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**Conference Paper**

## Knowledge intensive Entrepreneurship across regions: Makes being a new industry a difference?

51st Congress of the European Regional Science Association: "New Challenges for European Regions and Urban Areas in a Globalised World", 30 August - 3 September 2011, Barcelona, Spain

**Provided in Cooperation with:**

European Regional Science Association (ERSA)

*Suggested Citation:* Wyrwich, Michael (2011) : Knowledge intensive Entrepreneurship across regions: Makes being a new industry a difference?, 51st Congress of the European Regional Science Association: "New Challenges for European Regions and Urban Areas in a Globalised World", 30 August - 3 September 2011, Barcelona, Spain, European Regional Science Association (ERSA), Louvain-la-Neuve

This Version is available at:

<https://hdl.handle.net/10419/120358>

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**Knowledge intensive Entrepreneurship across regions:  
Makes being a new industry a difference?**

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March 4, 2011

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**Abstract**

**This paper investigates regional sources of entrepreneurial opportunities of knowledge-intensive start-up activity. Thereby it is investigated whether it makes a difference if the knowledge-intensive sector is a newly emerging industry compared to the case where its location across space could develop already over a long period of time. The analysis is on knowledge-intensive business services (KIBS) in East and West Germany in the 1990s. At the time of German reunification in 1990s in the former socialist East Germany no KIBS sector existed in contrast to West Germany. The findings indicate that being new to the region makes a difference.**

**Keywords:** Entrepreneurship; Regional Development; KIBS

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## 1 Introduction

This paper investigates whether the regional sources of entrepreneurial opportunities in a knowledge-intensive industry differ in an area where this sector was new to the region compared to a region with an established regional distribution of this industry. An understanding of this dependence is helpful in advising policy makers fostering the starting of knowledge intensive firms as a prerequisite to design a knowledge-based development of the economy. Within the paper, the example of knowledge-intensive business services (KIBS) is exploited. KIBS are regarded to be “brokers of knowledge” (Muller and Zenker, 2001) and “bridges of innovation” (Czarnitzki and Spielkamp, 2003) and fulfill a cross-divisional function in the knowledge-based development of economies. KIBS provide to their clients customized high value business services. Moreover, KIBS produce and diffuse knowledge and oversee markets and their consultancy support helps firms to exploit their own knowledge potential (see e.g. Miles et al., 1995; Muller and Zenker, 2001; Wood, 2002).

Previous empirical work on location patterns of the KIBS sector identifies local market size and sources of knowledge as drivers of KIBS location and new firm formation in this sector (e.g. Wood et al., 1993; Andersson and Hellerstedt, 2009). The evidence so far focuses solely on data for established market economies where the KIBS sector is in advanced stage of development with respect to its location across regions. But makes it difference if the KIBS sector is a newly emerging industry? Germany provides a quasi-natural experiment in regard to shed light on this question and to highlight differences of regional determinants of new firm formation

depending on the stage of development of the sector. In East Germany the KIBS sector was a newly emerging industry after the breakdown of communism 1989/90, whereas in West Germany it could develop over a much longer time.

The remainder of the paper is as follows: first, a framework is presented in which regional determinants of KIBS locations are discussed in more detail (Chapter 2). Second, the empirical strategy is described (Chapter 3), Third, descriptive results and findings of a regression analysis are presented discussed (Chapter 4). The last section concludes (Chapter 6).

## **2 Regional Determinants of KIBS location**

Knowledge-intensive business services (KIBS) purchase and provide knowledge, equipment and investment goods from manufacturing and other services and function as their (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 like customer preferences and business solutions (Andersson and Hellerstedt, 2009). Accordingly, KIBS firm combine knowledge gained from interactions with clients with existing knowledge to develop a customized service in accordance to the clients’ needs (Bettencourt et al., 2002; Wood, 2002).

In regard to KIBS’ location 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 cluster due to agglomeration economies, but especially due to access to localized tacit knowledge and the need to access interregional and global networks, clients

and knowledge. Wood (2002) also stresses these urban advantages. Thereby, urban-based business activities may, for instance, benefit from 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 and public sector activities. Knowledge spillovers stemming from 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. Previous research focused on the role of local manufacturing. First of all, tertiary activities are claimed to be influenced by industrial sector location (Jennequin, 2008). Co-location interdependencies can be supposed 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 non-manufacturing 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 knowledge-intensive business services empirical evidence reveals that the local manufacturing sector has no effect on start-up activity (Andersson and Hellerstedt, 2009). Nevertheless, especially manufacturing industries with a high R&D-intensity are in need of knowledge-intensive business services in close proximity, for instance, to advance their product development and

innovation activities (Makun and MacPherson, 1997; Den Hertog, 2000). This might create entrepreneurial opportunities for starting a KIBS firm, which should be more pronounced when the KIBS sector is newly emerging. Here the local presence of high quality manufacturing sector may provide a peculiar “window of opportunity” since there are only few incumbent local KIBS firms from which business services can be obtained. This situation might make a co-location of new KIBS firms attractive and induces spin-offs from the manufacturing sector until the “carrying capacity” (Geroski, 2001) provided by the demand of the local manufacturing sector is not exceeded.

The case of KIBS start-up activity in East and West Germany in the 1990s allows for an investigation whether the co-location of manufacturing affects the spawning of new P-KIBS under specific conditions. In the 1990s the KIBS sector in West Germany developed already over a long time compared to East Germany. In the eastern part of the country this sector was newly emerging after the breakdown of communism in 1989/90. The present paper investigates whether co-location with manufacturing affects start-up activity in the KIBS sector differently in a situation where the KIBS sector is new to the region (East Germany) compared to the case it could develop over a long period of time (West Germany). One can learn from this exercise how the sources of entrepreneurial opportunities for knowledge-intensive start-up activity change along its evolution across space.

The reasons for why there has been no KIBS sector in East Germany can be traced back to the socialist legacy. In the former German Democratic Republic (GDR) the service sector was underdeveloped since the economy was focused strongly on manufacturing and business service activities were

mainly integrated into the structure of state-owned enterprises. Moreover, the production knowledge in the GDR was like the entire economy centrally planned (Fritsch and Werker, 1999) and accordingly there was no need for brokers of knowledge and bridges for innovation. Despite these patterns self-employment was allowed only in selected private service industries in the former GDR (Pickel, 1992). In the early 1990s the eastern part of Germany underwent a “shock transition” towards market economy accompanied by a tremendous industrial restructuring (Brezinski and Fritsch, 1995; Burda and Hunt, 2001). New business formation was extremely high in the 1990s since entrepreneurs faced a “window of opportunity” reflected by high survival rates of start-up cohorts (Fritsch, 2004). Most start-up activity was in the service sector, but so far no study has focused on the KIBS sector and the regional determinants of its emergence and how its driving forces differ compared to West Germany.

### **3 Empirical Strategy**

Data on start-up activity in East and West Germany are obtained from the German Social Insurance Statistics. It contains information on every German establishment with at least one employee liable to 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 ruled out entirely 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 re-unification. 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 are obtained from the German Social Insurance Statistics as well as from the Federal Statistical Offices.

The empirical analysis in the current paper focuses on a particular part of the KIBS sector. The subgroup chosen comprises the professional services (e.g. legal services, advisory services), which is referred to as P-KIBS thereafter (for a definition of this sector, see Grupp and Legler, 2000 and Table A.1). Focusing on a particular KIBS subsector overcomes the problem of a sector bias (Castaldi et al., 2010). The service firms focused on, in the current paper, are likely to be of rather cross-divisional character and may therefore be not specific to particular regional industry structures. Unfortunately data on the NACE system of industry classification are not available for the period under analysis. The data are 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).

The period under analysis focuses on the time period from 1995 to 2000. Start-up activity in the P-KIBS sector in East Germany in the early 1990s might be affected by outsourcing processes in the course of privatization of the state-owned economy. Outsourcing of business services due to legal arrangements and political decisions cannot be disentangled from completely new firms in the data. The privatization process was almost completed by the end of 1994. Therefore, an effect of privatization on P-KIBS start-up activity should be modest if not negligible after 1994.

The effect of location attributes on P-KIBS start-up activity is addressed empirically by regression analysis (see Table A.1b for an overview about employed variables and their definition). It was argued that co-location with manufacturing might have a different effect on KIBS start-up activity in East and West Germany. In the regression framework the regional employment share of manufacturing is introduced. Knowledge spillovers stemming from the local manufacturing sector are modeled by the growth of the highly-skilled workforce. Thereby, the quality of the regional manufacturing sector is differentiated between R&D-intensive manufacturing, in accordance with the classification by Grupp and Legler (2000), and other manufacturing industries. For differentiating the quality of R&D-manufacturing the share of highly-skilled workforce within the total R&D-intensive manufacturing employment is introduced in the model.

Further variables employed in the regression analysis comprise characteristics of the local P-KIBS sector. Thereby, the employment share in already existing firms of the P-KIBS sector accounts for industry experience (market knowledge). It might be that the presence of KIBS firms induces further start-up activity. The previously found concentration of P-KIBS in large markets is controlled for 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. The role of population density is also focused on in the analysis in an extended version of the main model. In regard to knowledge spillovers, not stemming from manufacturing, the growth of highly-skilled employment in the service and the public sector is included.

Regional development prospects are captured by previous employment growth. Year dummies are included as well in the analysis.<sup>1</sup>

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 comprises 326 NUTSIII-Regions. The much larger Planning Regions, which are large functional economic regions, are not used as level of analysis since they might be too large for measuring location attributes reasonably since proximity to clients is important for KIBS. As a way to account for spatial autocorrelation cluster-corrected standard errors on the level of Planning Regions are integrated into the empirical analysis.

Since 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 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 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 negative binomial regression models (Hilbe, 2007) are conducted.<sup>2</sup> All independent variables are introduced as lagged values to avoid a simultaneity bias.

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<sup>1</sup> The year dummies control among other things for the fact that since 1999 also establishments that employ only marginal workers (*geringfügig Beschäftigte*) had to register.

<sup>2</sup> Only 8 out of 2628 observation had no P-KIBS start-up in a respective year. Therefore, zero-inflation is not an issue.

## 4 Results

### *Descriptive statistics*

Mean comparison tests clearly indicate that for all variables included in the present analysis except for the start-up rate significant differences between East and West Germany exist for the period under analysis (see Table A.2a and A.2b for summary statistics). The start-up rate is not further investigated in the regression analysis due to its weaknesses in panel designs, but the finding of the mean comparison test has an interesting implication. This is that P-KIBS start-up activity in post-socialist East Germany was on average not “naturally” higher due to catching-up processes after transition. In regard to the other employed variables differences can be traced back to the East German transition and the fact that the P-KIBS sector was newly emerging in the former GDR. Thus, the employment share of P-KIBS is much larger in West Germany since it could emerge since a much longer time than in East Germany. The growth of knowledge across sectors is becoming smaller on average in East Germany, which might be explained by the continuous migration of highly skilled workforce due to unfavorable labor market prospects in East Germany (Hunt, 2006). The unfavorable regional development 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 after the pronounced de-industrialization in the early 1990s. The relatively low level of R&D-intensive manufacturing in East Germany might suggest that there is also a low demand for knowledge-intensive business services 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 “window of opportunity”. Indeed the correlation (see Table A.2a and A.2b) between the employment share in (non-R&D-intensive) manufacturing with new P-KIBS formation is significantly negative. Further on, 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. The correlations suggest that there is probably no unconditional effect of local manufacturing on P-KIBS start-up activity. This is not surprising P-KIBS are concentrated in larger cities, where normally the employment share of manufacturing is low. The correlation matrix (see Table A.3a and A.3b) indeed reveals that the regional market potential and the employment share of the P-KIBS sector are highly positive correlated with start-up activity, whereby P-KIBS employment is concentrated in larger and densely populated areas. It is likely that the local manufacturing sector has an effect on start-up activity in the P-KIBS sector when controlling for other regional factors.

### *Regression Analysis*

The results of the main model of the regression analysis (see Table 1) reveal that the regional market potential and the growth of knowledge significantly affect the emergence of new P-KIBS firms in West Germany. In contrast, the local presence of manufacturing has no effect on start-up activity. These results are in line with previous research. The local manufacturing sector

seems to provide no entrepreneurial opportunities in the situation where the P-KIBS sector developed already over a long period of time. In contrast to this finding in East Germany the employment share of R&D-intensive manufacturing has a significant positive effect on P-KIBS start-up activity. The higher the share of highly-skilled employees within R&D-intensive manufacturing the stronger is the effect. Thus, co-location of manufacturing seems to provide entrepreneurial opportunities for the P-KIBS sector in East Germany. There is no effect for other manufacturing industries. So it seems that the quality of manufacturing drives the results. The market potential has a positive effect as well like in West Germany. Thus, this pattern seems to be not depending on the regional life-cycle of the P-KIBS sector. In contrast to West Germany the growth of knowledge in the economy has no effect on start-up activity. This might have to do with deficiencies in regional innovation systems in East Germany related to the transition process (Fritsch and Slavtchev, 2010) that negatively affect the commercialization of knowledge spillovers via entrepreneurship. It might also indicate that regional knowledge is a crucial source of entrepreneurial opportunities when the P-KIBS sector is in a later stage of development. The local employment share of the P-KIBS has a significant positive effect on start-up activity in East and West Germany only when one does not include year dummies in the analysis (see Appendix A.4).<sup>3</sup>

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<sup>3</sup> Changes occur also in regard to other variables but do not affect the effect of local high-quality manufacturing, market potential and general knowledge spillover.

Table 1: Main Model: Fixed Effects (NUTSIII) Count Data Models with Clustered (planning region) robust standard errors

<i>Start-ups in P-KIBS sector (Count)</i>	Poisson		Negbin	
	West	East	West	East
<i>Controls</i>				
Know Growth Non-Manufac	0.294*** -0.0807	0.213 -0.152	0.204** -0.0831	0.212 -0.156
Market Potential (Log)	5.442*** -0.836	3.138** -1.262	5.232*** -0.971	3.128** -1.286
Population Density (Log)	-	-	-	-
Emp Share P-KIBS	-0.345 -1.605	2.602 -6.39	-0.455 -1.582	2.372 -6.726
Emp Growth All	-0.184 -0.361	-0.124 -0.335	0.0237 -0.342	-0.118 -0.344
Year Dummies (YES=1)	YES	YES	YES	YES
<i>Manufacturing Sector</i>				
Emp Share R&D-Manufac	0.516 -0.628	2.030** -0.843	0.315 -0.637	1.988** -0.907
Emp Know R&D-Manufac	0.547 -0.604	1.996*** -0.74	0.413 -0.633	1.999*** -0.756
Know Growth R&D-Manufac	-0.00442 -0.0706	-0.132 -0.0884	-0.00261 -0.0645	-0.135 -0.0919
Emp Share Non-R&D-Manufac	-0.367 -0.657	1.19 -1.025	-0.519 -0.68	1.161 -1.015
Know Growth Non-R&D-Manufac	-0.0109 -0.0461	0.0208 -0.0788	-0.00511 -0.0433	0.0192 -0.0811
<i>Notes: Standard Errors in Parentheses (***) <math>p &lt; 0.01</math>, ** <math>p &lt; 0.05</math>, * <math>p &lt; 0.1</math>)/ No data for Berlin/ N=672 (112 NUTSIII-Regions) for East Germany/ N=1956 (326 NUTSIII-regions) for West Germany/ No data for Berlin employed</i>				

The results in regard to the local presence of manufacturing and knowledge spillovers do not change when introducing population density as a control for proximity of the local market (see Table 2). The market potential is insignificant in this specification in both parts of the country, which might at least in West Germany be explained by the high correlation of both variables ( $r=0.5$ ). In East Germany the effect of population density is only weakly

significant. Compared to West Germany there are except for the region around Berlin no agglomerations, which might explain this lower effect of density. The market potential variable in East Germany, in turn, seems to be driven by closeness to Berlin. Excluding regions adjacent to Berlin from the regression reveals that market potential becomes insignificant even without controlling for density (see Table A.6). Thus, the effect of market potential seems to be smaller in East Germany, which probably has to do with the rather peripheral character of the eastern part of Germany.

Table 2: Main model with additional control for population density

<i>Start-ups in P-KIBS sector (Count)</i>	Poisson		Negbin	
	West	East	West	East
<i>Controls</i>				
Know Growth Non-Manufac	0.298*** (0.0790)	0.202 (0.149)	0.205** (0.0807)	0.201 (0.152)
Market Potential (Log)	-1.484 (2.454)	-3.101 (4.059)	-3.221 (2.766)	-3.249 (4.150)
Population Density (Log)	3.692*** (1.392)	2.551* (1.406)	4.213*** (1.446)	2.598* (1.441)
Emp Share P-KIBS	-0.345 (1.605)	2.602 (6.390)	-0.455 (1.582)	2.697 (6.495)
Emp Growth All	-0.184 (0.361)	-0.124 (0.335)	0.0237 (0.342)	-0.0336 (0.352)
Year Dummies (YES=1)	YES	YES	YES	YES
<i>Manufacturing Sector</i>				
Emp Share R&D-Manufac	0.488 (0.627)	2.554*** (0.907)	0.311 (0.635)	2.516*** (0.961)
Emp Know R&D-Manufac	0.183 (0.575)	1.713** (0.711)	0.0751 (0.621)	1.722** (0.733)
Know Growth R&D-Manufac	0.00644 (0.0689)	-0.143 (0.0861)	0.00799 (0.0632)	-0.146 (0.0894)
Emp Share Non-R&D-Manufac	-0.418 (0.654)	1.212 (1.008)	-0.532 (0.679)	1.181 (1.003)
Know Growth Non-R&D-Manufac	-0.00560 (0.0442)	0.0175 (0.0778)	-0.000215 (0.0416)	0.0155 (0.0799)

*Notes: Standard Errors in Parentheses (\*\*\* p<0.01, \*\* p<0.05, \* p<0.1)/ No data for Berlin/ N=672 (112 NUTSIII-Regions) for East Germany/ N=1956 (326 NUTSIII-regions) for West Germany/ No data for Berlin employed*

Interestingly aggregating the employment share of all manufacturing industries has also a significant positive effect on start-up activity in East Germany in the P-KIBS sector (see Table 5). The effect is smaller than when disaggregating the shares. This indicates that there were a lot of general opportunities not directly related to R&D-intensity, but as shown previously those East German regions having a higher share of high quality manufacturing provide more entrepreneurial opportunities.

## **5 Concluding Remarks**

The aim of this paper was showing how sources of entrepreneurial opportunities in knowledge-intensive industries differ across regions. It is investigated whether there is a difference for an area where this sector newly emerges compared to the situation where its evolution across space developed over a much longer time. Within the paper, the example of knowledge-intensive business services (KIBS) was exploited, which are important actors for a knowledge-based development of economies. KIBS firms provide to their clients customized high value business services and help them to exploit their own knowledge potential. The KIBS sector is unevenly distributed across space, which previous research could reasonably explain by the local market size and sources of knowledge that are conducive for KIBS location and new firm formation in this sector. Research on KIBS so far has not considered the case where this sector is a newly emerging industry.

In the present study data on professional KIBS start-ups in the 1990s in East and West Germany were analyzed. In the eastern part of the country, the former socialist German Democratic Republic (GDR), no KIBS sector

existed at the time the socialist system collapsed in 1989/90. In West Germany the P-KIBS sector could develop over a much longer time period. The results indicate that in East Germany the presence of high-quality manufacturing has a positive effect on the level of P-KIBS start-ups, whereas in West Germany there is no effect of the co-location with manufacturing. The latter result is in line with previous research. The differing result for East Germany indicates that the local manufacturing sector required knowledge intensive business services in close proximity, which created a “window of opportunity” that lead to the co-location of new P-KIBS firms. Local manufacturers could obtain knowledge-intensive services from incumbent local P-KIBS firms only to a limited degree, which may have made starting a P-KIBS firm attractive. Nevertheless, also the general market potential has a positive effect in East Germany, which 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 that, in turn, negatively affects the commercialization of knowledge via entrepreneurship. Although, the transition background of East Germany may interfere with the findings the paper provides interesting insights on how regional sources of entrepreneurial opportunities depend on the stage of development of the industry with respect to its evolution across space. Altogether, it makes a difference if a knowledge intensive industry like the KIBS sector is a newly emerging industry!

This general finding implies that policy concepts to foster knowledge intensive entrepreneurship as a conduit of knowledge based development

cannot easily transferred from one economic area to another. Rather they should be tuned to specific regional conditions. The dependency on the stage of the evolution of this industry across regions should be considered for promoting knowledge-intensive start-up activity, when designing policy programs. In the context of this paper and its implications it would be interesting analyzing data on emerging economies and the centrally 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 to regions in which the same industries evolved already over a long time can be found? After which time become the regional sources similar to those in regions with a longer tradition in regard to this industry? Future research on these issues is clearly warranted to enhance our understanding of the emergence of knowledge intensive industries across space.

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## Appendix

Table A.1a: Definition of Non-technical Advisory ("Professional") Services (P-KIBS)

<i>NACE</i>	<i>WZ1973</i>	<i>Description</i>
7411	790	Legal activities
7412	791	Accounting, book-keeping 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 A1b: Definition of variables

<i>Variable</i>	<i>Definition</i>
<i>Start-up activity</i>	
Start-ups P-KIBS	Number of new establishments
Start-up rate P-KIBS	Start-ups divided by population between 18 and 64
<i>Controls</i>	
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)
Population Density (Log)	Total Populaion divided by size in sqkm
Emp Share P-KIBS	Share of Employees in P-KIBS
Emp Growth All	Annual Growth of total regional employment
<i>Manufacturing Sector</i>	
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 holding a university degree
Know Growth Non-R&D-Manufac	Annual Growth of Employment in non-R&D-intensive manufacturing holding a university degree

Table A.2a: 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
Population Density (Log)	5.215	1.056	3.711	7.983	5.011
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

Table A.2b: 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
Population Density (Log)	5.742	1.069	3.737	8.295	5.423
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=1956

Table A.3a: Correlation Matrix for East Germany

	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Start-ups P-KIBS	1												
2 Start-up rate P-KIBS	0.675***	1											
3 Know Growth Non-Manufac	0.032	0.042	1										
4 Market Potential (Log)	0.59***	0.186***	-0.144***	1									
5 Population Density (Log)	0.492***	0.521***	-0.088**	0.231***	1								
6 Emp Share P-KIBS	0.656***	0.629***	-0.076**	0.288***	0.593***	1							
7 Emp Growth All	-0.132***	-0.219***	0.255***	-0.039	-0.297***	-0.187***	1						
8 Emp Share Manufacturing	-0.267***	-0.282***	-0.082**	0.159***	-0.224***	-0.391***	0.078**	1					
9 Know Growth Manufac	-0.036	-0.015	0.002	-0.085**	-0.127***	-0.061	0.243***	0.043	1				
10 Emp Share R&D-Manufac	-0.028	0.035	-0.084**	0.298***	0.082**	-0.052	0.001	0.642***	0.047	1			
11 Emp Know R&D-Manufac	0.404***	0.377***	-0.037	0.339***	0.524***	0.375***	-0.195***	-0.023	-0.097**	0.29***	1		
12 Know Growth R&D-Manufac	-0.076*	-0.061	0.015	-0.177***	-0.089**	-0.053	0.127***	0.013	0.648***	0.002	-0.105***	1	
13 Emp Share Non-R&D-Manufac	-0.326***	-0.394***	-0.042	-0.025	-0.355***	-0.468***	0.1	0.803***	0.019	0.06	-0.255***	0.016	1
14 Know Growth Non-R&D-Manufac	-0.029	-0.022	-0.024	0.001	-0.089**	-0.06	0.148***	0.012	0.497***	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 A.3b: Correlation Matrix for West Germany

	1	2	3	4	5	6	7	8	9	10	11	12	13
1 Start-ups P-KIBS	1												
2 Start-up rate P-KIBS	0.601***	1											
3 Know Growth Non-Manufac	0.18***	0.466***	1										
4 Market Potential (Log)	0.618***	0.222***	0.003	1									
5 Population Density (Log)	0.388***	0.343***	-0.016	0.514***	1								
6 Emp Share P-KIBS	0.527***	0.529***	0.07***	0.386***	0.494***	1							
7 Emp Growth All	0.108***	0.25***	0.322***	-0.033	-0.162***	0.065***	1						
8 Emp Share Manufacturing	-0.249***	-0.261***	0.013	-0.064***	-0.248***	-0.481***	-0.024	1					
9 Know Growth Manufac	-0.002	0.092***	0.101***	-0.125***	-0.178***	-0.062***	0.25***	0.066***	1				
10 Emp Share R&D-Manufac	-0.02	0.013	0.029	0.069***	0.155***	-0.115***	-0.027	0.701***	0.035	1			
11 Emp Know R&D-Manufac	0.468***	0.433***	0.046**	0.375***	0.52***	0.468***	-0.004	-0.173***	-0.04*	0.228***	1		
12 Know Growth R&D-Manufac	-0.019	0.04*	0.024	-0.117***	-0.161***	-0.073***	0.177***	0.037*	0.717***	-0.003	-0.054**	1	
13 Emp Share Non-R&D-Manufac	-0.309***	-0.367***	-0.018	-0.171***	-0.524***	-0.505***	0	0.481***	0.047**	-0.287***	-0.513***	0.055**	1
14 Know Growth Non-R&D-Manufac	0.004	0.055**	0.091***	-0.06***	-0.083***	-0.006	0.127***	0	0.466***	-0.023	-0.037	-0.025	0.029

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

Table A.5: Main Model with reduced measuring of manufacturing sector

<i>Start-ups in P-KIBS sector (Count)</i>	Poisson		Negbin	
	West	East	West	East
<i>Controls</i>				
Know Growth Non-Manufac	0.284*** (0.0789)	0.209 (0.146)	0.193** (0.0807)	0.207 (0.149)
Market Potential (Log)	5.354*** (0.817)	3.412*** (1.217)	5.240*** (0.931)	3.399*** (1.235)
Population Density (Log)	-	-	-	-
Emp Share P-KIBS	-0.167 (1.679)	6.924 (6.390)	-0.309 (1.668)	6.482 (6.842)
Emp Growth All	-0.111 (0.335)	-0.224 (0.344)	0.102 (0.316)	-0.217 (0.353)
Year Dummies (YES=1)	YES	YES	YES	YES
<i>Manufacturing Sector</i>				
Emp Share Manufacturing	0.301 (0.510)	1.444** (0.667)	0.0837 (0.506)	1.397** (0.670)
Know Growth Manufac	-0.0392 (0.104)	0.0670 (0.134)	-0.0427 (0.0896)	0.0604 (0.137)
<i>Notes: Standard Errors in Parentheses (***) <math>p &lt; 0.01</math>, ** <math>p &lt; 0.05</math>, * <math>p &lt; 0.1</math>/ No data for Berlin/ N=672 (112 NUTSIII-Regions) for East Germany/ N=1956 (326 NUTSIII-regions) for West Germany/ No data for Berlin employed</i>				

Table A.5: Main Model without year dummies

<i>Start-ups in P-KIBS sector (Count)</i>	Poisson		Negbin	
	West	East	West	East
<i>Controls</i>				
Know Growth Non-Manufac	2.900*** (0.117)	1.004*** (0.268)	2.453*** (0.0829)	0.859*** (0.252)
Market Potential (Log)	14.65*** (1.895)	1.949 (2.498)	22.22*** (2.236)	2.297 (2.595)
Population Density (Log)	-	-	-	-
Emp Share P-KIBS	13.89*** (3.024)	64.36*** (10.23)	13.46*** (4.386)	64.11*** (11.34)
Emp Growth All	0.337 (0.529)	-1.774*** (0.425)	0.774 (0.494)	-1.682*** (0.421)
Year Dummies (YES=1)	-	-	-	-
<i>Manufacturing Sector</i>				
Emp Share R&D-Manufac	-0.726 (1.777)	4.948*** (1.106)	-0.572 (1.542)	5.147*** (1.251)
Emp Know R&D-Manufac	8.911*** (1.179)	-0.938 (1.143)	8.953*** (1.299)	-0.239 (1.050)
Know Growth R&D-Manufac	0.195** (0.0965)	0.0665 (0.117)	0.0516 (0.0939)	0.0163 (0.119)
Emp Share Non-R&D-Manufac	-6.814*** (1.110)	5.020*** (1.527)	-5.383*** (0.984)	4.916*** (1.560)
Know Growth Non-R&D-Manufac	0.270*** (0.0901)	0.149 (0.0989)	0.194** (0.0904)	0.142 (0.107)
<i>Notes: Standard Errors in Parentheses (***) <math>p &lt; 0.01</math>, ** <math>p &lt; 0.05</math>, * <math>p &lt; 0.1</math>) / No data for Berlin/ N=672 (112 NUTSIII-Regions) for East Germany/ N=1956 (326 NUTSIII-regions) for West Germany/ No data for Berlin employed</i>				

Table A.6: Main Model for East German regions not adjacent to Berlin

<i>Start-ups in P-KIBS sector (Count)</i>	Poisson	Negbin
	East	East
<i>Controls</i>		
Know Growth Non-Manufac	0.199 (0.153)	0.197 (0.157)
Market Potential (Log)	1.461 (1.984)	1.439 (2.018)
Population Density (Log)	-	-
Emp Share P-KIBS	-1.851 (6.664)	-2.136 (7.179)
Emp Growth All	-0.248 (0.330)	-0.241 (0.340)
Year Dummies (YES=1)	YES	YES
<i>Manufacturing Sector</i>		
Emp Share R&D-Manufac	2.154** (0.884)	2.104** (0.964)
Emp Know R&D-Manufac	2.112*** (0.747)	2.093*** (0.749)
Know Growth R&D-Manufac	-0.0726 (0.0855)	-0.0765 (0.0906)
Emp Share Non-R&D-Manufac	1.386 (1.166)	1.354 (1.163)
Know Growth Non-R&D-Manufac	0.0460 (0.0840)	0.0429 (0.0877)
<i>Notes: Standard Errors in Parentheses (***) <math>p &lt; 0.01</math>, ** <math>p &lt; 0.05</math>, * <math>p &lt; 0.1</math>/ No data for Berlin/ N=672 (112 NUTSIII-Regions) for East Germany/ N=1956 (326 NUTSIII-regions) for West Germany/ No data for Berlin employed</i>		