# Chapter 2
# Knowledge-Intensive Entrepreneurship Across Regions: Does Being a New Industry Make a Difference?

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## 2.1 Introduction

Knowledge-intensive business services (KIBS) and especially non-technical professional KIBS firms fulfill a cross-divisional function in the knowledge-based development of economies and provide their clients customized, high-value services. Moreover, KIBS produce and diffuse knowledge and oversee markets. Their consultancy support helps firms to exploit their own knowledge potential (e.g., Miles et al. 1995; Muller and Zenker 2001; Wood 2002). Accordingly, understanding where and why KIBS firms locate is helpful in advising policy makers to foster the establishment of knowledge-intensive industries as a prerequisite to designing a knowledge-based economy.

Previous empirical work on location patterns of KIBS identifies local market size and regional sources of knowledge as determinants of location and new firm formation (e.g., Wood et al. 1993; Andersson and Hellerstedt 2009). However, prior research focused solely on data for established market economies where KIBS industries are in an advanced stage of development with respect to their distribution across space. But what if KIBS industries are newly emerging? Are the sources of opportunities for starting KIBS firms different? Understanding how KIBS start-up activity depends on context is of crucial relevance when it comes to policy implications. Policy makers in lagging regions that want to stimulate the emergence of KIBS industries might need other recipes than those ones that want to promote

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KIBS start-up activity in areas where the respective industries are already well-established.

This paper investigates whether regional sources of entrepreneurial opportunities in KIBS differ in an area where such industries are new to the region. Germany provides an intriguing two-territory "quasi-natural experiment" for such an analysis. In East Germany, the total KIBS sector was a newly emerging industry after the breakdown of communism 1989–1990, whereas in West Germany it had a much longer time to develop. Despite catching up processes after transition, many KIBS industries in East Germany are still underdeveloped which is identified as a stumbling block for regional development (Bechmann et al. 2010).

The empirical results suggest that the co-location of (high-tech) manufacturing has a positive effect on professional KIBS (P-KIBS) start-up activity in East Germany, whereas there is no such effect for the western part of the country. The finding for East Germany suggests that strengthening the industrial base in peripheral regions like East Germany might provide entrepreneurial opportunities for starting KIBS firms, which, in turn, might be an important channel for promoting knowledge-based regional development. The results for West Germany reveal a crucial role of the growth of regional knowledge for start-up activity in P-KIBS industries.

The remainder of this paper is as follows: First, a framework is presented in which regional determinants of KIBS locations are discussed in more detail (Sect. 2.2). Second, the empirical strategy is described (Sect. 2.3). Third, the findings of a regression analysis are discussed (Sect. 2.4). The last section concludes the paper (Sect. 2.5).

## 2.2 Regional Determinants of KIBS Location and Start-Up Activity

KIBS purchase knowledge, equipment, and investment goods from manufacturers and service firms (Miles et al. 1995). KIBS are referred to as "brokers of knowledge" (Muller and Zenker 2001) and "bridges for innovation" (Czarnitzki and Spielkamp 2003). They oversee market characteristics such as customer preferences and business solutions (Andersson and Hellerstedt 2009). Accordingly, KIBS firms combine new knowledge – gained from interactions with clients – with existing knowledge to develop customized services to better meet the clients' needs (Bettencourt et al. 2002; Wood 2002).

In regard to KIBS locations, strong regional differences can be detected. KIBS typically concentrate in metropolitan areas (Wood et al. 1993). Keeble and Nachum (2002) claim that KIBS tend to do so because of access to localized tacit knowledge and the need to access interregional and global networks, clients, and knowledge. Wood (2002) also stresses these urban advantages. Therefore, urban-based business activities may benefit from an extra-regional (international) demand for their services. Moreover, the benefits of interactions with clients are highest in metropolitan areas due to the conjunction of commercial, manufacturing, trading,

business, and consumer as well as public sector activities. Knowledge spillovers stemming from these interactions might lead to the detection of entrepreneurial opportunities and KIBS spin-offs (Wood 2005). Accordingly, the importance of regional market size and regional sources of knowledge was found to affect the spawning of entrepreneurship in the KIBS sector (Andersson and Hellerstedt 2009).

The sector structure of the local economy – the regional customer base – might also affect the location of KIBS. First of all, tertiary activities are claimed to be influenced by industrial sector location (Jennequin 2008). Co-location interdependencies can be assumed, especially between manufacturing and (advanced) producer services (for a detailed discussion, see Andersson 2006). However, previous research also suggests that business services are utilized to a high degree by nonmanufacturing industries (Goe 1990; Glasmeier and Howland 1994). Andersson (2006) finds by simultaneous equation modeling that closeness to manufacturing is not an explanatory factor for the location of producer services in Sweden. For KIBS, empirical evidence reveals that the local manufacturing sector has no effect on start-up activity (Andersson and Hellerstedt 2009).

Nevertheless, manufacturing industries (especially with a high intensity of R&D) are in need of KIBS in close proximity, for instance, to advance their product development and innovation activities (Makun and MacPherson 1997; Den Hertog 2000). So, if a local KIBS sector is initially lacking or underdeveloped, the local presence of a high-quality manufacturing sector may provide a peculiar "window of opportunity," as there are only a few incumbent local KIBS firms from which business services can be obtained. This situation might make a co-location of new KIBS firms attractive or induces KIBS spin-offs from the manufacturing sector until the "carrying capacity" – provided by the demand of the local manufacturing sector – is not exceeded. Thus, it might be that the effect of the presence of local manufacturing is not mechanistic but context-specific. In this respect, comparing regional sources of KIBS start-up activity in East and West Germany in the 1990s allows an investigation of whether the co-location of manufacturing affects the spawning of KIBS under specific conditions.

West Germany was an established market economy around the time of German re-unification (Carlin 1994). Therefore, it is safe to assume that the drivers of KIBS start-up activity are similar to those found in the previously mentioned studies that analyze data from Western European countries. Thus, it is expected that market size and regional knowledge are the dominant drivers of new KIBS location. Similarly, it is likely that the local manufacturing sector has no effect on the emergence of new KIBS firms.

*H1: Market size has a positive effect on start-up activity across KIBS industries in West Germany.*

*H2: Regional knowledge has a positive effect on start-up activity across KIBS industries in West Germany.*

The drivers of KIBS start-up activity in East Germany might be much different since such industries did not exist before German re-unification. This pattern can be traced back to the socialist past. In the former German Democratic Republic (GDR), the service sector was underdeveloped, as the economy was focused

strongly on manufacturing and business service activities were mainly integrated into the structure of state-owned enterprises. Moreover, the production of knowledge in the GDR was organized by the state and centrally planned (Fritsch and Werker 1999), and accordingly there was no need for knowledge brokers and bridges for innovation and therefore no market for KIBS. Furthermore, self-employment was allowed only in selected private service industries in the former GDR serving private consumer demands (Pickel 1992).

In the early 1990s the eastern part of Germany underwent a "shock transition" toward a market economy and the principles and paradigms of market economy took over (Brezinski and Fritsch 1995). This process was accompanied by a tremendous privatization and downsizing of the state-owned economy (e.g., Hau 1998). Next to this top-down privatization there was a bottom-up process of new business formation. Start-up activity was extremely high in the 1990s, as entrepreneurs had a "window of opportunity" due to low competition and the immediate availability of entrepreneurial opportunities that were absent in socialism (Fritsch 2004).

There have been at least two sources of opportunities for starting a KIBS firm. First, the "institutional shock" of introducing the regulatory framework of West Germany (Brezinski and Fritsch 1995) presumably created demand for legal services, consultancy support, and other business services. Second, since the organization of innovation activity followed the principles of those in market economies as described, for instance, by Muller and Zenker (2001), brokers of knowledge were presumably needed. Furthermore, the general service orientation of firms in market economies, which sharply contrasts with socialist planned economies (Johnson and Loveman 1995), certainly created a general demand for (knowledge-intensive) business services.

The local economy could not obtain knowledge-intensive services from already existing incumbent firms. Thus, there opened a peculiar "window of opportunity" for starting a KIBS firm in East Germany. The size of this window depends also on the size of the manufacturing sector under the assumption that manufacturing firms are important clients of KIBS like in established market economies (e.g., Jennequin 2008). Further, given that proximity to clients is important in transition economies as well, it is expected that the local manufacturing sector makes a co-location of new KIBS firms attractive. This effect should be more pronounced for those manufacturing industries where knowledge plays an important role.

*H3: The local manufacturing sector has a positive effect on start-up activity across KIBS industries in East Germany.*

*H4: The quality of the local manufacturing sector has a positive effect on start-up activity across KIBS industries in East Germany.*

Regional knowledge presumably played only a minor role for KIBS start-up activity in East Germany. The former socialist system of innovation was in dissolution and a lot of knowledge depreciated since the GDR followed different technological paths (e.g., Mayntz 1995; Fritsch 2004). This socialist legacy explains to some degree deficiencies and low productivity in regional innovation systems in East Germany (Fritsch and Slavtchev 2010). Furthermore, positive

effects of local market size on KIBS start-up activity might be mediated by tremendous urban adjustment processes that were found to affect the general level of start-up activity in urban areas negatively (Wyrwich 2012). Altogether, the role of market size and regional knowledge for new KIBS formation in East Germany is rather ambiguous.

## 2.3 Empirical Strategy

Data on start-up activity in KIBS industries in East and West Germany is obtained from the German Social Insurance Statistics. It contains information on every German establishment with at least one employee required to pay Social Insurance (Fritsch and Brixy 2004). In the present analysis, the occurrence of a new establishment number is counted as a start-up if less than 20 employees worked in the establishment in the year of occurrence. Still, it cannot be fully determined whether subsidiaries of incumbent KIBS firms are counted. It might be the case that KIBS firms from West Germany opened establishments in East Germany after reunification. However, according to workflow analyses, less than 10 % of newly occurring establishments starting with less than 20 employees are likely to be subsidiaries of larger firms (Hethey and Schmieder 2010). Data on explanatory variables is obtained from the German Social Insurance Statistics as well as from the Federal Statistical Offices.

The empirical analysis focuses on professional KIBS (P-KIBS). P-KIBS industries comprise a large share of the total KIBS sector. The respective service firms offer legal services, advisory and auditing services, environmental services, training and general office services (Miles et al. 1995, pp. 29–30). Firms of P-KIBS industries are likely to be of a cross-divisional character and may therefore not be specific to regional industry (manufacturing) structures like KIBS firms that provide technology-oriented knowledge-intensive business services (T-KIBS).[1] This is a crucial advantage for the intended empirical analysis since the aim is measuring a general effect of manufacturing on entrepreneurial opportunities. Unfortunately, data on the NACE system of industry classification are not available for the period under analysis. The data is stratified in accordance to the German industry classification WZ1973, which does not perfectly match with the NACE system (for details regarding the WZ1973 industry classification, see Amend and Bauer 2005). Table 2.3 provides the definition of P-KIBS industries applied in this paper.

The period under analysis is from 1995 to 2000. Start-up activity in P-KIBS industries in East Germany in the early 1990s might have been affected by outsourcing processes in the course of privatizing the state-owned economy. New

[1] Example: one typical T-KIBS industry is "Architectural and engineering activities and related technical consultancy" (NACE2003-code: 742). If a region has a high employment share in construction, it seems likely that consulting civil engineers and architects co-locate.

establishments stemming from outsourcing of business services due to legal arrangements and political decisions cannot be disentangled from new firms in the data. However, the privatization process was almost completed by the end of 1994; therefore, any effect of privatization on P-KIBS start-up activity should be modest after 1994 (Hau 1998).

The analysis is on the level of NUTSIII-Regions, which are roughly comparable to US counties. There are 112 NUTSIII-regions in East Germany (excluding Berlin), which are used for the current analysis. West Germany is comprised of 326 NUTSIII-Regions. The much larger Planning Regions, which are large functional economic regions, are not used for analysis; they might be too large for measuring location attributes reasonably, as proximity to clients is important for P-KIBS. As a way to account for spatial autocorrelation, cluster-corrected standard errors on the Planning Regions level are integrated into the empirical analysis.

As the panel structure of the data is exploited, the total number of start-ups in the P-KIBS sector in a NUTSIII-region in a year is used as an indicator for start-up activity. This count variable has the advantage (compared to start-up rates) that it does not suffer from a pseudo-correlation with an independent variable partially captured by the denominator of the start-up rate (Fritsch and Falck 2007). The methods employed are fixed-effects Poisson (for technical details, see Wooldridge 1999; for an application in entrepreneurship research, see Boente et al. 2009) and, as a robustness check, negative binomial regression models (Hilbe 2007).[2] The main Poisson model has the following estimation equation where $\alpha_r$ represents region-fixed effects and $\lambda$ the expected number of start-ups in region $r$ in year $t$. The focus is on the role of local manufacturing, regional knowledge, and market size (see Table 2.4 for an overview of employed variables and their definitions).

$$E(Start-ups_{rt}|Manufacturing_{rt}, Knowledge_{rt}, MarketSize_{rt}, Controls_{rt}) = \lambda_{rt} = \exp(\alpha_r + \beta_1 Manufacturing_{rt} + \beta_2 Knowledge_{rt} + \beta_3 MarketSize_{rt} + \beta_4 Controls_{rt})$$

The effect of local manufacturing on the number of start-ups is measured by its employment share. The quality of the regional manufacturing sector is assessed by differentiating between R&D-intensive manufacturing, in accordance with the classification by Grupp and Legler (2000), and other manufacturing industries. For differentiating the (within) quality of R&D manufacturing, the share of highly skilled workers within the total R&D-intensive manufacturing employment is introduced in the analysis.

One problem is that the employment share provides no information about how firms organize their internal functional division of labor across space. The demand for KIBS might be larger in regions with more headquarters, for instance, measured by the share of employees working as managers in the region. So regions might have the same employment share, but a totally different occupational structure

[2] Only 8 out of 2,628 observations had no P-KIBS start-up in a respective year. Therefore, zero inflation is not an issue.

within this employment. In East Germany, there is a lack of headquarters and manufacturing firms are rather extended workshop benches of West German companies (at least in the 1990s) (Bechmann et al. 2010). Headquarters are supposedly more important drivers of demand for KIBS than other functional units of firms. Thus, the lack of headquarters in East Germany might mediate positive effects of local manufacturing on P-KIBS start-up activity. Data on the occupations are unfortunately not available on a disaggregated regional level for the investigated time span.

The role of regional knowledge is captured by proxies for the growth of the regional knowledge base. Knowledge spillovers stemming from the local manufacturing sector are modeled by the growth of the sector-specific highly skilled workforce. In regard to knowledge spillovers not stemming from manufacturing, the growth of highly skilled employment in the service and public sectors is included. The previously found concentration of P-KIBS in large markets is investigated by employing a Harris-type market potential function, which is a distance-weighted sum of population across regions (Redding and Sturm 2008). This sum is added to the local market size (population) for measuring intra- and extra-regional demand.[3]

It is controlled for the employment share of the local P-KIBS industries. This proxy accounts for the role of industry experience (market knowledge) for detecting entrepreneurial opportunities (Shane 2000). Regional development prospects are captured by previous employment growth. Year dummies are included as well in the analysis.[4] All independent variables (except year dummies) are lagged by 1 year to avoid a simultaneity bias.

## 2.4 Results

### *2.4.1 Descriptive Statistics*

Mean comparison tests indicate that there are significant differences between East and West Germany for all independent variables (see Tables 2.5 and 2.6 for summary statistics). This can be certainly traced back to the East German transition and the fact that P-KIBS industries were newly emerging in the former GDR.[5]

[3] The role of employment density is also focused on an extended version of the main model that is presented in the Appendix (see Table 2.9).

[4] The year dummies control, among other things, for the fact that since 1999, establishments that employ only marginal workers (*geringfügig Beschäftigte*) also had to register.

[5] The growth of knowledge across sectors is becoming smaller on average in East Germany, which might be explained by the continuous migration of the highly skilled workforce due to unfavorable labor market prospects in East Germany (Hunt 2006).

The unfavorable regional development, for instance, is reflected by the much lower employment growth. The market potential and the population density are higher in West Germany. The employment share of manufacturing and the share of R&D-intensive manufacturing are much lower in East Germany which has certainly to do with the pronounced de-industrialization in the early 1990s (for details, see Burda and Hunt 2001).

The relatively low level of R&D-intensive manufacturing in East Germany might suggest that there is also a low demand for KIBS tuned to the needs of quality manufacturing. Thus, the demand could also be provided by incumbent KIBS firms from outside the region – for instance, from West Germany. This counters the argument that there was a "window of opportunity." Indeed, the correlation (see Tables 2.7 and 2.8) between the employment share in non–R&D-intensive manufacturing and new P-KIBS formation is significantly negative. Furthermore, there is no correlation between R&D-intensive manufacturing employment and P-KIBS start-up activity. One feature of the local manufacturing sector that is positively related to P-KIBS start-up activity is the share of highly skilled employees in R&D-intensive manufacturing.

Altogether, the correlations suggest that there is probably no unconditional effect of local manufacturing on P-KIBS start-up activity. This is however not surprising; P-KIBS are concentrated in larger cities, where typically the employment share of manufacturing is low. Indeed, the correlation matrix reveals that the regional market potential and the employment share of the P-KIBS sector are positively correlated with start-up activity. P-KIBS employment is concentrated in larger and more densely populated areas.[6]

### *2.4.2 Regression Analysis*

The first set of models reveals that market size and the growth of knowledge has a significant positive effect on start-up activity in West Germany which is in line with hypothesis 1 and 2 (see Table 2.1). Market size seems also to affect start-up activity positively in East Germany. However, in contrast to West Germany, the growth of knowledge is not related to start-up activity. This might have to do with deficiencies in regional innovation systems in East Germany related to the transition process (e.g., Fritsch and Slavtchev 2010) that negatively affect the commercialization of knowledge spillovers via entrepreneurship. It might also indicate that regional knowledge is only a crucial source of entrepreneurial opportunities when the P-KIBS sector is in a later stage of development.

[6] Another Interesting descriptive finding is that there is no significant difference between East and West Germany for the start-up rate. Thus, P-KIBS start-up activity in post-socialist East Germany was not, on average, "naturally" higher due to catching-up processes after the transition.

**Table 2.1** Main model: fixed effects (NUTSIII) count data models with clustered (planning region) robust standard errors

| | Poisson | | Negbin | |
|---|---|---|---|---|
| *Start-ups in P-KIBS sector (count)* | West | East | West | East |
| *Manufacturing* | | | | |
| Emp Share Manufacturing | 0.301 | 1.444** | 0.0837 | 1.397** |
| | (0.510) | (0.667) | (0.506) | (0.670) |
| *Market size* | | | | |
| Market Potential (Log) | 5.354*** | 3.412*** | 5.240*** | 3.399*** |
| | (0.817) | (1.217) | (0.931) | (1.235) |
| *Knowledge* | | | | |
| Know Growth Non-Manufac | 0.284*** | 0.209 | 0.193** | 0.207 |
| | (0.0789) | (0.146) | (0.0807) | (0.149) |
| Know Growth Manufac | −0.0392 | 0.067 | −0.0427 | 0.0604 |
| | (0.104) | (0.134) | (0.0896) | (0.137) |
| *Controls* | | | | |
| Emp Share P-KIBS | −0.167 | 6.924 | −0.309 | 6.482 |
| | (1.679) | (6.39) | (1.668) | (6.842) |
| Emp Growth All | −0.111 | −0.224 | 0.102 | −0.217 |
| | (0.335) | (0.344) | (0.316) | (0.353) |
| Observations | 1,956 | 672 | 1,956 | 672 |
| Number of kreis | 326 | 112 | 326 | 112 |

Notes: Standard Errors in Parentheses (***p < 0.01, **p < 0.05, *p < 0.1)/Data for Berlin are not employed. All models include year dummies. It is also controlled for NUTS III dummies in the negative binomial regressions. These dummies are the fixed panel variable in the Poisson models

The local presence of manufacturing has no effect on start-up activity in West Germany. This finding is in line with previous research for Western Europe on entrepreneurship across KIBS industries. The local manufacturing sector seems to provide no entrepreneurial opportunities where P-KIBS industries are already well developed. There is a significant positive effect of the local manufacturing employment on start-up activity in East Germany where P-KIBS industries were newly emerging. This finding is in line with hypothesis 3. Regional employment growth and the share of already existing P-KIBS firms have no effect on start-up activity.[7]

The second set of models investigates the role of the quality of the local manufacturing sector for P-KIBS start-up activity (see Table 2.2). The results show that the employment share of R&D-intensive manufacturing has a significant positive effect in East Germany. The higher the share of highly skilled employees within R&D-intensive manufacturing, the stronger is the positive effect. Thus, co-location of manufacturing seems to provide entrepreneurial opportunities in East Germany. This finding is in line with hypothesis 4. There is no effect for

[7] The local employment share of the P-KIBS has a significant positive effect on start-up activity in East and West Germany only when year dummies are not included in the analysis. Results can be obtained upon request.

**Table 2.2** Main model with detailed assessment of local manufacturing

| | Poisson | | Negbin | |
|---|---|---|---|---|
| *Start-ups in P-KIBS sector (count)* | West | East | West | East |
| *Manufacturing* | | | | |
| Emp Share R&D-Manufac | 0.516 | 2.030** | 0.315 | 1.988** |
| | (0.628) | (0.843) | (0.637) | (0.907) |
| Emp Know R&D-Manufac | 0.547 | 1.996*** | 0.413 | 1.999*** |
| | (0.604) | (0.740) | (0.633) | (0.756) |
| Emp Share Non-R&D-Manufac | −0.367 | 1.19 | −0.519 | 1.161 |
| | (0.657) | (1.025) | (0.680) | (1.015) |
| *Market size* | | | | |
| Market Potential (Log) | 5.442*** | 3.138** | 5.232*** | 3.128** |
| | (0.836) | (1.262) | (0.971) | (1.286) |
| *Knowledge* | | | | |
| Know Growth Non-Manufac | 0.294*** | 0.213 | 0.204** | 0.212 |
| | (0.0807) | (0.152) | (0.0831) | (0.156) |
| Know Growth R&D-Manufac | −0.00442 | −0.132 | −0.00261 | −0.135 |
| | (0.0706) | (0.0884) | (0.0645) | (0.0919) |
| Know Growth Non-R&D-Manufac | −0.0109 | 0.0208 | −0.00511 | 0.0192 |
| | (0.0461) | (0.0788) | (0.0433) | (0.0811) |
| *Controls* | | | | |
| Emp Share P-KIBS | −0.345 | 2.602 | −0.455 | 2.372 |
| | (1.605) | (6.39) | (1.582) | (6.726) |
| Emp Growth All | −0.184 | −0.124 | 0.0237 | −0.118 |
| | (0.361) | (0.335) | (0.342) | (0.344) |
| Observations | 1,956 | 672 | 1,956 | 672 |
| Number of kreis | 326 | 112 | 326 | 112 |

Notes: Standard Errors in Parentheses (***p < 0.01, **p < 0.05, *p < 0.1)/Data for Berlin are not employed. All models include year dummies. It is also controlled for NUTS III dummies in the negative binomial regressions. These dummies are the fixed panel variable in the Poisson models

other manufacturing industries. So it seems that the quality of the local manufacturing sector matters. Further, there is no manufacturing effect in West Germany even when focusing on quality. The results on market size and regional knowledge are robust as well.

The results (with regard to the local presence of manufacturing and knowledge spillovers) do not change when introducing employment density as a control for proximity of the local market (see Table 2.9). The market potential is insignificant in this specification in both parts of the country, which might be explained (at least in West Germany) by the high correlation of both variables ($r = 0.5$). In East Germany, the effect of employment density is only weakly significant. Compared to West Germany there are no agglomerations, except for the Berlin region, which might explain the lower effect of density. The market potential variable in East Germany, in turn, seems to be driven by proximity to Berlin. Excluding regions adjacent to Berlin from the regression reveals that market potential becomes

insignificant even without controlling for density (see Table 2.10). Thus, the effect of market potential seems to be smaller in East Germany, which probably has to do with the peripheral character of the eastern part of Germany.

Altogether, the results are in line with the proposed hypotheses. It seems that the local manufacturing sector indeed provides opportunities for starting a P-KIBS firm under specific conditions. Market size and knowledge matter especially when the regional distribution of P-KIBS industries is already established.

## 2.5 Concluding Remarks: What Can Be Learned?

KIBS firms provide their clients with customized high-value business services and help them to exploit their own knowledge potential. Employment and start-up activity in this knowledge-intensive sector is unevenly distributed across regions, which previous research could reasonably explain by the local market size and local sources of knowledge.

Research so far has only focused on the case where KIBS industries have already been established with respect to their development across space. It is, however, unclear which factors determine the emergence of KIBS industries when they are newly emerging in a certain territory. The aim of this paper was to fill this research gap by showing how sources of entrepreneurial opportunities in knowledge-intensive industries can differ across space when taking into account such a scenario. To this end, this study analyzed data on professional KIBS (P-KIBS) start-ups in the 1990s in East and West Germany. In the eastern part of the country (the former socialist GDR), no KIBS existed when the socialist system collapsed in 1989–1990. In West Germany, P-KIBS industries had developed over a much longer time period.

The results indicate that the presence of (high-quality) manufacturing has a positive effect on the level of P-KIBS start-ups in East Germany, whereas there is no effect of manufacturing in the western part of the country. The latter result is in line with previous findings for Western Europe. The distinct result for East Germany where P-KIBS industries were underdeveloped in the early 1990s indicates that the local manufacturing sector requires at least a critical amount of KIBS in close proximity. Thus, there seems to have been a "window of opportunity" for starting new P-KIBS firms at the beginning of transition. This window might close when the regional distribution of P-KIBS industries is rather established like in the case of Western Germany.

With respect to other regional conditions, it could be shown that the general market potential has had a positive effect on P-KIBS start-up activity in East Germany. This relationship is however much smaller than in West Germany. Regional knowledge spillovers have a positive effect on new P-KIBS formation in West Germany, whereas in the eastern part of the country there is no such effect.

This difference might have to do with deficiencies in the East German innovation system – which, in turn, negatively affect the commercialization of knowledge via entrepreneurship. The results on regional knowledge and market size might be driven by the socialist legacy of East Germany. Nevertheless, the paper provides insights on how regional sources of entrepreneurial opportunities can depend on institutional context and the stage of development of the industry with respect to its evolution across space.

One drawback of the analysis is that no information on the distribution of functionally different economic units of companies (headquarters vs. extended workshop benches) can be exploited in the period under analysis. The actual demand for KIBS from the local manufacturing might be affected by the way manufacturing firms organize their activities across space. The lack of information on this pattern is a limitation of the present research. However, spatial proximity to headquarters is presumably more important than location close to extended workshop benches. Given that East Germany is in short supply of the former, one can speculate that the positive effect of local manufacturing would have been even stronger if the functional composition of East German manufacturing were different.

The positive effect of the presence of local manufacturing employment in East Germany indicates that it might be the case that strengthening the industrial base in lagging peripheral regions is a conduit for fostering the emergence of P-KIBS industries, which itself might become an important source of knowledge-based regional development. This might be even more important in places like East Germany where regional knowledge and spillovers hardly induce the emergence of new P-KIBS firms. Promoting KIBS is presumably not a stand-alone policy. Rather it should be considered as part of a much wider regional policy toolkit. Furthermore, the findings suggest that policy concepts to foster knowledge-intensive entrepreneurship as a conduit of knowledge-based development should be tuned to specific regional conditions.

It is acknowledged that the sources of entrepreneurial opportunities might be different for technology-oriented KIBS which have not been investigated in this paper. Furthermore, it needs to be tested which factors drive the initial emergence of KIBS firms in other regions of the world. So, it would be interesting to analyze data on emerging economies and the Central Eastern European economies, where KIBS and knowledge-intensive entrepreneurship are still in a comparatively early stage of development. Which regional sources can be found there? What differences and similarities can be found compared to regions where the same industries are well established? Apart from that, an analysis of (historical) data from market economies and other institutional contexts is warranted to enhance our understanding of the emergence of knowledge-intensive industries across regions.

# Appendix

**Table 2.3** Definition of non-technical advisory ("professional") services (P-KIBS)

| NACE | WZ1973 | Description |
|---|---|---|
| 7411 | 790 | Legal activities |
| 7412 | 791 | Accounting, bookkeeping and auditing activities; tax consultancy |

Notes: For details about the industry classification WZ1973, see Amend and Bauer (2005); for KIBS definition and classification, see Grupp and Legler (2000); the industries cannot be transcoded perfectly from the NACE system to the WZ1973

**Table 2.4** Definition of variables

| Variable | Definition |
|---|---|
| Start-ups P-KIBS | Number of new establishments |
| Start-up rate P-KIBS | Start-ups divided by population between 18 and 64 |
| Know Growth Non-Manufac | Annual growth of employment holding a university degree (service and public sector) |
| Market Potential (Log) | Distance weighted sum of population in other regions + total regional population (Harris-type function) |
| Employment Density (Log) | Total employment divided by size in $km^2$ |
| Emp Share P-KIBS | Share of employees in P-KIBS |
| Emp Growth All | Annual growth of total regional employment |
| Emp Share Manufacturing | Share of employees in manufacturing within total regional employment |
| Know Growth Manufac | Annual growth of employment in manufacturing holding a university degree |
| Emp Share R&D-Manufac | Share of employees in R&D-intensive manufacturing within total regional employment |
| Emp Know R&D-Manufac | Share of employees in R&D-intensive manufacturing holding a university degree |
| Know Growth R&D-Manufac | Annual growth of employment in R&D-intensive manufacturing holding a university degree |
| Emp Share Non-R&D-Manufac | Share of employees in non-R&D-intensive manufacturing within total regional employment |
| Know Growth Non-R&D-Manufac | Annual growth of employment in non-R&D-intensive manufacturing holding a university degree |

**Table 2.5** Summary statistics for East Germany

| | Mean | Standard deviation | Minimum | Maximum | Median |
|---|---|---|---|---|---|
| Start-ups P-KIBS | 18.391 | 21.033 | 0 | 214 | 13 |
| Start-up rate P-KIBS | 20.706 | 12.009 | 0 | 89.113 | 17.334 |
| Know Growth Non-Manufac | 0.992 | 0.106 | 0.65 | 1.842 | 0.985 |
| Market Potential (Log) | 12.915 | 0.188 | 12.406 | 13.653 | 12.929 |
| Employment Density (Log) | 3.85 | 1.219 | 2.148 | 6.965 | 3.554 |
| Emp Share P-KIBS | 0.011 | 0.004 | 0.003 | 0.032 | 0.01 |
| Emp Growth All | 0.983 | 0.047 | 0.787 | 1.298 | 0.98 |
| Emp Share Manufacturing | 0.241 | 0.072 | 0.067 | 0.446 | 0.247 |
| Know Growth Manufac | 0.961 | 0.103 | 0.487 | 1.512 | 0.959 |
| Emp Share R&D-Manufac | 0.085 | 0.043 | 0.016 | 0.313 | 0.076 |
| Emp Know R&D-Manufac | 0.126 | 0.062 | 0.009 | 0.456 | 0.116 |
| Know Growth R&D-Manufac | 0.971 | 0.172 | 0.315 | 2.5 | 0.96 |
| Emp Share Non-R&D-Manufac | 0.157 | 0.055 | 0.048 | 0.349 | 0.152 |
| Know Growth Non-R&D-Manufac | 0.975 | 0.176 | 0.433 | 3.449 | 0.969 |

Notes: N = 672. The mean values are significantly different than those in West Germany (except for the start-up rate)

**Table 2.6** Summary statistics for West Germany

| | Mean | Standard Deviation | Minimum | Maximum | Median |
|---|---|---|---|---|---|
| Start-ups P-KIBS | 29.547 | 51.257 | 0 | 803 | 15 |
| Start-up rate P-KIBS | 20.133 | 16.456 | 0 | 125.5 | 14.91 |
| Know Growth Non-Manufac | 1.042 | 0.136 | 0.596 | 1.789 | 1.035 |
| Market Potential (Log) | 13.141 | 0.334 | 12.466 | 15.124 | 13.079 |
| Employment Density (Log) | 4.278 | 1.285 | 2.007 | 7.446 | 3.554 |
| Emp Share P-KIBS | 0.017 | 0.009 | 0.003 | 0.094 | 0.015 |
| Emp Growth All | 0.991 | 0.029 | 0.604 | 1.173 | 0.99 |
| Emp Share Manufacturing | 0.409 | 0.111 | 0.133 | 0.785 | 0.413 |
| Know Growth Manufac | 1.028 | 0.08 | 0.577 | 1.793 | 1.027 |
| Emp Share R&D-Manufac | 0.192 | 0.102 | 0.015 | 0.753 | 0.176 |
| Emp Know R&D-Manufac | 0.076 | 0.047 | 0.006 | 0.333 | 0.064 |
| Know Growth R&D-Manufac | 1.037 | 0.118 | 0.433 | 2.361 | 1.031 |
| Emp Share Non-R&D-Manufac | 0.217 | 0.083 | 0.029 | 0.544 | 0.216 |
| Know Growth Non-R&D-Manufac | 1.024 | 0.111 | 0.385 | 2.798 | 1.019 |

N = 1,956. The mean values are significantly different than those in East Germany (except for the start-up rate)

**Table 2.7** Correlation matrix for East Germany

| | | [1] | [2] | [3] | [4] | [5] | [6] | [7] | [8] | [9] | [10] | [11] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| [1] | Start-up rate P-KIBS | 1 | | | | | | | | | | |
| [2] | Start-ups P-KIBS | 0.675*** | 1 | | | | | | | | | |
| [3] | Know Growth Non-Manufac | 0.042 | 0.032 | 1 | | | | | | | | |
| [4] | Market Potential [Log] | 0.186*** | 0.590*** | −0.144*** | 1 | | | | | | | |
| [5] | Employment Density [Log] | 0.539*** | 0.501*** | −0.084** | 0.234*** | 1 | | | | | | |
| [6] | Emp Share P-KIBS | 0.629*** | 0.656*** | −0.076** | 0.288*** | 0.602*** | 1 | | | | | |
| [7] | Emp Growth All | −0.219*** | −0.132*** | 0.255*** | −0.039 | −0.286*** | −0.187*** | 1 | | | | |
| [8] | Emp Share R&D-Manufac | 0.035 | −0.028 | −0.084** | 0.298*** | 0.081** | −0.052 | 0.001 | 1 | | | |
| [9] | Emp Know R&D-Manufac | 0.377*** | 0.404*** | −0.037 | 0.339*** | 0.540*** | 0.375*** | −0.195*** | 0.290*** | 1 | | |
| [10] | Know Growth R&D-Manufac | −0.061 | −0.076** | 0.015 | −0.177*** | −0.093** | −0.053 | 0.127*** | 0.002 | −0.105*** | 1 | |
| [11] | Emp Share Non-R&D-Manufac | −0.394*** | −0.326*** | −0.042 | −0.025 | −0.393*** | −0.468*** | 0.100*** | 0.06 | −0.255*** | 0.016 | 1 |
| [12] | Know Growth Non-R&D-Manufac | −0.022 | −0.029 | −0.024 | 0.001 | −0.089** | −0.06 | 0.148*** | 0.039 | −0.069* | −0.057 | −0.015 |

Notes: N = 672/Significance levels in parentheses (***p < 0.01, **p < 0.05, *p < 0.1)

**Table 2.8** Correlation matrix for West Germany

| | | [1] | [2] | [3] | [4] | [5] | [6] | [7] | [8] | [9] | [10] | [11] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| [1] | Start-up rate P-KIBS | 1 | | | | | | | | | | |
| [2] | Start-ups P-KIBS | 0.601*** | 1 | | | | | | | | | |
| [3] | Know Growth Non-Manufac | 0.466*** | 0.180*** | 1 | | | | | | | | |
| [4] | Market Potential [Log] | 0.222*** | 0.618*** | 0.003 | 1 | | | | | | | |
| [5] | Employment Density [Log] | 0.348*** | 0.380*** | −0.023 | 0.446*** | 1 | | | | | | |
| [6] | Emp Share P-KIBS | 0.529*** | 0.527*** | 0.070*** | 0.386*** | 0.481*** | 1 | | | | | |
| [7] | Emp Growth All | 0.250*** | 0.108*** | 0.322*** | −0.033 | −0.166*** | 0.065*** | 1 | | | | |
| [8] | Emp Share R&D-Manufac | 0.013 | −0.02 | 0.029 | 0.069*** | 0.215*** | −0.115*** | −0.027 | 1 | | | |
| [9] | Emp Know R&D-Manufac | 0.433*** | 0.468*** | 0.046** | 0.375*** | 0.542*** | 0.468*** | −0.004 | 0.228*** | 1 | | |
| [10] | Know Growth R&D-Manufac | 0.040* | −0.019 | 0.024 | −0.117*** | −0.154*** | −0.073*** | 0.177*** | −0.003 | −0.054** | 1 | |
| [11] | Emp Share Non-R&D-Manufac | −0.367*** | −0.309*** | −0.018 | −0.171*** | −0.530*** | −0.505*** | 0 | −0.287*** | −0.513*** | 0.055** | 1 |
| [12] | Know Growth Non-R&D-Manufac | 0.055** | 0.004 | 0.091*** | −0.060*** | −0.079*** | −0.006 | 0.127*** | −0.023 | −0.037 | −0.025 | 0.029 |

Notes: N = 1,956/Significance levels in parentheses (***p < 0.01, **p < 0.05, *p < 0.1)

**Table 2.9** Main model with additional control for employment density

| | Poisson | | Negbin | |
|---|---|---|---|---|
| *Start-ups in P-KIBS sector (count)* | West | East | West | East |
| *Manufacturing* | | | | |
| Emp Share R&D-Manufac | 0.203 | 2.003** | −0.0148 | 1.956** |
| | (0.610) | (0.837) | (0.613) | (0.902) |
| Emp Know R&D-Manufac | 0.198 | 1.941*** | 0.116 | 1.942*** |
| | (0.586) | (0.693) | (0.582) | (0.707) |
| Emp Share Non-R&D-Manufac | −0.405 | 1.137 | −0.575 | 1.103 |
| | (0.600) | (0.976) | (0.622) | (0.960) |
| *Market size* | | | | |
| Market Potential (Log) | 3.956*** | 2.813* | 3.603*** | 2.782 |
| | (0.957) | (1.653) | (1.111) | (1.696) |
| Employment Density (Log) | 0.777** | 0.139 | 0.775** | 0.147 |
| | (0.312) | (0.397) | (0.305) | (0.408) |
| *Knowledge* | | | | |
| Know Growth Non-Manufac | 0.319*** | 0.215 | 0.227*** | 0.214 |
| | (0.0804) | (0.150) | (0.0821) | (0.154) |
| Know Growth R&D-Manufac | 0.0127 | −0.134 | 0.0118 | −0.136 |
| | (0.0715) | (0.0894) | (0.0658) | (0.0932) |
| Know Growth Non-R&D-Manufac | −0.0106 | 0.0215 | −0.00516 | 0.0198 |
| | (0.0475) | (0.0791) | (0.0437) | (0.0813) |
| *Controls* | | | | |
| Emp Share P-KIBS | −0.674 | 3.486 | −0.838 | 3.309 |
| | (1.432) | (6.489) | (1.424) | (6.765) |
| Emp Growth All | −0.716 | −0.197 | −0.494 | −0.195 |
| | (0.447) | (0.429) | (0.421) | (0.439) |
| Observations | 1,956 | 672 | 1,956 | 672 |
| Number of kreis | 326 | 112 | 326 | 112 |

Notes: Standard Errors in Parentheses (***p < 0.01, **p < 0.05, *p < 0.1)/Data for Berlin are not employed. All models include year dummies. It is also controlled for NUTS III dummies in the negative binomial regressions. These dummies are the fixed panel variable in the Poisson models

**Table 2.10** Main model for East German regions not adjacent to Berlin

| | Poisson | Negbin |
|---|---|---|
| *Start-ups in P-KIBS sector (count)* | East | East |
| *Manufacturing* | | |
| Emp Share R&D-Manufac | 2.154** | 2.104** |
| | (0.884) | (0.964) |
| Emp Know R&D-Manufac | 2.112*** | 2.093*** |
| | (0.747) | (0.749) |
| Emp Share Non-R&D-Manufac | 1.386 | 1.354 |
| | (1.166) | (1.163) |
| *Market size* | | |
| Market Potential (Log) | 1.461 | 1.439 |
| | (1.984) | (2.018) |
| *Knowledge* | | |
| Know Growth Non-Manufac | 0.199 | 0.197 |
| | (0.153) | (0.157) |
| Know Growth R&D-Manufac | −0.0726 | −0.0765 |
| | (0.0855) | (0.0906) |
| Know Growth Non-R&D-Manufac | 0.046 | 0.0429 |
| | (0.0840) | (0.0877) |
| *Controls* | | |
| Emp Share P-KIBS | −1.851 | −2.136 |
| | (6.664) | (7.179) |
| Emp Growth All | −0.248 | −0.241 |
| | (0.330) | (0.340) |
| Observations | 606 | 606 |
| Number of kreis | 101 | 101 |

Notes: Standard Errors in Parentheses (***p < 0.01, **p < 0.05, *p < 0.1)/Data for Berlin are not employed. All models include year dummies. It is also controlled for NUTS III dummies in the negative binomial regressions. These dummies are the fixed panel variable in the Poisson models

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