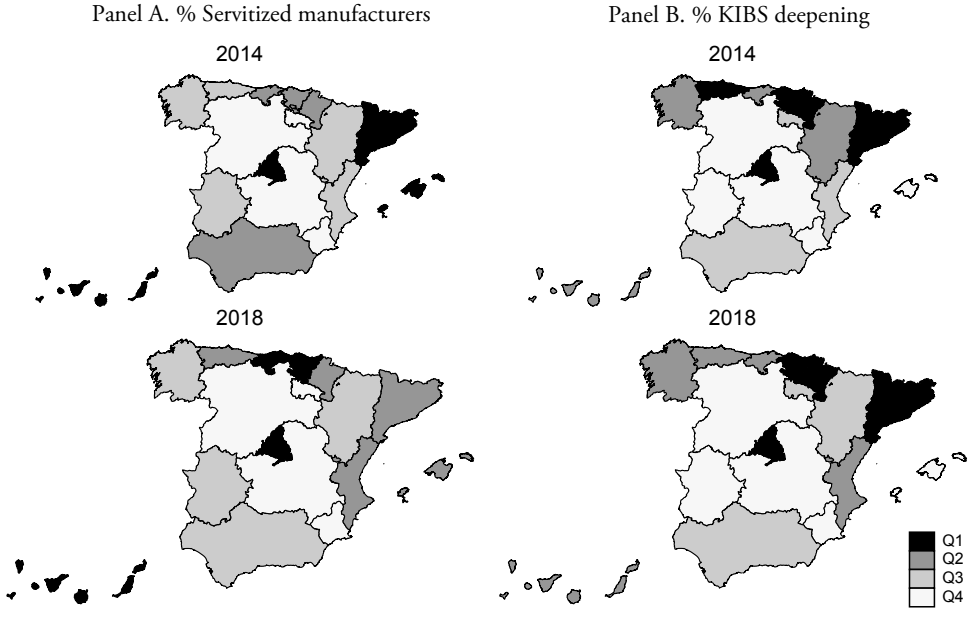
[1] Following standard practice used the following secondary NAICS codes to identify knowledge-based services: 518 "*Data Processing, Hosting, and Related Services*"; 519 "*Other Information Services*"; 54 "*Professional, Scientific, and Technical Services*"; 56 "*Administrative and Support and Waste Management and Remediation Services*"; and 811 "*Repair and Maintenance*".

FIGURE 1.
Servitization and KIBS deepening evolution in Spain (2014-2018)



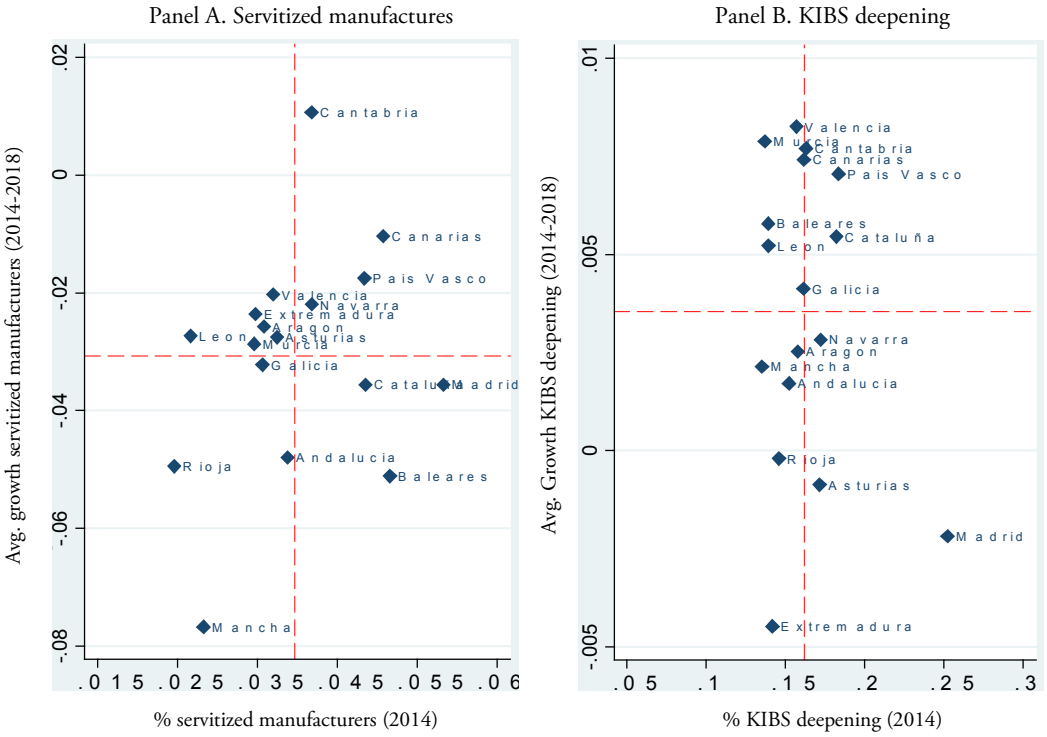
2. Servitization of manufacturing and KIBS fabric seems to occur in the same Spanish regions that normally are described as leaders of manufacturing, innovation and entrepreneurship (Gonzalez-Pernia et al., 2012). Regions as Madrid, Basque Country, Catalonia and Navarre are consistently in the top two quartiles in both periods (see Panels A and B, Figure 2). Some regions traditionally lagging are also top performers, this includes Canary Islands, Balearic Islands and Cantabria in the percentage of servitized manufacturers, and Asturias in KIBS deepening.

FIGURE 2.
Map of servitization and KIBS deepening by Spanish Autonomous Communities



3. Some lagging regions can converge to leading regions. Madrid, the leading region in both indicators, exhibit negative growth in both indications, whereas, lagging regions like Valencia and Cantabria increase KIBS deepening and have neutral growth in servitization of manufacturing, indicting some tendency towards convergence (see Panels A and B, Figure 3). Interestingly, not all regions are able to converge. Examples of that are Andalusia, La Rioja, and Castile-La Mancha for the case of servitized manufactures, and Extremadura for the case of KIBS deepening.

FIGURE 3.
Servitization and KIBS deepening: volume (2014) and growth (2014-2018)



4. NEW ADVANCEMENTS IN THIS SPECIAL ISSUE

The interrelations between manufacturing companies and knowledge-intensive service firms often dominate current territorial servitization discourse, and the papers published in this special issue share this common focus. The special issue contains five research articles that help us to develop further our understanding of territorial servitization. These articles are multidisciplinary and contain quantitative and qualitative evidence from Spanish, Italian and Latin-American regions. In sum, the monograph emphasizes the importance of evaluating the antecedents of KIBS formation, the analysis of KIBS heterogeneity, the significance of KIBS-manufacturing geographical proximity and the re-design of industrial policies in lagging regions.

4.1. ANTECEDENTS IN KIBS FORMATION

In this special issue, Araya, Horváth & Leiva (this issue) provide more nuances on the antecedents of KIBS formation. They evaluate the catalytic power of manufacturing industry to promote change in the rate of business service firms, which constitutes a relevant antecedent to territorial servitization. More specifically, their study analyses the impact of quantitative characteristics (size and relative weight) of the manufacturing sector, while acknowledging the potentially moderating role of local competitive conditions that may explain the different dynamics in the rate of business service firms across territories. Local

competitiveness level is measured by an index number that evaluates various competitive dimensions related to economic and social features of the territory. After employing panel-data models on a sample of 81 Costa Rican counties during 2010-2016, the findings are twofold. First, they demonstrate that structural change towards increased specialization in business services only takes place in counties with a large manufacturing base (a critical mass), while the relative weight of the industry within the local economy does not have an impact. Second, results indicate a substitution effect among the size of the manufacturing industry and local competitiveness: a competitive local environment can compensate the lack of a large manufacturing base, whereas a larger manufacturing base even in a low-competitive region can potentially contribute to increasing rates of business service firms.

A second contribution on the same domain is the article of Zubiaurre-Goena and Sisti (this issue). It uses a rich panel database covering the seventeen Spanish regions for the period 2000-2016 formed by merging secondary data from multiple sources (Spanish Statistical Office (INE), Eurostat, and BvD). Interestingly, the study recognizes KIBS heterogeneity by differentiating into three types: technical KIBS (T-KIBS), computer-related services (C-KIBS), and "traditional" professional services (P-KIBS). The results of the study suggest that KIBS antecedents depend on the type of KIBS analysed. Regions with stronger innovation systems are more likely to generate P-KIBS and T-KIBS, whereas regions with more manufacturing quality are more likely to generate C-KIBS.

4.2. Geographical proximity between KIBS and manufacturing firms

One of the premises of territorial servitization is that geographical proximity is important in developing strong partnerships between manufacturing and service industries; however, with the exceptions of Liu et al. (2019) this premise has not been evaluated empirically (Lafuente et al., 2019). In this special issue, two articles analyze this issue in-depth.

First, Opazo-Basáez, Narvaiza-Cantín & Campos (this issue) follow a qualitative approach to evaluate the importance of geographical proximity in the manufacturing-KIBS collaboration. They used two case studies in the Basque Country. In both cases, the manufacturing company is in the Basque Country. However, they collaborate with KIBS firms from different geographical areas, "inside" and "outside" the Basque region. Their evidence proposes that geographical distance plays a key role on the KIBS-Manufacturer relationship for servitization capacity, the greater the geographical proximity the better.

Second, Seclen-Luna and Moya-Fernandez (this issue) seek to evaluate to what extent the proximity to KIBS firms is beneficial to manufacturing firms' capacity to innovate. Drawing on the World Bank Enterprise Survey (WBES) for eleven Latin-American countries, they analysed 3,029 manufacturing firms, with the purpose to uncover the relationship between KIBS co-locations and the innovativeness of the manufacturing firms. Findings indicated that manufacturing firms' locations based on KIBS proximity, is a critical determinant of product innovation, which could facilitate the adoption of servitization strategies and introduce value-adding services into their operations.

To sum up, these two articles provide consistent evidence that geographical proximity needs to be considered as an important aspect for successful territorial servitization. Both studies recognize the value added obtained from collaborating with a firm that is within the same city/region.

4.3. Territorial economic systems and path dependency policies

Marino and Trapasso (this issue) present the last study in this monograph. Their work addresses a fundamental question: whether industrial policy is best designed based on the development of a knowledge intensive service economy having the same focus for all regions (one size fits it all) or if there are certain intrinsic characteristics that make it necessary for regions to customize their industrial policy. To respond this question, advanced and peripheral regions are considered (Wyrwich, 2019). The study analyses Italian regions for the period 2009 to 2014. It is found that the accumulation of capital and the ability to develop

the service economy are main drivers of regional competitiveness. This means that peripheral regions with fewer resources (capital) and capacities (services) must redirect their efforts in achieving the necessary pre-conditions of territorial servitization. In other words, there are sufficient and necessary conditions to be able to develop territorial economic systems with a strength in knowledge-based services. In the case of not having said conditions, policy makers should first prioritize the construction of the said conditions.

5. Research agenda

This special issue has focused on achieving a better understanding of the role of KIBS firms in the economy. It also has analysed how KIBS are changing business dynamics. To visualize these changing conditions, we paid particular attention to the case of Spain. It is interesting to see how the descriptive data indicates that there is a pattern where the synergies between manufacturers and KIBS seem to be more relevant than internalizing services in-house for the manufacturing sector, as the literature on servitization would invoke. It is also interesting to see how the peripheral regions in Spain are managing to converge to the leading regions such as Madrid and the Basque Country. However, the analysis offered in this introductory article is descriptive in nature and requires future work to characterize with greater rigor and detail the European dynamics in territorial servitization.

With this special issue, we know much more about the interrelations between KIBS and manufacturers and how geographic proximity can improve the effectiveness of these symbiotic relations. Even so, it is necessary to carry out studies that propose specific industrial policies that help state and regional governments to accelerate these servitization processes. This requires considering the joint effect of all industrial and fiscal policies and not evaluating each policy in isolation (Magro and Wilson, 2019). It is also necessary that the policies described have the same practicality and nature as the recommendations given in the practice of strategic management (Bailey, Pitelis & Tomlinson, 2020).

Another point of utmost importance is how the service-based knowledge economy is more resilient than the product-based economy (Ariu, 2016). In this sense, future research can take advantage of the economic disruption of Covid-19 to see the effects of economic resilience in regions with different degrees of territorial servitization. In particular, it will be important to assess the different trends in job destruction / creation in regions with different strengths of territorial servitization. It is important to remind that job creation is an intrinsic feature of territorial servitization (Lafuente et al., 2017) that has not yet been sufficiently studied.

Finally, a reflection on the dynamics of collaboration between KIBS and manufacturing companies. The existing literature does not seem to emphasize market power. On the one hand, KIBS companies may be dominant in some regions, contributing to accelerating the regional servitization process from the side of service innovation. In other regions, it may be manufacturers that have sufficient market power to set the territorial servitization process in motion based on enabling product innovation. Future studies should analyse these dynamics in detail and above all see to what extent they may be the focus of regional policy, or, on the contrary, they may be shaped by the productive dynamics of multinational companies (Buckley et al., 2020), which by re-locating may be able to change the processes of how a region is servitized.

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Articles

The role of county competitiveness and manufacturing activity on the development of business service sectors: A precursor to territorial servitization

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ABSTRACT:

This study evaluates how regional competitiveness and relevant properties of the manufacturing industry—i.e., size and rate of manufacturing firms—impact changes in the rate of business service firms. By employing fixed-effects regression models on a sample of 81 Costa Rican counties during 2010-2016, the findings reveal that the quality of the local environment positively affects business service specialization. Besides, manufacturing businesses contribute to increase in the rate of business services; however, this effect is only significant in counties with a greater manufacturing base, that is, in counties with a critical mass of manufacturers, in terms of number of manufacturers.

KEYWORDS: Territorial servitization; county competitiveness; industry configuration; Costa Rica.
JEL CLASSIFICATION: L26; O14; O54; R58.

El papel de la competitividad cantonal y de la actividad manufacturera en el desarrollo de los sectores de servicios empresariales: un precursor de la servitización territorial

RESUMEN:

Este estudio analiza el efecto de la competitividad regional y de las características relevantes de la industria manufacturera, cómo, el tamaño y la tasa de crecimiento de las empresas manufactureras, sobre la variación en la tasa de las empresas de servicios empresariales a nivel regional. El análisis empírico emplea modelos de regresión de efectos fijos *(fixed-effects regression models)* sobre una muestra de 81 cantones costarricenses para el período 2010-2016. Los resultados revelan que la calidad del entorno local (competitividad regional) afecta positivamente la especialización regional en empresas de servicios empresariales. Además, las empresas manufactureras contribuyen a aumentar la proporción de empresas de servicios empresariales; sin embargo, este efecto solo es significativo en cantones con una mayor base de empresas manufactureras, es decir, en cantones con una masa crítica de empresas manufactureras, en términos de la cantidad de empresas.

PALABRAS CLAVE: Servitización territorial; competitividad cantonal; configuración industrial; Costa Rica.
CLASIFICACIÓN JEL: L26; O14; O54; R58.

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1. Introduction

This study evaluates how counties' competitiveness—i.e., the contextual factors driving local development—and local manufacturing characteristics—i.e., the stock and rate of manufacturing firms—impact the change in the rate of business service firms in a developing country, namely Costa Rica. In the aftermath of the economic crisis that hit most countries after 2008, territories are more exposed to competing demands and policy makers increasingly struggle between the implementation of different support policies and meeting societal goals. Ultimately, these action plans and policy interventions seek to enhance territories' economic development.

In parallel with the call made by public administrations (e.g., European Commission, 2011 and 2014), scholars have recently suggested that policies promoting the development of a solid business service sector that actively interacts with local manufacturers have the potential to revitalize manufacturing sectors and, consequently, territorial outcomes (Lafuente et al., 2019).

Building on the work by Lafuente et al. (2017 and 2019), the emerging research stream of 'territorial servitization' emphasizes the territorial benefits resulting from the mutually dependent connections between manufacturing and knowledge-intensive business service (KIBS) firms. At the territorial level, recent work has confirmed the importance of service transitions for manufacturers (Arnold et al., 2016; Bellandi and Santini, 2019; Castellón-Orozco et al., 2019; Gomes et al., 2019; Sforzi and Boix, 2019); while other studies have verified the role of institutional and spatial attributes on the business formation rate of business service firms (Horváth and Rabetino, 2019; Wyrwich, 2019).

Despite the economic relevance of territorial servitization processes (Lafuente et al., 2019), the overwhelming majority of research has been conducted in developed contexts; therefore, the main hypotheses of the territorial servitization frame remain untested in developing settings.

This is the focus of this study. More concretely, we evaluate how relevant features of manufacturing firms—i.e., stock of firms (size) and rate of manufacturing activities (weight)—trigger structural change in terms of the rate of business service firms, which constitutes a relevant antecedent to territorial servitization processes. Additionally, our approach to territorial servitization acknowledges local competitiveness level as an important source of heterogeneity that may explain the discrepancies in the rate of new business service firms across territories. We argue that local competitive conditions—in our case, measured via the county competitiveness index (CCI) that evaluates various competitive dimensions related to businesses, households and local administrations (Ulate et al., 2012)—plays a decisive role in explaining the territorial servitization hypothesis that states that the rate of new (knowledge-intensive) business service sectors is more vigorous in territories with a solid industrial fabric (Lafuente et al., 2017, p. 21).

The empirical analysis considers a unique dataset that includes information for 81 Costa Rican counties during 2010-2016. The data was generated from two sources. First, economic figures related to population, employment, number of businesses and the configuration of the local industrial fabric were obtained from the Costa Rica Statistics Office (Instituto Nacional de Estadística y Censos, INEC: http://inec.cr). Second, data on the level of competitiveness of Costa Rican counties (municipalities)—i.e., the county competitiveness index (CCI) developed by Ulate et al. (2012)—was obtained from the databases available at the Costa Rica Observatory of Development of the University of Costa Rica (http://odd.ucr.ac.cr).

Costa Rica is an attractive setting for various reasons. First, Costa Rica's successful economic performance—e.g., growth in GDP per head at PPP (1991 = 7,787 US$, 2016 = 14,374 US$)—and social achievements—e.g., life expectancy = 79.6 years, and high level of human capital among the working population (tertiary educational attainment in 2016 = 40%)—realized over the last decades have been acknowledged (OECD, 2016). The positive evolution of Costa Rica's economic and social indicators positions the country atop Latin America, together with Chile (World Economic Forum, 2016), and

opened the doors of the OECD who approved and set out the roadmap for Costa Rica's accession to the Organization in 2015 (OECD, 2015).

Second, manufacturers and business service firms play an important role in Costa Rica's economy. The country's economic strategy has triggered the diversification of the productive basket reflected in the increased importance of manufacturing activities (manufacturing exports grew from 29.80% of total exports in 1980 to 57% in 2015), high-tech electronic products (semi-conductors by Intel) and, more recently, manufacturing goods linked to the medical industry (medical devices and instruments) (OECD, 2017). Additionally, this trend towards a greater alignment with global value chains has also led to the rise of exports of business services, in particular, knowledge-based informatics and information services (OECD, 2017). Besides these achievements, however, the manufacturing industry is highly dependent on foreign enterprises that should be compensated and supported by a strong national business service sector in a synergic manner (Monge-González et al., 2015; World Bank, 2019). In this sense, mutual collaborations based on territorial servitization strategies may constitute an effective way to create synergies and enhance manufacturers' performance.

The contribution of this study is twofold. First, in line with the increased attention on the renaissance of the manufacturing industry recently proposed by policy makers and scholars (e.g., European Commission, 2014; Lafuente et al., 2017 and 2019), the results of the panel-data (fixed-effects) regression models allow to infer the direction of the territorial servitization processes: in our case, the connection between the size of the manufacturing industry and the creation of business service firms constitutes a precursor to territorial servitization, and this relationship is conditioned by the competitive level of territories.

Second, the analysis proposed in this study constitutes the first attempt for scrutinizing territorial servitization processes in developing contexts, thus contributing to the increasing stock of knowledge on territorial servitization (e.g., Horváth and Rabetino, 2019; Lafuente et al., 2019).

The rest of the paper is structured as follows. Section 2 presents the theoretical background and the study hypotheses. Section 3 describes the data, variables, and methods. Empirical results are presented in section 4. Finally, section 5 offers the concluding remarks, policy implications and future research avenues.

2. Background theory and hypotheses development

Since Marshall's (1920) famous claim *"Nature makes no leaps"*, it has become clear that economic growth and development require substantial changes in institutions and restructuring patterns of economies. One way territories experience this upgrading is via structural change that mostly follows a conventional track. 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—, that is, mainly to manufacturing activities. As the economy becomes more developed, 'tertiarization'—i.e., development of the service sector—takes the dominance over the economic landscape (Porter, 1990; Cypher, 2014).

Regarding the 'why' questions, the increased presence of business services in economies has been driven by, among others, the appearance and spread of more advanced technologies, and elevated customer demands that transcends the basic needs (Cuadrado-Roura, 2016). Although the list could be expanded by adding additional factors such as legal and demographic changes, from a territorial development point of view, the elevated inter-industry demand of services from manufacturers has grown to become one of the most recent, high-potential but yet unexplored factor (e.g., Crozet and Milet, 2017; Bellandi and Santini, 2019; Gebauer and Binz, 2019).

Identifying the possible territorial benefits of the interactions between manufacturing and business service firms—e.g., temporary demand from independent service providers, outsourcing activities or business servitization (e.g., Hätönen and Eriksson, 2009; Bustinza et al., 2019)—at the aggregate level,

Lafuente et al. (2017) recently developed the analysis of a phenomenon called 'territorial servitization'. More specifically, the authors define territorial servitization as 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'* (Lafuente et al., 2017, p.20). Although the authors emphasize manufacturing interdependencies with knowledge-intensive business service (KIBS) businesses, previous scientific evidence underlies that the concept of territorial servitization can be reasonably extended to interactions with business service firms (Horváth and Rabetino, 2019). For instance, using input-output analysis, ten Raa and Wolff (2001) found that from the 1980s to the 1990s the increased use of service inputs contributed to higher productivity growth in the US manufacturing industry. 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 industry and, consequently, to the rapid economic growth of the country.

2.1. Territorial servitization: Manufacturers as potential drivers of 'new-age' tertiarization

Prior research shows that geographic proximity still plays a role for territorial development, and that access to a critical mass of key sources of competitive advantage may be crucial (Porter, 1994). For instance, geographical closeness to a high concentration of core business partners—in our case, to manufacturing clients—might facilitate collaboration and knowledge spillovers (e.g., Arnold et al., 2016; Lafuente et al., 2017; Araya, 2019; Bellandi and Santini, 2019).

Based on these arguments, and as revealed in the literature, increasing interdependencies between manufacturing and business service firms might translate into large-scale and self-reinforcing territorial patterns. These processes are compatible with the primary hypotheses of the territorial servitization frame (Lafuente et al., 2017 and 2019). In general, Frenken et al. (2007) distinguishes two types of co-locations among diversified industries. First, they identify 'related variety', in which case industries with complementary competences (knowledge and skills) locate in close proximity that provides a likely source of regional knowledge spillovers. Second, they recognize the case of 'unrelated variety' that stems from the co-location of industries with highly different activities that result in less knowledge spillover between industries.

At the territorial level, scientific evidence provides advantages to both industrial configurations (e.g., Castaldi et al., 2015; Content et al., 2019). Based on these classifications, the relationship between business service firms—e.g., transportation businesses, consultancy businesses—and manufacturing businesses should fit in a moderate related variety category.

Besides the potential gains from knowledge spillover mechanisms that might be more important for knowledge-intensive business service industries, prior scholarly work showed that the demand of manufacturing firms can also positively affect the location decision of business service firms (Guerrieri and Meliciani, 2005; Gallego and Maroto, 2015). For instance, Meliciani and Savona (2015) identified manufacturing industries that are intense users of business services and found that the higher the manufacturing demand the greater the regional specialization is in business services. They measured this intermediate demand by the weighted share of employment in manufacturing industries that are intense users of business services over total employment.

Subsequent contributions aimed to further refine the industrial dynamics that drive the co-location of service and manufacturing firms. Wyrwich (2013) revealed that a higher employment share of manufacturing in a NUTS-3 level region in East Germany might contribute to a higher formation of specific KIBS industries in the same region. In their analysis of Spanish regions (NUTS-2 level), Lafuente et al. (2017) found no significant relationship between the stock of manufacturing firms and the rate of new KIBS firms in the region. In an extended geographic context of 121 European regions (NUTS-1 and NUTS-2 level) from 24 countries, Horváth and Rabetino (2019) found that in a good quality

environment, the rate of manufacturers positively impacts KIBS formation rates in the region. In their study of 17 Spanish and 38 German NUTS-2 level regions, Gomes et al. (2019) showed that the stock of manufacturing businesses is conducive to a higher regional specialization in KIBS activities, a process that is defined as KIBS deepening. From this theory and evidence it seems plausible to argue that manufacturing businesses are economic magnets, and that a larger concentration of manufacturing businesses has the capacity to trigger service-driven structural changes in a territory, which materializes in greater rates of business service sectors.

In the context of this study, for a country like Costa Rica that is strongly dependent on foreign capital, inter-industry interactions might be of crucial importance for enhanced long-term development as well as superior resilience capacities to economic shocks. In this sense, we argue that a dynamically growing business service sector induced by a larger concentration of manufacturing businesses can be considered a precursor to successful territorial servitization processes. Based on these arguments and scientific evidence, we propose our first hypothesis:

Hypothesis 1 (H1). Regions with a solid manufacturing base—in terms of size and relative weight—show higher growth rates of business service sectors.

2.2. Quality of the local environment: Adhesive to territorial servitization processes?

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, co-location of businesses with mutual value-creating potential does not necessarily lead to the emergence of territorial servitization processes. As suggested by, among others, McCann and Sheppard (2003), Lafuente et al. (2010) and Acs et al. (2014), businesses' location decisions should incorporate the analysis of the quality of the local environment. Prior studies suggest that service businesses are likely to do so. Analyzing the regional drivers of territorial servitization, Horváth and Rabetino (2019) found that KIBS business formation is more intense in regions with a better quality entrepreneurial ecosystem. Entrepreneurial ecosystems (e.g., Silicon Valley) are the territorially bounded manifestations of individual characteristics (e.g., capability to recognize business opportunities, risk perception) and institutional factors (e.g., quality of education, support from financial institutions) that drive entrepreneurial actions (Acs et al., 2014). As an extension, existing research shows that territories with a competitive environment are more attractive for business service firms (e.g., Lafuente et al., 2010; Meliciani and Savona, 2015; Bellandi and Santini, 2019). Consequently, we hypothesize that a healthy business environment contributes to a more vivid growth in the number of business services.

Hypothesis 2 (H2). Regions with a more competitive local environment show higher growth rates of business service sectors.

Nevertheless, scientific evidence rooted in the territorial servitization frame shows that the expansion of business service sectors can follow different paths in which the quality of the business environment plays a critical role. On the one hand, as shown by Horváth and Rabetino (2019), in European regions—with a different institutional background across countries—a solid regional manufacturing base can only trigger KIBS formation rates if the region also has a developed entrepreneurial ecosystem. On the other hand, Wyrwich (2019) pointed to an opposite phenomenon, in which the increase in the rate of business services was the result of entrepreneurial opportunity recognition. More concretely, Wyrwich (2019) found that in Eastern Germany where KIBS firms were absent due to the characteristics of the economic system in the early 1990s, KIBS firms increasingly appeared in regions with a strong local manufacturing base during the 1990s. For instance, startup rates in 1994 exceeded the more developed West Germany's startup rates in terms of KIBS businesses. These tendencies continued until 2010, when the startup rates of the two German regions showed a stronger convergence. Wyrwich (2019) explained the phenomenon—that was more pronounced for professional KIBS businesses such as market research businesses and accounting businesses—by the narrowing business opportunities in East Germany.

Based on these two scenarios from which either could be the case for our study territory—that is, regions with more or less developed business environment could constitute an opportunity to launch a business service firm—, we propose the following hypothesis:

Hypothesis 3 (H3). At regional level, the quality of the local environment—in terms of competitiveness—moderates the positive relationship between the local manufacturing base—in terms of size and relative weight—and the growth of business service sectors.

3. Data, variable definition and method

3.1. Data and variable definition

The data used in this study come from two sources. First, economic figures related to population, employment, number of businesses and the configuration of the local industrial fabric were obtained from the Costa Rica Statistics Office (Instituto Nacional de Estadística y Censos, INEC: http://inec.cr). Second, data on the competitiveness of Costa Rican counties—i.e., the county competitiveness index (CCI) developed by Ulate et al. (2012)—was obtained from the databases created by the Observatory of Development (http://odd.ucr.ac.cr) and the School of Economics of the University of Costa Rica (http://economia.ucr.ac.cr).

In this study, the unit of analysis is the county, and the final dataset includes information for the 81 counties that form Costa Rica during the period 2010-2016.[1] The choice of counties as unit of analysis is based on the fact that this territorial unit possesses governmental autonomy to implement specific policies at local level, and thus requires feedback on the outcomes of its territorial decisions. From a policy perspective, monitoring the relative performance of each county allows to formulate relevant support measures as well as to establish priorities with the objective to promote the development of the focal county and, consequently, of the country.

Dependent variable. The dependent variable in this study is the variation in the rate of business service firms expressed in the following form (equation 1):

$$Variation\ in\ the\ rate\ of\ business\ service\ firms_{it} = \frac{Rate\ of\ business\ service\ firms_{it} - Rate\ of\ business\ service\ firms_{it-1}}{Rate\ of\ business\ service\ firms_{it-1}} \quad (1)$$

where, for each county $i = 1, \ldots, N$ ($N = 81$) and year $t = 1, \ldots, T$ ($T = 6$), the rate of business service firms is computed as the number of business service firms divided by the total number of businesses in the county. Due to data availability issues, we employ a broad definition of business services that includes knowledge-intensive services (e.g., transportation and storage, information and communications, and professional and technical services) as well as nonknowledge-intensive business services (e.g., real estate, rental and administrative and support services). This variable reflects the overall variation in the stock of business service firms in each county, that is, the outcome of business entries and exits in the industry.

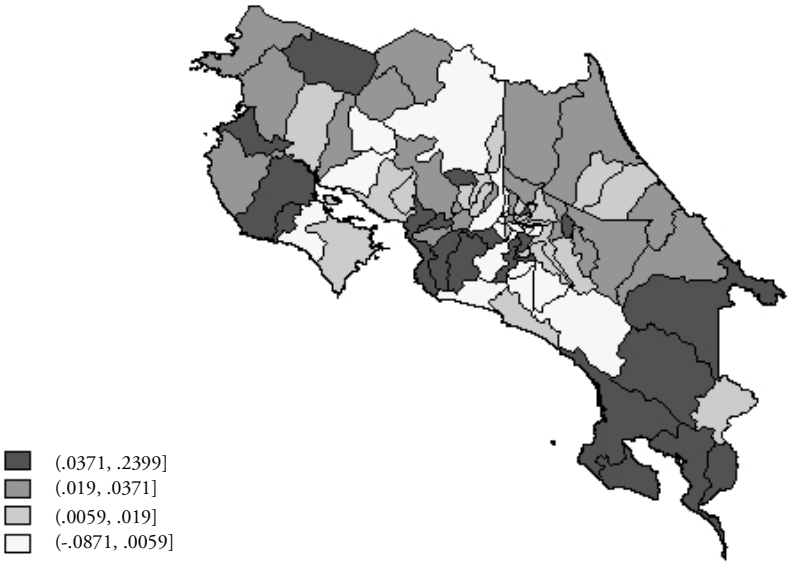
Figure 1 visually presents, for each county, the distribution of the average variation of the dependent variable between 2011 and 2016.

Looking at the figure, we can see that given the number of counties, the most intense changes in business service specialization take place in San José—the province that hosts the capital city of Costa Rica,

[1] The 82nd county (Río Cuarto) was created in 2018, and therefore, is not included in our analysis.

located at the center of the map—as well as in the provinces of Puntarenas—in the center and South-Pacific coast of Costa Rica—and Alajuela—to the north-west side of San José.

FIGURE 1.
Variation in the rate of business service firms in Costa Rican counties (2011-2016)



Source: Authors' elaboration based on the study data.

The strongest positive changes can be observed in Turrubares (0.2399)—the most western county in San José province that almost reaches the Pacific Ocean—and Alvarado (0.1058)—a small county in Cartago province which is located to the east of San José province—which suggest ongoing structural changes in these territories. Similar to the location of counties with the most increasing rate of business services, counties with the lowest variation in business service sectors do not concentrate in one single province. In this sense, San José province constitutes an interesting case of a territory with several counties where business services have gained (and lost) relevance over time. The county with the poorest variation in the share of business services is León Cortés (-0.0871), a small county in the southern part of San José province.

Characteristics of the manufacturing industry. This study employs two variables to measure the importance of manufacturing sectors in a region. First, we analyze the differentiating impact of the *stock of manufacturing firms* that reflects the number of manufacturing businesses in the region. Second, we employ the *rate of manufacturing firms*, that is, the proportion of manufacturing businesses relative to the total number of businesses in a region. The difference between these two approaches is that the rate of manufacturing firms controls for the size of the territory and shows the actual specialization (concentration) in manufacturing, while the stock of manufacturing firms reflects the presence of 'critical mass' in manufacturing in the region. The reason behind the application of both of these approaches comes from the smaller size of the study regions compared to the analyzed territories (NUTS-1 and NUTS-2 level) in previous studies on territorial servitization (e.g., Gomes et al., 2019; Horváth and Rabetino, 2019).

Quality of local environment. We measure the quality of the regional environment using the County Competitiveness Index (CCI), specifically developed for Costa Rican counties by the Observatory of Development and the School of Economics of the University of Costa Rica (Ulate et al., 2012 and 2016). The CCI is a composite indicator (index number) that measures the relative competitive performance of Costa Rican counties. The main objective of the CCI is to aggregate a number of variables connected to different municipalities' stakeholders, including businesses, households and the local

administration (Ulate et al., 2012). The CCI is a good proxy variable to quantify differences in regional attractiveness for business service firms. The CCI includes 37 variables that are grouped into seven pillars (y): (1) economic environment, (2) local administration, (3) physical and digital infrastructures, (4) business environment, (5) human capital, (6) innovative capacities, and (7) quality of life.

According to Ulate et al. (2012), the variables that form the CCI have different measurement scales and, therefore, their values are standardized in the [0,1] range. The standardized variables are then averaged to compute the seven pillars of the CCI. Finally, for each county (i) the value of the County Competitiveness Index (CCI) is obtained as the arithmetic mean of the seven pillars ($CCI_i = \sum w_{ki} y_i \; \forall \; w_{ki} = 1/7$). Table A in the Appendix presents the variables used to compute the seven pillars that make up the CCI.

As it can be noticed in Table 1, small differences can be found in the average regional competitiveness between 2010 and 2016, which is compatible with the notion that significant changes in the regional institutional setting take time. Nevertheless, we can see that from 2010 to 2016 a small decrease took place in the general county-level competitiveness, while in parallel, the difference between regions' competitiveness showed a slight increase.

TABLE 1.
County Competitiveness Index (CCI) in Costa Rican counties (2010-2016)

	Mean	Standard deviation
2010	0.3471	0.1164
2011	0.3432	0.1190
2012	0.3442	0.1133
2013	0.3344	0.1217
2014	0.3409	0.1336
2015	0.3368	0.1220
2016	0.3369	0.1221
Total	0.3405	0.1207

Control variables. We control for population, business size, and time in the different model specifications. The *population* variable is expressed as the number of inhabitants in the county, and it controls for the size of the territory where business service firms are located. Population has been used as a control variable in several economic and regional studies (e.g., Busse and Gröning, 2009; Gantman, 2012; Kauder, 2015).

The second control variable is the *average business size*, measured as the average number of workers per business in the region. A higher average business size in the region can be evidence of either the presence of some outliers—for instance, multinational enterprises (MNEs)—or an environment with generally larger businesses. Therefore, this variable indicates whether business service firms concentrate in areas where large businesses dominate the economic landscape. Actually, it has been shown that the growth ambition of businesses might condition future cooperation-based interactions. For instance, Segarra-Blasco and Arauzo-Carod (2008) found that businesses with a consolidated growth record or those that had taken actions to grow (e.g., higher R&D investment, cooperation with other external parties) are more likely to embark on cooperation agreements with other businesses (e.g., their customers and suppliers). Within the territorial servitization framework, this evidence is supported by Lafuente et al. (2017) who found that, in Spanish regions, the average size of new manufacturers is positively associated with the rates of new KIBS firms in the region.

Finally, we introduced a set of (T-1) *time dummies* to rule out year effects linked to unobserved changes in economic and other environmental conditions that are common to all counties. Notice that,

in all our models, the stock of manufacturing businesses, population and the average business size were logged in order to reduce skewness.

Descriptive statistics for the study variables are presented in Table 2. During the analyzed period, we note that the variation in the rate of business services slowed down. Based on the values depicted in Figure 1, a relatively low variation in this variable was the general trend in most counties. On the other hand, a clearly increasing trend can be observed in the total number of firms at county level. While the average stock of manufacturers remains relatively stable around 59-60 manufacturing firms at county level, we observe a slight structural change that manifests in the decrease in the rate of manufacturers. At the same time, the average population is clearly growing, similar to the average firm size per county.

TABLE 2.
Descriptive statistics for the selected variables (2010-2016)

	Variation in the rate of business service firms	Total businesses	Stock of manufacturing firms	Rate of manufacturing firms	Population (county)	Average firm size (county)
2010		875.88	59.21	0.0641	17739.88	19.31
2011	0.0611	925.23	59.84	0.0611	18497.88	19.17
2012	0.0207	949.00	59.06	0.0592	19231.89	19.67
2013	0.0028	980.01	59.42	0.0581	19758.43	19.66
2014	0.0391	998.77	59.14	0.0568	20146.85	19.61
2015	0.0177	1016.19	59.24	0.0564	20422.25	19.73
2016	–0.0095	1033.49	59.07	0.0554	21065.98	19.92
Total	0.0220	968.37	59.28	0.0587	19551.88	19.59

Sample size: 81 counties.

3.2. METHOD

Concerning the econometric approach, panel data analysis is the most efficient tool when the sample is a mixture of time series and cross-sectional data, since this structure allows for taking into consideration the unobservable and constant heterogeneity, i.e., the specific characteristics of each county. In line with the arguments that underpin this study, we employ panel data techniques to estimate the proposed model emphasizing the relationship between county competitiveness and variations in the rate of business service firms. Pooling repeated observations on the same counties violates the assumption of independence of observations, resulting in autocorrelation in the residuals, thus rendering ordinary least squares (OLS) estimates inefficient and biased (Wooldridge, 2002). Therefore, we estimate fixed-effects panel data models with robust standard errors to take into account the unobserved and constant heterogeneity among the analyzed counties. Also, the use of fixed-effects models controls for the potential endogeneity problems that result from the correlation between the explanatory variables and the time-invariant county-specific unobserved heterogeneity (Greene, 2003).

To evaluate the role of county competitiveness and the local manufacturing fabric on changes in the rate of business service firms, we propose a fixed-effects model with the following form:

$$Variation\ in\ the\ rate\ of\ business\ service\ firms_{it} = \beta_0 + \beta_1 CCI_{it-1} + \beta_2 Manufacturing\ industry_{it-1} + \beta_{12} CCI_{it-1} \times Manufacturing\ industry_{it-1} + \beta_3 Population_{it-1} + \beta_4 Avg.business\ size_{it-1} + \sum_{k=1}^{T-1} \beta_k Time_t + \eta_i + \varepsilon_{it} \quad (2)$$

where $i = 1, \ldots, N$ (N = 81) and $t = 1, \ldots, T$ (T = 6) represent the cross-sectional units (counties) and the time periods, respectively. In equation (2), β is the vector of coefficients estimated for the independent variables, η_i is the time-invariant fixed-effect that controls for unobserved heterogeneity across counties (i), and ε_{it} is the stochastic normally distributed error term that varies cross-counties (i) and cross-time (t).

4. RESULTS

Table 3 presents the results of the fixed-effects regressions for our two models. For both Model 1 (with the stock of manufacturing firms) and Model 2 (with the rate of manufacturing firms) we have a baseline (a) and a full model (b) including the interaction term between the analyzed manufacturing features and county competitiveness. To address the threat of collinearity, we computed the average variance inflation factor (VIF) for all variables and models. In all model specifications, the average VIF values are below the commonly accepted cut-off threshold of ten. The results for these diagnostic tests do not raise collinearity concerns.

TABLE 3.
Fixed-effects panel regression results

(Dependent variable: Variation in the rate of business service firms, number of counties: 81, time period: 2010–2016, N=486)

	Model 1a	Model 1b	Model 2a	Model 2b
County competitiveness index (CCI) (t-1)	0.3315 (2.06)**	1.7685 (3.25)***	0.3384 (2.09)**	0.6771 (1.84)*
ln Stock of manufacturing firms (t-1)	0.0237 (1.74)*	0.1660 (2.52)**		
Rate of manufacturing firms (t-1)			0.4982 (1.55)	2.5991 (1.21)
CCI (t-1) × ln Stock of manufacturing firms (t-1)		–0.4497 (3.17)***		
CCI (t-1) × Rate of manufacturing firms (t-1)				–6.1470 (1.12)
ln Population (county) (t-1)	–0.2531 (0.72)	–0.3092 (0.89)	–0.2613 (0.75)	–0.1975 (0.57)
ln Average business size (t-1)	–0.0035 (0.49)	–0.0028 (0.40)	–0.0042 (0.63)	–0.0032 (0.47)
Time dummies	Yes	Yes	Yes	Yes
Intercept	2.6117 (0.72)	2.7749 (0.78)	2.7569 (0.76)	1.9529 (0.54)
F test	7.06***	8.01***	7.44***	7.01***
R2 (within)	0.1169	0.1532	0.1175	0.1241
Average VIF	3.55	8.46	1.43	9.53
Observations	486	486	486	486

All time varying independent variables are lagged one period to avoid potential endogeneity problems related to joint causality. Values in parentheses are absolute t-statistics based on robust standard errors adjusted by heteroskedasticity. *, **, *** indicate significance at 10%, 5% and 1%, respectively.

From the results presented in Model 1a in Table 3 we observe that the size of the manufacturing industry—i.e., stock of manufacturers—has a positive effect on the annual change in the rate of business

services at county level. Additionally, the results for Model 1a in Table 3 reveal that the quality of the local environment—measured by the County Competitiveness Index (CCI)—positively impact the annual change in the rate of business services at county level. This latter result connecting the CCI and the variation in the rate of business service firms is consistent throughout the different model specifications (Table 3).

The findings in Model 1b show a different case. While the individual effect of the size of the manufacturing base and the CCI is generally positive, the result of the interaction term between these two variables is negative and significant. This means that the two influencing factors act as substitutes, that is: counties with a relatively small manufacturing base can increase their attractiveness and promote the creation of business service firms by developing a more competitive local environment, and vice versa.

Models 2a and 2b analyze the same phenomenon but using a different approach to quantify the potential effect of the manufacturing industry, that is, using the rate of manufacturing businesses in the region. The results confirm that more business service firms are created in counties with a more competitive environment, while manufacturing specialization (i.e., the rate of manufacturing firms) has no impact on the county-level variation in the rate of business service firms.

Overall, our results indicate that a higher concentration of manufacturing businesses in a county can actually induce a more dynamic growth in the rate of business service firms; however, this effect is statistically significant only when the size of the manufacturing industry (number of manufacturers in the region) is the focal industry-related variable (Models 1a and 1b). These findings give partial support to the hypothesis H1 that states that a higher concentration of manufacturing businesses is conducive to a more dynamic growth of the business service sector in the region. Additionally, the results consistently show a significant positive effect of the quality of the local environment (measured via the CCI) on the variation of business service firms. This finding gives support to our hypothesis H2 that proposes that territories with a more competitive local environment show higher variations in the rate of business service firms.

Finally, the results do not support our hypothesis H3 that emphasize the joint effect of manufacturing specialization and county competitiveness on the rate of new business service firms. On contrary, it was found in this study that counties can compensate their low manufacturing specialization—in terms of the size of the local manufacturing base—with a more competitive environment that attracts business service firms (Model 1b).

5. Concluding remarks and future research avenues

5.1. Concluding remarks

The study presented in this paper looks into whether relevant characteristics of the manufacturing industry—i.e., size and relative importance in the local industrial fabric—and the competitive level of territories—measured via the county competitiveness index—trigger territorial servitization processes via enhanced rates of business service firms. In our view, the analyzed phenomenon constitutes an important precursor to the even more valuable, knowledge-driven territorial servitization phenomenon (Lafuente et al., 2017).

By employing panel-data (fixed-effects) models on a unique sample comprising information for 81 Costa Rican counties during 2010-2016, the results of this study provide further evidence that contributes to understand how territories with different competitiveness levels can orchestrate their resources and industrial base to promote territorial servitization processes.

Our findings show that the interconnectedness between manufacturing and business service businesses might play a role for explaining business service specialization patterns at the territorial level. However, it was found that structural change towards increased specialization in business services only takes place in territories with a relative large manufacturing base, in terms of number of manufacturing

businesses; while no significant effect was reported for regions with high rates of manufacturers. These findings suggest that firms operating in business service sectors choose to locate in areas that provide a high enough potential customer base, that is, a critical mass of manufacturers. Although this result arguably contradicts the arguments found in previous studies on territorial servitization (e.g., Lafuente et al., 2017; Horváth and Rabetino, 2019), it should be noted that in a country where counties are relatively small the presence of a critical mass of potential customers—in our case, the stock of manufacturing firms—may constitute an economic incentive to develop a strong business service sector.

Additionally, and similar to Horváth and Rabetino (2019), we found a positive association between counties' competitive environment and the specialization in business service sectors, and that a competitive local environment compensates the lack of a large manufacturing base when it comes to attract business service firms. Nevertheless, we also found that a stronger manufacturing base even in a low-competitive region can potentially contribute to increasing rates of business service firms. Within a national context, Wyrwich (2019) reported similar findings which suggest that in some cases, business service firms can exploit temporary industry gaps (e.g., related to increasing demand) emerging in less competitive areas.

5.2. Academic and policy implications

This study has important implications for scholars and policy makers. From an academic perspective, the results highlight that, in small geographic areas, both local competitiveness and a strong manufacturing base are important conduits of increased business service specialization. This is an important contribution of this study. Also, prior research has mostly analyzed territorial servitization processes in developed settings (e.g., Lafuente et al., 2017; Bellandi and Santini, 2019; Gomes et al., 2019; Horváth and Rabetino, 2019; Sforzi and Boix, 2019), while this study is the first attempt for analyzing territorial servitization processes in a developing country, thus contributing to increase the stock of knowledge on this research stream (Lafuente et al., 2019).

For policy makers, the results of the quantitative models corroborate that territorial servitization processes can be stimulated in different economic contexts, and that policy actions in this direction have the potential to promote the development of business service sectors. The findings presented in our study are in line with recent arguments on the importance of the renaissance of the manufacturing industry for territorial performance (e.g., European Commission, 2014; Lafuente et al., 2017 and 2019). In this sense, we argue that the result connecting the size of the manufacturing base to the creation of business service firms is a precursor to territorial servitization. However, this relationship is conditioned by counties' competitive level. Therefore, we suggest that local administrations (at county level) should have a more specific and targeted design to successfully create and/or develop a more competitive environment that attracts both business service and manufacturing firms and, consequently, encourage territorial servitization processes.

We emphasize the development of specific policies because any support action may turn sterile if policy makers adopt a generalist approach that does not take into consideration the heterogeneous nature of the local industrial fabric and the specific needs of the different agents that operate within any focal county. Besides bringing together manufacturing and business service firms, policy makers should focus on the design of specific actions that facilitate the quality enhancement of local conditions. In particular, specific elements that are important for manufacturers may foster the creation of business service firms and, in turn, enhance territorial servitization. In line with Lafuente et al. (2017) and Horváth and Rabetino (2019), these policies should focus on the promotion of both technological developments—e.g., digital infrastructures—and other forms of innovation linked to organizational change—e.g., integration of digital technologies into production processes—which may contribute to generate effective networks with implications for territorial servitization processes.

For instance, after the abolition of the army in 1948, Costa Rica adopted a sustained policy that emphasized investments in health and public education. This policy shift towards high-quality human capital gave a major push to territorial servitization processes by attracting significant foreign direct

investment (FDI) (Procomer, 2018) that generated knowledge, technology and productivity spillovers to the national economy. More specifically, a productivity increase of 8.1% took place in the manufacturing sector and 9% in the service sector between 2011 and 2015 (Medaglia and Mora, 2016). Sectors that have benefited from FDI include information technology (IT) services, medical and precision equipments, and electronic equipments. These sectors have been integrated into the global value chains, and show a growing trend in generating value added and attracting world leading companies (Gereffi et al., 2013).

5.3. Future research lines

The work is not exempt from limitations that, in turn, offer space for further research. First, the relevance of the quality of the local environment should be further analyzed in future research by identifying the weight of the entrepreneurial ecosystem in the local economy. An analysis that incorporates the quality of the local entrepreneurial ecosystem can offer important insights that can help explain territorial servitization outcomes (Horváth and Rabetino, 2019). Second, future studies should take into consideration the presence of manufacturing clusters when evaluating territorial servitization processes (Bellandi and Santini, 2019). Third, due to data availability issues, this study uses large aggregates of business service sectors. Future research should investigate how a higher presence of manufacturing businesses encourages the development of specific industries (e.g., transportation, research and development services) in a territory. Finally, it is plausible to argue that a spatial dependence exists between the analyzed counties. In this sense, future studies should conduct spatial diagnostics and test the extent to which Costa Rican counties affect each others' capacity to contribute to territorial servitization processes.

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APPENDIX

TABLE A.
The structure of the County Competitiveness Index: Variables and pillars

Variable	Sub-index (pillar)	Index
1.1. Electricity consumption growth rate	Local economy	County Competitiveness Index (CCI)
1.2. M2 of construction per Km2		
1.3. Municipal expenditures per capita		
1.4. Total exports per worker		
2.1. Municipal income per capita	Local administration	
2.2. Municipal non-administrative expenditure per capita		
2.3. Degree of dependence on public sector transfers		
2.4. Time to grant patents (days)		
2.5. Participation in municipal and presidential elections		
2.6. County road network: Expenditure on roads per Km		
2.7. Number of environmental impact evaluations per construction permit		
3.1. Percentage of paved road network	Local infrastructures	
3.2. Housing with access to electricity per Km2		
3.3. Percentage of houses with access to drinking water		
3.4. Percentage of houses with access to Internet		
3.5. 4G mobile network coverage and quality*		
3.6. 4G global download performance percentage*		
4.1. Competition index	Business environment	
4.2. Number of financial entities (branches) per Km2		
4.3. Activity concentration index		
4.4. Percentage of exporting companies		
5.1. English coverage in elementary school	Work environment (workers' human capital)	
5.2. Secondary studies enrolment		
5.3. Tertiary education enrolment		
5.4. Economically active population		
5.5. Workers' specialization in services and industry		
5.6. Growth rate of formal employment relative to the economically active population		
6.1. Concentration of exports in high technology sectors	Innovative capacities	
6.2. Tertiary enrolment (%) in science and technology		
6.3. Rate of education centres (elementary schools and high schools) with Internet connection		
7.1. Mortality rate caused by infections	Quality of life	
7.2. Number of entertainment establishments per 10-thousand inhabitants		
7.3. Homicide rate (deaths)		
7.4. Inhabitants per primary health care centre (EBAIS)		
7.5. Robberies and assaults per 10-thousand inhabitants		
7.6. Municipal effort in environmental mitigation		

* Before 2016, the reference technology was 2G and 3G. Source: Authors' elaboration based on Ulate et al. (2012).

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Articles

Panel analysis of the creation of new KIBS in Spain: The role of manufacturing and regional innovation systems (RIS)

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Abstract:

Territorial servitization is a topic of interest due its impact on regional growth and innovation. Considering that the formation of new KIBS is a good indicator of such TS process and with the aim of contributing to the empirical literature on this topic, this study analyses to what extent the 'manufacturing quality' and 'innovation environment' profiles determined the different types of new knowledge intensive business services (KIBS). The research tackles the creation of new KIBS in 17 Spanish regions for the period 2000 to 2016 in the respective regions. The results reveal that new KIBS were deeply affected by economic changes that happened as a result of the great 2008 crisis and some KIBS categories are more affected by the techno-economic environment than others.

Keywords: Servitization; knowledge-intensive business services; innovation; typology.
JEL classification: L80; L26; P25.

Análisis de datos de panel de la creación de nuevas KIBS en España. La importancia de la manufactura y el sistema de innovación.

Resumen:

La servitización territorial es un tema de interés debido a su impacto en el crecimiento regional y en la innovación. Con el objetivo de contribuir a la literatura empírica sobre este tema, este estudio analiza en qué medida los perfiles de 'calidad manufacturera' y 'entorno de innovación' de 17 regiones españolas para el período 2000 a 2016 afectan la creación de los diferentes tipos de nuevos servicios empresariales intensivos en conocimiento en las respectivas regiones, siendo esta creación un buen indicador de las condiciones para la servitización territorial. Los resultados, además del gran impacto de la crisis del 2008, revelan que no todos los KIBS son iguales y que algunas categorías de KIBS están más afectadas por el entorno tecnoeconómico.

Palabras clave: Servitización; servicios avanzados en conocimiento; innovación; tipología.
Clasificación JEL: L80; L26; P25.

1. Introduction

Servitization is a new competitive model in which manufacturing firms create added value by transitioning from products to services with the aim of raising revenues and maintaining a sustainable competitive advantage in global markets (Vandermerwe & Rada, 1988; Bowen, Siehl & Schneider, 1989; Cohen & Whang, 1997; Kamp & Parry, 2017, Belandi & Santini, 2019).

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Academic discussion has acknowledged the role of KIBS in servitization and highlighted how manufacturers can achieve product-service innovation by partnering with KIBS (Bustinza et al. 2017). The recent literature on servitization shows that not only firms but whole territories can benefit from the positive effects of a solid KIBS sector (Lafuente, Vaillant & Vendrell-Herrero, 2017). The advantages of servitization do not apply only to companies but tend to spill over into the surrounding region (Gebauer & Binz, 2019) since territorial servitization "not only enables the upgrading of existing manufacturing competences but also offers an opportunity to develop and anchor new technological capabilities within regions" (Lafuente et. al, 2009). Accordingly, the growth of the KIBS sector is viewed as an indicator of regional modernization and renewal (Corrocher & Cusmano,2014; Horvath&Rabetino,2018) and it is worthy to analyze the factors underlying the formation of new KIBS since the existence of KIBS is considered a good indicator of territorial servitization.

Despite the fact that KIBS have been recognized as successfully achieving technological outcomes, few studies have examined the specific regional factors that cause heterogeneity in the creation of new KIBS. More recently, however, a line of research has examined territory-specific aspects of KIBS formation rates. Noteworthy examples include the studies by Horvath & Rabetino (2018), Wyrwich (2019) and Gomes et al. (2019). Wyrwich (2019) analyses the connection between local manufacturing and KIBS start-ups, while Horvath & Rabetino (2018) also takes the entrepreneurial ecosystem into consideration. Meanwhile, Gomes et al. (2019), who also understand servitization as a response to a demand by regional manufacturing firms for new knowledge with which to innovate the provision of products and services, introduces and defends the idea that a greater knowledge stock leads to greater territorial servitization.

Elsewhere, Koch & Stahlecker (2006) used qualitative methodology to compare Bremen, Munich and Stuttgart (Germany), three powerful socioeconomic, manufacturing regions, and concluded that different economic, technological and institutional (RIS) preconditions affect the creation of new KIBS. Building on Koch & Stahlecker (2006), this article addresses the following research question: Does a stronger manufacturing base and the quality of the Regional Innovation System influence the creation of new KIBS?

It is well known that KIBS are specialized in a range of diverse technological activities such as R&D, management, and IT outsourcing, (Strambach, 2001; Lafuente et al. 2017; Horvarth and Rabetino, 2019). In addition to the "mainstream" differentiation between T-KIBS and P-KIBS adopted by Miles et al. (1995) this paper also includes i) T-KIBS (R&D and other technical services); ii) C-KIBS (computer-related services) and iii) P-KIBS (legal services, consultancy and market services). In order to address the different KIBS branches, this study formulated a second research question: Is the positive correlation between the quality of the Regional Innovation System and the formation of new KIBS equally significant in all the KIBS categories?

For this research, quantitative panel data techniques were applied to a purpose-built data base consisting of 289 observations from 17 Spanish regions over a 16-year period from 2000 to 2016. The data was sourced from the Spanish Statistical Office (INE), Eurostat, and the SABI-Informa database. The results corroborate the positive relation between the strength of the RIS (Regional Innovation Index) and the creation of new KIBS of all kinds. However, the positive relation is not so clear when considering the quality of manufacturing, since only the creation of new C-KIBS are correlated positively to employment in high and medium-high manufacturing firms. It is also remarkable that the foundation of new KIBS was deeply affected by economic changes happened as a result of the 2008 great crisis.

This study offers two main contributions to the scarce empirical research on regional heterogeneity in the creation of new KIBS (Meliciani & Savona, 2015, Lafuente et al. 2017; Horvath & Rabetino 2019). Firstly, a distinction was made between technical KIBS (T-KIBS), computer-related services (C-KIBS), and "traditional" professional services (P-KIBS). Secondly, and an extensive database was created using data from 2000 to 2016 which allows to examine the impact of the economic crisis on the creation of advanced services firms, and to use panel data techniques adding value to the study. Additionally, we believe that this this work reinforces the path undertaken by Castellón-Orozco, Jaría-Chacón & Guitart-

Tarrés (2019) and contributes to a better knowledge of territorial servitization within the Spanish environment.

The paper consists of five parts. The key theoretical considerations regarding the manufacturing and innovation features of the KIBS and the regions are presented in Section 2. Section 3 presents the regional statistical data for Spain. Section 4 explains the data and research method guidelines. The results are presented in Section 5. Finally, some brief conclusions and policy recommendations are discussed in section 6.

2. THEORETICAL APPROACH

The concept of servitization was introduced at the end of the last century to describe an emerging trend where manufacturers introduced combined product-service offers (Vandermerwe and Rada, 1988; Bowen, Siehl, & Schneider, 1989; Cohen and Whang, 1997; Kamp & Parry, 2017; Bustinza et al., 2017). These competitive strategies were either developed in-house or outsourced to knowledge-based services (Vandermerwe & Rada,1988; Wise & Baumgartner, 1999). Bustinza et al. (2017) claim that strategic partnerships between manufacturing and KIBS companies foster servitization and minimize risks inherent to all innovation since these alliances allow manufacturing companies to focus in their unique resources and core competences.

Recently, Lafuente et al. (2017) introduced the concept of territorial servitization as a new economic paradigm to highlight the influence of KIBS on territorial growth dynamics through the formation of a virtuous circle in which manufacturers and KIBS reinforce each other through iterative relationships, stimulating innovation within a territorial boundary (Lafuente et al., 2017). Basically, this means "a symbiotic recoupling between services and manufacturing with a spatial dimension" (De Propis & Storai, 2019) is created which benefits the whole territory (Arnold et al., 2016, Lafuente et al., 2017; Horwarth & Rabetino, 2019; Gomes et al., 2019). In this vein, one of the main features of the literature on the new territorial servitization trend is the recognition of the importance of KIBS firms because growing numbers of KIBS in a region may be indicative of a more vigorous servitization-enhancing regional environment (Gomes et al. 2019).

In assessing the effects of the development of new KIBS on regional outcomes, the debate is based on the assumption that KIBS are agents of knowledge transformation (Strambach, 2008; Muller & Doloreux, 2007). Specifically, KIBS are considered supply vehicles of specialized expertise, providers of high skills resources, and are characterized by their involvement and participation in complex operations (Muller & Doloreux, 2007).

Again, KIBS are specialized in different activities such as R&D, management, and IT outsourcing, (Strambach, 2001; Lafuente et al. 2017; Horvarth and Rabetino, 2019). However, few servitization studies have developed KIBS typologies based on specializations, with the exception of the recent work by Wrywich (2019). Wrywich carried out an empirical analysis of KIBS start-ups in East and West Germany in which he made a distinction between professional P-KIBS services and new technology-based T-KIBS. His study confirms that all KIBS do not behave in the same way when P-KIBS and T-KIBS are considered different dependent variables.

The classification of KIBS firms according to their specializations has also been discussed in the literature (Miles et al., 1995; Haas & Lindemann, 2003; Bhom & Thomi, 2003; Koch & Stahlecker, 2006; Gallego & Maroto, 2013; Wrywich, 2019). According to conventional categorizations, manufacturing firms demand legal services, consultancy, and market services from P-KIBS, and use technical expertise from T-KIBS to improve their product portfolios.

However, due the dynamic nature of the knowledge that flows between KIBS and manufacturing firms, definitions of the boundaries for categorizing KIBS have also been discussed (Koch & Stahlecker, 2006). In this context, it is worth pointing out that digitalization, in particular, has facilitated servitization

by making it easier to create new services, platforms, and intelligent products (Kohtamäki et al., 2019). For this reason, we recommend placing all computer-related C-KIBS services in a separate category from the other technical T-KIBS services.

When discussing the factors that determine the development rate of new KIBS, the literature on territorial servitization mentions the spillover effect that occurs in consolidated manufacturing regions as enhancing the local development of KIBS. Lafuente et al. (2017) also corroborated that manufacturing creates a demand for local KIBS. This is a core idea that has been driven throughout the empirical research into territorial servitization. A recent empirical study by Horváth & Rabetino (2019) highlighted the importance of the regional industrial fabric – apart from the entrepreneurial environment – in developing a competitive KIBS sector. However, these authors stress that the quality of manufacturing should be included in the empirical assessment and propose studying the average size of manufacturing companies. While Horváth & Rabetino (2019) and Wrywich (2019) both point out that manufacturing companies are KIBS' main clients, Wrywich also assesses the quality of manufacturing by focusing on R&D-intensive manufacturing companies.

Hypothesis 1: A strong local manufacturing fabric characterized by higher levels of R&D is conducive to greater numbers of new KIBS.

Another facet to consider in terms of the "host environment" is the combination of a variety of regional determinants which may create an environment which is conducive to innovation (Fernandez de Lucio et al., 2003). In particular, the regional innovation system (RIS) approach focuses on the factors that condition the creation and diffusion of knowledge at a regional level (Cooke et al., 1997; Morgan, 1997; Maskell & Malmberg, 1999; Asheim & Gertler, 2005; Tödtling & Trippl, 2005; Martin & Trippl, 2014). This conceptual framework assumes that innovation activities are based on interactive learning and emphasizes the importance of knowledge flows and networks which require intensive communication and collaboration between different actors (Lundvall 1992, Edquist, 2005). Indeed, when RIS actors, organizations and institutions develop strong communication networks, the result is a continuous flow of knowledge, skills and human resources at the regional level, leading to systemic innovation activities (Martin & Trippl, 2014). Gomes et al. (2019) acknowledge that technological and scientific knowledge is a critical factor in attracting new knowledge-intensive companies to a region and therefore increasing its potential for servitization. However, evidence shows that regions differ markedly in their commitment to developing innovation-related organizations and institutions (Martin&Trippl, 2014), and particularly evolve over time (Edquist, 2005; Isaksen & Trippl, 2016).

Since to induce or manage innovations is a multidimensional, social, interactive and complex task, it needs to be evaluated in a broad sense (Zabala-Iturriagoitia et al. 2007). The Regional Innovation Scoreboard is the most comprehensive database that allows at least basic evolutionary trends to be compared at regional scale (Blažek & Kadlec, 2019). This synthetic indicator is based on 17 indicators covering framework conditions, investments, innovation activities and innovation impacts (Hollanders et al., 2019).

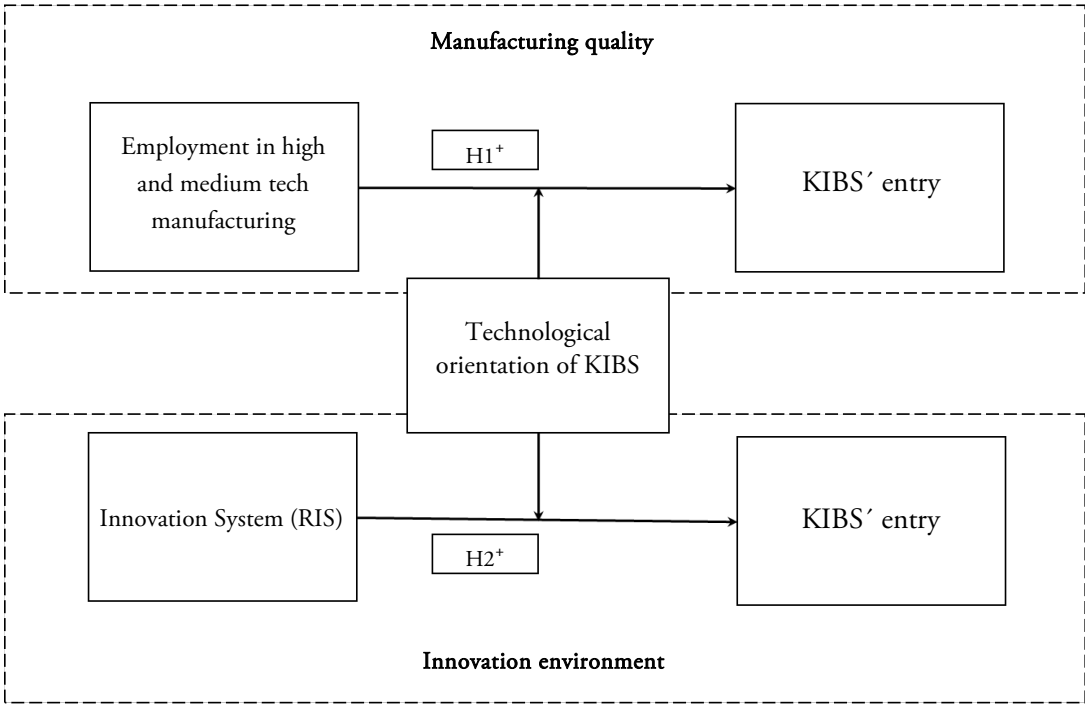
Hypothesis 2.a: The quality of Regional Innovation Systems as characterized by the Regional Innovation Scoreboard affects the entry rate of new KIBS.

When using the Regional Innovation Systems as a framework for understanding innovation, the concept of differentiated knowledge bases (analytical, synthetic and symbolic) are equally important in order to understand the learning process (Asheim et al., 2011) as they contain different combinations of tacit and codified knowledge and require different innovation skills. The evidence shows profound differences between regions in industrial structures and the degree of specialization of the region's KIBS that may be caused by the knowledge and diffusion dynamics, as well as by the innovation patterns and challenges (Isaksen & Trippl 2016).

Hypothesis 2.b: The relationship between the quality of the Regional Innovation System and the entry rate of new KIBS is not the same for all KIBS categories.

In summary, when analyzing determinants of KIBS creation, our conceptual approach (Figure 1) suggests that both regional structure characteristics, manufacturing quality and innovation environment, could determine the emergence of new KIBS. However, we propose that not all KIBS are equally affected by regional factors and we hypothesize that the technological orientation of KIBS could mediate in the creation rate.

FIGURE 1.
Conceptual approach



Source: Researchers' own.

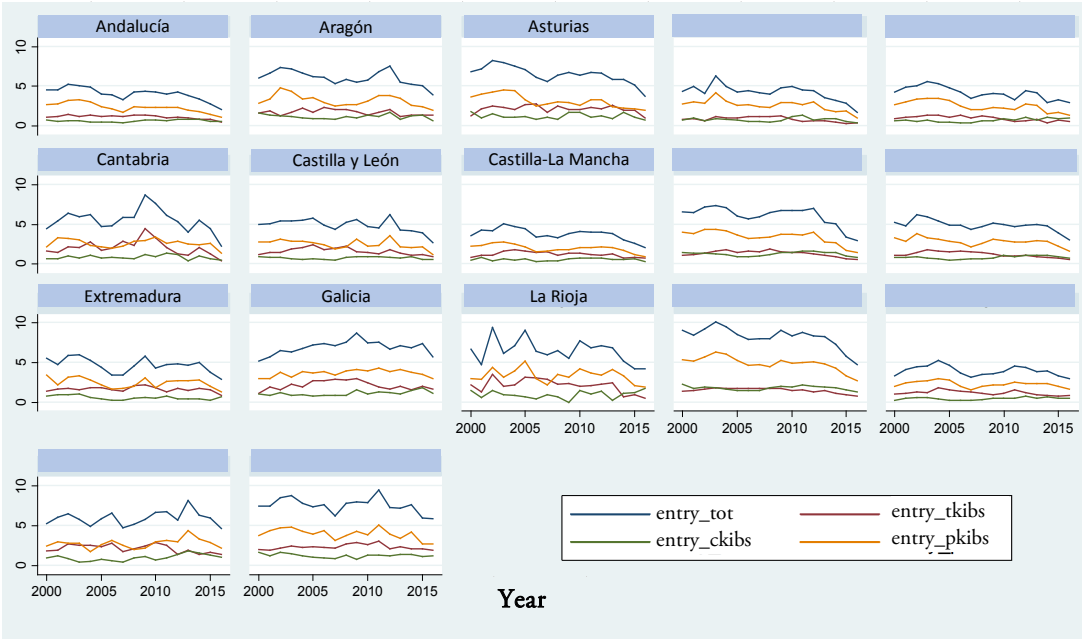
3. THE CREATION OF NEW KIBS IN SPAIN

The data from the Sabi-Informa database indicates that 106.271 new KIBS were created in Spain between 2000 and 2016. 56.9% of the new KIBS were involved in providing professional services (P-KIBS), i.e. legal, accounting and auditing activities, management consultancy, and market services. Technical KIBS (T-KIBS) came second and accounted for 24.7% of the sample. Finally, new computer-related services KIBS (C-KIBS) made up 18.2% of the sample.

Based on these categories, the evolution of the entry index (i.e. new KIBS / total new firms in the region-year) for seventeen Spanish regions is shown in Figure 2. An overall decline in the creation of KIBS in Spanish regions can be observed. This decline was particularly noticeable during the critical years (2008-2010) of the global financial crisis. Finally, the number of new PKIBS and TKIBS dropped following the crisis while the rate of new CKIBS remained stable.

The reasons for this are debatable. It could be argued, for example, that the advanced services sector is one of scale and low margins, explaining the decline in the creation of new KIBS in the sector during the crisis. Also, the economic downturn may have had led to a drop in the number of interesting innovation projects, the introduction of budget restrictions, and a preference for developing knowledge-related capabilities internally.

FIGURE 2.
Evolution of entry index* in the Spanish regions form 2000 to 2016 by KIBS categories



Source: Researchers' own based on Sabi-Informa & INE. *New KIBS / New Firms in the region-year.

In addition, Figure 2 clearly reflects the heterogeneity of the regional evolutionary paths and configuration of new KIBS. Finally, in terms of new KIBS per region, the data shows that in the period 2000-2016, the creation of new KIBS was concentrated in four regions: Madrid (28.2%), Catalonia (19.8%), Andalusia (11.4%), and the Valencian Community (9.8%). This can be explained by the size of their economies and the fact that Spain's biggest cities are located in these regions. Apart from the theoretical reasons, the heterogeneity of these indicators is reason enough to warrant further investigation into the effects of certain regional factors in territorial servitization

4. DATA AND METHODS

The empirical objective of this research was to examine to what extent the emergence of new KIBS in Spain's regions was affected by the techno-economic characteristics of the regions' manufacturing and innovation environment. The heterogeneous trajectories of the regions' industries and the regional differences in the development of innovation systems throughout this considerable period justified an analysis of the factors that determine the creation of new KIBS as a critical measure of territorial servitization (Lafuente et al. 2017; Wyrwich, 2019; Horvath & Rabetino, 2018). As stated before, the geographical context of the study is Spain, and the unit of analysis is the geographical disaggregation at NUTS2 level. The entry rates of three types of new KIBS in seventeen Spanish regions were analysed for the period 2000 to 2016 producing a database with a total of 289 region-year observations.

4.1. DATA

The data comes from the "Sistema de Análisis de Balances Ibéricos" (SABI) database, developed by Informa in collaboration with Bureau Van Dijk. The database contains economic and financial information on the annual accounts of approximately 2.7 million companies domiciled in Spain.

Dependent variable. The dependent variable is the ratio between the new KIBS and the total number of new firms (in all sectors) in each region and year considered as used by Lafuente et al. (2017) and

Horvath & Rabetino (2019). A further three dependent variables were also used based on the three aforementioned KIBS categories: T-KIBS, C-KIBS, and P-KIBS (see ANNANNEX 1 for NACE codes). The ratio was calculated using data from the SABI-Informa dataset as the numerator and data from the Spanish statistical office (INE) as the denominator.

Independent variables. The variables used for measuring the manufacturing quality and innovation environment are explained thus:

Manufacturing quality. This concept was calculated based on the numbers involved in high and medium high-technology manufacturing as a share of the total employment (EMP_HMTECH _MANUF). The data for this variable was taken from Eurostat and is consistent with the figure for employment in R&D-intensive manufacturing used by Wyrwich (2019).

Innovation environment. This measure was calculated using the regional innovation performance (RIS_SCORE) figures from the Regional Innovation Scoreboard for the years 2009, 2011, 2013, 2015, and 2017. The indicator shows the performance of the regions relative to the EU in 2011. The series was completed by assigning the figure for 2009 to the years prior to 2009. The figures for 2010, 2012, 2014 and 2016 were estimated based on the previous available scores. All these figures were obtained from the European Innovation Scoreboards (EIS) project.

TABLE 1.
Description and statistical summary of variables (n=289)

Type	Variable	Variable Description	Code(s)	Aver.	Std. Dev.	Min.	Max	Source
Dependent	Total entry rate	Share of new KIBS firms in total of new firms in the region	entry_tot	5,49	1,62	1,67	10	SABI – INE
	T-KIBS entry rate	Share of new technological KIBS firms in total of new firms in the region	entry_tkibs	1,59	0,64	0,32	1,5	SABI -INE
	C-KIBS entry rate	Share of new computer-based KIBS firms in total of new firms in the region	entry_ckibs	0,93	0,42	0	2,3	SABI -INE
	P-KIBS entry rate	Share of new professional KIBS firms in total of new firms in the region	entry_pkibs	2,96	0,95	0,94	6,3	SABI -INE
Independent	Manufacturing quality	Share of employment in high and medium technology manufacturing sector in total employment	emp_hmtech _manuf	3,97	2,87	0,18	12	Eurostat
	Innovation environment	Regional Innovation Score (relative to EU)	ris_score	73,4	12,67	48,2	99	EU
Control	Size (GDP)	GDP PPP (ln)	gdp_ln	10,62	0,92	8,66	12	Eurostat
	Agglomeration	Inhabitants/km² (in ln)	pop_dens_ln	4,6	0,96	3,08	6,7	INE
	Entrepreunership	Share of new firms in the region in total incumbent firms	Entrep	0,03	0,01	0,01	0,1	INE
	Economic crisis	Dummy (2000-2008: 1, 0 otherwise)	d1	0,52	0,5	0	1	--

Source: Researchers' own.

Control variables. Three control variables were included in the analysis. First, the Gross Domestic Product (GDP_LN) was used as a control for the size differences among regions; the variable was used in logs. Second, the population density (POP_DENS_LN) indicator was used in the same way as other studies on KIBS (Gallego & Maroto, 2015; Horvath & Rabetino, 2018) and also with the creation of new firms (Fotopoulos, 2012) to catch any agglomeration effects. Also, this variable "is included as a catch-all variable of various regional characteristics such as housing and land prices, availability of infrastructure

and other inputs" (Fritsch & Kublina, 2016). Third, an indicator of regional entrepreneurship (ENTREP) was included as a control for the differences in business dynamism among regions. Next, using data from the INE, the share of new firms in the total number of incumbent firms for each region-year was calculated. Finally, to test the effect of the economic crisis on the emergence of new KIBS, a dummy variable (d1) was included. The dummy variable was estimated by assigning a value of 1 to the years before the crisis (2000-2008), and 0 to the other years.

4.2. Method

The empirical analysis used a dataset taken from the sources mentioned previously. The configuration of the sample includes data for seventeen Spanish regions for the period 2000 to 2016 producing 289 observations which could be analysed using data panel econometrics. The hypotheses were tested using a quantitative approach based on a regression of panel data. The functional specification was established as the following equation estimation:

$$Entry_{rt} = \alpha + \beta_1 Manufacturing\ quality_{rt} + \beta_2 RIS_{rt} + \beta_3 Size_{rt} + \beta_4 Entrepreunership_{rt} + \beta_5 Agglomeration_{rt} + \beta_6 Economic\ crisis_{rt} + \sigma_{rt} + \varepsilon_{rt}$$

The dependent variable Entry is the KIBS entry rate in its four formulations for each region r and each year t. With the applied method, Hausman tests were carried out to determine the importance of considering the variations of the variables only over time or whether variations between regions should also be considered. Finally, as a robustness test, Poisson regressions with fixed effects were performed using the number of new KIBS in the year-region as a dependent variable, as used by Wyrwich (2019). Likewise, ordinary least squares (OLS) regressions were performed since the sample includes highly persistent (and / or structural) variables, as used in Bettin et al. (2018). A comparative table of the coefficients is presented in Annex 2.

5. Results

The results of the panel data regression analysis specifications are presented in Table 2. The estimates include the full sample of KIBS and estimates for technical KIBS (T-KIBS), computer-related services (C-KIBS), and "traditional" professional services (P-KIBS), respectively. The analyses support the idea that an innovation prone regional context leads to the creation of new KIBS, and thus, suggesting that influences the probability of bigger collaboration among KIBS and manufacturers and enabling better conditions for territorial servitization. The model reveals a significant positive coefficient in the regional innovation system proxy as measured by the Regional Innovation Scoreboard, revealing a significant statistical influence on the creation of all the KIBS considered. In other words, the regional innovation system may well influence value-creating processes in the territory because product-service innovation increases when the number of new KIBS increases.

The assessment of the local quality of manufacturing, however, did not seem to influence the creation of new KIBS, since no significant changes in the outcome variable were observed when the numbers employed in high and medium-high technology manufacturing environments increased. Despite this general trend, it is worth underlining that a positive correlation was observed between new C-KIBS and increased numbers in high and medium-high manufacturing positions. This corroborates with Wyrwich's findings (2019) which revealed that while TKIBS and PKIBS were already well-developed in Spanish regions, CKIBS were also growing. This could suggest that firms may need to address the challenge of digitalization and industry 4.0.

Regarding the analyses of the control variables, the model did not throw up any statistically significant predictors when the population density logarithm indicator was used to measure the impact of

the degree of agglomeration in each region. Therefore, the results obtained from the model would seem to contradict previous expectations regarding the spill-over effect of large urban centres.

The control variable analyses also supported the relevance of the "wealth" effect, although with the opposite (negative) effect in the case of P-KIBS and C-KIBS. Furthermore, the impact of the overall entrepreneurial environment was statistically relevant in a negative sense. The fact that C-KIBS do not follow this pattern could evidence, once again, the emergence of new C-KIBS in some Spanish regions.

When considering the economic downturn dummy variable, i.e. the influence of the crisis on the creation rates of KIBS, the estimates corroborate a positive trend in all the KIBS, including the T-KIBS and P-KIBS before the crisis and a sharp deceleration afterwards, suggesting a weakness in the long-term commitment to strategic servitization. However, in the C-KIBS column, the significant, negative indicators corroborate a tendency towards growth in the sector.

TABLE 2.
Results of the regression
(Dependent Variable: entry index)

	Total	T-KIBS	C-KIBS	P-KIBS
emp_hmtech_manuf	0,0225	-0,024	0,0485*	-0,00204
	(0,103)	(0,0487)	(0,0271)	(0,0636)
ris_score	0,0830***	0,0223**	-0,00186	0,0626***
	(0,0222)	(0,0106)	(0,00589)	(0,0138)
gdp_ln	-2,404***	0,938***	-0,912***	-2,430***
	(0,642)	(0,305)	(0,17)	(0,398)
Entrep	-38,76***	-13,31**	-9,320***	-16,13**
	(12,71)	(6031)	(3362)	(7877)
pop_dens_ln	1280	-1064	0,502	1842
	(1997)	(0,948)	(0,528)	(1238)
d1	0,802***	0,600***	-0,149***	0,352***
	(0,198)	(0,0942)	(0,0525)	(0,123)
Constant	19,74***	-4900	8,626***	16,02***
	(7146)	(3392)	(1891)	(4431)
Observations	289	289	289	289
R-squared	0,23	0,191	0,267	0,32
Number of regions	17	17	17	17
Standard errors in parentheses				
*** p<0.01, ** p<0.05, * p<0.1				

Source: Researcher´s own.

6. CONCLUSIONS AND FINAL REMARK

The existence of KIBS is considered a good indicator of territorial servitization. This research attempted to analyse the factors underlying the formation of new KIBS in Spanish regions between 2000 and 2016. As such, it contributes to the debate about the importance of "host" conditions in terms of intermediate demand and more specifically the regional innovation profile and the quality of the manufacturing fabric. The results corroborate the positive relation between the strength of the RIS (Regional Innovation Index) and the creation of new KIBS of all kinds and supports the notion that KIBS are an important source of knowledge-based regional development (Wrywich, 2019).

However, the C-KIBS were the only branch that correlated positively to employment in high and medium-high manufacturing firms. This is mostly likely due to the greater commitment of these advanced sectors to industry 4.0 and digitization. It is also important to note that this study establishes a distinction between the three types of KIBS mentioned in the literature and thus sheds light on the fact that not all KIBS are equal and that some are more sensitive to local demands for innovation.

In addition, another important general observation is that, despite having overcome the toughest periods of the economic crisis, there was an overall decline in the creation of new KIBS. It is also worth noting that the creation of new KIBS was deeply affected by economic changes. Overall, the study supports the notion that although KIBS are considered strategically desirable for servitization, the observed trend reveals how budgetary factors can lead to the prioritization of other less risky projects.

Last but not least, the study does not corroborate that population density and agglomeration economies influence the creation of new KIBS and thus contradicts the broadly-held assumption (Muller & Doloreux, 2007; Shearmur & Doloreux, 2008; Sthalecker, 2014) that other hinterland areas play catch-up when KIBS are prevalent in metropolitan areas (Gallego & Maroto, 2015).

With reference to the practical implications of this study, in order to analyse what drives the creation of new KIBS and thus stimulates servitization, the mechanisms that facilitate interaction between different networks and drive a territory's economy need to be fully understood. In this attempt, it is worth to highlight among the implications for the academic field how the proposition of the presence of KIBS as an indicator of regional growth and innovation is reinforced. Likewise, it is important to consider the importance of creating different types of KIBS in the face of different determining factors of the regional environment.

A deeper understanding of how servitization is materialized in territories can contribute to designing appropriately-targeted industrial and innovation policies at subnational level. Regarding policies aimed at supporting the creation of new KIBS, it would seem advisable to develop a more holistic service sector capable of boosting the innovative capacity of companies and enhancing the demand for their products and services.

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ANNEX 1

KIBS classification by NACE 2009 codes

Type	Activity	NACE	Definition
T-KIBS	Research and Development	7211	Research and experiemntal development on biotechnology
		7219	Other research and experimental develeopment on natural sciences and egineering
		7220	Research and experiemntal development on social sciences and humanities
	Technical services	7111	Architectural activities
		7112	Engineering activities and related technical consultancy
		7120	Technical testing and analysis
C-KIBS	Computer and related services	6201	Computer programming activities
		6202	Computer consultancy activities
		6203	Computer facilities management activities
		6209	Other information technology and computer services
		6311	Data processing, hosting and related activities
		6312	Web portals
P-KIBS	Legal services and auditing	6910	Legal activities
		6920	Accounting, bookkeeping and auditing activities, tax consultancy
	Consultancy and labour recruitment	7020	Business and other management consultancy activities
	Marketing services	7311	Advertising agencies
		7312	Media representation
		7320	Market research and opinion polling

Source: Own elaboration based Böhn & Thomi (2003).

	Total			T-KIBS			C-KIBS			P-KIBS		
	Panel	OLS	Poisson (fe)[a]	Panel	OLS	Poisson (fe)[a]	Panel	OLS	Poisson (fe)[a]	Panel	OLS	Poisson (fe)[a]
emp_hmtech_manuf	0,023	-,174**	-,019**	-0,023	-0,034	-,036**	0,048	-0,006	,040**	-0,002	-,134***	-,031***
ris_score	,083***	,104***	,040***	,022*	,029***	,039***	-0,001	,016***	,016***	,062***	,059***	,048***
gdp_ln	-2,404***	-0,154	-,194***	,938**	-,155***	,756***	-,912***	0,026	-,689***	-2,430***	-0,025	-,519***
entrep	-38,759**	-70,701***	14,861***	-13,312*	-34,866***	16,529***	-9,319**	-11,054***	8,632***	-16,127*	-24,780***	15,782***
pop_dens_ln	1,279	,496***	1,027***	-1,063	0,040	0,434	0,502	,147***	1,242***	1,841	,309***	1,326***
d1	,801***	1,626***	,322***	,599***	,804***	,552***	-,149**	0,027	0,001	,351**	,794***	,328***
Constant	19,744**	-0,781		-4,899	1,727***		8,625***	-,848**		16,018***	-1,661**	

*** p<0.01, ** p<0.05, * p<0.1.

[a] the dependent variable is the number of new KIBS in the region-year.

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Articles

Does distance really matter? Assessing the impact of KIBS proximity on firms' servitization capacity: evidence from the Basque country

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ABSTRACT:

Servitization strategy is becoming increasingly recognized as a key source of value with important competitive and economic implications across the globe. It has been proven to contribute to territorial performance through the provision of services to manufacturing businesses. However, this contribution has largely been the consequence of the configuration of local industrial structures, and most importantly, of the interconnectedness between manufacturing firms and knowledge-intensive business service (KIBS) firms. Hence, the process of territorial servitization is highly conditioned by the association between manufacturing businesses and KIBS firms. To date, the literature on territorial servitization has mostly described the implications of KIBS firms for service deployment and service innovation in manufacturing, with knowledge and technological capabilities being considered the main variables in its success. Nevertheless, the literature is silent on how the geographical distance between KIBS firms and manufacturing companies may affect servitization capacity. This paper aims to raise the importance of the geographical distance of KIBS firms in manufacturers' servitization capacity. To meet this aim, an analysis of two manufacturing companies*; Alpha* and *Beta*, is provided. They are both located in the Basque country but collaborate with KIBS firms located in different geographical areas, either "inside" or "outside" the Basque region. Through a qualitative study based on (i) measuring these firms' capacity for servitization, and (ii) in-depth interviews, results suggest that geographical distance plays a key role in the KIBS firm-Manufacturer relationship for servitization capacity purposes, and should be regards as an important aspect for successful territorial servitization.

KEYWORDS: servitization capacity; knowledge-intensive business service (KIBS); geographical distance.
JEL CLASSIFICATION: L14; L23; L60; M11.

¿Realmente importa la distancia? Evaluación del impacto de la proximidad de las KIBS en la capacidad de servitización de las empresas: evidencia de estudios en el País Vasco

La estrategia de servitización está siendo progresivamente reconocida a lo largo del mundo como una fuente clave de valor con importantes implicaciones competitivas y económicas. Se ha demostrado, entre otras cosas, que contribuye al desempeño territorial mediante la prestación de servicios a empresas manufactureras. No obstante, esta contribución se debe en gran parte a la configuración de las estructuras

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industriales locales, y lo que es más importante, a la interconexión entre empresas manufactureras y empresas de servicios empresariales intensivos en conocimiento (KIBS). En consecuencia, el proceso de servitización territorial está muy condicionado por la asociación entre empresas manufactureras y empresas KIBS. Hasta la fecha, la literatura sobre servitización territorial ha descrito principalmente las implicaciones de las empresas KIBS en el despliegue de servicios y la innovación de servicios en la manufactura, considerando el conocimiento y las capacidades tecnológicas las principales variables de su éxito. Sin embargo, la literatura es escasa o casi inexistente respecto de cómo la distancia geográfica entre las empresas KIBS y las empresas manufactureras puede afectar la capacidad de servitización. Por consiguiente, este documento tiene como objetivo plantear la importancia de la distancia geográfica de las empresas KIBS en la capacidad de servitización de los fabricantes. Para cumplir con este objetivo, proporciona el análisis de dos empresas manufactureras; Alfa y Beta. Ambas situadas en el País Vasco, pero en colaboración con firmas KIBS ubicadas en diferentes áreas geográficas, ya sea "dentro" o "fuera" del País Vasco. A través de un estudio cualitativo basado en (i) medir la capacidad de servitización de estas empresas y (ii) entrevistas en profundidad, los resultados sugieren que la distancia geográfica juega un papel clave en la relación empresa KIBS y la capacidad de servitización del fabricante, y debería ser considerada como un aspecto importante para el éxito de la servitización territorial.

Palabras clave: capacidad de servitización; servicios de negocios intensivos en conocimiento (KIBS); distancia geográfica.
Clasificación JEL: L14; L23; L60; M11.

1. Introduction

Servitization refers to the transition process that involves the innovation of an organization's capabilities and processes to shift from selling products to selling integrated product and service offerings (Vandermerwe and Rada, 1988). In manufacturing environments, servitization has proven to be an important source of competitiveness and differentiation, as it enables manufacturing companies to sustain a competitive advantage over their competitors (Vendrell-Herrero et al., 2017).

However, the development and provision of services differs greatly from the traditional design and manufacture of products (Bustinza et al., 2019a). The dynamic nature of services requires companies to reformulate their organizational structures, capabilities, talent, and conception of value to be truly effective in manufacturing settings (Bustinza et al., 2015). Consequently, servitization demands that firms consolidate their service capabilities in order to overcome the various critical junctures that they face in their service-provision transition.

According to Vargo and Lush (2008), manufacturing capabilities and service capabilities emerge from two opposite standpoints or dominant logics for understanding value; whereas manufacturing capabilities (goods-dominant logic) emphasize value-in-exchange, the service-dominant logic emphasizes value-in-use. Hence, while traditional manufacturing capabilities settle on tangibility, economies of scale, trade-off among costs and quality, and product functions, service capabilities focus on intangibility, customization, flexibility, customer centricity, and innovation (Alghisi and Saccani, 2015). Accordingly, the transition towards servitization can be very complex and in some cases may result in a dead end, bringing serious consequences for the organization and its survival. This situation has been referred to as the "service paradox" (Gebauer et al., 2005). It manifested as a reverse or backward transition, which has been defined as "deservitization" (Valtakoski, 2017).

In most cases, problems arise from the inability of a company to establish coherent guidelines toward service orientation (Lenka et al., 2018), something that requires the commitment of the entire organization and demands integrating distinctive knowledge and capabilities not traditionally required in product-based firms (Opazo-Basáez et al., 2019; Vendrell-Herrero et al., 2020). In order to mitigate possible difficulties and expedite the transition toward services, product-based firms seek the essential capabilities that they do not possess in external partners, building relationships with particular "entities" that have deep knowledge

in technical areas that exceeds the knowledge portfolio of the firm. They are defined as knowledge-intensive business service (KIBS) firms (Lafuente et al., 2017).

Knowledge-intensive business service (KIBS) firms are defined as expert organizations or private companies that use professional knowledge related to specific (technical) disciplines to develop and provide advanced, highly intellectual "value-added" business services. In servitized contexts, KIBS firms are increasingly recognized as "bridges for innovation" in services (Bustinza et al., 2019b), and vectors of knowledge transmission (Strambach, 2008), as they provide a platform to create and transfer service innovation, in addition to developing and co-producing service-oriented knowledge together with manufacturing firms and other players in the value network (Lafuente et al., 2020).

The blossoming of KIBS firms has promoted proactive and open knowledge sharing between otherwise unconnected firms in the regional, national and international context. This has revitalized depressed regions and sectors (Gomes et al., 2019) and fostered the emergence of highly specialized competitive poles in the form of either "clusters" or "industrial districts" (Grandinetti, 2011). The convergence of high- level knowledge and innovation services in manufacturing has generated a synergistic development of economic sectors that not only has benefited firms with the need for servitization, but has also bolstered once non-competitive geographical areas that have found in KIBS firms a catalyst for local networks, partnerships, and innovation systems (Liu et al., 2019).

As manufacturing competitiveness increasingly depends on innovative knowledge contents, KIBS firms play an important role in offering manufacturers access to a stock of knowledge capital created, accumulated or disseminated by them (Lafuente et al., 2018) and in helping them to develop highly innovative value-adding services (Lafuente et al., 2017). As such, the interconnected coexistence of manufacturers and service providers has given rise to a new notion of territorial competitiveness, built on the premise that servitization is the main axis for knowledge transfer between companies and KIBS firms; this is the concept of territorial servitization (Lafuente et al., 2019).

At the territorial level, the interconnectedness between product-based firms and KIBS firms could improve and increase the capacity of a territory to be competitive (Vendrell-Herrero and Wilson, 2017). However, further research is still needed on the mechanisms through which this collaboration can be effectively carried out, and the key factors that might strengthen or weaken these types of relationships (Hu, 2017). Although existing literature on KIBS firms considers geographical proximity to be one key factor influencing the relationship between KIBS firms and manufacturers (e.g., Growe, 2019), research is still lacking on the effect that KIBS firms' geographic proximity has on firms' servitization capacity and the factors that might positively or negatively influence this effect.

To address this gap, this paper aims to empirically assess the impact of KIBS geographical proximity on firms' servitization capacity through a qualitative study of two manufacturing companies located in the Basque country, *Alpha* and *Beta*. Both of them are servitized and collaborate with KIBS firms to enhance their service provision capacity, but one of them has the KIBS collaborators in the Basque Country (in Spain) and the other one out of the Basque country (in France).

To measure the impact of KIBS geographical proximity on each of the firm's servitization capacity, two rounds of in-depth interviews were conducted with two firm's representatives. In the first stage, each interview focused on each of the firm's servitization capacity, taking Coreynen´s servitization capacity tool as a framework (Coreynen et al., 2018). In the second stage, interviews centered on the impact that KIBS firms have on the company's servitisation capacity. This combined approach enabled us to rate and compare each of the firm's current servitization capacity and the impact that KIBS firms have had in enhancing this capacity.

Key findings suggest that firms' servitization capacity results are higher when KIBS collaborators are in a geographical area that is closer to the relevant manufacturing company. Furthermore, it has been shown that KIBS firms' impact on servitization capacity is also higher in organizations with KIBS collaborators located nearer to their operations. These results validate the notion that the relationship

between manufacturers and KIBS firms positively affects the servitization capacity when both companies are closer to each other.

This paper is organized as follows. Section 2 presents the conceptual background for this study by reviewing the relevant literature on Servitization, territories, KIBS firms and KIBS inter-organizational partnerships. Section 3 provides a description of the research setting, the companies, and the methodology and data used to assess both servitization capacity and KIBS firms' impact on servitization capacity. Section 4 reports the findings of the study based on the analysis of Coreynen´s servitization capacity tool and an in-depth interview. Section 5 provides a discussion, some conclusions, and a prospectus for future research.

2. Conceptual background

2.1. Servitization, territories and KIBS firms

Faced with more and more complex scenarios, companies need to develop either defensive or offensive strategies to cope with increasing competition, and enhance the maturity of their own firm (product or technology) within their sector or market (Bustinza et al., 2018). In order to successfully meet this challenge, manufacturers are increasingly adding services to their value proposition, whether by a joint proposal or by substituting the property of the good and using a strategy that has been named servitization (Vandermerve and Rada, 1988). These new hybrid product-service systems or fully servitized systems have been gaining momentum as manufacturers have realized that traditional, well-known downstream services are not 'a necessary evil' but a source of competitiveness based on the value offered to the customers (Galera-Zarco et al., 2014; Vendrell-Herrero et al., 2014).

The transformation, however, implies a profound change in the mindset, skills, culture and, frequently, in the whole structure of the company (Opazo-Basáez et al., 2019). This sometimes results in negative financial results (Visnjic, et al., 2016) or even in a backward transformation called *deservitization* (Valtakoski, 2017). But there is space for hope, as it seems that success can be accomplished if a strategy is properly devised (Opazo-Basáez et al., 2018). Hence, there is an increasing interest in the field of servitization, which focuses on offering definitions, describing the purpose(s) of the process, and communicating the benefit(s) obtained and the obstacle(s) to be avoided, both from the point of view of creation and of the growth of firms and sectors (Galera-Zarco et al., 2014; Vendrell-Herrero and Wilson, 2017).

Nevertheless, despite the increasing production of academic papers on the subject (more than 1000 articles in 2018), several authors have acknowledged the need to further the knowledge of this field inside and across the communities that are studying it (Rabetino et al., 2018). Changes in the business model due to servitization and the positive effects of constructing a collaborative product-service ecosystem (Bustinza et al., 2019b) are some recent examples of the efforts to provide this academic domain with more valuable and up-to-date knowledge.

KIBS organizations are considered an important stakeholder in the knowledge economy (Lafuente et al., 2010), as they play a major role in the transition from an industrial economy to a knowledge-based one (Lafuente et al., 2017). Similarly, many international institutions have acknowledged the role of KIBS firms in the development and better performance of the economy. The OECD (2001) reported that this was the fastest growing sector in the OECD countries during the 1980s and the 1990s. The European Commission (2007) has also confirmed previous studies by the OECD (2005) and declared that KIBS companies were "*likely to be one of the main engines for the future growth within the European Union*". This included highlighting their importance in the annual employment growth of the European Commission (2011).

During the last decade, the role assigned to KIBS organizations as "*bridges for innovation*" has garnered interest from the academic research community, and several authors have assessed their

contribution to regional and national innovation systems in European regions (e.g., Gomes et al., 2019), as well as in the economic development of particular regions or countries (Liu et al., 2019)

Recently, Vendrell-Herrero and Wilson (2017) pinpointed the positive association between servitization and territorial competitiveness. Likewise, Lafuente et al. (2017) analyzed the interactions between the manufacturing sector and knowledge-intensive business services from the territorial perspective, and defined territorial servitization as all the results that different kinds of mutually dependent associations of knowledge-intensive service companies and manufacturing firms create or develop within a focal territory. They also stated that territorial servitization is crucial to developing a more resilient industry, which would eventually lead to higher, more balanced growth that can be better distributed within the community (Lafuente et al., 2019).

2.2. KIBS FIRMS AND INTER-ORGANIZATIONAL PARTNERSHIPS

In order to gain competitiveness and adapt to fast-changing market demands, manufacturing firms are increasingly embracing product-service innovative capabilities (Bustinza et al., 2019a). Within this context, manufacturers face key decisions about whether to develop service innovation internally or in partnership with others (Rabetino et al., 2017). While Veugelers and Cassiman (1999), among others, have held that in-house innovation is important, several authors have argued that this is no longer enough to respond rapidly and maintain cutting-edge sophistication, and that collaborative partnership is needed between manufacturers and KIBS firms (Bustinza et al. 2019a). When it comes to servitization, decisions to make, buy or form alliances (Bustinza et al., 2019b) are very important for manufacturers. Regarding the decision to form alliances, there is a growing interest in analyzing different types of collaborations and partnerships in the servitization literature. Recent publications have studied related topics, such as the role and impact of servitization through external strategic partnerships with KIBS providers (Hu, 2017).

Collaborative or inter-organizational partnerships are an important organizational form covering a wide range of research topics such as mergers and acquisitions, strategic alliances, joint ventures and entrepreneurial partnerships (Liu et al 2019). The essence of inter-organizational partnerships lies in the interactions and interdependences among the participants (Liu et al. 2019). Moreover, collaborations with external partners may provide opportunities to offer bundles of products and services, without necessarily involving increased investment (Bustinza, et al., 2019a). Collaborating with KIBS companies instead of other types of agents (such as public research centers) offers an advantage for manufacturers, because they can ensure greater responsiveness and proximity to private firms' culture and vocabulary. Furthermore, KIBS firms exhibit a stronger ability to think along with private firms in terms of market applications and product and process design. They are also more prone to explore innovation matters, particularly in terms of affinity (i.e., shared view) to work with short-term assignments (Kamp and Ruiz de Apodaca, 2017).

The advantages of partnership with KIBS include, firstly, that manufacturers can experiment with service provision without fully internalizing the risks and costs of service implementation (Cusumano et al., 2015). Secondly, that KIBS partnerships help manufacturers to manage the paradox of focusing on core manufacturing activities while diversifying and differentiating their products by developing complementary innovative services (Einola et al., 2016), especially to devise and provide advanced business for SME manufacturing firms (Muller and Zenker, 2001). Thirdly, it helps servitized manufacturers avoid the risk of bankruptcy, since their internal functioning is not affected; and finally, it may be valuable in overcoming and managing the paradoxes involved in growth and diversification (Einola et al., 2016).

Although KIBS organizations have been mainly studied at the microlevel, there is an increasing interest in territorial servitization (Lafuente et al., 2017) that takes into account the spatial perspective of servitization (Castellon-Orozco et al. 2019). Research on territorial servitization has claimed that the collaboration between KIBS and manufacturing firms has several benefits not only for the specific organizations involved, but also for their region as a whole. In addition to the benefits for manufacturers, the territorial impact of servitization through partnerships between manufacturing firms and their KIBS collaborators could improve a territory's ability to compete by developing a strong manufacturing sector

that increases jobs (Gomes et al. 2019). Several scholars have stated that KIBS can turn knowledge and technology into improvements in regional competitive performance (Strambach, 2008), while other authors have studied the key role that KIBS plays in developing and revitalizing multi-industry districts and clusters (Liu et al. 2019).

The local coexistence of interconnected manufacturers and service providers is at the core of territorial servitization (Gomes et al., 2019). Face-to-face contacts between manufacturing firms and KIBS organizations are usually needed to deliver services (Growe, 2019). Accordingly, recent studies have introduced the spatial proximity of KIBS into the servitization debate. The literature on KIBS has considered spatial proximity as one key factor influencing the relationship between manufacturers and KIBS firms (Castellon-Orozco et al., 2019; Growe, 2019; Vendrell-Herrero et al., 2019), but further research is still needed on the effect of KIBS firms' geographic proximity on organization's servitization capacity and the factors that might positively or negatively influence this effect.

3. Methodology

3.1. Research setting

This study analyzed two industrial from the Basque Country, one of the major industrial centers in Spain. This setting was chosen for several reasons. Firstly, because the Basque Country's economy has been strongly manufacturing-based since the beginning of the 20th century. In 2016, manufacturing accounted for 46.7% of industry's gross value added (GVA), and 25.4% of the total GDP (European Commision, 2019). Industrial production is diverse, but all the activities derived from metal, such as the production of steel and machine-tools, are particularly important. However, other sectors are also strong, such as the chemical and petrochemical industry and refineries, which account for a significant part of the region's GDP. Hence, the main industrial sectors of the Basque economy are machinery, aeronautics and energy. The region is clearly better endowed than the EU-15 average, as employment in industry represents some 22 percent in the Basque Country, whereas this is around 17 per cent for EU-15 (Orkestra, 2015; European Commision, 2019).

Secondly, there is a strong drive to review and renew the region's competitive basis by innovating and applying industrial policies (Aranguren, el al., 2014). New technologies and research and development (R&D) initiatives are becoming essential. Basque companies manufacture a wide variety of capital goods, durable goods, and other intermediate products (European Commission, 2019). However, in the transition to competitiveness of traditional manufacturing activities in the context of today's economy, attention has been turned to the upgrading of existing activities through a concerted focus on advanced manufacturing. Consequently, a range of policy measures are being employed to facilitate the upgrading of the current activities toward an approach that is better suited to the region's strategy. Primary support for advanced manufacturing is coordinated through the SPRI[1] (Basque Business Development Agency) and the Department of Economic Development and Competitiveness[2] is responsible for the region's advanced manufacturing strategy. Other regional agents also play important roles in supporting advanced manufacturing activities. Recent studies have shown an increased interest in studying manufacturing 4.0 in servitization (Frank et al., 2019), and the increasing importance of KIBS as a catalyst for innovation (Bustinza et al., 2019a).

And thirdly, the importance of KIBS in the Basque Country is another solid reason to choose this research context. The KIBS sector in the Basque Country grew from around 60,000 employees plus self-employed people in 2004 to close to 70,000 in 2010 (Kamp and Alcalde, 2014). KIBS employment is above 7% of the total employed population in the Basque Country (above Spain, with 6.4%, above the

[1] https://ec.europa.eu/growth/tools-databases/regional-innovation-monitor/organisation/spri-basque-business-development-agency
[2] http://datos.bne.es/entidad/XX5382299.html

EU-12, with 4.4%, and similar to the EU-15 countries (7.4%) (Orkestra, 2013). Compared to other regions in Spain, the share of KIBS in the overall market is smaller in the Basque Country than in Madrid (12.9%), but it is similar to the percentage in Catalonia (7.5%) and Navarre (5%). From an evolutionary perspective, KIBS firms in the Basque Country shifted from an employment of 6.6% in 2004 to 7.3% in 2010 (Kamp and Alcalde, 2014). In 2014 the workforce employed in the KIBS sector increased to 8.2 percent, whereas the EU-15 average is 8.84 per cent (Orkestra, 2015).

3.2. Description of the case studies

Description of company 'Alpha'

Alpha is a European leader in milling, boring and turning technology, with 57 years of experience driven by innovation. *Alpha* offers a wide range of milling machines, boring machines and vertical lathes, multifunction solutions and automated systems, and provides professional advice in machining engineering. It also has a team of highly experienced technicians who evaluate the production and machining processes of their customers (both remotely and on-site) and provide solutions for their optimization.

The success of *Alpha* has been based on excellent quality standards, premium service, state-of-the-art, differentiated technology, and a strong international outlook. *Alpha* develops innovative solutions committed to the technological progress of its customers, in order to be highly productive and efficient in respond to the most demanding machining challenges, setting new standards in milling, boring and turning (for further details, see Table 1).

Table 1.
Companies' data

Alpha	
Number of employees	300
Annual revenue (Mill)	100
Type of service provided	Cloud-based service platform, virtual machine management.
Number of years servitized	4 years
Number of years in the industry	57 years
Service turnover (%)	18%
Product lifespan (mean in years)	20 years
Type of KIBS partner	Technological center (t-KIBS)
KIBS location	Elgoibar, Basque Country, Spain
KIBS scope (support)	Devising, developing, and marketing technologies
Beta	
Number of employees	500
Annual revenue (Mill)	95
Type of service provided	Product development, reengineering, and repair
Number of years servitized	17 years
Number of years in the industry	19 years
Service turnover (%)	5%
Product lifespan (mean in years)	7 years
Type of KIBS partner	Technological division (t-KIBS)
KIBS location	Bressuire, Deux-Sèvres, France
KIBS scope (support)	Innovation adoption, product development, market knowledge

Description of company 'Beta'

Beta is a leading global automotive supplier company specialized in the design and production of roofs for the automotive sector. The company principally focuses on design, engineering, manufacturing and customer service for closure systems, interior systems, and motors & electronics, and is currently positioned among the three main manufacturers of this segment of products worldwide.

Formed in 1999, this tier-one supplier is focused on achieving sustained global growth, providing excellent customer service, and driving innovation. *Beta* has sixteen production plants and six R&D centers in seven countries (United States, Mexico, Germany, Slovakia, Romania, China and India). Its clients include the main vehicle builders (OEMs), with a significant presence of Chinese OEMs (for further details, see Table 1).

3.3. Method

The study described here followed a qualitative research blueprint which took an inductive approach (Eisenhardt, 1989; Thomas, 2006). This qualitative methodology is considered eminently suitable for studying strategical, organizational, and technological transference, adoption, and use within organizations (Cavaye, 1996). It is also deemed to be useful in establishing "new theoretical constructs, bounds and/or midrange theory from case-based, empirical evidence" (Eisenhardt and Graebner, 2007).

Specifically, a case study research protocol was used (Sánchez- Montesinos et al., 2018; Basaez et al., 2014), which allowed researchers to better incorporate contextual aspects such as the history of the company, its institutional setting, and its organizational strategy (Meredith, 1998). Furthermore, this method is widely accepted as a suitable approach for empirical inquiry when the phenomena to be studied cannot easily be decoupled from its organizational and/or geographical context (Lockström et al., 2010), enabling researchers to gain better insight into their object of study (Welch et al., 2011). Given that the goal was to gain an understanding of the importance of the KIBS organization's geographical proximity for *Alpha* and *Beta's* servitization capacity, a single-case strategy was used. This made it possible to portray these illustrative cases, which could serve as an inspiration for practitioners in building new theory and encourage new research connected with servitization and geographical locations (Maffei, 1995).

A semi-structured or unstructured approach was used for data collection. Two rounds of in-depth interviews with a company representative of each company were conducted by two of the authors during the month of July 2019 in each company's headquarters (for further details, see Table 2).

Table 2.
Respondents' data

Alpha	
Age	37 years old
Sex	Male
Position	Service & Solutions Director
Number of years in the current position	4
Number of years in the company	12
Number of years in the industry	15
Beta	
Age	48 years old
Sex	Male
Position	Engineering Director
Number of years in the current position	4
Number of years in the company	21
Number of years in the industry	22

Each respondent participated in two rounds of interviews carried out at the companies´ headquarters. All interviews were recorded and extensive notes were taken.

In the first stage, the interviews were focused on the servitization capacity of each of the firms, using Coreynen´s servitization capacity tool as a framework to measure that effect (Coreynen et al., 2018). This tool consists of 48 questions about three servitization categories or service-related organizational factors: (i) capabilities for service development, (ii) capabilities for service deployment and (iii) the service orientation of corporate culture, which were rated on a 7-point scale (ranging from 0 = "totally disagree"

to 7 = "totally agree"). As a result, respondents could calculate the average scores for each construct and plot them for comparing servitization capacity among companies, departments, and/or different divisions.

In the second stage, interviews were focused on the effect that KIBS providers had on the company`s servitization capacity. Respondents were encouraged to engage in discussion and share their perceptions on the impact that KIBS firms had on each of the servitization categories or service-related organizational factors. All interviews were recorded and lasted approximately an hour and a half each. During the interviews, extensive notes were also taken, providing useful insights for the study.

Subsequently, respondents were asked to rate the impact that they perceived the collaborating KIBS firm had on the servitization categories and service-related organizational factors. Their response options were rated as follows: 0 = "No impact", 1 = "Low impact", 2 = "Medium impact", 3 = "High impact" and 4 = "Critical impact". Altogether, this combined approach enabled us to gain further knowledge of the current servitization capacity of each firm and the impact that the KIBS organizations had on that capacity. It also made it possible to rate and compare the differences and similarities descriptively.

4. FINDINGS

The results of our two-step analysis reveal major differences between the two focal firms. The first part of the analysis, which used the servitization tool (Coreynen et al., 2018), revealed both differences and similarities between the two companies. In general terms, it was found that *Alpha* possessed greater servitization capacity than *Beta*, with a total average score of 6.0 and 5.2, respectively. The first overall result showed a servitization capacity of 85.7% for *Alpha* and 74.3% for *Beta*.

With regard to the three general servitization categories or service-related organizational factors in the servitization tool, the analysis showed that *Alpha* had superior capacity in all the three components analyzed. However, some differences, particularly at the sub-category level, favored *Beta*, namely Sensing (same result), and Digitization and Employee behavior (higher result). However, in the remaining seven sub-categories (Seizing, Reconfiguring, Customization, Network management, Management values, Management behavior, and Employee values) Alpha scored more highly and therefore proved to have greater capacity.

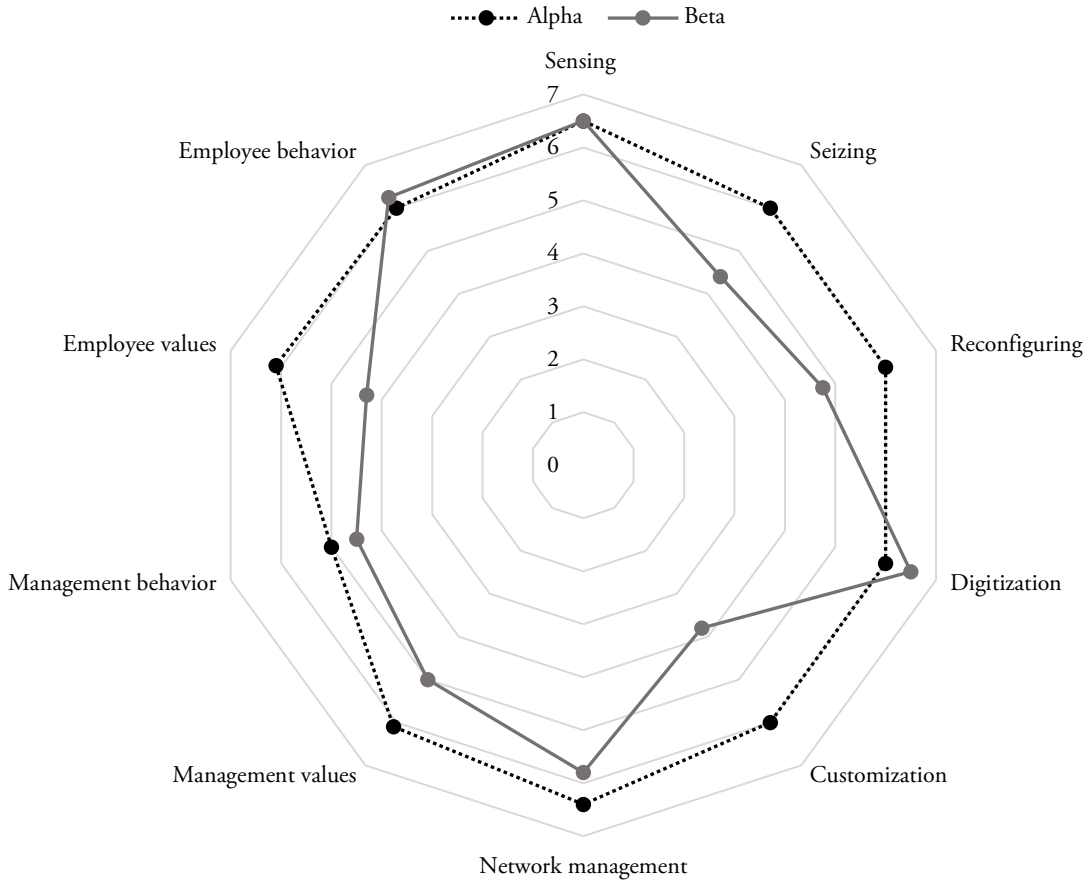
The results for the two companies regarding servitization capacity and the associated general servitization categories or service-related organizational factors (see Table 3 above) are shown below.

TABLE 3.
Results of the servitization capacity tool analysis

Categories	Alpha	Beta
Service development		
Sensing	6.5	6.5
Seizing	6.0	4.4
Reconfiguring	6.0	4.75
Service deployment		
Digitization	6.0	6.5
Customization	6.0	3.8
Network management	6.4	5.8
Service orientation		
Management values	6.1	5.0
Management behavior	5.0	4.5
Employee values	6.1	4.3
Employee behavior	6.0	6.25
Total average score	6.0	5.2
Percentage	85.7%	74.3%

A radar chart was plotted for each of the companies in order to exhibit the differences descriptively and graphically. At first glance it can be seen that *Alpha's* radar was much wider than *Beta's* radar, and that it had higher scores in various sub-categories. *Alpha* (black dotted line) had greater servitization capacity than *Beta* (grey plain line) (see Figure 1 above).

FIGURE 1.
Comparison of the firms' servitization capacity



The results of the second phase were based on an assessment of the KIBS collaborating firms by both *Alpha* and *Beta*. This was aimed to identify if the servitization capacity could be determined by the geographical proximity of the KIBS partner firm. Both organizations depended heavily on their relationship with the KIBS company to servitize, so geographical distance could be a determining factor in making this process easier or more difficult.

Both respondents were encouraged to assess the impact that the collaborating KIBS company had on each of the sub-categories of the servitization tool. The results from this stage can be contrasted with the scores obtained in the first stage. An extensive description of the respondents' perceived impact was also analyzed using the tool.

The respondents were asked to rate the impact by using a 4-point Likert scale: 0 = "No impact", 1 = "Low impact", 2 = "Medium impact", 3 = "High impact", and 4 = "Critical impact". They then complemented their evaluation with a detailed description (see Table 4 above).

TABLE 4.
Impact of KIBS firms on the company`s servitization capacity

Based on daily operations, please rate the impact perceived from your collaborating KIBS firm on strengthening the following categories. '' Response options: 0 = "no impact", 1 = "low impact", 2 = "medium impact", 3 = "high impact", and 4 = "critical impact".

General categories	Sub-categories	Alpha	Beta
Service development	Sensing	Critical impact The collaborating KIBS firm plays a key role in mapping and identifying digital services (advanced services) in the industry. The KIBS firm also provides a competitors' analysis on services implemented (service benchmarking).	Critical impact The collaborating KIBS firm plays an essential role in analyzing trends in the market and among competitors, looking for customer trends in terms of services. The KIBS firm also participates in selecting and proposing services with potential for differentiation.
	Seizing	Medium impact The collaborating KIBS firm provides a competitive intelligence bulletin periodically with significant market and technology information. The KIBS firm also supplies knowledge on how to package the service into a product (technical knowledge), and if necessary, it helps in replicating (developing) competitors' services.	Low impact The collaborating KIBS firm intermittently provides critical knowledge of service development. Principally due to customers requesting very "traditional" or "closed" product capabilities, this generates a major barrier for integrating new knowledge on services.
	Reconfiguring	High impact The company strongly relies on the KIBS firm to reconfigure assets in multiple areas where the adoption of new technologies demands streamlining former business areas or processes. Upgrading operative or organizational structures and processes is seen as a differentiating element to achieve competitive advantage, and the "fresh" perspective of the KIBS firm is highly regarded.	Low impact The company operates on a more individual basis, since it seeks flexibility and reconfiguration of assets preferably at internal level. Yet, when the reconfiguration required exceeds the company´s capacity, they tend to collaborate with the KIBS firm and integrate it into the process. However, they usually focus their efforts on finding solutions internally and individually.

TABLE 4. Cont.
Impact of KIBS firms on the company`s servitization capacity

Based on daily operations, please rate the impact perceived from your collaborating KIBS firm on strengthening the following categories. '' Response options: 0 = "no impact", 1 = "low impact", 2 = "medium impact", 3 = "high impact", and 4 = "critical impact".

General categories	Sub-categories	Alpha	Beta
Service deployment	Digitization	High impact The company possesses an internal IT department that operates conjointly with the KIBS firm. They are aligned in order to integrate new technologies and optimize the digital infrastructure to better provide digital services.	High impact The company possesses a unified IT system where the KIBS firm is integrated. This integration allows (both) tracing and retrieving manufacturing information relevant for reconfiguring product and services and disclosing new paths for service provision.
	Customization	High impact The company collaborates with the KIBS firm in order to (jointly) develop new digital service propositions targeted to meet customers' requirements. These services are crafted firstly based on the specific requirements of each individual client. However, when the new service proves to be efficient, it is integrated in other products with a similar architecture to provide higher value to similar clients.	Low impact The company collaborates with the KIBS firm to innovate and offer customized solutions, but in a very restricted manner. This is principally due to the fact that the value of customization is not perceived as a differentiating factor by its customers. The company prefers to focus on technical aspects of the product that are more highly valued by its clients.
	Network management	High impact The company heavily relies on the KIBS firm for finding technological partners and possible collaboration opportunities on digital service development. The KIBS firm plays a key role in localizing, selecting, contacting, and integrating new partners that fit the company´s technological aims.	High impact The KIBS firm highly influences the company`s relationship with international partners that do not operate at local level. This facilitates close relationships with foreign partners at a faster pace, assuring their availability and avoiding possible cultural mishaps, in addition to providing additional technical knowledge.

TABLE 4. Cont.
Impact of KIBS firms on the company`s servitization capacity

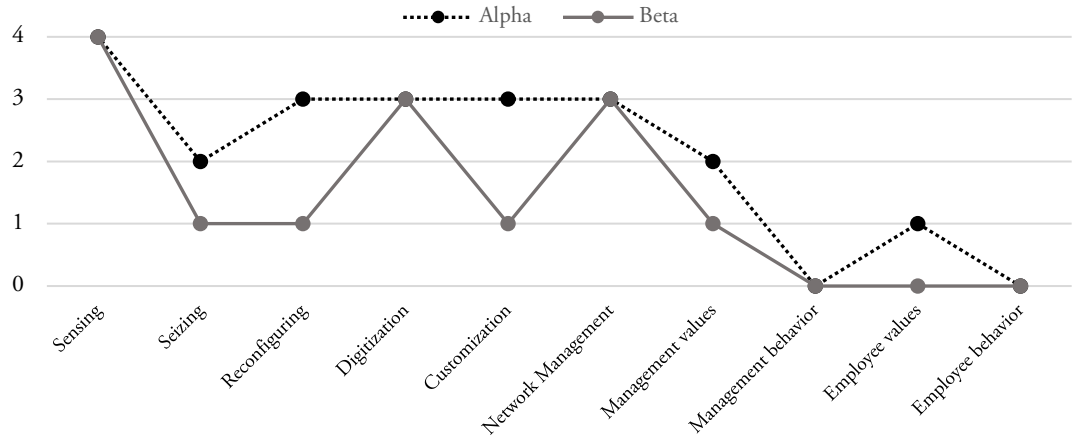
Based on daily operations, please rate the impact perceived from your collaborating KIBS firm on strengthening the following categories. '' Response options: 0 = "no impact", 1 = "low impact", 2 = "medium impact", 3 = "high impact", and 4 = "critical impact".

General categories	Sub-categories	Alpha	Beta
Service orientation	Management values	Medium impact The KIBS firm influences the company in terms service development, but the philosophy of the company was oriented toward services deployment way before. However, the collaboration with the KIBS firm instilled in the organization a new way of operating, understanding digital service deployment as a differentiating aspect.	Low impact The KIBS firm promotes service orientation. However, the company possesses a conditional philosophy toward services; the company is willing to consider services as a key element in their operations, but as long as they are highly regarded by customers and consequently profitable.
	Management behavior	No impact The KIBS firm is perceived to have no influence on the company in terms of promoting service behavior. The company acknowledges having a strong disposition (guideline) toward services that comes from its internal philosophy and the recognition that services provide competitiveness.	No impact The KIBS firm seems to have no effect on service behavior within the company. The company perceives that services may lead to better results, and they are willing to invest in them, but only if the client is willing to pay what the services are worth.
	Employee values	Low impact The company´s workers have deeply internalized that services are critical for its success. However, the KIBS firm has provided them with a holistic view that has helped them to understand that the entire organization (not only a specific division) is actually the service provider.	No impact The company´s employees consider service provision to be important, but only to a certain extent. However, the KIBS firm appears to have neither an impact nor any effect. Indeed, the company promotes competitiveness and incentivizes cost efficiency above all other factors.
	Employee behavior	No impact The members of the organization have a general understanding that services are important. This view has been internalized without the influence of the KIBS firm. In fact, employees by themselves conceive services as a new development or competitive source.	No impact The company´s workers themselves look for new service opportunities, without the KIBS firm being involved. In this regard, they recognize the necessity to seek new opportunities. However, there is no solid conviction that services may be the key decisive element.

This analytical process enabled us to determine the effect that the KIBS collaborating company had and on the servitization capacity and process of each company (along the various servitization categories), on an individual basis.

The analysis showed that *Alpha* and *Beta* had overlapping scores in 5 out of the 10 sub-categories contained in the servitization tool: Sensing, Digitization, Network management, Management behavior, and Employee behavior. However, *Alpha* (black dotted line) perceived the KIBS collaborating firm to have a higher impact than *Beta* (grey plain line) on its servitization capacity for the remaining sub-categories (Seizing, Reconfiguring, Customization, Management values, and Employee values) (see Figure 2 above).

FIGURE 2.
Perceived impact of the KIBS firm on servitization categories



5. DISCUSSION AND CONCLUSIONS

This study used a qualitative methodology, specifically a case study (Welch et al., 2011; Basaez et al., 2014; Sánchez- Montesinos et al., 2018), to analyze the servitization capacity of two companies (*Alpha* and *Beta*), located in the Basque country, Spain. They are manufacturing companies that use a KIBS collaborating firm to foster their capacity to provide services in addition to its traditional (product-based) value offering (Bustinza et al., 2019a; Bustinza et al., 2019b; Lafuente et al., 2017; Lafuente et al., 2020).

Coreynen´s servitization capacity tool was employed to assess the servitization capacity of each company. It showed that *Alpha* had a greater capacity than *Beta*. This might be explained by the fact that the *Alpha* has a greater focus on service development, service deployment, and service orientation. *Alpha* scored highly on all of these categories and achieved 85.7% servitization capacity, whereas *Beta* only obtained 74.3%. The results demonstrated a strong commitment and a clear organizational inclination to incorporating services into their operations to compete in manufacturing settings (Vendrell-Herrero and Wilson, 2017; Lafuente et al., 2018; Liu et al., 2019).

In order to determine whether the collaborating KIBS company had any impact on the servitization capacity of the companies, a second analysis was carried out to discover how each of the firms rated this impact.

The results established once again that *Alpha* perceived that the KIBS collaborating company had a higher impact on its servitization capacity. This served to form the first major interlinked relationship: the higher the capacity, the greater the perceived impact of the KIBS partner company.

At the same time, this result suggests a new emerging relationship, as it shows a positive connection between the servitization capacity, the perceived impact of the KIBS company, and partner's (i.e., KIBS firm's) proximity. Based on these results, it can be concluded that there was a positive relationship that

demonstrates the importance of geographical proximity for firms pursuing collaboration strategies with a KIBS partner aimed at integrating complementary services as a new competitive source of value (Lafuente et al., 2017; Growe, 2019; Vendrell-Herrero et al., 2019).

Thus, *Alpha,* which servitizes with the support of a KIBS collaborating company located in the Basque country (i.e., geographically closer) was shown to have greater servitization capacity; but it was also found that the KIBS collaborating company was perceived to have a higher impact on *Alpha* according to the tool's categories. These results open a new theoretical frontline linked to the importance of geographical location when establishing collaboration strategies, particularly when manufacturing innovation is pursued, as in the paradigm shift involved in servitization (Lafuente et al., 2017; Bustinza et al., 2019a; Bustinza et al., 2019b; Gomes et al., 2019; Lafuente et al., 2019; Liu et al., 2019; Vendrell-Herrero et al., 2020).

Although the results obtained cannot be generalized due to the methodological limitations of case studies, these results highlight the importance of geographical interconnectivity for territorial and organizational competitiveness (Growe, 2019; Lafuente et al., 2017; Vendrell-Herrero and Wilson, 2017; Vendrell-Herrero et al., 2019).This article shows the importance of geographical proximity in establishing strategic relationships aimed at strengthening service deployment in manufacturing companies (Bustinza et al., 2019a; Vendrell-Herrero and Wilson, 2017).

Future research should consider geographical proximity when pursuing KIBS firms' collaboration in highly innovative manufacturing settings, and determine whether other aspects such as technology, knowledge, and/or organizational characteristics also play a crucial role.

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Articles

Exploring the relationship between KIBS co-locations and the innovativeness of manufacturing firms in Latin America

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ABSTRACT:

The literature provides empirical evidence on the importance of geographic location for an effective provision of knowledge intensive business services (KIBS). According to the postulates of territorial servitization, KIBS are also fundamental for the development of manufacturing firms. Despite this, KIBS can be an important source of innovation. In Latin America there is still little attention paid to KIBS, both from academia and from policy makers. The purpose of this research is to analyse the relationship between KIBS co-locations and the innovativeness of the manufacturing firms in context of emerging countries. Drawing on the World Bank Enterprise Survey (WBES) for Latin-American countries, authors analysed 3,029 manufacturing firms using the OLS method. Findings indicated that manufacturing firms' locations based on KIBS proximity, is a critical determinant of innovativeness. This relationship is considerably stronger in Central American countries, while in South America this relationship is negative, which leads to debate.

KEYWORDS: KIBS; Manufacturing; Innovation; Latin America; Firm Location.
JEL CLASSIFICATION: L86; L60; O31; O54; R39.

Explorando la relación entre la co-localización de los KIBS y la innovación de las empresas manufactureras en América Latina

RESUMEN:

La literatura proporciona evidencia empírica sobre la importancia de la localización geográfica para una efectiva provisión de KIBS. Según los postulados de la servitización territorial, los KIBS también son fundamentales para el desarrollo de las empresas manufactureras. A pesar de que los KIBS puede ser una fuente importante de innovación, en América Latina aún se presta poca atención a los KIBS, tanto desde la academia como de los responsables políticos. El propósito de esta investigación es analizar la relación entre la co-localización de los KIBS y la innovación de las empresas manufactureras en contextos de países emergentes. En base a la Encuesta Empresarial del Banco Mundial (WBES) para países de América Latina, los autores analizan 3.029 empresas manufactureras utilizando el método MCO. Los resultados indican que la localización de las empresas manufactureras basadas en la proximidad de los KIBS es un determinante crítico de la innovación. Esta relación es considerablemente más fuerte en los países centroamericanos, mientras que en América del Sur esta relación es negativa, lo cual conlleva a un debate.

PALABRAS CLAVE: KIBS, Manufacturas; Innovación; Latino América; Localización.
CLASIFICACIÓN JEL: L86; L60; O31; O54; R39.

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1. INTRODUCTION

In recent years there has been a growing interest in the geography of KIBS (Müller & Zenker, 2001; Simmie & Strambach, 2006; McCann, 2007; Doloreux & Shearmur, 2012). Researchers have generally adopted the hypothesis that knowledge spillovers are localized and decay across space (Simmie, 2003; Simmie & Strambach, 2006; Antonietti & Cainelli, 2008). Notwithstanding, a second way of conceptualizing the link between innovation and space has recently been derived from the idea that local dynamics are not necessarily those that lead an establishment to innovate (Boschma, 2005; McCann, 2007) and that information exchange and collaboration can occur across space. Indeed, Doloreux & Shearmur (2012) find evidence of a negative innovation-distance relationship across spatial scales. In this way, a long-standing debate still exists around the KIBS location (Antonietti & Cainelli, 2016).

Our study analyses to what extent manufacturing firms' innovativeness is enhanced by KIBS co-location, especially when KIBS may have a positive impact on their innovation capacity (Ciriaci, Montresor & Palma, 2015; Seclen-Luna & Barrutia-Güenaga, 2018). Furthermore, the adoption of servitization strategies provides manufacturers with better information about customers' needs, which is critical to future product development (Visnjic & Van Looy, 2013; Baines et al., 2017) and introduces value-adding services into their operations (Cusumano, Khal & Suarez, 2015; Bustinza et al., 2018), which raises the following research question: Is there a positive relationship between the innovativeness of the manufacturing firms and KIBS co-colocation?

However, most of these theoretical and empirical insights are mainly drawn from the experiences of advanced Western countries where mature market mechanisms have already been established (Wang, Zhang & Yeh, 2016). Latin American countries are very different from these economies. In any case, these issues have so far not been examined in the context of emerging countries (Braga & Marques, 2016). Thus, our research suggests the need for further contextualization of KIBS theories in Latin America. In this way, our contribution is to know whether there is a relationship between KIBS co-location and the innovativeness of the manufacturing firms in Latin America.

Knowledge-intensive services are becoming a prominent way to create or adapt and to implement both technological and non-technological innovation in developing economies (Rubalcaba, Aboal & Garda, 2016). In a recent study, Figueiredo & De Matos Ferreira (2019) affirm that there is the possibility of expanding the perception of emerging countries on the importance of developing KIBS for economic and business development. Especially when the Latin American region has both similarities and differences in terms of its structural characteristics (Dutrénit, 2016), in productive structure and export specialization (Pietrobelli & Rabellotti, 2007), which raises the follow research question: Are there differences in the KIBS co-location and innovativeness for manufacturing firms in Latin America?

The empirical analysis uses the OLS method and is based on a sample of 3,029 manufacturing firms in 11 Latin American countries using data from WBES. Consistent with the work of Vendrell-Herrero et al. (2019), the results for the full sample illustrate the complexity of the location of KIBS for the innovation. For understanding heterogeneities further, we compared the Central and South American regions. The results indicate that the innovation in manufacturing firms from Central America is positively related to proximity to KIBS, while in South America it is negatively related. In this sense, this study contributes to the debate that still exists around the KIBS co-location. More generally, we believe that innovation varies both in the continuous space and in different territories (Doloreux & Shearmur, 2012). In any case, traditional theories that apply to Western economies may not apply to less developed countries (Hsieh et al., 2015; Vendrell-Herrero et al., 2019). The present research examines these relationships in the developing economies of Latin America; the finding of somewhat similar results to those of advanced economies being an important contribution.

Finally, the analysis is relevant since the relationship between KIBS co-locations and the innovativeness of manufacturing firms can help to build a process of territorial servitization (Lafuente et al., 2017) which contributes to the consolidation and resistance of the regional industrial fabric, creating

competitive advantages for companies, leading to an improvement in regional competitiveness (Gomes et al., 2019; Lafuente et al., 2019).

The structure of the paper is as follows: The next section introduces the literature review on the KIBS co-location and this leads to the research hypotheses. The third section details the databases and tests the assumptions. The empirical results are provided in the fourth section. Finally, the fifth section provides some brief conclusions, limitations and future research.

2. Literature review and hypotheses

2.1. Knowledge Intensive Business Services (KIBS)

Two decades after the seminal contribution by Miles et al. (1995), KIBS are still attracting a great deal of attention. KIBS are service organisations whose primary value propositions include knowledge-intensive inputs to the business processes of customer organisations (Miles, 2005). Thus, their specialization in the knowledge field constitutes the specific mode of production adopted by them (Den Hertog, 2000). However, owing to KIBS including a set of very heterogeneous services, it is important to notice that they have multiple classifications; these three specific categories of KIBS being the most useful (Miles, 2012): professional services (P-KIBS), technological services (T-KIBS) and creativity services (C-KIBS). The first category is comprised of accounting services, human resources, business management, and others that are characterised by having specialised knowledge in the administration and organisation fields. The second category is made up of designing and maintaining computer systems, software design, programming, engineering services and R&D services. The third category includes advertising and design services that are based on creativity as well as symbolic and cultural knowledge. In this study, we focus on the second category, since the literature identified agglomerations of a specific type of KIBS, the T-KIBS (Guimarães & Meirelles, 2014).

On the other hand, KIBS can be an important source of innovation (Muller & Doloreux, 2009) since they can compensate or complement the innovation capabilities of their client companies (Muller & Zenker, 2001; Seclen-Luna & Barrutia-Güenaga, 2018). Furthermore, they can act as innovation facilitators or knowledge intermediaries (Den Hertog, 2000; Gallego & Maroto, 2015) since they support clients in the development of their innovation processes. Ultimately, KIBS plays a very important role in the context of innovation systems (Cooke & Leydesdorff, 2006; Aslesen & Isaksen, 2010) and in different levels of analysis: micro and sectoral (Doloreux & Shearmur, 2013), urban and regional (Antonietti & Cainelly, 2016), and macroeconomic or across the whole economy (Shi, Wu & Zhao, 2014). For these reasons, KIBS have recently become an important field in both theoretical and empirical study (Braga & Marques, 2016). In summary, KIBS have gradually been perceived as a strategic sector (Hsieh et al., 2015) in the context of the knowledge-based economy (Muller, & Zenker, 2001; Miles, 2005; Koch & Stahlecker, 2006).

2.2. KIBS Location

In recent years there has been a growing interest in the geography of KIBS (Müller & Zenker, 2001; Simmie & Strambach, 2006; McCann, 2007; Doloreux & Shearmur, 2012). Researchers have generally adopted the hypothesis that knowledge spillovers are localized and decay across space. Simmie (2003) argues that when a firm's location is relatively close to other firms, partners, etc., it becomes more likely that such proximity boosts innovation, whereas a rather remote firm cannot benefit from many of these potential spillovers and interactions and, therefore, the likelihood of innovative activities decreases. Antonietti & Cainelli (2008) emphasized the role of agglomeration externalities in affecting the decision to relocate knowledge-intensive activities on a local scale, where geographic proximity, knowledge spillovers and closer interaction among agents make it easier for firms to manage complex transactions and to increase their competitiveness. In this way, the provision of KIBS is thought to rely heavily on strong

supplier–customer interactions (Miles, 2005) and, therefore, the importance of location is a critical variable for understanding the effectiveness of KIBS (Simmie & Strambach, 2006).

Notwithstanding, a second way of conceptualizing the link between innovation and space has recently been derived from the idea that local dynamics are not necessarily those that lead an establishment to innovate. Boschma (2005) and McCann (2007) argue that information exchange and collaboration can occur across space. Specifically, Bochma (2005) argues that proximity per se is not a necessary or sufficient condition for innovative processes. In addition to location, innovation requires a mixture of a firm's absorptive capacity as well as organizational, social and institutional embeddedness in the local economy. In the same vein, McCann (2007) shows analytically that in a monocentric urban economic setting innovation intensity decreases with increasing distance in a convex relationship, depending on the relative importance of proximity and face-to-face contacts. Additionally, Doloreux & Shearmur (2012) find evidence of a negative innovation-distance relationship across spatial scales.

More recently, Brunow, Hammer & McCann (2019) found that proximity to cities matters for innovation and KIBS benefits from urbanization externalities. That is, the innovation probabilities decrease considerably with longer distances to metropolises and decreases innovation probabilities for distances from large and small cities. In this form, a long-standing debate still exists around the KIBS location. Hence, empirical evidence on the spatial organization for KIBS is limited due to a lack of research on the spatial patterns for analysing successful KIBS locations (Antonietti & Cainelli, 2016).

In any case, the existing literature shows that KIBS have a strong concentration propensity and are highly concentrated in metropolitan areas, particularly, in capital cities (Shearmur & Doloreux, 2009). These metropolitan areas are characterized by a high density of innovative industries (Camacho & Rodríguez, 2005; Gallego & Maroto, 2010) that promote information exchange among suppliers and the appearance of knowledge spillovers, having access to transport and communications infrastructures, high-quality labour markets and greater opportunities for face-to-face interaction with clients (Muller & Doloreux, 2009). In addition, the more recent explanations have highlighted the importance of other factors, such as cumulative causation mechanisms and global production networks, especially from the multinational enterprises (Jacobs, Koster, & Van Oort, 2014). However, most of these theoretical and empirical insights are drawn from the experiences of advanced Western countries where mature market mechanisms have been established (Wang, Zhang & Yeh, 2016).

2.3. Manufacturing firms, KIBS and Territorial Servitization

The literature recognized that the evolution patterns for KIBS are affected significantly by the characteristics of the local manufacturing industry (Corrocher & Cusmano, 2014). In this way, a consolidated manufacturing base not only generates economic activity, but also creates the conditions to attract KIBS entrepreneurs to these territories (Lafuente, Vaillant & Vendrell-Herrero, 2017). In the same vein, KIBS activities are of critical importance with respect to the recent dynamics of the production systems. Thus, by acquiring knowledge-intensive services necessary for the realisation of their final products, manufacturing firms also learn by interacting, and acquire technical knowledge and customised problem-solving experience which may have a positive impact on their innovation capacity (Ciriaci, Montresor & Palma, 2015). Furthermore, the adoption of servitization strategies provides manufacturers with better information about customers' needs, which is critical to future product development (Visnjic & Van Looy, 2013; Baines et al., 2017) and introduces value-adding services into their operations (Cusumano, Khal & Suarez, 2015; Bustinza et al., 2018). These arguments suggest a double-sided relationship between manufacturers and service providers, and the local manufacturing fabric can develop and add service offerings to products to build a process of territorial servitization (Lafuente et al., 2017).

Manufacturing firms would be in a better position to exploit knowledge-intensive services, while territorial connectivity networks allow KIBS to better reach all manufacturing firms (regardless of their location) via the development and the provision of value adding services (Arnold et al., 2016). However, owing to the fact that not all KIBS are clearly oriented towards innovation, the innovation is carried out

in several ways due to different competitive strategies which produce different impacts on the business ecosystem or territories (Lafuente et al., 2017). Therefore, not all KIBS require the same level of geographical proximity and more research is needed to better understand how territorial servitization is affecting territorial growth (Lafuente et al., 2019; Castellón-Orozco, Jaria-Chacón & Guitart-Tarrés, 2019).

Lafuente et al. (2017) argued that territorial servitization contributes to the consolidation and resistance of the regional industrial fabric through interactive agglomeration economies, taking into account that such networks and territorial servitization interactions can create competitive advantages for companies, leading to an improvement in regional competitiveness (Gomes et al., 2019; Lafuente et al., 2019). Likewise, territorial servitization has lately been described as a development process based on synergistic joint co-location between manufacturing firms and KIBS (Lafuente et al., 2017), highlighting the benefits of these interconnections and interactions (Gomes et al., 2019). Hence, the existing evidence supports the notion that KIBS contributes to sustaining the competitive advantage of manufacturing firms (Doloreux & Shearmur, 2013). Thus, based on these arguments, we propose the following hypothesis:

Hypothesis 1. Innovativeness for manufacturing firms is positively associated with closeness to KIBS co-location.

2.4. KIBS in Latin America

Despite the recent, rapid economic growth experienced by several Latin American countries during the commodity boom (Brenes, Haar & Requena, 2009), the fall in commodity export prices has underscored the many competitive challenges required for new growth sectors to emerge. Services have become the most important economic sector in the global economy, in developed as well as in most developing economies. In this way, knowledge-intensive services are becoming a prominent way to create or adapt and to implement both technological and non-technological innovation in developing economies (Rubalcaba, Aboal & Garda, 2016). Through knowledge-intensive services, emerging countries can make effective use of accompanying services providing new added value and product/service differentiation (in design, marketing, logistics, distribution, and so forth). Besides this, they can be embedded in the diffusion of information technology that is particularly relevant for developing economies (Guy & Arnold, 1995), in the service components of technological transfer associated with exports and imports (Almeida & Fernandes, 2008) and in the technological catching up prior to innovation (Wang & Tsai, 2010).

Figueiredo & De Matos Ferreira (2019) affirm that there is a possibility of expanding the perception of emerging countries of the importance of developing KIBS for economic and business development. In this way, innovation is perceived as a clear means to stimulate the local economy, as long as it is carried out with the intensive use of knowledge generated by KIBS. In this context, KIBS are the protagonists of the transformative role of services in any productive activity. For instance, the natural resource-processing companies have over the past two decades evolved from vertically integrated production organization to subcontracting and outsourcing major parts of the activity to external service providers and engineering firms. In this way, the outsourcing of production services constitutes one of the main reasons explaining the rapid increase of knowledge intensive service firms now to be seen in many Latin American countries. This has also induced the formation of clusters of specialized suppliers, which gradually develop into an important source of technological change associated to the expansion of natural resource-based industries. The degree of development of these clusters varies from sector to sector and from country to country (Crespi, Katz & Olivari, 2018).

Additionally, within the Latin American region, countries have both similarities and differences in terms of their structural characteristics (Dutrénit, 2016). Even, the productive structure and export specialization show that the region is heterogeneous (Pietrobelli & Rabellotti, 2007). Recently, in the classification of countries by their level of economic development, some countries, such as Honduras or Nicaragua, have economies based on natural resource extraction, while other countries have advanced

towards economies based on efficiency, like Argentina, Colombia, Ecuador, Peru and Uruguay (World Economic Forum, 2017). Thus, based on these arguments, we propose the following hypothesis:

Hypothesis 2. There are differences in the KIBS co-location and innovativeness for manufacturing firms in Latin America.

3. Data collection and methodology

3.1. Data Description

The data is obtained from the World Bank Enterprise Survey (WBES). The WBES data is available for over 130,000 firms in 135 countries. The World Bank collects survey information through face-to-face interviews with firm managers and owners regarding the business environment in their countries and the productivity of their firms. The population of the survey is consistently defined in all countries as non-agricultural, non-extracting, formal, privately owned firms; both the manufacturing and service sectors are covered by the survey. The WBES uses stratified random sampling by location, size, industry, and other country-specific information. The standardization of the enterprise survey across all countries strengthens the level of external validity and provides a basis for comparisons across countries in the region with other developing regions (Grazzi & Pietrobelli, 2016).

The WBES has been used extensively in previous international studies. For instance, in Grazzi and Pietrobelli (2016), the authors focus on firm innovation and productivity in Latin America and the Caribbean using WBES data. Likewise, WBES data has been used in various studies on management and published in relevant journals, for example, see Luo & Bu (2016), Fernández (2017), Montalbano, Nenci & Pietrobelli, (2018), Vendrell-Herrero et al. (2017 & 2019), Moltalbano & Nenci (2019).

Our study uses information available from the WBES survey rounds conducted in 2016 for Central American countries and survey rounds conducted in 2017 for South American countries, because the survey uses the same set of questions during this period, thus ensuring consistency between waves and countries. In accordance with our research objectives (to know whether there is a relationship between KIBS co-locations and the innovativeness of the manufacturing firms in Latin America), the final sample used consists of 3,029 manufacturing firms across 11 Latin American countries. Cross-sectional surveys conducted in four countries located in Central America (El Salvador, Guatemala, Honduras and Nicaragua) and seven in South America (Argentina, Bolivia, Colombia, Ecuador, Paraguay, Peru and Uruguay). In this respect, it provides a good set of countries in which to analyse the patterns of innovativeness and KIBS co-location in emerging economies. Table 1 summarizes the sample composition by manufacturing firms.

On the other hand, the sample contains 3,092 service firms and differentiates among various service sectors. In this study we consider the technological service firms (T-KIBS) due to these firms designing and maintaining computer systems, software design, programming, engineering services and R&D services. Hence, they are more knowledge-intensive and have the potential to contribute to the manufacturer's business model. With this in mind, we take the total number of service firms in IT (398 observations) as a share of the total number of service firms in each country and city.

3.2. Description of Variables

The dependent variable, KIBS co-location, is the share of firms in technological services (T-KIBS) as the total service firms in a city where a manufacturing firm is located and is measured at the country-city level using the method first described in Vendrell-Herrero et al. (2019). In deriving our measurement of KIBS, we differentiate between service firms in the IT sector and service firms in other service industries,

TABLE 1.
Sample composition by country (percentage of firms)

Country	Innovators	Non-innovators	Total
Argentina	49.5	50.5	21.5
Bolivia	72.9	27.1	3.9
Colombia	71.0	29.0	18.8
Ecuador	87.4	12.6	3.4
El Salvador	42.4	57.6	14.6
Guatemala	61.3	38.7	5.0
Honduras	50.5	49.5	3.0
Nicaragua	65.9	34.1	4.1
Paraguay	61.5	38.5	3.9
Peru	73.1	26.9	18.2
Uruguay	77.2	22.8	3.8
Total	**61.8**	**38.2**	**100**

Source: Own elaboration from WBES Database (2016-2017).

including the retail sector. The independent variable 'innovativeness' is measured through a dummy variable where the firm reported the carryout innovation over the last three years. Table 2 provides a definition of the variables used in the study and Table 3 presents the summary statistics of those variables and the results of the differences in means tests for innovator and non-innovator firms.

TABLE 2.
Definition of variables

Variable	Definition
KIBS co-location	Share of firms in communications and business as total service firms in the city where the manufacturing firm is located.
Innovator	Dummy variable. A value of 1 indicates that the firm reported that carryout innovation over the last three years. 0 otherwise.
Exporter	Dummy variable. A value of 1 indicates that the firm reported at least 1% of annual sales in exports. 0 otherwise.
Firm size	Logarithm of number of workers.
Firm age	Time from foundation of the firm.
Industry	Industry dummies for each industrial sector.

TABLE 3.
Summary statistics

Variable	(1) Innovators		(2) Non-Innovators		(3) Difference in Means	
	Mean	SD	Mean	SD	Diff	t-test
Co-location	0.136	0.076	0.118	0.076	0.018	0.000
Exporter	0.399	0.489	0.241	0.427	0.158	0.000
Firm size	154.8	404.4	101.7	303.4	53.01	0.000
Firm age	21.99	21.14	20.04	19.54	1.95	0.005

3.3. Method and Regression Model

In accordance with our research objectives, we estimate the effects of KIBS co-location and innovativeness using the OLS method. The equation describing this relationship takes the form:

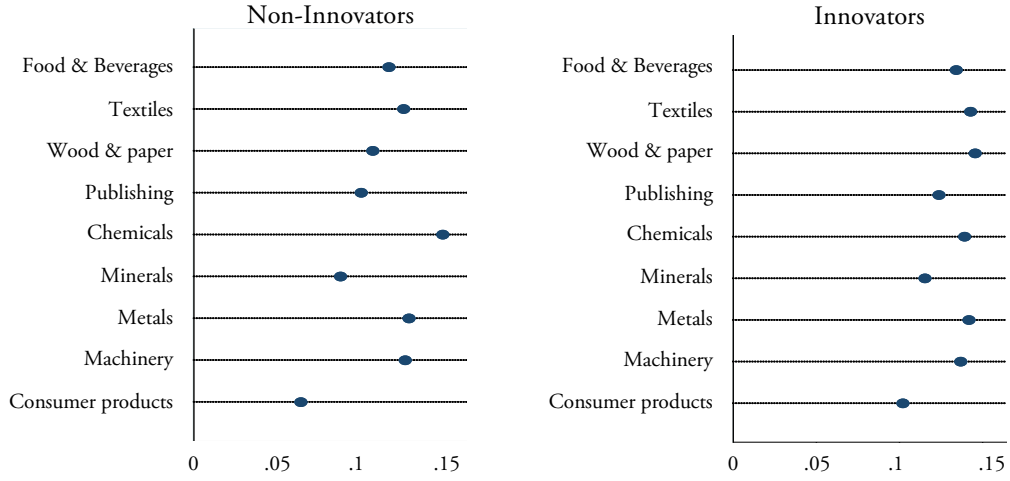
$$KIBS_{i,j} = \beta_0 + \beta_1 Innov_i + \Omega_i + \vartheta_s + \vartheta_c + \varepsilon_{i,j} \quad (1)$$

where the sub-indexes i and j refers to the firm and the city respectively. Ω_i is a vector of firm characteristics including exporting status, size (nº workers), and firm age; ϑ_s and ϑ_c refer to the industry and country dummies respectively, and $\varepsilon_{i,j}$ is the error term. To support hypothesis 1, β_1 needs to be positive.

4. Results and discussion

The results indicate that a manufacturing firms' decision about location based on KIBS proximity, is a critical determinant of their innovativeness. If we analyse the total sample (Figure 1), these are some descriptions of the percentage of non-innovative and innovative companies by industries that are close to a KIBS in different countries.

Figure 1.
KIBS Co-location by Industry
Innovators Vs Non-Innovators

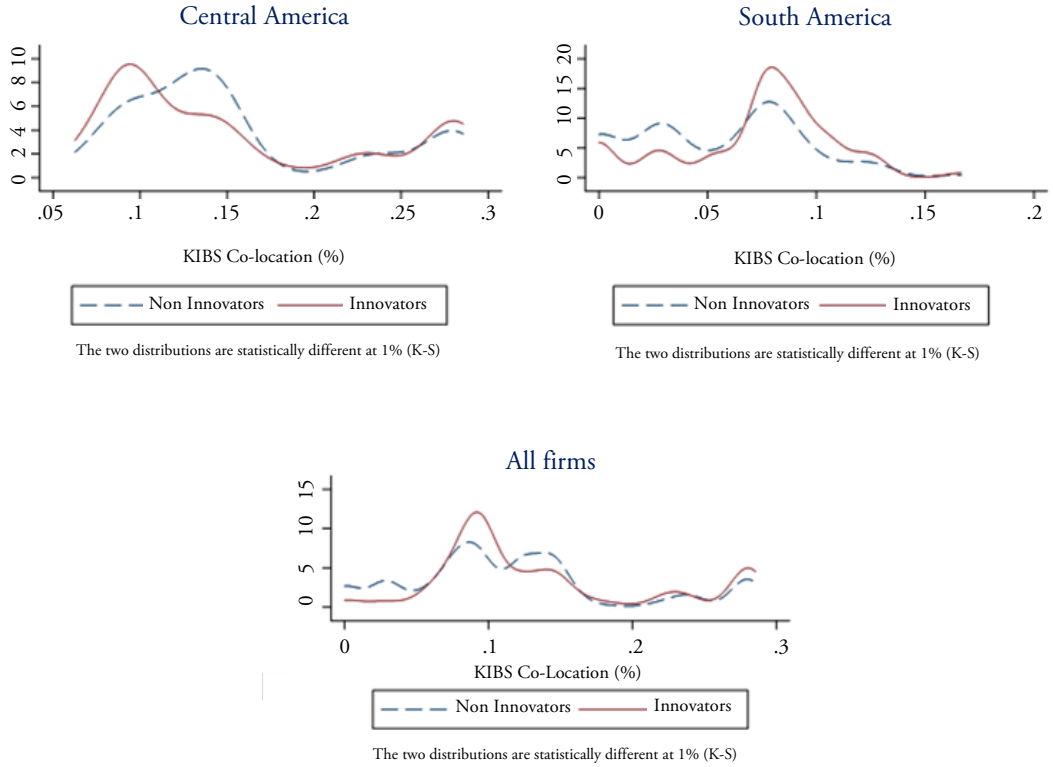


As can be seen in the graph to the right, innovative companies tend to be one percentage point closer to KIBS than non-innovative ones. It is especially innovative firms in the Wood and Paper industry that have the largest share of KIBS proximity. In contrast, firms in the Consumer Products industry have a smaller share of KIBS proximity. Despite these findings, at this level of analysis, we cannot see if these are differences between Central and South American regions. It is important to know these differences because, according to previous studies in Latin America, the characteristics of the productive structure, exports and productivity, are heterogeneous (Pietrobelli & Rabellotti, 2007; Dutrénit, 2016).

Figure 2 represents the distribution of manufacturing companies close to KIBS for Central America, South America, and the complete sample according to whether they are innovative companies or not. As can be seen, Central American countries are closer to KIBS than South American countries, and innovative companies tend to be a percentage point closer to KIBS than non-innovative ones. This shows, firstly, that

there are differences between both regions, i.e. Latin America is heterogeneous (Pietrobelli & Rabellotti, 2007), and second, there is a relationship between KIBS co-location and the innovativeness of the manufacturing firms (Lafuente et al., 2017). Hence, this evidence supports the arguement that KIBS contributes to sustaining the competitive advantage of manufacturing firms (Doloreux & Shearmur, 2013; Ciriaci, Montresor & Palma, 2015).

FIGURE 2.
Innovation and KIBS Co-location



In any case, it is visually appreciated that, according to the Kolmogorov-Smirnov test, the distribution of companies close to KIBS differs, as to whether they are innovative companies or not, with a statistical significance of 1%. Therefore, this test justifies the use of different regressions for the sample of innovative and non-innovative companies.

Following the results of the Kolmogorov-Smirnov test reported in Figure 2, equation (1) is also estimated separately for innovator and non-innovator firms, with the same set of independent and control variables. Table 4 presents the results for the effects of KIBS co-location and innovativeness for the full sample and subsamples of innovator and non-innovator firms. Equation (1) is estimated with and without variables that capture firm characteristics contained in vector Ω_i. Furthermore, the control variables shows the significance of the regression models.

More generally, models 1-3 report the results with all explanatory variables included. The results show that the firm' age is relevant in all models, that is, companies with more time on the market tend to look for a close proximity to KIBS. However, firm size (number of workers) is only positive for Central America and is negative for both South America and the full sample, respectively. That is to say, the largest companies from Central America and the smaller ones from South America are more prone to have close proximity to KIBS.

TABLE 4.
Regression models to KIBS Co-location

Variables	Model 1 Full Sample	Model 2 Central America	Model 3 South America
Innovator	-0.00171	0.00590**	-0.00599**
	(0.00207)	(0.00238)	(0.00275)
Exporter	-0.00175	-0.00311	-0.00230
	(0.00238)	(0.00289)	(0.00302)
Ln (Workers)	-0.00199**	0.00262***	-0.00389***
	(0.000771)	(0.000917)	(0.00102)
Firm Age	0.000121**	0.000237***	0.000115*
	(0.0000503)	(0.0000598)	(0.0000650)
Constant	0.139***	0.0624***	0.149***
	(0.00309)	(0.00517)	(0.00409)
Observations	3029	807	2222
R^2	0.534	0.355	0.359
Industry FE	YES	YES	YES
Country FE	YES	YES	YES

Dep Variable: KIBS Co-Location (%).
Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

On the other hand, the exporter variable is not significant for all models. One possible explanation for this in some Latin American contexts, the firms have scarce knowledge about foreign markets and institutional differences between countries are an important limitation for the international expansion of firms (Shrader, Oviatt & McDougall, 2000).

Finally, the innovativeness variable shows that, for the full sample, it is not significant and illustrates the complexity of the location of KIBS for innovation. However, when compared to Central and South American regions, the results indicate that the innovation in manufacturing firms from Central America is positively related to proximity to KIBS (coefficient = 0.00590**), while in South America it is negatively related (coefficient = -0.00599**). In this sense, the study contributes to a debate that still exits around the KIBS co-location. In other words, the results for the Central America sample support hypothesis 1 (Model 2). Thus, the analysis of innovator and non-innovator firm subsamples provides a better understanding and enables us to test Hypothesis 1. The results for innovator firms (Model 2) strongly support Hypothesis 1, suggesting that KIBS co-location and innovativeness are positively related for innovator firms. This finding is even more important when we compare these parameters with those estimated for the subsample of non-innovators.

In short, innovation in Central America is positively related to proximity to KIBS (manufacturing must be close to KIBS), while in South America it is negatively related. Therefore, these results support Hypothesis 2, suggesting that, for Central America, the proximity is crucial where firm's location is relatively close to KIBS, and it becomes more likely that such proximity boosts innovation (Simmie, 2003; Simmie & Strambach, 2006). However, for South America, the proximity per se is not a necessary or sufficient condition for innovative processes (Bochma, 2005; Doloreux & Shearmur, 2012). Thus, without contradicting the more widely held view that innovation is associated with local dynamics, these results show that there are wider spatial patterns of innovation. For instance, the spatial scale and proximity for innovation could be explained through different geographical extensions (Shearmur & Doloreux,

2009) of the countries from Central and South America, or that not all KIBS require the same level of geographical proximity (Lafuente et al., 2019).

In any case, these results show that both approaches to understanding the geography of KIBS innovation are valid, and that they are complementary. Whilst our results are suggestive and call for further investigation, we postulate that the decision of KIBS co-location becomes more important when the technological and knowledge intensive services is scarcer, and hence valuable, in the context of national innovation systems in emerging stages with scarce science, technology and innovation capabilities, and with weak links between actors, as in the case of Latin America (Crespi & Zuñiga, 2012; Rubalcaba et al., 2016; Dutrénit, 2016).

5. Conclusions

5.1. Theoretical Implications

Understanding the interplay between KIBS co-location and the innovativeness of manufacturing firms demands a conceptual framework that would help us to understand these relationships in context of emerging countries. The present research examines these relationships in some of Latin America's developing economies to corroborate traditional theories that apply to Western economies on these issues (Hsieh et al., 2015). The evidence presented in this paper provide empirical support to illustrate the complexity of the location of KIBS for innovation, which shows that the Latin American region is heterogeneous (Pietrobelli & Rabellotti, 2007; Dutrénit, 2016; Crespi, Katz & Olivari, 2018). Hence, demands more analysis in different dimensions.

From a theoretical standpoint, this study continues the debate that still exists around the KIBS co-location (Antonietti & Cainelli, 2016), where some arguments affirm that knowledge spillovers are localized and decay across space (Simmie, 2003; Simmie & Strambach, 2006), and other argues that proximity per se is not a necessary or sufficient condition for innovative processes (Bochma, 2005; McCann, 2007). Despite most of the theoretical and empirical insights of this topic being mainly drawn from the experiences of advanced Western countries (Wang, Zhang & Yeh, 2016), we find somewhat similar results in Latin America.

In sum, we believe that innovation varies both in the continuous space in different territories, and decision of KIBS co-location becomes more important when the technological and knowledge intensive services is scarcer, and hence valuable.

5.2. Managerial and Policy Implications

This study contains two main implications; the first is suggesting that KIBS co-location and the innovativeness of the manufacturing firms are positively related. Therefore, KIBS could have a positive impact on their innovation capacity (Ciriaci, Montresor & Palma, 2015; Seclen-Luna & Barrutia-Güenaga; 2018). Furthermore, it can facilitate the adoption of servitization strategies for manufacturing firms and introduce value-adding services into their operations (Visnjic & Van Looy, 2013; Cusumano, Khal & Suarez, 2015; Baines et al., 2017; Bustinza et al., 2018). The second implication suggests that new institutions are needed to support the development of local capabilities and the establishment of KIBS (Crespi, Katz & Olivari, 2018). Hence, it is important for regional and local governments to consider integrating KIBS into manufacturing clusters when designing industrial policies (Vendrell-Herrero & Wilson, 2017; Vendrell-Herrero et al., 2019). This is especially important because these relationships can help to build a process of territorial servitization (Lafuente et al., 2017) which contributes to the consolidation and resistance of the regional industrial fabric creating competitive advantages for companies and leading to an improvement in regional competitiveness (Gomes et al., 2019; Lafuente et al., 2019).

Finally, the contextual domain of this research of Latin American manufacturers presents no obstacles to the arguments described above due to Latin America's business fabric being less developed than those of Western economies. KIBS co-location could help manufacturing firms to design a more advanced strategy of competitiveness by building-up knowledge-service competences. Hence, our contextual findings have the potential to influence managerial and political agendas in Latin America. That is, there is a clear invitation to design an innovation policy for each specific case (institutional and cultural contexts), far from the classic generic 'recipes' and mechanical imitations (Seclen-Luna & Barrutia-Güenaga, 2019).

5.3. Limitations and Future Research

Although the empirical analysis is supported by a large and reliable WBES database, the low number of observations for some of the key variables prohibits analysis at a national level. Therefore, they aggregate countries together for the empirical analysis, allowing only for interpretations at a regional level (Grazzi & Pietrobelli, 2016). Furthermore, as the WBES database does not provide information on how manufacturers and KIBS coordinate and share knowledge, this question remains open for future research.

In the same vein, at a micro level, our study does not evaluate how manufacturing firms internalize professional services into their operations and it does not consider the types of innovation; further research on this issue would therefore be valuable. Besides this, at a meso level, future research on this topic should identify how specific policies on territorial servitization can revitalize manufacturing activities in territories with relatively undeveloped manufacturing industries (Lafuente et al., 2017).

Finally, despite the relationships which are significant in our model, other factors not included in the current model may also play an important role. Thus, future research will need to corroborate the results in specific contexts (at regional and national levels, including size and maturity of the industry), in a long-term analysis, to determine some of the causal mechanisms.

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Articles

Servitization and territorial self reinforcing mechanisms: a new approach to regional competitiveness

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ABSTRACT:

The present paper discusses a theoretical model to explain the link between servitization and territorial competitiveness based on the situation in Italy. A key assumption of the model is that once the link between manufacturing and KIBS is established within a TES, there is a positive feedback between the increasing productivity (competitiveness) and the link between firms and KIBS, which becomes stronger and stronger triggering a self-reinforcing dynamic. This means that every evolutionary step of the system influences the next and thus the evolution of the entire system, so generating *path dependence*. Such a system has a high number of asymptotic states, and the initial state (time zero), unforeseen shocks, or other kinds of fluctuations, can lead the system into any of the different domains of the asymptotic states (1). In other words, both the theoretical assumptions and the empirical model outlined in this paper demonstrate that when a functional relationship between manufacturing and services is established (servitization), economic performance is positive or very positive.

KEYWORDS: Servitization; Self-Reinforcing Mechanism; Regional Policies.
JEL CLASSIFICATION: R11; R12; O31.

Servitización y mecanismos de autorrefuerzo territorial: un nuevo enfoque a la competitividad regional

RESUMEN:

El presente artículo analiza un modelo teórico para explicar el vínculo entre servitización y competitividad territorial basado en estudio empírico de tal relación en Italia.

Un supuesto clave es que, una vez que se establece el vínculo entre la manufactura y KIBS dentro de un TES, hay una retroalimentación positiva entre el aumento de la productividad (competitividad) y el vínculo entre las empresas productoras y los KIBS se genera una dinámica de retroalimentación positiva que conduce a un aumento de la productividad (competitividad). Esto implica que cada paso evolutivo del sistema influye en el siguiente y, por lo tanto, en la evolución de todo el sistema, se generan interdependencias (generando así dependencia del camino). Tal sistema tiene un alto número de estados asintóticos, y durante el estado inicial (tiempo cero), choques imprevistos u otros tipos de fluctuaciones, pueden llevar al sistema a cualquiera de los diferentes dominios de los estados asintóticos (1). En otras palabras, tanto los supuestos teóricos como el modelo empírico esbozado en este trabajo demuestran que cuando se establece una relación funcional entre manufactura y servicios (servitización), el desempeño económico es positivo o muy positivo.

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PALABRAS CLAVE: Servitización; Mecanismo de autorrefuerzo; Política Regional.
CLASIFICACIÓN JEL: R11; R12; O31.

1. INTRODUCTION

The connections between firms and manufacturing and knowledge-intensive business services KIBS) are important in explaining the differences in competitiveness at local level. There is, however, very little literature on the subject. Therefore, the papers (2) (4), (5), (10); (11) ares very important as it shows how the growth of employment in a specific territory interacts strongly with Servitization and how this functional link can generate virtuous cycles.

A comprehensive survey of the literature on Servitization can be found in (10). In this paper, the authors build an interesting taxonomy of the key contributions on Servitization, by dividing the different approaches into four quadrants, where the relationship between internal analysis and external analysis is shown on the horizontal axis, and the relationship between mainstream and alternative approaches is shown on the vertical axis. Quadrant IV, focusing on the KIBS, is of particular interest and is where the present paper is ideally positioned, albeit with a different approach.

The present paper puts forward a theoretical model to explain the link between Servitization and territorial competitiveness based on the situation in Italy. We estimated the contribution of Servitization to the performance of Territorial Economic Systems (TESs) in Italy. A key assumption of the model is that once the link between manufacturing and KIBS is established within a TES, there is a positive feedback between the increasing productivity (competitiveness) and the link between firms and KIBS, which becomes stronger and stronger triggering a self-reinforcing dynamic. This means that every evolutionary step of the system influences the next and thus the evolution of the entire system, so generating *path dependence.* Such a system has a high number of asymptotic states, and the initial state (time zero), unforeseen shocks, or other kinds of fluctuations, can lead the system into any of the different domains of the asymptotic states (1).

In other words, both the theoretical assumptions and the empirical model outlined in this paper demonstrate that when a functional relationship between manufacturing and services is established (Servitization), economic performance is positive or very positive.

However, promoting development in lagging regions by relying on "traditional" policies may not be a good policy choice. Indeed, the paper shows that, due to path dependence and poor response function, in weak TESs, traditional regional policies that focus on compensating the scarce factors of production (for example capital to stimulate production investment) risk creating a Dutch disease effect, because the TES is unable to effectively absorb the additional (traditional) factor of production. Consequently, "compensatory" or "additional" regional policies end up accentuating the differences between regions due to the different response functions and which are manifested in multiple, resilient equilibriums (similar to fitness landscapes). Instead of fostering convergence, the traditional policies create underdevelopment traps (the lowest points in the fitness landscape) from which TESs struggle to escape.

We found a high and positive correlation between the specialisation of a given TES in knowledge-intensive business service (KIBS) and productivity, measured as per capita value added. We also found that path dependence strongly influences the capacity of manufacturing firms located in a given TES to diversify their products in order to embed a service component.

2. THEORETICAL BACKGROUND

The TES is the physical space in which economic agents interact; the equilibrium properties of this system depend on its structure and, if the space is complex, on the particular attraction basin in which the

system stays. The increasing returns, the multiple equilibria, the history dependence can found a meaning in the complex space (3).

By introducing the notion of Territorial Economic System (TES) as unit of analysis, it is possible to move towards the increase of interpretative capability when a synthesis among production system, technological knowledge at territorial level and local institution is searched. A TES then consist of interconnection among production system, technological knowledge and *social capabilities*. Each of these dimensions encompasses some factors which determine the performance of the TES (see Table. 1) (6).

TABLE 1.
Elements of the TES

FIRM LEVEL (FL)	EXTRA TERRITORIAL LEVEL (ETL)	TERRITORIAL LEVEL (TL)
Access to: - Contextual and codified knowledge - Local and regional infrastructure networks *Receptiveness:* - Size - Organisational structure - Constitutive structure - Innovative experiences - Business networks	Codified knowledge: technological, organisational and communication codes	*Intangible elements:* Available knowledge and social capabilities *Physical elements:* - Available infrastructure - Production system - Material resources

TES is a multidimensional concept that encompasses economic and social dimensions. Whereas the production system has a mainly material connotation, technical knowledge and social capability have a mainly immaterial nature (6), (7). It is important for a description of the TES to define two dimensions: the proximity and the resiliency. Each territory shows first of all a different degree of proximity which does not necessarily mean contiguity, but can have a functional meaning. There is, in fact, an industrial organization, cultural and temporal proximity.

The resiliency shows the problem of the spatial evolution in the forms of the production, which leads to the question of the historic dynamics and the evolutive trajectories of each TES. It is the capability of the system in the self-organization and in the metabolizing of the change in the external environment. Proximity and resiliency are a way to express the concepts of local interaction and self-organization. Within TESs economic dynamic takes the form of a *self-reinforcing mechanism*: a positive (or negative) feedback that characterizes the evolution of a dynamic system.

TES are characterised by a high degree of complexity that select development trajectories stochastically, but then follows a given trajectory based on a self-reinforcing mechanism. The concept of self-reinforcing mechanism can be expressed as a dynamic system, with path dependence and a positive feedback, which tends to a large variety of asymptotic states. Every evolutionary step of the system influences the next one and then the evolution of the entire system, thus generating *path dependence.*

This system has a high number of asymptotic states, and the initial state (Time zero), unpredicted shocks, or other kind of fluctuations, can all conduct the system in any of the different domains of the asymptotic states (1).

Furthermore, the system selects the state in which placing itself. Such dynamics are well known in physics, in chemistry as well as in biology and the final asymptotic state it is called the *emergent structure*. The concept of positive feedback in fact is relatively new for the economic science. The latter generally deals with problems of optimal allocation of scarce/insufficient resources; thus, the feedback is usually considered to be negative (decreasing utility and decreasing productivity).

Self-reinforcing mechanism dynamic can be used to assess many different economic problems with different origins: from those related to the international dimension, to those typical of the industrial economy, as well as problems related to regional economics.

Many scholars have assessed multiple equilibria and their inefficiency. Multiple equilibria depend on the existence of increasing returns to scale. If the mechanism of self-reinforcing is not counterbalanced by any opposite force, the output is a local positive feedback. The latter, in turn, amplifies the deviation from some states. Since these states derive from a local positive feedback, they are unstable by definition, so multiple equilibria exist and are efficient.

I the *vector field* related to a given dynamic system is regular and its critical points follow some particular rules, then the existence of other critical points or of stable cycles (also called *attractors*) turns out (6), (7). The multi-attractors systems have some particular properties that are very useful for our research. Strict path dependence is therefore manifested, and the final state of the system will depend on the particular trail it has been covering during its dynamic evolution from an (instable) equilibrium towards another (instable) equilibrium, and so on. Accordingly, the system's dynamic is a non-ergodic one.

Description of the evolution of spatialised economies emphasizes the role of a new economic paradigm. The latter is based on a series of different features. For instance, new productive factors seem to have replaced land, work and physical capital. Natural and environmental resources, human resources (skills and human capital) and technology are beginning to get the upper hand following the "technological revolution". Another feature is that co-operation within businesses and between businesses and business systems takes place on a vertical and horizontal scale in which the local dimension and the territorial variables constitute the catalyst for processes of development. In addition, technological expertise and social capabilities (3) are the basic elements capable of explaining the different levels of development seen in different territorial contexts. Bellandi & Santini (2), introduce a framework for the interpretation of changes in local productive configurations and the assessment of territorial servitization trajectories. It includes three main variables: multiplicity of know-hows, transaction costs and the entrepreneurial drive. Lafuente., Vaillant & Vendrell-Herrero (5). by adopting a multidisciplinary perspective that combine a variety of frameworks (organizational, place-based, economic geography), explain the mechanics and relationships underlying territorial servitization as well as its territorial economic repercussions. Wyrwich (11) suggests that strengthening the industrial base in peripheral regions could induce knowledge-intensive start-up activity.

Territorial variables, in other words, are decisive factors in explaining development differentials, especially when they are associated with the idea of the market conceived as a social construction. This new market requires rules that will guarantee its smooth running given that access rights, exchange mechanisms and opportunities for distribution of the wealth generated not only do not re-assemble uniformly and autonomously in time and space (8), (9), but almost always require outside intervention to achieve the objectives set for development policies. Re-equilibrium policies thus appear necessary to guarantee a more equitable development process. Within the market it is necessary to define collective rules ensuring that positive dynamics (increasing returns) can develop through the interaction of the agents operating in it. Therefore, the territorial dimension and the systemic nature of the production process are fundamental elements to understanding and governing development processes.

3. Methodology and Findings

The collective properties of a given TES in relation to the link existing between productivity growth and information could be represented in terms of response function.

It is possible to create a generalised function – an interpretative model – to describe the propagation mechanism of economic policy in a situation of complexity. The description of the transmission

mechanism logically completes the previous observations regarding objectives and instruments. Single economic policy decisions, aimed at achieving the *j-th* objective through the use of the *i-th* instrument, can be represented as an outside stimulus which superimposes itself on interactions between agents.

Agents in this approach are thought of as being spatially distributed and linked to each other by local mutual interactions (of a nearest neighbour type). We use H to indicate the effect of the economic policy. We can thus define an effective *Heff* stimulus which includes both outside stimulus and agent interaction.[1] Obviously, without agent interaction *H* and *Heff* are equal. *Heff* therefore assumes the form:

$$Heff = H + \int dr' c(r-r') \delta\gamma(r') \tag{1}$$

Where $c(r-r')$ is a function of correlation between agents which can constitute an acceptable means of modelling the concept of proximity, $\delta\gamma(r')$ is a variation in the behaviour of agents induced by the policy applied, the integral can be linked to the concept of resilience. This type of behaviour arises in the area of a linear response model for systems with collective properties. The effect of an economic policy on a complex system made up of many agents interacting with each other can therefore be described in this way and modelled by means of the response properties of the system itself. Therefore, in the area of linear response theory we have a cause-effect relationship of the type:

$$E(X) = G(X) \otimes H(X) \tag{2}$$

where *E(X)* represents the generalized effect, *G(X)* the response function, and *H(X)* the generalized cause. Therefore, it is possible to study the generalised transmission mechanism of economic policy by describing the response function as a sort of susceptivity which comes to depend on the distribution of agents within the market. Obviously, the type of response depends not only on distribution, but also on the type of interaction between agents.

The relationship between competitiveness, servitization and development can be examined econometrically through a 2SLS regression model. The basic idea analysed is that there is a relationship between added value, intensity of capital accumulation and the capacity for business services development. The equation that must be calculated, therefore, is expressed as follows:

$$VA_t = VA_{t-1} + \text{intaccap} + \text{capsviser} \tag{3}$$

It was decided to use a 2SLS regression model to avoid the impact of the autocorrelations which exist between the variables to be estimated. 2SLS regression models succeed in doing this through instrumental variables. The database used to estimate and define the variables used, both predictive and instrumental, is shown in the appendix. The model not only serves to highlight the link between the variables; being based on territorialised data, it also takes regional differentials into account. In short, if the coefficients are significant, this model will not only highlight a link between added value, capital accumulation and the capacity to develop business services, but it will also explain the territorial differentials.

The model was populated with data from Italian regions. The tables with the values of the variables are given in the appendix. The results of the model are outlined in the following tables:

[1] Heff represents the actual output of the implemented policy.

TABLE 2.
Model Description

		Type of Variable
Equation 1	vapercapita2014	dependent
	vapercapita2009	predictor
	Intensity of capital accumulation	predictor
	Ability to develop business services	predictor
	Perceived risk of crime	instrumental
	Work regularity rate	instrumental
	Wealth index	instrumental
	Share of employees in high-intensity knowledge sectors	instrumental
	VA rate of change	instrumental
	Share of technical and scientific degree	instrumental

TABLE 3.
2SLS Regression

		Unstandardized Coefficients		Beta	t	Sig.	
		B	Std. Error				
	(Constant)	-89.064	42.304		-2.105	.051	*
	vapercapita2009	.762	.152	.738	5.000	.000	***
	Intensity of capital accumulation	.428	.195	.331	2.197	.043	**
	Ability to develop business services	.696	.398	.289	1.749	.099	*
F di Fisher						60.575	***
Adjusted R Square						.904	

4. DISCUSSION

As can be seen from the data, the regression has a good level of significance, both overall with a high F value, and for the individual coefficients which have very good Student's T-values. The sign of the coefficients correlates an incremental contribution of the individual variables to added value at time t and highlights a relationship between added value at time t and the "delayed" added value (of the previous period) and two fundamental variables in regional development theory, namely capital accumulation intensity and business services development capacity.

These results are perfectly in line with the theoretical analyses previously developed in defining the territorial economic system. In particular, the link between business services development capacity, which is an excellent proxy for the concept of servitization and added value at time t, highlights the active role of servitization in regional development processes, also in relation to territorial differences. In particular, the model identifies the three variables 'delayed added value', 'capital accumulation' and 'business services development capacity' as the incremental factors determining territorial differences in added value at time t.

By using the data of the Italian regions, a very strong relationship can be established between the 'business services development capacity' variable, which is a proxy for servitization, and 'added value per capita' at time t, taking delayed value added per capita as the baseline.

The territorial value differentials in value added per capita are determined by the initial value added per capita, by servitization and by the intensity of capital accumulation which is an investment-linked variable. Thus, by using the TES as a key to interpretation, it is possible to identify the Territorial Level (TL) in servitization and the Firm Level (FL) in the intensity of capital accumulation. These two dimensions explain most of the differentials in regional development expressed in terms of value added per capita. Both the theoretical assumptions and the empirical model developed in this paper demonstrate, on the one hand, that the functional relationship between manufacturing and services is the basis of positive or very positive economic performance. On the other hand, it is also demonstrated that the weak regions are not equipped to respond in a positive manner (with endogenous growth) to the stimulus represented by "traditional" regional policy, which attempts to compensate for the lack of factors of production, for example by injecting capital to stimulate production investment.

5. Some concluding remarks

An initial consideration concerns the path dependence which characterises regional development trends. A given tool (e.g. regional policy) deployed to promote development in a specific TES, which is characterized by a given response function, may actually create development traps. This traditional approach risks creating a Dutch disease effect because the TES fails to effectively absorb the additional (traditional) factor of production. It is like trying to fit a piece that does not fit into a puzzle.

This type of "compensatory" or "add-on" regional development policy ends up accentuating the differences between regions, which are due to the different response functions and are manifested in multiple, resilient equilibriums (similar to fitness landscapes). Instead of fostering convergence, traditional policies create underdevelopment traps (the lowest points in the fitness landscape) from which the TES struggle to escape.

Peripheral regions are the ones most exposed to loss of competitiveness since the rules governing the economic system promote the aggregation of factors and "classic" regional policy is unable to counter this trend, despite generous financial compensation.

An effective regional policy should work on two levels: modify the response function of a TES and also provide an investment able to generate a vector (defined as a "generalised cause"). Moreover, interventions should be minimal and aimed at creating stronger connections between economic agents and, in particular, combining production activities with services, to foster the servitization that probably influences "soft" factors inside the TES.

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APPENDIX

Indicators for Italian regions used for 2SLS Model - Standardized and Normalized data (Italy=100) [2]

	Share of employees in high-intensity knowledge sectors	Share of technical and scientific degree	Intensity of capital accumulation	Ability to develop business services	VA per capita 2014	VA per capita 2009	VA Rate of Change	Perceived risk of crime	Work regularity rate	Wealth index
Piemonte	105.65	133.47	126.44	103.72	106.75	104.02	2.62	97.86	99.92	171.67
Valle dAosta	82.35	6.14	139.85	87.99	126.83	128.72	-1.47	43.08	106.38	160.94
Lombardia	118.74	123.55	96.99	115.85	132.69	130.05	2.03	119.31	168.32	257.50
Trentino Alto Adige	75.34	73.48	147.89	84.70	139.82	131.79	6.09	31.10	158.06	271.05
Veneto	80.70	90.76	100.39	95.09	114.04	125.84	-9.37	102.27	137.17	228.89
Friuli Venezia Giulia	90.69	142.17	108.08	109.99	107.77	104.58	3.05	55.25	107.22	130.38
Liguria	123.86	115.00	91.24	100.45	112.55	111.73	0.73	77.13	101.23	132.05
Emilia Romagna	87.63	141.97	100.92	102.94	124.09	119.01	4.27	104.74	143.00	245.24
Toscana	90.00	125.93	90.12	100.63	108.88	107.02	1.74	85.20	128.24	201.96
Umbria	79.99	92.65	100.21	94.90	87.76	92.05	-4.66	118.76	97.35	128.75
Marche	80.45	124.00	97.17	92.82	96.03	97.73	-1.74	88.98	113.56	104.04
Lazio	144.79	136.25	93.61	112.62	114.50	125.77	-8.96	131.76	123.61	177.59
Abruzzo	80.15	74.47	144.40	88.67	89.33	85.14	4.93	81.83	91.13	81.10
Molise	75.51	26.58	124.58	84.75	69.85	78.32	-10.81	30.53	47.54	53.37
Campania	88.68	84.72	82.80	82.99	63.55	67.10	-5.28	116.55	71.32	53.09
Puglia	79.18	50.80	90.67	81.62	63.47	63.43	0.07	107.63	69.32	50.24
Basilicata	77.06	35.58	116.65	91.31	72.00	70.14	2.66	46.16	53.31	40.39
Calabria	79.95	78.16	113.93	80.52	60.89	63.36	-3.90	69.76	41.57	38.29
Sicilia	85.60	60.87	81.79	82.82	63.11	68.87	-8.36	88.31	62.60	40.87
Sardegna	80.85	59.97	95.87	87.90	71.38	66.70	7.02	43.08	54.81	68.21

Source: Our elaboration from ISTAT data.

[2] Except variable VA rate of change.

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