# KIBS as fosters for innovativeness in manufacturing industries: The case of Latin-America

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Abstract

Previous analysis of the relationship between KIBS and innovation outcomes have shown how KIBS contribute to economic development in industrialized countries, where the competitiveness of manufacturing industries depends more and more on the specific knowledge provided by highly specialized suppliers. In this way, KIBS has been gradually perceived as a strategic sector in the context of the knowledge-based economy. According to territorial servitization postulates KIBS are also fundamental for the development of the manufacturing fabric. In this vein, the purpose of this research is analyzing the relationship between innovativeness and location decisions in manufacturing decisions, in order to understand whether the presence of KIBS can be seen as a magnet for manufacturing development.

Drawing on the World Bank Enterprise Survey 2017 for Latin-American countries, authors analyze 3,029 manufacturing firms. Findings indicate that manufacturing firms' location decision based on KIBS proximity is a critical determinant of innovativeness. Preliminary results indicate that manufacturing firms' location decision based on KIBS proximity is a critical determinant of innovativeness. This relationship is considerably stronger in Central American countries, where according to our data there is KIBS scarcity. Whilst this result requires further discussion, we postulate that the decision of KIBS co-location become more important when the technological and service knowledge is more scarce and hence valuable.

L84, O30, O54, R11.

KIBS, Innovation, Latin America & Caribbean, Regional Economic Activity.

## 1. Introduction

Nowadays there has been a growing body of literature dealing with innovation activities in emerging countries (Goedhuys & Veugelers, 2012). Latin American countries stand out as a particularity intriguing case. Overall investment in R&D in these countries have always been low, even when compared other emerging economies in Asia and Eastern Europe (Olavarrieta & Villena, 2014). Also, Latin American countries are highly heterogeneous in terms of their innovation environments (Crespi & Zuñiga, 2012).

In Latin America, innovation studies have been carried out with some lag when compared to the United States and Europe (Tello-Gamarra et al., 2018). These authors in their bibliometric analysis find that Latin American still falls behind the reference countries in the area, accounting for 2.75% of the worldwide bibliographic production on innovation. Thus, the Latin American region still present a marginal contribution to this respect (Ketelhöhn & Ogliastri, 2013), these authors summarized the literature for innovation and entrepreneurship in Latin America and indicated that most articles were focused on marketing innovation rather than innovation activities.

Our study analyses to what extend firms' innovativeness is enhanced by KIBS co-location. KIBS are service organisations whose primary value propositions include knowledge-intensive inputs to the business processes of customer organisations (Miles, 2005). Currently, it is recognised that 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). Likewise, KIBS can act as innovation facilitators or knowledge intermediaries (Den Hertog, 2000) since they support clients in the development of their innovation processes.

The evolution patterns for KIBS are affected significantly by the characteristics of the local manufacturing industry (Corrocher & Cusmano, 2014; De Propris & Storai, 2019; Horváth & Rabetino, 2018; Wyrwich, 2018). Furthermore, not all KIBS require the same level of geographical proximity and more research is needed to better understand how territorial location is affecting territorial growth (Lafuente et al., 2018). In line with this argument, empirical evidence on the spatial organization for KIBS is very limited, being a lack of research on the spatial patterns for analysing successful KIBS location and performance (Antonietti & Cainelli, 2016).

Most of the empirical research on KIBS is based on studies and comparisons between global cities belonging to developed countries that show how location factor is key, while

variations between metropolitan areas particularly in developing countries remain largely unstudied (Hsieh et al., 2015). In fact, research analysing KIBS in Latin America still scarce (Figueiredo et al., 2017). An empirical analysis that is carrying out using a large sample of Latin American manufacturing firms.

For further understanding heterogeneities, we compare Central and South American regions. The final sample used consists of 3,029 manufacturing firms across 9 Latin American countries. Therefore, cross-sectional surveys conducted in five Central American and four South American countries. 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.

Preliminary results indicate that manufacturing firms' location decision based on KIBS proximity is a critical determinant of innovativeness. The analysis of innovator and non-innovators firm subsamples provides a better understanding and enables us to test our hypothesis. The results for innovators firms strongly support the hypothesis, suggesting that KIBS co-location and innovativeness are positively related for innovators firms. Whilst this result requires further discussion, we postulate that the decision of KIBS co-location become more important when the technological and service knowledge is scarcer and hence valuable.

In any case, the present research examines these relationships in developing economies from Latin America, as traditional theories that apply to Western economies may not apply to less developed countries (Hsieh et al., 2015). Contrary to the KIBS theories in favour of the proximity to building relational knowledge, the results are not clear for countries from South America. From a theoretical standpoint, our research suggests the strong need for further contextualization of KIBS theories in Latin America. This is important as previous research acknowledges that proximity per se does not necessarily result in knowledge sharing and innovation.

The structure of the paper is as follows: first, we establish a theoretical framework about the KIBS colocation and innovation. Following this, we carry out an empirical study to test the assumption and present the results. Finally, we concluded these results in the manufacturing firms across 9 Latin American countries.

## 2. Theoretical background

From the seminal research by Miles et al. (1995), the literature has analysed a new pattern of innovation fostered by "knowledge-intensive business services" (KIBS). KIBS are service organisations whose primary value propositions include knowledge-intensive inputs to the business processes of customer organisations (Miles, 2005). Likewise, they are a set of very heterogeneous services that have multiple classifications. For instance, according to Miles (2012) there are three specific categories to classify KIBS: 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 domain of the organisation and administration. The second category is made up of designing and maintaining computer systems, software design, programming, engineering services and R&D services. Therefore, the generation and transfer of technologies are key characteristics (Landry et al., 2012). The third category includes advertising and design services that are based on creativity, as well as, symbolic and cultural knowledge (Miles, 2012).

The above classification is important to highlight because some authors argue that not all KIBS are equally innovative (Rodríguez & Camacho, 2010) and we should be cautious when generalising about innovation in KIBS since they have different 'knowledge-bases' (Strambach, 2008; Pina & Tether, 2016). Currently, it is recognised that 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). Likewise, KIBS can act as innovation facilitators or knowledge intermediaries (Den Hertog, 2000) since they support clients in the development of their innovation processes. Therefore, KIBS plays a very important role in the context of innovation systems (Cooke & Leydesdorff, 2006; Aslesen & Isaksen, 2010; Corrocher & Cusmano, 2014).

Following with the analysis of the relationship between KIBS and innovation outcomes, some authors have shown how KIBS contribute to economic development in industrialized countries, where the competitiveness of manufacturing industries depends more and more on the specific knowledge provided by highly specialized suppliers (Corrocher & Cusmano, 2014). In this way, KIBS has been gradually 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).

However, considering that selective agglomeration is important for the success and competitiveness of KIBS (Scott, 1998), literature has provided empirical evidence showing that KIBS tend to be grouped in large metropolitan areas. These metropolitan areas are characterized by high density of innovative industries (Porter, 1990; Camacho & Rodríguez, 2005; Gallego & Maroto, 2010) that promote information exchange among suppliers and the appearance of knowledge spillovers (Krugman, 1991), having access to transport and communications infrastructures (Marshall & Wood, 1995), high-quality labour markets (Illeris, 1996; Coffey & Shearmur, 2002) and greater opportunities for face-to-face interaction with clients (Keeble & Nachum, 2002; Shearmur & Avergne, 2002; Shearmur & Doloreux, 2008; Muller & Doloreux, 2009). Therefore, the importance of location is a critical variable for understanding KIBS effective service provision (Wood et al., 1993; Simmie & Strambach, 2006).

Furthermore, there are differences in the location of KIBS even when located in large metropolitan areas. For example, in Canada, the technological KIBS are located in more central and large cities, and they collaborate with all kinds of external actors. On the contrary, professional KIBS are more dependent on local markets (Pinto et al., 2013). In the same vain, technological services tend to be located in those European regions with better innovation systems with higher inputs, knowledge production and R&D investments. On the contrary, market and financial services are located in those regions with higher levels of economic potential and higher population density (Gallego & Maroto, 2010).

Even when innovation literature recognized that KIBS intensity strongly influences innovation outcomes (Hsieh et al., 2015), KIBS intensity is not the only pattern behind this process. Where business R&D intensity is high –as in the case of those European regions of manufactures with medium and high technology– the expansion of KIBS has been slower, although significant. This suggests that the evolution patterns for KIBS are affected significantly by the characteristics of the local manufacturing industry (Corrocher & Cusmano, 2014; De Propris & Storai, 2019; Horváth & Rabetino, 2018; Wyrwich, 2018). Thus, not all KIBS are clearly oriented towards innovation, and even within the innovative KIBS firms, innovation is carried out in several ways due to different competitive strategies, which produces different impacts on the business ecosystem (Freel, 2006; Corrocher et al., 2009 & 2012). Therefore, not all KIBS require the same level of geographical proximity and more research is needed to better understand how territorial location is affecting territorial growth (Lafuente et al., 2018).

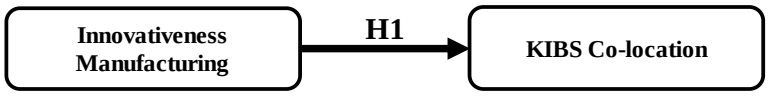
In line with this argument, empirical evidence on the spatial organization for KIBS is very limited, being a lack of research on the spatial patterns for analysing successful KIBS location and performance (Antonietti & Cainelli, 2016). In any case, most of the empirical research on KIBS is based on studies and comparisons between global cities belonging to developed countries that show how location factor is key, while variations between metropolitan areas particularly in developing countries remain largely unstudied (Hsieh et al., 2015). In fact, most of the KIBS literature published in the Web of Science, Scopus and SCIELO comes mainly from authors from North America and Europe, being research analysing KIBS in Latin America still scarce (Figueiredo et al., 2017), presenting just 3.3% of the world publication on innovation issues in general (Tello-Gamarra, et al., 2018).

KIBS presence can be especially important in the peripheral regions, as they can help SMEs firms in solving complex problems, as well as connect them to a huge amount of expertized knowledge (Pinto et al., 2013). However, the peripheral areas are affected by a relative lack of support infrastructure, social capital, access to markets and skilled human resources (Tödtling & Trippl, 2005; Shearmur & Doloreux, 2009) and tend to present a lower concentration of KIBS. Therefore, SMEs in these areas may encounter problems of accessing to the provision of specialized knowledge (Pinto et al., 2013). Thus, based on these arguments, we propose the following hypothesis:

*H1: Innovativeness for manufacturing firms is positively associated with closeness to KIBS location.*

Figure 1 represents visually the empirical relationship hypothesized.

Figure 1. Hypothesis



## 3. Data collection and methodology

### 3.1 Context and data description

With a population of over five hundred million inhabitants, a growing middle class, and a GDP of approximately US$4 trillion, Latin America is becoming one of the world's most important economic regions (Vendrell-Herrero et al., 2017). The data was obtained from the World Bank Enterprise Survey (WBES) 2017 to shed light to the research question proposed. A survey specifically conducted to gather information on the business climate in developing countries.

The WBES has been used extensively in previous international management studies (Luo & Bu, 2016; Vendrell-Herrero et al., 2017; Cole et al., 2018; Gomes et al., 2018). The survey uses a stratified sampling technique based on firm size, geographical region and sector and collects detailed information on firm sales, size, age and export status, and other country-specific information. Our study uses survey rounds conducted from 2009 to 2017, partly 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, we restrict the sample to firms in the manufacturing sector. The final sample used consists of 3,029 manufacturing firms across 9 Latin American countries.

Therefore, cross-sectional surveys conducted in five Central American and four South American countries. 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.

A striking increase in cluster policy has stimulated certain manufacturing sectors but the role of knowledge-intensive firms in these economies remains largely unknown (Vendrell-Herrero, Darko & Ghauri, 2019). This study focuses on survey data, which unlike accounting/financial databases are able to better represent more knowledge nuances (Del Giudice & Della Peruta, 2016).

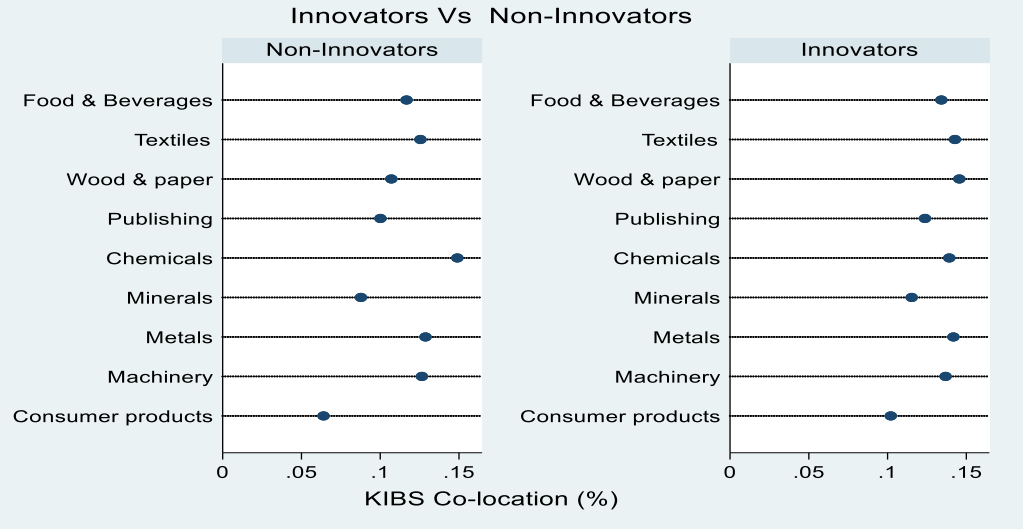
### 3.2 Description of variables

Our dependent variable, KIBS co-location, is measured at the country-city level, using the method first described in Vendrell-Herrero et al., (2019). The independent variable innovativeness is measured through a dummy variable.

4. Results and discussion

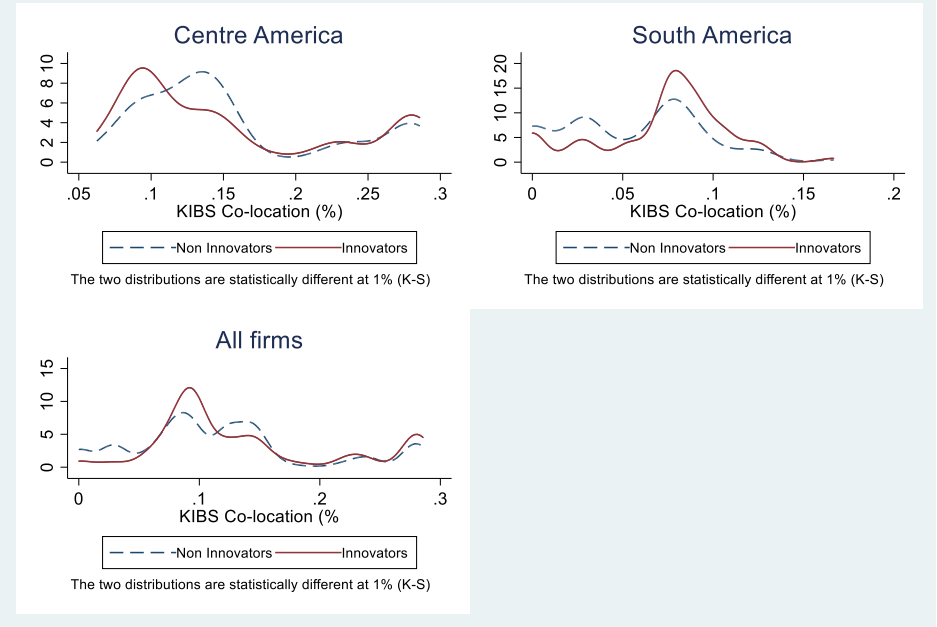
Preliminary results indicate that manufacturing firms' location decision based on KIBS proximity is a critical determinant of innovativeness. This relationship is considerably stronger in Central American countries, where according to our data there is KIBS scarcity (Figure 2). These are some descriptive of the percentage of non-innovative and innovative companies by industrial sectors that are close to a KIBS in different countries. As can be seen in the graph to the right, innovative companies tend to be in a percentage closer to KIBS than non-innovative ones.

Figure 2. KIBS Co-location by Sector




Furthermore, figure 3 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 close to KIBS than South American countries and innovative companies tend to be in a percentage closer to KIBS than non-innovative ones. It is visually appreciated that, according to the Kolmogorov-Smirnov test, the distribution of companies close to KIBS differs if 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.

Figure 3. Innovation and KIBS Co-location




We estimate the effects of KIBS co-location and innovativeness using OLS. 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. $\Omega_i$ is a vector of firm characteristics including exporting status, size (nº workers), and firm age. $\vartheta_s$ and $\vartheta_c$ refer to the sector and country dummies respectively. $\varepsilon_{i,j}$ is the error term. To support hypothesis 1 we need $\beta_1$ to be positive.

Following the results of the Kolmogorov-Smirnov test reported in Figure 3, equation (1) is also estimated separately for innovators and non-innovators firms with the same set of independent and control variables. Table 1 presents the results for the effects of knowledge-intensive firms', KIBS co-location and innovativeness for the full sample and subsamples of innovators and non-innovators firms. We estimate equation (1) with and without variables that capture firm characteristics contained in vector $Xi$. Columns 1-3 report the results with all explanatory variables are included. The results show that the firm age and workers are relevant in all models, however, the lasts one only is positive for Central America. Furthermore, the innovativeness and exporter are significant to Central America and full sample respectively.

Table 1. Regressions models to KIBS Co-location

| | Model 1 Full Sample | Model 2 Central America | Model 3 South America | Model 4 Full Sample | Model 5 Central America | Model 6 South America | Model 7 Full Sample | Model 8 Central America | Model 9 South America |
|---|---|---|---|---|---|---|---|---|---|
| Innovator | 0.0201*** | 0.0145*** | -0.0000896 | 0.0186*** | 0.0127*** | -0.000433 | -0.00171 | 0.00590** | -0.00599** |
| | (0.00289) | (0.00267) | (0.00326) | (0.00287) | (0.00265) | (0.00326) | (0.00207) | (0.00238) | (0.00275) |
| Exporter | -0.00841*** | -0.00604* | 0.00179 | -0.0114*** | -0.00686** | 0.000464 | -0.00175 | -0.00311 | -0.00230 |
| | (0.00321) | (0.00309) | (0.00365) | (0.00324) | (0.00313) | (0.00368) | (0.00238) | (0.00289) | (0.00302) |
| Ln (Workers) | -0.00200* | 0.00277*** | -0.00594*** | -0.00243** | 0.00369*** | -0.00591*** | -0.00199** | 0.00262*** | -0.00389*** |
| | (0.00103) | (0.000994) | (0.00116) | (0.00104) | (0.00101) | (0.00118) | (0.000771) | (0.000917) | (0.00102) |
| Firm Age | 0.000185*** | 0.000339*** | 0.000144** | 0.000191*** | 0.000349*** | 0.000171** | 0.000121** | 0.000237*** | 0.000115* |
| | (0.0000647) | (0.0000684) | (0.0000711) | (0.0000648) | (0.0000675) | (0.0000716) | (0.0000503) | (0.0000598) | (0.0000650) |
| Constant | 0.123*** | 0.0421*** | 0.173*** | 0.124*** | 0.0296*** | 0.172*** | 0.139*** | 0.0624*** | 0.149*** |
| | (0.00395) | (0.00323) | (0.00446) | (0.00465) | (0.00387) | (0.00511) | (0.00309) | (0.00517) | (0.00409) |
| *Observations* | 3029 | 851 | 2178 | 3026 | 851 | 2175 | 3026 | 851 | 2175 |
| $R^2$ | 0.020 | 0.089 | 0.012 | 0.049 | 0.141 | 0.022 | 0.534 | 0.355 | 0.359 |
| *Industry FE* | NO | NO | NO | YES | YES | YES | YES | YES | YES |
| *Country FE* | NO | NO | NO | NO | NO | NO | YES | YES | YES |

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

Columns 4-6 present the results including the industry as control variable. The results are slightly comparable, specially, the model 5 have more significant parameters where Central America show that the firm age, workers and innovativeness are significant for the model. Columns 7-9 present the results including the industry and country as control variables. The results are qualitatively comparable, especially, the model 8 have more significant parameters, like the model 5.

At this point is relevant to say that all these results are significant at 1 per cent. The results for full ample and Central America sample support H1 (Colum 1 and 2). Different result is obtained when sector-level dummies are introduced in the analysis (Column 8). The analysis of innovator and non-innovators firm subsamples provides a better understanding and enables us to test H1. The results for innovators firms (Columns 5 and 8) strongly support H1, suggesting that KIBS co-location and innovativeness are positively related for innovators firms.

This finding is even more important when we compare these parameters with those estimated for the subsample of non-innovators. In models 7, 8, and 9 that include variables of control such as industry and country, that the relationship between being innovative and proximity to KIBS is not significant for the entire sample (Model 7), but that in Central America if it is with a positive coefficient = 0.00590** (Model 8) as in South America but with a negative coefficient = -0.00599 ** (Model 9). Therefore, 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 (KIBS must be near

manufacturing to innovate). Whilst this result requires further discussion, we postulate that the decision of KIBS co-location become more important when the technological and service knowledge is scarcer and hence valuable.

## 5. Conclusion

This study fills this research gap by theoretically and empirically examining the interplay between KIBS and innovation in the firm. We do this by using measures in innovation (KIBS co-location) to establish a measurement framework (Vendrell-Herrero et al., 2019) to test our hypotheses. While these hypotheses have been partially tested in other contexts (Vendrell-Herrero et al., 2017 & 2019), the present research examines these relationships in developing economies from Latin America, as traditional theories that apply to Western economies may not apply to less developed countries (Hsieh et al., 2015).

More specifically, our study examines the proximity for innovation (Bochma, 2005) in Latin America and tests contextual tensions in how location of the KIBS affects the innovation of the manufacturing firms. It seeks specifically to determine whether the KIBS presence can be especially important in the peripheral regions, as they can help SMEs firms in solving complex problems, as well as connect them to a huge amount of expertized knowledge (Pinto et al., 2013; Shearmur & Doloreux, 2009).

The empirical analysis is based on a sample of manufacturing firms in 9 countries using data from WBES (five Central American and four South American countries). 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. Contrary to the KIBS theories in favour of the proximity to building relational knowledge (i.e. territorial servitization, clusters); however, the results are not clear for countries from South America

From a theoretical standpoint, our research suggests the strong need for further contextualization of KIBS theories in Latin America. According to the results, manufacturing firms in South American differ from those included in “Western” models. This conclusion builds on previous findings that criticize the use of theories established to explain Western business environments for the context of Latin America. To this end, our contextual results have the potential to influence political and managerial agenda in Latin America.

In line with theoretical predictions from agglomeration and systems of innovation (Lafuente et al., 2017; Seclen-Luna & Barrutia-Güenaga; 2018; Sforzi & Boix, 2018), it is important for regional and local governments to consider integrating knowledge-intensive firms into formal and informal manufacturing clusters when designing industrial policies.

The empirical analysis is supported by a large and reliable database – WBES. Two of the relevant variables (location of KIBS and innovation) follow standard academic procedure (Vendrell-Herrero et al., 2017; Gomes et al., 2018). This is important as previous research acknowledges that proximity per se does not necessarily result in knowledge sharing and innovation. There are negative aspects of proximity, including lock-in problem and coordination failure (Boschma, 2005). As the WBES database does not provide information on how collaboration manufactures and KIBS coordinate and share knowledge, this question remains open for future research. Finally, our cross-sectional analysis does not capture the dynamic nature of the competences analyzed. Although the relationships are significant, other factors not included in the current model may also play an important role. Future research will need to corroborate the results in a longitudinal setting to determine some of the causal mechanisms.

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