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Does Quality make a Difference? Employment Effects of High- and Low-Quality Start-ups*

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Abstract

This paper investigates the impact of new firms' quality on the magnitude of their employment effects. Our results clearly show that the quality of start-ups, measured by their affiliation to sectors and innovative industries, strongly influences the direct and the overall employment contribution of new firms. In particular, start-ups in manufacturing industries generate larger direct and overall growth effects than those in services. Moreover, new businesses in innovative manufacturing and in knowledge-intensive service industries make a larger direct contribution to employment than start-ups affiliated to other industries. We also find a relatively strong overall effect of new business formation in knowledge-intensive service industries. The impact of start-ups in innovative manufacturing industries on overall regional employment growth is, however, not statistically significant what may be mainly a result of their rather small share in all start-ups and due to the fact that they impact more on firms in other regions than start-ups in non-innovative manufacturing. Finally, we discuss conclusions for entrepreneurship policy, which can be derived from our findings.

JEL classification: L26, M13, O1, O18, R11

Keywords: Entrepreneurship, new business formation, innovative industries, regional development, entrepreneurship policy

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1. Aims and scope

Recent empirical evidence suggests that the magnitude of the effect of new business formation on employment and economic growth is closely related to the quality of new businesses.[1] Generally, the quality of a start-up denotes the intensity of the challenge in terms of competitive pressure that a newcomer exerts on the incumbents. This challenge can be regarded as the main driving force of the effect that new businesses have on economic development (for an overview see Fritsch, 2008). The quality of a new business may be indicated by factors such as the innovativeness of the supplied goods and services, the qualification of the entrepreneur, the marketing strategy that is pursued, the amount and quality of resources that are mobilized for the new business as well as its productivity.

The present paper investigates the link between the quality of new businesses and the magnitude of their employment effects for West German regions in the 1988-2002 period. The quality of start-ups is measured by their affiliation to broad economic sectors (manufacturing and services) as well as to innovative industries.[2] We analyze the employment contribution of new ventures by distinguishing between the employment development in entry cohorts which represents their direct employment effect and their overall impact on growth including their indirect effect. Our basic hypotheses are that

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[1] Baptista and Preto (2010), Falck (2007), Metzger and Engel (2006), Fritsch and Noseleit (2009b).

[2] Another aspect of the quality of new businesses is their competitiveness in terms of survival on the market. Falck (2007) found on the level of industries that new businesses that survived for at least five years ('long-distance runners') had a significantly positive impact on GDP growth while the effect of entries that stayed in the market for only one year ('mayflies') was statistically insignificant or significantly negative. Fritsch and Noseleit (2009b) could confirm this result on the level of regions. According to their analysis start-ups which survived four years or longer have a significantly positive effect on employment growth while the effect of new businesses that survived less than four years was insignificant or even significantly negative.

(a) cohorts of high-quality start-ups have a relatively strong direct employment effect, i.e. they create comparatively more jobs than other new firms and

(b) high-quality start-ups represent a stronger challenge for incumbent suppliers and, therefore, generate stronger overall effects on regional development than their lower-quality counterparts.

Section 2 explains in more detail why the quality of a start-up should make a difference and gives an overview on the respective empirical evidence that is available so far. Section 3 focuses on data and measurement issues. The results of the empirical analysis are presented in Section 4 and the final section (Section 5) discusses conclusions for policy as well as for further research.

2. Why should the quality of entry be important for its employment effects?

Recent empirical studies have shown that the effect of new business formation on regional development occurs over a longer period of time.[3] Typically, several phases of the effects can be distinguished. In the first phase, the setting-up of new businesses leads to an employment increase, obviously because extra personnel is needed to operate the additional capacities. This can be regarded as the *direct employment effect* of new businesses. However, there are two other categories of effects that new businesses may exert on employment. One of these categories is the *displacement effect*, which results from the competition between the new and the incumbent businesses on input as well as on output markets. The entry of new ventures spurs the market selection and as long as this market selection process works according to a 'survival of the fittest'-scenario, the least productive firms have to reduce their level of economic activity or must exit the market. Because such a scenario leads

[3] Audretsch and Fritsch (2002), Fritsch and Mueller (2004, 2008), Acs and Mueller (2008), Mueller, van Stel and Storey (2008), van Stel and Suddle (2008), Baptista, Escária and Madruga (2008), Arauzo-Carod, Liviano-Solís and Martín-Bofarull (2008).

to a rise in average productivity, employment should decrease as far as output remains at a constant level. There are, however, several ways in which competition by entry of new businesses can stimulate improvements on the supply-side of the regional economy that may lead to improved competitiveness and higher employment levels. The main *supply-side effects* of entry can be securing efficiency by contesting established market positions, an acceleration of structural change, amplified innovation and greater variety of products and problem solutions (see Fritsch, 2008, for a more detailed exposition). These supply-side effects are the reasons why one should expect positive employment effects of new business formation.

Hence, new businesses may lead to employment growth because they stimulate competition by challenging the incumbents. The effect of entries on growth depends on the competitive pressure that they exert on the incumbents as well as on the incumbent's response. This means that improvements may occur on the side of the start-ups as well as on the side of the incumbents and, therefore, do not necessarily require the newcomers to be successful and survive in order to make a contribution. Therefore, the development of the new businesses, as measured by employment in start-up cohorts, reflects only a part of their effect on growth. In addition, displacement and supply-side effects have to be considered in order to assess the overall contribution of new business formation on growth. In fact, Fritsch and Noseleit (2009 a,b) show that the indirect effects of new business formation are quantitatively much more important than the direct effects.

New businesses may differ considerably with regard to the challenge they exert on the incumbents. This challenge is closely related to the quality of the new ventures, which can be indicated by various factors such as the innovativeness of the supplied goods and services, the qualification of the entrepreneur, the amount and quality of mobilized resources, the marketing strategy that is pursued, as well as their productivity. Recent empirical studies suggest that start-ups in

manufacturing generate a stronger employment effect than new businesses in other economic sectors (e.g. van Stel and Suddle, 2008). This is particularly remarkable because entries into manufacturing industries are relatively few due to high entry barriers in terms of minimum efficient size and capital intensity. However, these high entry barriers may induce a higher quality of entries due to a self-selection of potential entrepreneurs, which could explain the comparatively larger economic effect of start-ups in manufacturing industries. Besides, purely imitative entry of suppliers which just replicate the already available product program based on identical production processes and at the same costs represents a far lesser challenge than innovative start-ups with completely new products or production processes that allow for much lower prices. It is, therefore, not very farfetched to assume that innovative entries may have a larger positive effect on growth than start-ups which are entirely imitative (for a more detailed exposition of the argument see Fritsch and Schroeter, 2010).

There are only few empirical studies investigating the employment effect of start-ups differentiated by their sector affiliation or innovativeness. Concerning the direct employment effect of new businesses, empirical analyses for Germany give evidence that the number of employees in start-up cohorts rises in the first one or two years but then declines quite quickly and even falls below the initial employment level after about eight years. This general pattern, however, differs largely between sectors. The number of employees in cohorts of manufacturing start-ups grows stronger and remains above the initial employment level for a longer period of time than in services (Schindele and Weyh, forthcoming).

With regard to innovative new ventures, empirical results indicate that starting such businesses bears a considerably higher risk of failure than setting up new ventures in non-innovative industries (Audretsch, 1995; Audretsch, Houweling and Thurik, 2000). Engel and Metzger (2006) as well as Metzger and Rammer (2009) show that despite this higher failure risk during the first years entry-cohorts in West-German superior-

tech and high-tech manufacturing as well as knowledge-intensive service industries experience a by far stronger employment growth than entry cohorts in non-innovative, low-tech and non-knowledge-intensive industries. This suggests that surviving firms in innovative and knowledge-intensive industries tend to grow larger than in non-innovative industries.

In order to assess the overall growth impact of new firms Audretsch, Keilbach and Lehmann (2006) included the start-up rate (number of start-ups over population) into a regional production function as an input together with capital, labor, and R&D investment. In their analysis for West-Germany they found that start-ups in high-tech industries and in the information and communication industries had a statistically significant impact on the regional level of output as well as on the level of labor productivity. The coefficients for start-ups in these industries for explaining regional GDP were smaller than for the start-ups in all industries. However, when labor productivity is used as dependent variable the coefficient for high-tech entrepreneurship was higher. Causal interpretation of these results is, however, problematic since the empirical analyses are limited to the *level* of GDP and productivity, not to their development.

Analyzing the overall effect of new business formation on regional employment for Portuguese regions Baptista and Preto (2010) found that the overall effect of knowledge based firms on regional employment is substantially larger for businesses in knowledge-based industries than for start-ups in other industries. Particularly, the displacement effects as well as the supply-side effects of new businesses in knowledge-based industries were much more pronounced than in non-knowledge intensive industries.

3. Data and measurement

Our analysis of the effect of new business formation on regional economic development over time is at the spatial level of West German planning

regions (*Raumordnungsregionen*). Planning regions consist of at least one core city and the surrounding area. Therefore, the advantage of planning regions in comparison to districts (*Kreise*) is that they can be regarded as functional units in the sense of traveling to work areas and that they account for economic interactions between districts. Planning regions are slightly larger than what is usually defined as a labor market area. In contrast to this, a district may be a single core city or a part of the surrounding suburban area (see Federal Office for Building and Regional Planning, 2003, for the definition of planning regions and districts). We excluded East Germany from our study since many analyses show that the developments in East Germany in the 1990s were heavily shaped by the transformation process to a market economy. Therefore, it represents a rather special case that should be analyzed separately (e.g., Kronthaler, 2005). The Berlin region had to be excluded due to changes in the definition of that region after the unification of Germany in 1990.[4]

The data used in this study stem from the Establishment History Panel which is based on official employment statistics. It is provided by the Institute for Employment Research (IAB) of the Federal Employment Agency. This database comprises information on all establishments that have at least one employee subject to obligatory social insurance. Due to the fact that the database records only businesses with at least one employee, start-ups consisting of only owners are not included. Unfortunately, the German Social Insurance Statistics is completely on the level of establishments and does not allow us to separate new firms from new plants and new branches that are created by existing firms. In order to avoid distortions caused by new large subsidiary plants of incumbent firms, new establishments with more than 20 employees in the first year of

[4] For historical reasons, the cities of Hamburg and Bremen are defined as planning regions even though they are not functional economic units. In order to avoid possible distortions, we merged these cities with adjacent planning regions (Hamburg with the region of Schleswig-Holstein South and Bremen with Bremen-Umland). Therefore, we have 71 regions in our sample.

their existence are not counted as start-ups.[5] In addition, we excluded start-up and employment data in agriculture and fishery, energy, mining, railway, and postal services because of highly regulated market conditions that strongly diverge from the rest of the economy. Data on population and population density are from the German Federal Statistical Office.

New business formation activity is measured by the yearly start-up rates calculated according to the labor market approach; namely, the number of start-ups per period is divided by the number of employees in the regional workforce (in thousands) at the beginning of the respective period (see also Audretsch and Fritsch, 1994). Start-ups are classified as innovative or non-innovative according to their affiliation to certain industries. This classification is mainly based on the knowledge- and R&D-intensity of industries as well as on the innovativeness of their product programs (Grupp and Legler, 2000). Manufacturing industries are classified as innovative if their R&D-intensity, i.e. the ratio of R&D expenditures over sales, is 3.5 percent or higher. Since many service firms do not have a standardized product program but provide support according to the individual needs of their customers they are not innovative in the same sense as manufacturing firms. Hence, service industries which may be relevant for innovation processes are entirely defined according to the knowledge-intensity of their inputs. Theses knowledge-intensive service industries comprise for example ‘computer services’, ‘research and development in natural sciences and engineering’ or ‘business consultancy’ (see Appendix A1).

On average, there were about 9.98 new businesses per 1,000 employees set-up in the period under inspection (1988 and 2002). The start-up rate in services was about 7.82 and only 2.16 in manufacturing. Start-ups in innovative manufacturing and knowledge-intensive services were much less frequent with rates of 0.26 and 1.10, respectively. New

[5] The share of new establishments in the data with more than 20 employees in the first year is rather small (about 2.5 percent).

firms in knowledge-intensive service industries account only for about 11 percent of all start-ups and 14.28 percent of all new ventures in services. New firms in innovative manufacturing industries represent only a share of 2.79 percent of all start-ups and 12.1 percent of all new businesses set-up in the manufacturing sector. Hence, new businesses in innovative manufacturing industries are a very rare event (Metzger and Rammer, 2009; see also Licht and Nerlinger, 1998, for the period 1985-1992).

Table 1: Average start-up rates and shares of start-ups in different types of industries

	All start-ups	Manufacturing	Services
Start-up rate	9.98	2.16	7.82
Share in all start-ups (%)	100	22.97	77.02
Start-up rate in innovative manufacturing	-	0.26	-
Start-up rate in knowledge-intensive services	-	-	1.10
Share of start-ups in innovative manufacturing (%)	2.79	12.10	-
Share of start-ups in knowledge-intensive service industries (%)	11.02	-	14.28

Our indicator for regional development is the average yearly change of employment (*E*) over a two-year period (percentage), i.e., between the current period t_0 and t_{+2}. A two-year average is used in order to avoid disturbances by short-term fluctuations.

4. Empirical analysis

In a first step, we analyze the development of start-up cohorts differentiated by sector and their affiliation to innovative and knowledge-intensive industries (section 4.1). This type of analysis provides particular insights into the direct employment impact of new businesses in different sectors and different types of industries. In a second step, we assess the overall employment contribution of new businesses in different sectors and

different types of industries including direct and indirect effects generated by the new ventures (section 4.2).

4.1 The direct effect of new business formation on regional employment over time

Our period of investigation between 1988 and 2002 covers 15 yearly cohorts of new businesses. In order to identify their general pattern of employment development, we aggregate these cohorts and calculate average values. In order to compare the development of start-up cohorts in the different industries the figures are presented as indices with the number of employees in the initial year given by an index level of 100 and the values of subsequent years representing the percentage share of the initial level.

Figure 1 displays the evolution of entry cohorts of all start-ups as well as of new firms in manufacturing and services. Consistent with previous findings for Germany, start-up cohorts in manufacturing perform much better than those in services (Schindele and Weyh, forthcoming). The average number of jobs in manufacturing start-ups reaches a maximum of 114% of the initial employment after two years and then declines to the original level six years after foundation. After 14 years, the number of employees is about 90 percent of the initial employment number. In contrast, the highest average employment level of entry cohorts in services amounts to 108 percent in the first year and reaches its basic level already four years after foundation. Since most start-ups occur in the service sector, the cohort development of all start-ups is much weaker than for manufacturing and resembles more the evolution of start-up cohorts in services.

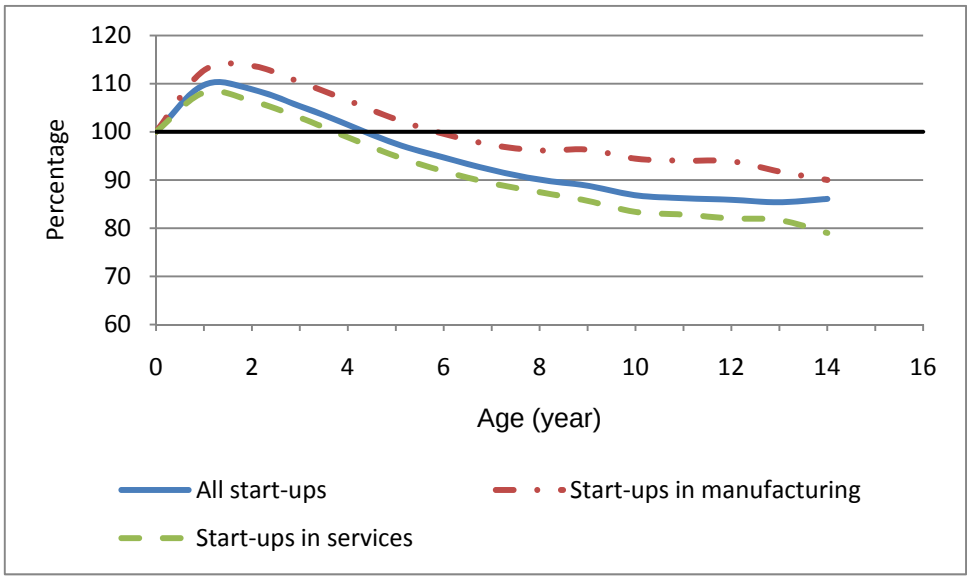

Figure 1: Evolution of employment in entry cohorts of all start-ups, start-ups in manufacturing and start-ups in services

Employment development in cohorts of start-ups in innovative manufacturing industries clearly exceeds that of their non-innovative counterparts (figure 2). Employment in the average start-up cohort in innovative manufacturing industries rises to 121 percent of the initial level in the second year compared to 109 percent for the start-ups in manufacturing industries classified as being non-innovative. Although employment declines in both groups during the subsequent years, the number of jobs in the innovative manufacturing start-ups never falls below the level of the initial year. Moreover, their employment development remains fairly constant after seven years at about 106 percent of the initial number of employees.[6] By contrast, employment in the average start-up cohort in non-innovative manufacturing industries falls below the initial level after four years and continues to decline to about 85% of the basic employment level after 14 years.

[6] The sharp increase in the number of jobs after 14 years is caused by the cohort of 1988, which obviously represents a special case that should not be generalized.

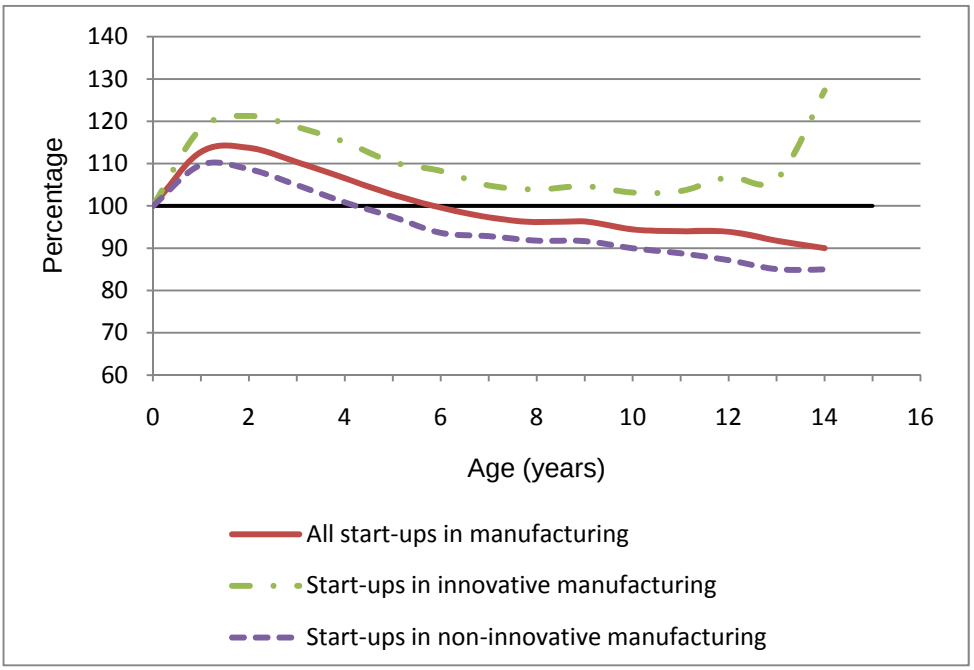

Figure 2: Evolution of employment in entry cohorts of all manufacturing start-ups, start-ups in innovative and non-innovative manufacturing industries

Comparing employment development of start-ups in knowledge-intensive and in non-knowledge intensive service industries (figure 3) reveals that the cohort employment in the first group strongly increases after foundation and reaches 124 percent of the initial level after four years. In the subsequent years, the number of employees slightly declines but starts to grow again after ten years finally reaching 132 percent of the initial number of jobs. However, the high level of employment in the 13th and 14th year are caused by only two cohorts and should, therefore, be interpreted with caution. Nevertheless, the number of employees in the average cohort of knowledge-intensive start-ups remains clearly above the initial level and tends to grow almost over the whole period of inspection. Moreover, it considerably exceeds the employment contribution of cohorts in innovative manufacturing. This difference is quite remarkable and might be attributed to the growing demand for high-end services as well as to increasing outsourcing of such activities in advanced economies (see e.g., Peneder, Kaniovsky and Dachs, 2003; Schettkat and Yocarini, 2006). Average development of start-up cohorts in non-innovative services is

marked by a weak employment increase up to 106 percent of the initial level in the first year. This is followed by a rapid decline that reaches the initial number of employees already after three years. After 13 years, only about three quarters of the original number of employees are still employed in the new firms.

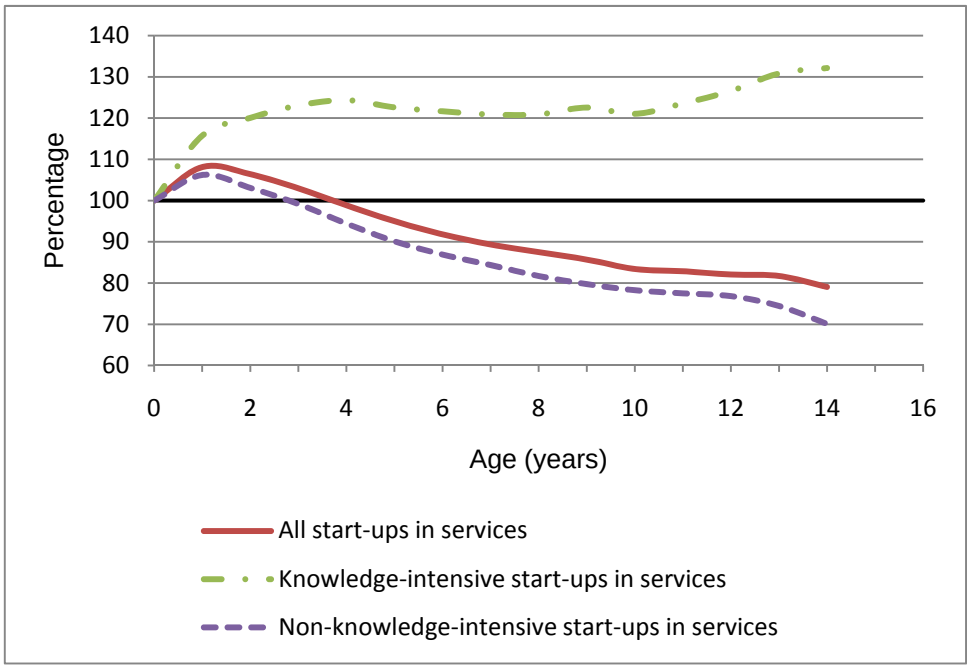

Figure 3: Evolution of employment in entry cohorts of all start-ups in services, start-ups in knowledge-intensive and non-knowledge-intensive services

Although the employment development of entry cohorts in manufacturing industries exceeds those in services considerably (figure 1), the overall development of these two large economic sectors shows a different picture (figure 4). While the number of jobs in services steadily grew between1997 and 2002, employment in manufacturing declined to about 95 percent of the 1997 level in 2002. A relatively strong increase of overall employment is found for the knowledge-intensive service industries (figure 5). That employment in non-knowledge-intensive service industries also increased in this period may be cause by the general long-term trend towards the service sector. While employment in innovative manufacturing

remained about constant it declined in the non-innovative manufacturing industries (figure 5).

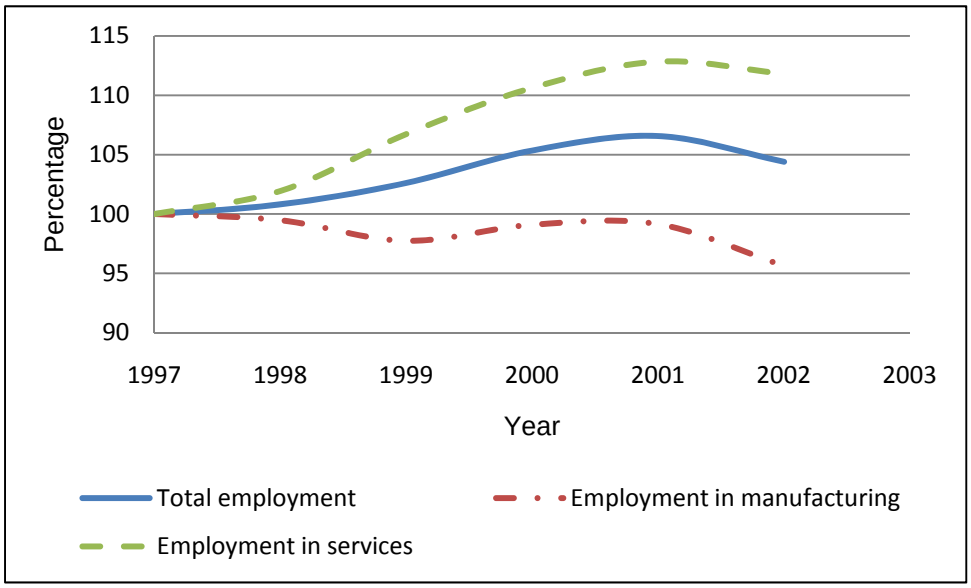

Figure 4: Evolution of total employment, employment in manufacturing and services

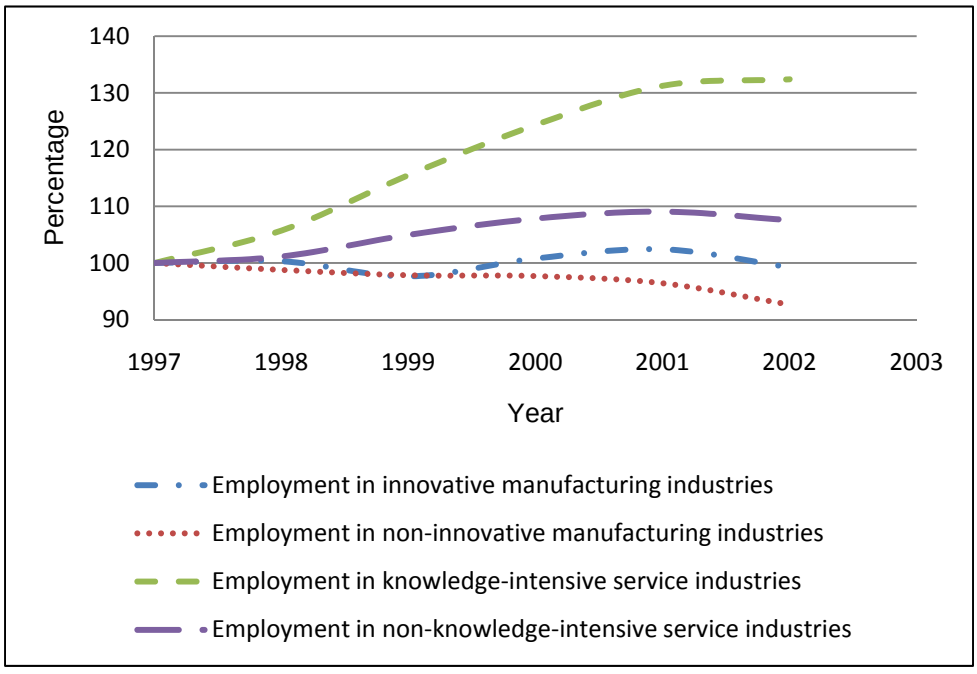

Figure 5: Evolution of employment in innovative and non-innovative manufacturing industries as well as in knowledge-intensive and non-knowledge-intensive service industries

There are some striking differences between the sectoral groups with regard to their share in the direct employment effect of new business formation, i.e. the number of jobs which remained in the 15 yearly cohorts at the end of the period under inspection (1988 and 2002). Figure 4 shows that new firms in manufacturing created roughly 35 percent of all jobs in entry cohorts although they represent only about 23 percent of all start-ups. The remaining 65 percent of the new jobs in new businesses are in service firms which make almost 80 percent of all new ventures. These figures show rather clearly that the manufacturing entries have a stronger direct employment effect than new businesses in the service sector. Such differences of the direct employment effect of new businesses become even more pronounced when distinguishing them by their innovativeness and knowledge-intensiveness. Start-ups in knowledge-intensive service industries which account for 11 percent of all start-ups create 17.9 percent of all new jobs in entry cohorts. Start-ups in innovative manufacturing contribute 16.6 percent to total cohort employment while accounting for only 2.77 percent of all new businesses. Start-ups in non-innovative manufacturing industries which make a bit more than 18 percent of all new businesses account for about 18.3 percent of all new jobs. The share of new jobs in non-knowledge-intensive services is about 47 percent which is considerably less than their share in the number of start-ups.

The share of employees in the 15 yearly entry cohorts at the end of the period under inspection (2002) in total employment amounts to about 27 percent (figure 4). Most of these new jobs are in new service firms (almost 18 percent of all new jobs in 2002); new manufacturing firms contribute about nine percent of overall employment in the year 2002. Given their small number, new firms in innovative manufacturing and knowledge-intensive service industries create a relatively large share in overall employment of 4.5 and 4.8 percent, respectively. The contribution of new businesses in non-innovative and non-knowledge-intensive industries to overall employment amounts to 4.9 and 12.6 percent.

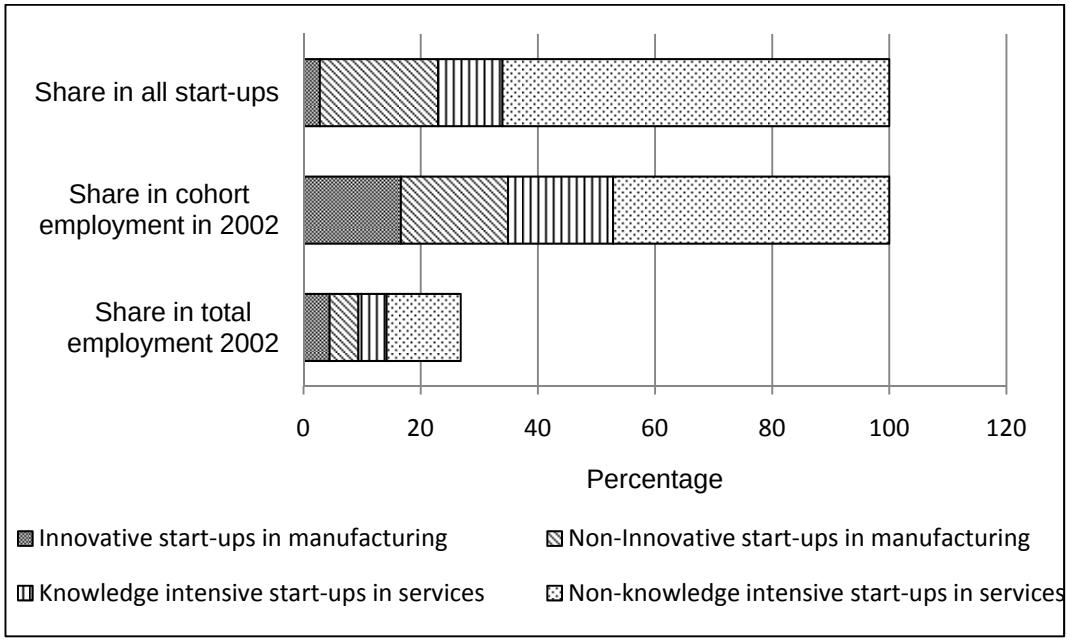

Figure 4: Share of start-ups and employment contribution of start-ups differentiated by their sector affiliation and innovativeness

In a nutshell, the preceding analysis showed that cohorts of high-quality start-ups contribute relatively more to employment growth than cohorts of their lower quality counterparts. On the one hand, this is reflected by an employment evolution of high-quality entry cohorts that clearly exceeds those of new businesses of lower quality. On the other hand, given their share in all new firms, high-quality start-ups create a comparatively larger job share both in cohort as well as in total employment. We can, thus, confirm our first hypothesis that high-quality start-ups create a relatively stronger direct employment effect than start-ups of lower quality.

4.2 The overall employment contribution of new business formation on regional employment over time

Previous analyses of the effects of new business formation on employment over time for Germany (Fritsch and Mueller 2004, 2008) have found that this effect is statistically significant over a period of ten years. Therefore, we regresses the start-up rate of the current year (t_0) as well of

the ten preceding years (t_{-1} to t_{-10}) on the average rate of employment change in region r between t_0 and t_{+2}. We estimate

$$\Delta EMP_{r,t} = \alpha + \beta\ average\quad start\ -up\ rate_{r,t0-t-10} + X_{r,t-1} + \mu_r + \varepsilon_{r,t}$$

whereas the start-up rate is calculated as a moving average over a period of ten years in order to allow for the time-lag that has been identified in previous analyses (Fritsch and Mueller, 2008), $X_{r,t-1}$ are other exogenous variables, μ_r is a regional fixed effect, and $\varepsilon_{r,t}$ is the error term. Panel estimation techniques were used that allowed to account for unobserved region-specific factors. Application of the Huber–White method provided robust standard error estimates.

The set of further variables ($X_{r,t-1}$) is included to account for other factors than the start-ups that are relevant for regional growth. In particular, we include population density as a catch-all variable for a number of local characteristics such as the wage level, real estate prices, quality of the infrastructure or qualification and diversity of the labor market, that might affect regional growth. Since human capital is an important determinant of regional growth (Lucas, 1988; Glaeser et al., 1992), we add the regional share of highly-skilled employees to our model. In order to account for the influence of industry structure on employment growth (Glaeser et al., 1992; Peneder, 2002; Combes, 2000) we include the employment shares of 27 out of 28 aggregated industries into our model. Finally, local employment growth may also be driven by the proximity to other markets. Hence, we included a Harris-type market potential function, which is a distance-weighted sum of GDP per population in all other districts (Redding and Sturm 2008, Südekum 2008). This variable particularly controls for spatial autocorrelation.

Table 1 shows our estimation results for the basic model and for different specifications of it. The effect of start-ups in all industries on regional employment growth is statistically significant at the 1% level (model I). Including only the new businesses in manufacturing (model II) leads to a considerably higher effect than in a model which contains only

the start-ups in services (model III). However, model II and III may overestimate the effects of start-ups since new business formation in the other industries is not included. Hence, in order to avoid an omitted variable bias, all new ventures should be accounted for. In a model which contains start-ups in services and in manufacturing (model IV) both indicators are statistically significant with the effect of new ventures in manufacturing being larger than the effect for start-ups in services. This result is quite remarkable since start-ups in manufacturing make only about 20 percent of all new businesses while the start-ups in services account for about 80 percent.

Surprisingly, running our model only with start-ups in innovative manufacturing industries does not yield to any significant impact on regional employment growth (model V). By contrast, new businesses in knowledge-intensive services (model VI) have a distinct impact on regional growth (model VI). Likewise, non-innovative start-ups in services and manufacturing also exert a statistically significant influence on employment development, which is slightly smaller than the effect of knowledge-intensive new ventures (model VII). However, including all three indicators into one model reveals a much larger growth effect induced by knowledge-intensive new firms than for non-innovative manufacturing and service start-ups. The indicator for start-ups in innovative manufacturing industries still remains insignificant (model VIII).

With regard to the control variables we find a significantly positive effect of human capital intensity on regional employment growth which is in line with our expectations. The local industry structure also plays a role while regional population density and proximity to other markets remain insignificant.

Based on the preceding results, our second hypothesis, suggesting high-quality start-ups to generate larger overall employment effects than

Table 2: Employment effects of new business formation differentiated by the type of new firms

Employment change / Independent variables	I	II	III	IV	V	VI	VII	VIII
Start-up rate of all start-ups	0.294*** (3.38)							
Start-up rate in manufacturing		0.265** (2.36)		0.190** (2.08)				
Start-up rate in services			0.216*** (3.42)	0.105* (1.68)				
Start-up rate in innovative manufacturing industries					-0.002 (0.05)			-0.035 (0.84)
Start-up rate in knowledge-intensive service industries						0.200*** (2.68)		0.172** (2.27)
Start-up rate in non-innovative manufacturing and services							0.198*** (2.83)	0.157** (2.12)
Share of highly-skilled employment	0.054** (2.23)	0.058** (2.46)	0.052** (2.28)	0.054** (2.25)	0.057** (2.38)	0.057** (2.41)	0.053** (2.27)	0.054** (2.32)
Population density	-0.646 (1.21)	-0.452 (0.80)	-0.696 (1.29)	-0.395 (0.70)	-0.652 (1.18)	-0.820 (1.42)	-0.637 (1.18)	-0.727 (1.34)
Market potential	-0.284 (1.04)	-0.210 (0.78)	-0.237 (0.89)	-0.362 (1.54)	0.063 (0.23)	-0.151 (0.58)	-0.187 (0.68)	-0.239 (0.84)
Control for industry composition	Yes[a)]	Yes[a)]	Yes[a)]	Yes[a)]	Yes[a)]	Yes[a)]	Yes[a)]	Yes[a)]
Time dummies	Yes***	Yes***	Yes***	Yes***	Yes***	Yes***	Yes***	Yes***
Constant	-0.328 (1.14)	-0.317 (0.97)	-0.388 (1.37)	-0.363 (0.12)	-0.547* (1.75)	-0.534* (1.73)	-0.392 (1.33)	-0.405 (1.38)
Observations	284	284	284	284	284	284	284	284
Number of ror	71	71	71	71	71	71	71	71
R-squared	0.71	0.63	0.64	0.71	0.57	0.63	0.67	0.71
Log-likelihood	753.6	751.1	753.1	754.3	726.5	751.7	751.0	754.6

Notes: Robust t statistics in parentheses. ***: statistically significant at the 1 percent level; **: statistically significant at the 5 percent level; *: statistically significant at the 10 percent level. a): jointly significant at the 1 percent level.

their lower-quality counterparts, can be confirmed with the limitation of new firms in innovative manufacturing industries. However, the insignificance of the effect of start-ups in innovative manufacturing industries on overall employment is quite surprising and contradicts our expectations. There are at least two explanations for this result. First, new businesses in innovative manufacturing industries are a very rare event as they make only 2.8 percent of all start-ups. Hence, their effect on overall employment may be too small to become statistically significant. Second, by regressing regional start-ups on employment change in the same region we cover only that part of the displacement and the supply-side effects that occur in the same region. This incomplete coverage of the indirect employment effects of new business formation may be relatively pronounced with regard to start-ups in innovative manufacturing industries since these new businesses tend to be more engaged in interregional markets than other start-ups. It is therefore plausible to assume, that the insignificant results for start-ups in innovative manufacturing do not indicate a lacking employment impact, but are caused by problems of empirical assessment.

5. Discussion

Recent empirical analyses indicate a strong relationship between the magnitude of the employment effects of start-ups and their quality. Our investigation confirms these findings with regard to the direct employment effect of start-ups, i.e. the employment in the new firms, and partly also for their impact on overall employment. Distinguishing different sectors, we find that new businesses affiliated to manufacturing industries have a stronger direct and total employment effect than start-ups in services. Within these two large economic sectors the new businesses affiliated to innovative and to knowledge-intensive industries make a relatively larger direct employment contribution than their non-innovative and non-knowledge-intensive counterparts. Our argument that start-ups in innovative and in knowledge-intensive industries also cause comparatively larger total employment effects due to relatively strong competitive

pressure that they exert on incumbents could only be confirmed for the new ventures in knowledge-intensive services. The insignificance of the effect of start-ups in innovative manufacturing on overall regional growth may result from their relatively small number and from estimation problems with regard to their displacement and supply-side effects. Our results show very clearly that not all start-ups are equally important for growth and that the quality of the new businesses as indicated by their affiliation to sectors and innovative and knowledge-intensive industries plays an important role.

One main weakness of our analysis that it has in common with most other empirical work in the field pertains to the identification of innovative and knowledge-intensive services by their industry affiliation. Industry affiliation is only a rather imprecise criterion for identifying innovative start-ups because the respective industries comprise quite a number of non-innovative firms while highly innovative start-ups can and regularly do also occur in industries which are not classified as innovative. The reason why this rough method is quite common practice in empirical analyses is that convincing alternatives are largely missing. We are not aware of any comprehensive data set that allows for a better definition of innovative and knowledge-intensive start-ups in Germany as well as in other countries.

The empirical evidence clearly shows that it is only a relatively small share of all start-ups that is responsible for the main effect of entrepreneurship on growth. This suggests that a growth oriented policy should particularly focus on this type of start-up. Such a policy may comprise a number of different strategies. First, fight any kinds of severe market failures that hamper innovative new businesses such as an insufficient supply of Venture Capital and credit rationing. Second, stimulate the formation of more innovative start-ups. Third, support innovative start-ups also after entry.

The first strategy is conceptually unproblematic and may gain wide agreement. The main question here concerns the most suited policy instruments to achieve the goals. The second strategy, supporting the

formation of innovative start-ups, offers a wide range of policy options. They comprise areas such as basic education in natural sciences, access to tertiary education, provision of entrepreneurial education programs, creating an entrepreneurial climate as well as implementing institutions which are conducive to innovative start-ups (for a more detailed discussion of these issues see Henrekson, and Johansson, 2009). These instruments are rather indirect in nature. Since this strategy is targeting at the pre-entry phase it does not bear the risk of disturbing the ‘survival-of the-fittest’-scenario, which is a precondition for the emergence of positive supply-side effects of new business formation. Hence, introducing measures that try to enhance the quality of start-ups in the pre-entry phase seem to be a recommendable strategy.

The third strategy comprises all kinds of support for new ventures which are already in operation. The scope for a reasonable support of existing young businesses is quite limited as this might lead to severe distortions of the market selection process. This may include deadweight losses as well as substitution effects (Santarelli and Vivarelli, 2002; Vivarelli, 2004). In the first case, new firms obtain public support (e.g. subsidies) although they do not need them in order to survive and grow. In the latter case, subsidies keep less efficient start-ups in the market while competition would have forced them to exit. Such a distortion of the market selection process hampers the emergence of supply-side effects of new business formation that tend to be quantitively much more important than their direct effect, i.e. the jobs that are created in the young firms (see Fritsch and Noseleit, 2009a and b, for details). Hence, subsidizing firms after market entry, no matter of what quality they are, is not only a waste of taxpayer’s money but may also be harmful for growth. This option can, therefore, not be recommended.

Our results clearly suggest that not all start-ups are of equal importance for growth and that the quality of new businesses plays an important role in this respect. The relationship between the quality of new businesses and its effect on overall economic development is a largely

unexplored field that provides interesting and promising possibilities for further research. While we in this paper largely focused on innovativeness and knowledge-intensity future studies should also investigate further aspects of quality such as the qualification of the entrepreneur and the business concept as well as the amount and quality of resources that are mobilized for the new business. A main bottleneck for such research is the measurement of a new businesses' quality. With regard to innovativeness of start-ups further research should particularly focus on a more reliable and precise definition of innovativeness than industry affiliation that is dominating empirical research in this field.

Appendix

Table A1: Classification of innovative manufacturing industries and knowledge-intensive service industries

Innovative manufacturing industries

Manufacture of chemicals and chemical products
- Manufacture of basic chemicals
- Manufacture of other chemical products
- Manufacture of man-made fiber

Manufacture of machinery and equipment n.e.c.
- Manufacture of general purpose machinery
- Manufacture of special purpose machinery
- Manufacture of domestic appliances n.e.c.

Manufacture of office, accounting and computing machinery

Manufacture of electrical machinery and apparatus n.e.c.
- Manufacture of electric motors, generators and transformers
- Manufacture of electricity distribution and control apparatus
- Manufacture of insulated wire and cable
- Manufacture of accumulators, primary cells and primary batteries
- Manufacture of electric lamps and lighting equipment
- Manufacture of other electrical equipment n.e.c.

Manufacture of radio, television and communication equipment and apparatus
- Manufacture of electronic valves and tubes and other electronic components
- Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy
- Manufacture of television and radio receivers, sound or video recording or reproducing apparatus, and associated goods

Manufacture of medical, precision and optical instruments, watches and clocks
- Manufacture of medical appliances and instruments and appliances for measuring, checking, testing, navigating and other purposes, except optical instruments
- Manufacture of optical instruments and photographic equipment

Manufacture of motor vehicles, trailers and semi-trailers
- Manufacture of motor vehicles
- Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers
- Manufacture of parts and accessories for motor vehicles and their engines

Manufacture of other transport equipment

- Manufacture of railway and tramway locomotives and rolling stock
- Manufacture of aircraft and spacecraft

Knowledge-intensive services

Financial intermediation, except insurance and pension funding

Activities auxiliary to financial intermediation

Renting of transport equipment; Renting of other machinery and equipment

Research and development activities

Real estate activities

Legal, accounting, book-keeping and auditing activities; tax consultancy; market research and public opinion polling; business and management consultancy

Architectural, engineering and other technical activities

Advertising

Source: Own classification according to Grupp and Legler (2000)

Table A2: Descriptive statistics

Variable	Mean	Median	Minimum	Maximum	Standard Deviation
Start-up rate (log)	2.104	2.112	1.501	2.763	0.232
Start-up rate in manufacturing (log)	0.133	0.133	-0.401	0.660	0.187
Start-up rate in services (log)	1.949	1.952	1.259	2.670	0.257
Start-up rate in innovative manufacturing industries(log)	-1.393	-1.384	-2.062	-0.747	0.232
Start-up rate in knowledge-intensive Service industries (log)	0.014	0.007	-0.700	0.874	0.307
Share of highly-skilled employees	0.050	0.043	0.014	0.183	0.025
Population density	5.442	5.288	0.659	4.253	7.126
Market potential (log)	-3.452	-3.435	-4.122	-2.871	0.261
Employment change	-0.001	-0.011	-0.150	0.240	0.048

Table A3: Correlations between variables (*Pearson* correlation coefficients)

		1	2	3	4	5	6	7	8	9
1	Start-up rate all sectors (log)	1								
2	Start-up rate in manufacturing (log)	0.848	1							
3	Start-up rate in services (log)	0.934	0.776	1						
4	Start-up rate in innovative manufacturing industries (log)	0.441	0.641	0.375	1					
5	Start-up rate in knowledge-intensive services (log)	0.719	0.434	0.754	0.337	1				
6	Share of highly-skilled employees	0.198	0.058	0.045	0.147	0.56	1			
7	Population density (log)	-0.031	-0.190	0.006	-0.024	0.401	0.603	1		
8	Market potential (log)	-0.393	-0.534	-0.349	0.161	0.401	0.577	0.508	1	
9	Employment change	0.187	0.075	0.105	0.169	0.325	0.233	0.076	0.253	1

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