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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.

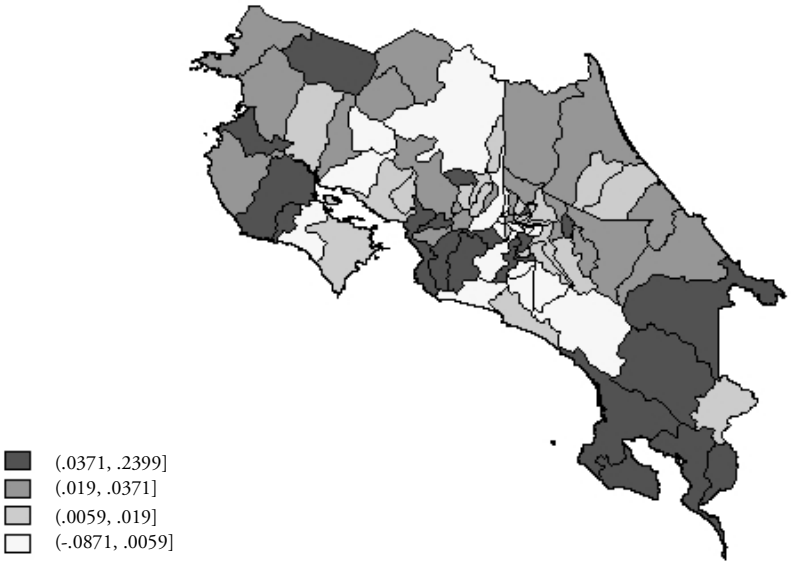
Figure 1 visually presents, for each county, the distribution of the average variation of the dependent variable between 2011 and 2016.

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).