Centre of Excellence for Science and Innovation Studies

CESIS Electronic Working Paper Series

Paper No. 256

Creative Destruction and Productivity

– entrepreneurship by type, sector and sequence

Martin Andersson, Pontus Braunerhjelm and Per Thulin

August 2011

The Royal Institute of Technology
Centre of Excellence for Science and Innovation Studies (CESIS)
http://www.cesis.se

CREATIVE DESTRUCTION AND PRODUCTIVITY

Entrepreneurship by type, sector and sequence

August 2011

Martin Andersson, Pontus Braunerhjelm and Per Thulin[1]

Abstract

Schumpeter claimed the entrepreneur to be instrumental for creative destruction and industrial dynamics. Entrepreneurial entry serves to transform and revitalize industries, thereby enhancing their competiveness. This paper investigates if entry of new firms influences productivity amongst incumbent firms, and the extent to which altered productivity can be attributed sector and time specific effects. Implementing a unique dataset we estimate a firm-level production function in which the productivity of incumbent firms is modeled as a function of firm attributes and regional entrepreneurship activity. The analysis finds support for positive productivity effects of entrepreneurship on incumbent firms, albeit the effect varies over time, what we refer to as *a delayed entry effect*. An immediate negative influence on productivity is followed by a positive effect several years after the initial entry. Moreover, the productivity of incumbent firms in services sectors appears to be more responsive to regional entrepreneurship, as compared to the productivity of manufacturing firms.

Keywords: entrepreneurship, entry, business turbulence, incumbent firms, productivity, region, business dynamics

JEL: L26, L10, R11, D22, O31

[1]Andersson is affiliated to the Centre for Innovation, Research and Competence in the Learning Economy (CIRCLE) at Lund University and Blekinge Institute of Technology (BTH). Both Braunerhjelm (corresponding author) and Thulin are affiliated with the Department of Transport and Economics, Royal Institute of Technology, 100 44 Stockholm, SWEDEN. Tel. +46 (8) 790 9114, pontusb@abe.kth.se. Braunerhjelm is also Managing director of Swedish Entrepreneurship Forum, a research institute.

1. Introduction

Schumpeter attributed the entrepreneur a critical role in the process of industrial evolution and economic progress. By challenging existing economic structures through innovative endeavors, the entrepreneur was claimed instrumental in promoting growth and inducing structural change. In such processes of creative destruction the entrepreneur combine knowledge, existing as well as new, in innovative ways, thereby being an impetus to growth. The result is new products, services, inputs, novel ways of organizing production and the identification of new markets which all serve to transform industries and societies. More precisely, Schumpeter described the entrepreneur in the following way:

> "Whatever the type, everyone is an entrepreneur only when he actually carries out new combinations and loses that character as soon as he has built up his business, when he settles down to running it as other people run their business" (Schumpeter 1911/1934, p78).

> "And what have they done: they have not accumulated any kind of goods, they have created no original means of production, but have employed means of production differently, more advantageously. They have carried out new combinations! They are the entrepreneurs. And their profit, the surplus to which no liability corresponds, is the entrepreneurial profit." (Schumpeter 1911/1934, p. 132).

For our purposes, there are two particularly interesting insights that can be extracted from these quotations; first, imitation as such would have little or no effects, and, second, due to more efficient and novel production methods entrepreneurs are likely to enjoy higher productivity than incumbents, reflected in the "entrepreneurial profit". The latter effect is in Schumpeter's (1911) model solely attributed the innovative entrepreneur. It could however also be argued that part of that surplus may be appropriated by other firms due to learning effects, spillovers and the incumbents absorptive capacities, i.e. also incumbents become more productive. Such mechanisms are a key element of contemporary knowledge driven neo-Schumpeterian growth models, where innovation play a critical role.

That innovation constitutes the major ingredient in growth seems undisputed. Moreover, entrepreneurs has increasingly been acknowledged as being one essential vehicle in converting knowledge to innovation, albeit there is considerably less understanding of exactly how their endeavor translates into higher growth and productivity (Braunerhjelm 2010). Partly this is related to measurements problem associated with the two concepts entrepreneur and innovation. Schumpeter viewed the entrepreneur as distinctively separated from the inventor, who comes up with a new discovery or invention, while the innovative part had to do with creating (market) value. Thus, entrepreneurs and innovations were two inseparable concepts, but, as reflected in Schumpeter's statements above, the entrepreneurial part ceased as soon as production became "business as usual". In contemporary industrial organization models, the firm is often modeled as embracing both of these competencies – that is, both inventors and innovators are represented among employees. Such integrated firms may also have higher capacities to absorb new knowledge brought to the market by entrepreneurial entry.

The main objective of this paper is to investigate if entry influences productivity amongst incumbent firms and the extent to which a productivity effect differs depending on the sector to which the entrant firms belong. In doing so, we account for the time sequence of the effect of entry. Recent research emphasize that it is important to acknowledge that the dynamics due to entry may differ over time (van Stel and Storey 2004, Fritsch and Mueller 2008, Fritsch 2011). In the short-run entry may for example yield price competition that tends to lower revenues for incumbents firms but would also increase purchasing power and could eventually boost profits and diversity over time. In addition, it may attract purchasing power from outside the region and overall make the region more attractive.

We estimate a firm-level production function for incumbent firms augmented with variables reflecting the level of entrepreneurship in the region the firms are located in. The estimated effects of entrepreneurship and business dynamics on the productivity of incumbent firms are in this way conditioned on several characteristics of the individual firms. We include several lags of the entrepreneurship indicators to account for the time sequence of the effects. This may be considered as a methodological improvement in production function approaches. Fritsch (2011, p. 16) maintains for instance that "To date, none of the available approaches using a production function framework has used longer time lags of the entrepreneurship indicators".[2]

The analysis shows how the effect of entry varies over time and with respect to different industrial sectors. A negative instantaneous effect of entry may be fully compatible with a delayed positive effect. We refer to this effect as the *delayed entry effect*. Indeed, we find robust evidence for positive effects of entry on regional production and productivity, albeit appearing with a time lag and displaying distinct differences with respect to sectors of origin.

Some aspect of entry and growth is seen as less relevant in the analysis presented below. For instance, there is a large literature looking at regulation and its impact on industrial dynamics and economic growth.[3] Regulation as such has been shown to influence entrepreneurship, the size of startups and

[2] Fritsch (2011) considers this to be a major drawback of such studies, and argue that the inclusion of longer time lags is crucial.
[3] For instance, Gordon (2004) and Bosma and Harding (2007) claim that institutional differences explain the growth differences between Europe and the US. Djankov (2008) shows that the differences in entry between

also regional economic development (Ciccone and Papaionnou 2006, Ardagna and Lusardi 2009). Since we are dealing with regions in one country, where all firms are basically exposed to the same institutional design, issues referring to regulations will not be accounted for in the present study.

A particular difficulty in empirical analyses of entrepreneurship has to do with the lack of adequate data. Hence, entrepreneurship has frequently been assumed synonymous with the level of self-employment in a number of previous empirical studies (Blanchflower 2000), which however implies that the innovative feature that Schumpeterian thought critical in the entrepreneurial process is less likely to be captured. Most self-employment is based on imitative behavior. In order to circumvent these problems alternative data on entrepreneurship has been implemented, such as tax register data on new business establishments, survey data, and the like. Also here, however, problems of identifying what is genuinely new businesses, i.e. separating through new business from those established through outsourcing of business units, division and mergers of existing businesses, often creates insurmountable problems.

Those deficiencies have though largely been remedied in the current study where a Swedish data set (population) will be implemented which allows us to identify genuinely new ventures as compared to those associated with reorganizations of existing businesses, i.e. splits and mergers. In addition, data are distributed on Swedish functional labor market regions. Hence, the analysis will examine the regional impact of entry in three different sectors while controlling for a number of other variables during the period 1998 to 2004. In the empirical analysis we will implement both entry and turbulence variables to estimate the effects of entrepreneurship on productivity of incumbents.

The rest of this paper is organized as follows: section 2 briefly presents the theoretical underpinnings and goes through previous findings in this vein of the literature, while section 3 describes that data, variables and the empirical model. The following section 4 presents the results and the section 5 concludes.

2. Theoretical framework and previous research

Theory

The advances in the neo-Schumpeterian endogenous growth models have highlighted the importance of entrepreneurial entry on productivity and growth. Entry is claimed to contribute new knowledge or/and exploitation of knowledge in new ways, thereby positively affecting firm level productivity (Aghion and Howitt 1992). The first wave of neo-Schumpeterian growth models designed entry as R&D races between incumbents where a fraction of R&D led to successful innovations that yielded

countries with little regulation as compared to the most heavily regulated, influences entry rate by five percent annually.

the firm temporary monopoly power.[4] While this implied a considerable step forward as compared to previous endogenous growth models, the essence of the Schumpeterian entrepreneur and its impact on structural change was basically neglected. The innovation process stretches far beyond R&D races that predominantly involve large incumbents and concern quality improvements of existing goods (Acs et al 2009, Braunerhjelm et al 2010).

More recently these models have become more rigorously defined, seeking to capture how entry of technology-based firms affect innovativeness and productivity of incumbents. Increased entry and firm heterogeniety is argued to impact creative destruction and result in enhanced efficiency, higher productivity and growth.[5] An increased influence of small firms and start-ups is also claimed to reflect increased competition and the exploitation of new technologies or knowledge (Jovanovic and Rousseau 2005). The current analysis links to that strand in theoretical literature, with the objective to empirically investigate the impact of entry on regional value added.[6]

Previous empirical findings

The inter-temporal and indirect effects of entrepreneurship on aggregate production and productivity are largely unaccounted for.[7] Even though they have been noted since long, data restrictions imply that these dynamic effects have largely been ignored (Kirzner 1973, Geroski 1995 and Nickell 1996). Yet, increasing competition, the replacement of older and less productive firms and other indirect effects may be more important than the direct effects of entry (Robinson et al 2006). Recently an emerging strand of empirical research addressing these issues have however provided some evidence that net entry induces a positive lagged effect on regional growth (Johnson and Parker 1996, Dejardin 2008, Thurik and Carré 2008). Still, the results are inconclusive.[8] An explanation may be lack of good data, another that the process of entry and exit is characterized by a considerable degree of heterogeneity, and it is not given that it will generate creative destruction and economic progress in all sectors at all times (Manjón-Antolin 2004, Vivarelli 2007).

If the positive impact is measured in terms of jobs created rather than production or productivity, there seems to be more of consensus as regard the importance of new and small firms (Stel and Storey 2004, Baptista et al 2008, van Stel and Suddle 2008). At the firm level, startups are more likely to grow and create new jobs (Johnson et al 2000, Lingelbach et al 2006, Braunerhjelm and Thulin 2010, Haltiwanger 2010). Fritsch and Muellers (2004) argue that these effects are strongest in the earliest

---

[4] Romer 1986, Lucas 1988, Rebelo 1991, and others, emphasized the influence of knowledge spillovers on growth without specifying how knowledge spills over. For early neo-Schumpeterian models, see Segerstrom, Anant and Dinopoulos (1990), Segerstrom (1991), Cheng and Dinopoulos (1992), Segerstrom (1995).

[5] See for instance Durnev et al. (2004), Aghion et al.(2004, 2005), Acemoglu et al. (2003, 2006), Aghion and Griffith (2005) and Chun et al. (2007).

[6] For a theoretical regional growth model, see Greis and Naudé (2008).

[7] There are a number of studies finding a positive correlation between entrepreneurship and growth. See Acs et al. (2004) and Braunerhjelm et al. (2009).

[8] See Braunerhjelm (2010) for a survey.

stage of the firm's life cycle. In a recent paper by Glaeser and Kerr (2009) it is shown how a 10 percent increase in the number of firms per worker increase employment growth with 9 percent, while a 10 percent increase in average size of firms is claimed to result in a 7 percent decrease in employment growth due to new startups.

The regional dimension and embeddedness

Turning to the regional level, a large number of studies have shown how geographical density is positively associated with regional productivity and growth (Ciccone & Hall 1996, Ciccone 2002, Rosenthal and Strange 2003). Within the last decade there have also been several attempts to pin down the relationship between entrepreneurship and regional growth. Reynold's (1999) study indicated a positive relationship for the United States, as did Holtz-Eakin and Kao (2003) analysis of the impact of entrepreneurship on productivity over time. A recent study from the US also concludes entrepreneurship to positively influence regional total factor productivity, and much more so than knowledge (Sutter 2009). More precisely, Sutter attributes up to 90 percent of regional variation in total factor productivity growth to the regional knowledge stock (patent) and regional new firm formation. Entrepreneurship is however claimed to have an effect on growth that is five times larger than knowledge.

Corresponding analyses on European data, covering roughly the same time period, reach similar conclusions. Audretsch and Fritsch (2002) found that regions with a higher startup rate exhibited higher growth rates in Germany, while, according to Callejon and Segarra (1999), both new-firm startup rates and exit rates contribute positively to the growth of total factor productivity in regions as well as industries in Spain. Similar results are reported by Bosma and Nieuwenhuijsen (2002) looking at 40 regions in Netherlands 1988 to 1996 and separating between service and manufacturing sector. Positive total factor productivity effects were observed for the service sector. The analysis is extended to 2002 in Bosma et al (2005). The positive relationship between entrepreneurship and growth at the regional level has also been concluded in analysis on regionally distributed data for Sweden (Fölster 2000, Braunerhjelm and Borgman 2004).

Other studies are based on net entry, e.g. by Dejardin (2008) who found a positive lagged effect for entry in the service sector 1982-1996 on growth. Alternatively an industry turbulence variable has been implemented, i.e. the combined levels of entry and exits.[9] Fritsch (1996) concluded that entry and exits impact growth, but also that turbulence measures are highly sensible to the product cycle phase, i.e. it is particularly high in the earlier stages. A number of other studies report

[9] Another dynamic feature is the expected correlation between regional entry and exit (Keeble and Walker 1994, Reynolds, Storey and Westhead 1994). A denser environment tends to lower survival rate but also implies higher growth prospects for survivors (Fritsch et al 2006, Weyh 2006).

entrepreneurship to influence growth, the product cycle, technological progress and competition (for instance Miracky 1993, Reynolds et al 1994, Stam 2006, Glaeser 2007, Naudé et al 2008).

The importance of an environment dominated by smaller and independent firms for prompting entry has recently been analyzed by for instance Glaeser et al (2009) and Glaeser and Kerr (2009). Holding an industry's establishment size constant (or/and city), the number of entrepreneurs increase when the surrounding city has a greater number of small establishments. In addition, there is a remarkably strong correlation between average establishment size and subsequent employment growth through startups, particularly in manufacturing.[10] The regional economic milieu as manifested in culture, knowledge base and business attitude seems likely to be influenced by the prevalence of small business and start-ups.

Grek et al (2009) argue that regional size (local and external accessibility to gross regional product) is found to positively influence entrepreneurship (implementing several variables) in the service sector, whereas a negative influence of entrepreneurship seems to prevail in manufacturing and primary sectors. In addition, the impact of entrepreneurship on growth may also be affected by the composition of industries, as argued by Klepper (2002) and Rosenthal and Strange (2003). Even though a considerable number of studies have shown how innovative activities and growth seem to be higher in more diversified regions (Glaeser et al. 1992, Feldman and Audretsch 1999, Henderson and Thisse 2004), the issue of diversity versus specialization in promoting productivity and growth is not settled. A couple of previous studies on Swedish data find significant differences across industries as regard the impact of entrepreneurs on regional growth.[11]

Thus, to summarize, irrespective of the impressive research on a broad range of entrepreneurial issues in the last decades, a number of puzzles and contradicting findings remain and need to be further investigated before the impact of entrepreneurship on productivity and growth can be concluded. One particular problem has been the varying, and often weak, quality of the data, making it hard to compare or draw inferences from previous studies. Here we implement unique and well-defined data on genuine entry distributed on sectors and regions.

3. Data, variables and empirical model

Data

We wish to estimate the influence of regional entrepreneurship activity on the productivity of incumbents. To accomplish this we make use of a firm-level dataset comprising firms in both

[10] See also Rosenthal and Strange (2009). Glaeser and Kerr (2009) note that the fraction of entrepreneurs that are active in the region where they were born are significantly higher than the corresponding fraction for workers. In addition, Michalecci and Silva (2006) show that firms created by locals are more valuable, bigger, more capital intensive and obtain more financing per unit of capital invested.

[11] See Braunerhjelm and Johansson (2003) and Braunerhjelm and Borgman (2004).

manufacturing and service sectors 1998-2004. The firm-level data are based on audited register data maintained by Statistics Sweden. These data include balance-sheet information of individual firms on a yearly basis. It comprise variables such as book value of capital, employees, value-added and sales. Each firm is also assigned to different regions through a spatial identifier which informs about the location of each firm. Four other sources of data have been matched to the original firm-level data. The first is export data by firms, making it possible to identify firms engaged in international trade. The second is education data, informing about the education level of each firm's employees. The third is data on ownership structure which provide information on whether a firm is non-affiliated or belongs to a corporate group. The fourth data consist of information on entry and exit of establishments by sector at the regional level. These data are used to characterize the region firms are located in and test whether regional characteristics pertaining to entrepreneurship phenomena influence incumbent firms' productivity.

Variables

Our purpose is to assess the relationship between regional entrepreneurship and productivity of incumbent firms located in the regions. We start by defining the entrepreneurship variables. The study employs two measures of entrepreneurship at the regional level: (i) entry rates and (ii) business turbulence. Entry rates in a region are defined as the number of start-ups normalized by regional size in terms of employees (cf. Audretsch and Fritsch 1994).

A start-up is defined as a new establishment, and the data contain information distinguishing between truly new establishments and new establishments occurring because of reorganizations and change of ownership structure, etc.[12] In the Business Register, each establishment is assigned a unique identity number (CFAR). For all new identity numbers between years, the FAD database discloses whether an establishment identity number is truly new or new as a result of mergers and splits of existing establishments. This classification involves an analysis of individuals associated with the establishments between executive years, conducted by SCB. In our analysis, we use data on truly new establishments.[13]

The analysis we present in the subsequent sections excludes new establishments with personal liability. New establishments of this type are in general small and have zero or very few employees and can be expected to have a small impact on productivity in incumbent firms. Some start-ups with

[12] The presentation and discussion of the measurement of entry draws on Andersson and Noseleit (2011).

[13] In relation to some previous Swedish analyses of start-ups and employment we employ a more precise measure of start-ups. Data on start-ups in e.g. Nyström (2008) is based on tracing new firm identity numbers in the business register on a year to year basis. In this case, the identity may change due to changes in for instance legal form or simply an error. Borgman and Braunerhjelm (2007) measure entrepreneurship by the change in the number of establishments with 0 or 1 employee.

personal liability, however, may be large in terms of employees, in particular when investments and risks are low, for example, household cleaning services.

New establishments may be the result of a new firm being started or an incumbent firm opening a new establishment. We cannot discriminate between these two forms in the data. At the aggregate level, we know that the latter type of start-up constitutes about 12 percent of all start-ups when start-ups with personal liability are excluded. Hence, a vast majority of new establishments are in fact the result of new firms.

The second measure is business turbulence. The rationale for using such a measure in entrepreneurship studies is of course that not only entries matter (cf. Bosma and Nieuwenhuijsen 2002). Schumpeter emphasized *creative destruction* in which exits are important. Exits may for instance reflect a process where less efficient firms are displaced by new firms. When firms exit, resources previously held by the existing firms can be allocated to more productive means elsewhere in the economy. Business turbulence is measured by the summation of the numbers of entries and exits, scaled on the stock of business (van Stel and Diephuis 2004). Since entries and exits are measured by establishments, the stock of business is given by the total number of establishments.

Both entry rate and business turbulence is measured at the level of functional regions. A functional region consists of several municipalities that together form an integrated local labor market. They are delineated based on the intensity of commuting flows between municipalities. We use a definition of functional regions in which there are 72 regions in Sweden.[14] We calculate entry rate and business turbulence for different sector aggregates, i.e. manufacturing (NACE 15-36) and low- (NACE 37-64) and high-end (NACE 65-74) services, respectively.

Table 1 present correlations between entry-rates and business turbulence for the three sector aggregates across functional regions in Sweden over the period 1998-2004.

[14] Developed by NUTEK - the Swedish Agency for Economic and Regional Growth.

Table 1. Correlations between turbulence and entry rates across FA-regions

	Entry rate manu	Entry rate low-end	Entry rate high-end	Turbulence manu	Turbulence low-end	Turbulence high-end
Entry rate manu	1.00					
Entry rate low-end	0.40	1.00				
Entry rate high-end	0.15	0.56	1.00			
Turbulence manu	0.62	0.62	0.64	1.00		
Turbulence low-end	0.28	0.81	0.72	0.72	1.00	
Turbulence high-end	0.33	0.50	0.55	0.60	0.57	1.00

It is evident that the turbulence measures are more correlated across sectors that the entry rate measures. In general, regions with high turbulence in manufacturing tend also to have high turbulence in high- and low-end services, respectively. The same applies to entry rates but here the correlations are not as strong. Moreover, turbulence and entry rates are positively correlated.

In the empirical analysis we estimate a firm-level production function augmented with the described measures for regional entrepreneurship phenomena. We observe individual firms in three sector aggregates: (i) manufacturing (NACE 15-36), (ii) retail and wholesale (NACE 50-52) and (iii) knowledge intensive business services, KIBS (NACE 72-74). Table 2 presents the distribution of firms across these three sector aggregates, from which it is evident that the majority of the firms are in services sectors.

Table 2. Distribution of firms across 3 sector aggregates.

	Fraction (%)	Cumulative fraction (%)
Manufacturing	18.79	18.79
Retail and Wholesale	46.06	64.85
KIBS	35.15	100.00

The sample of incumbent firms that we include in the analysis are firms that fulfill the following criteria:

- No exports during the period 1998-2004
- Median number of employees over the period less than or equal to 50

We single out non-exporting smaller firms because these are the firms that are most likely to be influenced by regional business dynamics. Entrepreneurship may influence incumbent firms through the supply- and demand-side. Demand-side effects are clearly more limited for exporting firms and larger firms generally have more internal capabilities which make them less dependent on the regional environment than smaller firms (cf. Henderson 2003).

Empirical model

The empirical model is based on the assumption that incumbent firms produce according to:

(1) $$Y_{f,t} = A_{f,t} C_{f,t}^{\alpha} L_{f,t}^{\beta}$$

where $Y_{f,t}$ denotes value-added of firm *f* in year *t*, *C* is physical capital and *L* is the number of employees (firm size). *A* is a productivity parameter. The key question concerns our assumptions about *A*, i.e. what determines a firm's productivity? We model *A* in the following manner:

(2) $$A_{f,t} = \exp\left\{\phi K_{f,t} + \sum_{i=1}^{3} \beta_i O_{f,t}^{i} + \sum_{\tau=0}^{n} \gamma_{t-\tau} E_{r,t-\tau} + \mathbf{x}'_{\mathbf{f,t,r}} \boldsymbol{\lambda} + \varepsilon_{f,t}\right\}$$

where *K* is the human capital employed in the firm defined as the fraction of employees with long university education (at least three years). A large literature suggests that human capital reflects the knowledge stock of a firm and its capacity to absorb external knowledge from the local milieu, the company group, national and international suppliers and consumers, and others (cf. Bartel and Lichtenberg 1987, Cohen and Levinthal 1990). $O_{f,t}^{i}$ is a dummy variable taking the value 1 if firm *f* belongs to ownership category *i* in year *t*. We consider four ownership categories: (i) non-affiliated firms, (ii) domestic corporation (DC), (iii) domestic MNE (D-MNE) and (iv) foreign MNE (F-MNE). Category (i) is reference. The ownership structure of the firm, in particular whether it is part of an MNE, may indeed affect its technology. By definition, MNEs have established networks to a rich set of markets and thereby a coupling to several knowledge sources and innovation systems (cf. Dachs et al. 2008). They also have strong internal capabilities pertaining to the development of proprietary information and knowledge within the corporation (Pfaffermayr and Bellak 2002). $E_{r,t-\tau}$ refers to entrepreneurship activity in the region the firms is located in. As is evident from the formulation in (2), we include time lags in order to capture the time sequence of the effects of entrepreneurial activity. *E* is measured either by entry rate or business turbulence. **x** is a matrix of control variables and include industry dummies, time dummies and regional size. Regional size is a standard control variable intended to capture general agglomeration phenomena (see e.g. Andersson and Lööf 2011). It is measured as the total number of employees in the region firm *f* is located in. $\varepsilon_{f,t}$ is a stochastic error term.

By putting equations (1) and (2) together and taking logs we arrive at the estimating equation:

$$\ln Y_{f,t} = \delta + \alpha \ln C_{f,t} + \beta \ln L_{f,t} + \phi K_{f,t} + \beta_1 O_{f,t}^{DC} + \beta_2 O_{f,t}^{D-MNE} + \beta_3 O_{f,t}^{F-MNE} + \cdots$$
$$+ \sum_{\tau=0}^{n} \gamma_{t-\tau} E_{r,t-\tau} + \mathbf{x}'_{\mathbf{f,t,r}} \boldsymbol{\lambda} + \varepsilon_{f,t} \quad (3)$$

The above model will be used to estimate the influence and associated time sequence of the effect of regional entrepreneurship (*E*) on productivity on incumbent firms. We will measure regional entrepreneurship by entry rate and business turbulence, and make a distinction between three sector aggregates: manufacturing and low- and high-end services. Descriptive statistics for all variables in the empirical model are presented in Appendix.

4. Results

We estimate several variants of the model in equation (3). First, we consider a model where firms in all sector-aggregates (manufacturing, retail and wholesale trade, KIBS) are included and estimate the influence of total entry rates and turbulence, i.e. in all sectors. Second, we consider the influence of entry and turbulence in manufacturing and low- and high-end services, respectively. Thirdly, we conduct three separate estimations for firms in manufacturing, retail and wholesale trade and KIBS, respectively. Since we study both entry rates and business turbulence, the described empirical strategy imply in total ten estimations.

The results from these estimations are presented and discussed in the subsequent subsections. In all specifications, the models are estimated with a panel estimator with random firm-specific effects with industry (2-digit NACE), year and ownership dummies. To capture the time sequence of the effect of regional entrepreneurship on firms' productivity we include four lags of the entrepreneurship variable(s) in every model.

Results for entry rate

Table 3 presents baseline results for entry rates. The model considered here include all firms (manufacturing, retail and wholesale trade and KIBS) and value-added is explained by total entry rates in the region they are located in, while controlling for other factors. We see from the table that physical capital and size are positive and significant and have the expected signs. Moreover, human capital has as expected a positive sign and is significant. We also see that regional size (assumed to reflect general agglomeration phenomena) is positive and significant which is consistent with that agglomerations induce external scale economies which improves the productivity of firms (cf. Andersson and Lööf 2010).

Table 3. Baseline model – all firms and total entry rates (panel estimation with firm-specific random effects)

	lnY
lnC	0.103***
	(0.00175)
lnL	0.702***
	(0.00376)
K	0.175***
	(0.0123)
Entry_rate	-4.982**
	(2.315)
L1.Entry_rate	-5.534**
	(2.313)
L2.Entry_rate	-4.895**
	(2.233)
L3.Entry_rate	1.198
	(2.483)
L4.Entry_rate	11.49***
	(2.642)
lnreg_size	0.0244***
Ownership Dummies	YES
Year Dummies	YES
Industry Dummies	YES
Constant	5.543***
	(0.0244)
Observations	88,636
Number of Firms	22,159

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Turning to the variables in focus – the entry rate variables – we see that they appear to have a negative initial effect on productivity. Up to the second lag, the estimated influence on productivity is negative and significant. This could reflect that the newcomers "steal" resources from the incumbent firms or that incumbent firms loose productivity while adjusting routines and strategies etc. to respond to the newcomers on the regional market. However, the fourth lag is positive and significant suggesting that over the longer run, a higher start-up activity may improve productivity.[15] Such a "delayed entry effect" might be due to that means incumbents employ to respond to the newcomers make them more productive over time.

Table 4 performs a similar estimation but consider entry rates by sector. Here manu is manufacturing and LE and HE denotes low- and high-end services, respectively. The variables besides entry rates

[15] The third lag has a positive sign but the estimated parameter is not significant.

remain virtually unchanged. When looking at the influence of entry rates by sector, however, the general message is that the positive effects in later time periods are due to low- and high-end services. For entry rates in manufacturing there is an initial negative effect but no long-run positive effect.

Table 4. All firms and entry rates by sector (panel estimation with firm-specific random effects)

	lnY
lnC	0.103***
	(0.00175)
lnL	0.702***
	(0.00376)
K	0.175***
	(0.0123)
Entry_rate_manu	9.169
	(7.326)
L1.Entry_rate_manu	-16.60**
	(7.186)
L2.Entry_rate_manu	-15.16**
	(6.493)
L3.Entry_rate_manu	1.750
	(6.079)
L4.Entry_rate_manu	6.502
	(6.563)
Entry_rate_LE	-3.572
	(4.238)
L1.Entry_rate_LE	-12.29***
	(4.346)
L2.Entry_rate_LE	-9.371**
	(4.056)
L3.Entry_rate_LE	7.726*
	(4.066)
L4.Entry_rate_LE	14.84***
	(4.226)
Entry_rate_HE	-10.85**
	(4.412)
L1.Entry_rate_HE	6.967*
	(4.175)
L2.Entry_rate_HE	-0.250
	(3.774)
L3.Entry_rate_HE	-4.799
	(4.338)
L4.Entry_rate_HE	10.37**
	(4.077)
lnreg_size	0.0220***
Ownership Dummies	YES
Year Dummies	YES
Industry Dummies	YES
Constant	5.570***
	(0.0433)
Observations	88,636
Number of Firms	22,159

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5. Firms and entry rates by sector (panel estimation with firm-specific random effects)

	Manufacturing	Retail and Wholesale	KIBS
lnC	0.121***	0.100***	0.0994***
	(0.00409)	(0.00232)	(0.00344)
lnL	0.752***	0.658***	0.715***
	(0.00811)	(0.00589)	(0.00603)
K	0.115**	0.0691***	0.202***
	(0.0522)	(0.0250)	(0.0144)
Entry_rate_manu	-16.18	8.553	21.47
	(15.64)	(8.754)	(18.46)
L1.Entry_rate_manu	4.100	-18.11*	-24.92
	(13.68)	(9.247)	(17.91)
L2.Entry_rate_manu	2.221	-9.759	-38.31**
	(11.98)	(8.441)	(16.38)
L3.Entry_rate_manu	-20.30	4.496	16.21
	(12.56)	(7.643)	(14.75)
L4.Entry_rate_manu	15.91	2.738	0.946
	(12.62)	(8.580)	(16.12)
Entry_rate_LE	3.481	-1.173	-13.57
	(8.974)	(5.378)	(10.19)
L1.Entry_rate_LE	-28.36***	-4.070	-14.26
	(9.456)	(5.226)	(10.85)
L2.Entry_rate_LE	-7.301	-8.308	-10.71
	(7.747)	(5.310)	(9.617)
L3.Entry_rate_LE	-1.847	2.622	20.06**
	(8.131)	(4.979)	(10.10)
L4.Entry_rate_LE	2.336	5.699	35.65***
	(8.663)	(5.136)	(10.61)
Entry_rate_HE	-7.786	-6.904	-7.902
	(9.709)	(5.310)	(10.60)
L1.Entry_rate_HE	11.96	7.176	-0.187
	(8.347)	(5.235)	(9.672)
L2.Entry_rate_HE	16.84**	3.382	-16.08*
	(7.895)	(4.784)	(8.290)
L3.Entry_rate_HE	-3.689	-0.543	-9.530
	(8.822)	(5.916)	(9.087)
L4.Entry_rate_HE	-2.052	6.956	17.90**
	(7.850)	(5.370)	(8.919)
lnreg_size	0.0154**	0.0172***	0.0361***
	(0.00737)	(0.00516)	(0.00823)
Ownership	YES	YES	YES
Year Dummies	YES	YES	YES
Industry Dummies	YES	YES	YES
Constant	5.342***	5.648***	5.375***
	(0.172)	(0.0587)	(0.0946)
Observations	16,778	40,690	31,168
Number of firms	4,260	10,260	7,838

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5 splits the firms into three groups: manufacturing, retail and wholesale and KIBS, and presents results for each respective sector. Here the results convey that regional entry rates seem to influence primarily firms in KIBS sectors. The productivity of firms in manufacturing and retail and wholesale sectors appears not to be affected by regional entrepreneurship to any significant extent. One reason why it is primarily KIBS firms that seem to be influenced by regional entrepreneurship could be that KIBS firms typically customized services for which deliveries and transactions tend to be distance sensitive, such that the local market is important. Moreover, the primary production factor for KIBS firms is human capital that is usually acquired on the local market. Thus, for KIBS firms both supply- and demand-side effects have a clear regional dimension. It should also be observed that the influence of general agglomeration phenomena (the regional size variable) is greatest for KIBS firms.

Results for business turbulence

We now turn to the results when employing an alternative measure of regional entrepreneurship, i.e. business turbulence. Results are presented in the same way as in the previous section.

Table 6 shows the results for all firms when total business turbulence rates are considered. It is evident from the table that the general pattern found in Table 3 is repeated. There appear to be an initial negative influence in productivity followed by a delayed positive effect in year 4 (lag 4). The estimated influence of the control variables are as before. Tables 7 and 8 present results when using business turbulence by sectors and considering firms in the respective sectors.

The general observation from Tables7 and 8 and as compared with the associated tables for entry rate is that business turbulence appears to be less important for productivity compared to entry rates. The general pattern that there is an initial negative effect and a long-run positive one is visible but restricted to low- and high-end services. Moreover, business turbulence in low-end sector seems to be the most important source of the long-run positive effect.

In summary, we find that productivity of incumbent firms is indeed affected by regional entrepreneurship phenomena but that sector and time sequence matter. The productivity of incumbent firms in services sectors appear to be more responsive to regional entrepreneurship, as compared to the productivity of manufacturing firms. Also, it is regional entrepreneurship in service sectors that appear to have the largest influence on the productivity of incumbent service firms.

Table 6. All firms and total business turbulence rates (panel estimation with firm-specific random effects)

	lnY
lnC	0.103***
	(0.00175)
lnL	0.702***
	(0.00376)
K	0.175***
	(0.0123)
Turbulence	-0.0179
	(0.0820)
L1. Turbulence	-0.204***
	(0.0749)
L2. Turbulence	-0.179**
	(0.0726)
L3. Turbulence	-0.0842
	(0.0815)
L4. Turbulence	0.273***
	(0.0780)
lnreg_size	0.0265***
Ownership Dummies	YES
Year Dummies	YES
Industry Dummies	YES
Constant	5.554***
	(0.0246)
Observations	88,636
Number of Firms	22,159

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 7. All firms and business turbulence rates by sector (panel estimation with firm-specific random effects)

	lnY
lnC	0.103***
	(0.00175)
lnL	0.702***
	(0.00376)
K	0.176***
	(0.0123)
Turbulence_manu	-0.00666
	(0.0643)
L1.Turbulence_manu	-0.145**
	(0.0600)
L2.Turbulence_manu	-0.0433
	(0.0613)
L3.Turbulence_manu	-0.0173
	(0.0584)
L4.Turbulence_manu	0.0939
	(0.0595)
Turbulence_LE	0.00232
	(0.0600)
L1.Turbulence_LE	-0.242***
	(0.0623)
L2.Turbulence_LE	-0.118*
	(0.0609)
L3.Turbulence_LE	0.0927
	(0.0621)
L4.Turbulence_LE	0.238***
	(0.0580)
Turbulence_HE	-0.0286
	(0.0376)
L1.Turbulence_HE	0.0308
	(0.0318)
L2.Turbulence_HE	-0.0345
	(0.0305)
L3.Turbulence_HE	-0.0443
	(0.0308)
L4.Turbulence_HE	0.0164
	(0.0314)
lnreg_size	0.0249***
	(0.00253)
Ownership Dummies	YES
Year Dumies	YES
Industry Dummies	YES
Constant	5.564***
	(0.0315)
Observations	88,636
Number of Firms	22,159

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 8. Firms by sector and business turbulence rates by sector (panel estimation with firm-specific random effects)

	Manufacturing	Retail and Wholesale	KIBS
lnC	0.121***	0.1000***	0.0995***
	(0.00409)	(0.00232)	(0.00344)
lnL	0.752***	0.659***	0.715***
	(0.00812)	(0.00589)	(0.00604)
K	0.116**	0.0696***	0.203***
	(0.0522)	(0.0250)	(0.0144)
Turbulence_manu	-0.0142	0.0116	-0.0893
	(0.134)	(0.0775)	(0.161)
L1.Turbulence_manu	-0.0274	-0.185**	-0.0605
	(0.125)	(0.0744)	(0.142)
L2.Turbulence_manu	0.0645	-0.0814	-0.0267
	(0.120)	(0.0787)	(0.149)
L3.Turbulence_manu	-0.145	0.0233	0.120
	(0.129)	(0.0731)	(0.132)
L4.Turbulence_manu	0.0718	0.0589	0.113
	(0.124)	(0.0768)	(0.133)
Turbulence_LE	-0.0104	0.0579	-0.131
	(0.129)	(0.0747)	(0.145)
L1.Turbulence_LE	-0.294**	-0.128*	-0.349**
	(0.128)	(0.0767)	(0.151)
L2.Turbulence_LE	-0.0439	-0.0400	-0.308**
	(0.126)	(0.0782)	(0.139)
L3.Turbulence_LE	-0.00446	0.0706	0.0944
	(0.129)	(0.0768)	(0.149)
L4.Turbulence_LE	-0.0548	0.185**	0.406***
	(0.110)	(0.0745)	(0.138)
Turbulence_HE	0.0119	0.0203	-0.125
	(0.0751)	(0.0471)	(0.0968)
L1.Turbulence_HE	0.0784	0.0337	-0.0756
	(0.0661)	(0.0395)	(0.0784)
L2.Turbulence_HE	0.0423	-0.00855	-0.138*
	(0.0640)	(0.0382)	(0.0822)
L3.Turbulence_HE	-0.0533	-0.0347	0.00551
	(0.0612)	(0.0423)	(0.0692)
L4.Turbulence_HE	0.00738	-0.0127	0.0621
	(0.0640)	(0.0390)	(0.0806)
lnreg_size	0.0251***	0.0209***	0.0383***
	(0.00485)	(0.00336)	(0.00597)
Ownership Dummies	YES	YES	YES
Year Dummies	YES	YES	YES
Industry Dummies	YES	YES	YES
Constant	5.259***	0	5.471***
	(0.127)	(0)	(0.0673)
Observations	16,778	40,690	31,168
Number of Firms	4,260	10,260	7,838

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5. Summary and conclusions

This paper has analyzed if entry influences productivity amongst incumbent firms and the extent to which a productivity effect differs depending on the sector to which the entrant firms belong. In doing so, the analysis accounted for the time sequence of the effect of entry.

The analysis made use of a firm-level production function in which the productivity of incumbent firms was modeled as a function of not only firm attributes, but also entrepreneurship activity in the region they are located.

The general conclusion from the empirical analysis is that there is indeed empirical support for that regional entrepreneurship influence the productivity of incumbent firms. We find an immediate negative influence followed by a positive effect several years after the initial entry (or business turbulence). Thus, we find evidence of a *delayed entry effect* which is positive. This is consistent with recent analyses of the effect of entrepreneurship on regional employment growth, though these analyses often have regions as the observational unit (cf. Fritsch 2011). The analysis also suggest that entry rates are more important for productivity than business turbulence. Moreover, the productivity of incumbent firms in services sectors appear to be more responsive to regional entrepreneurship, as compared to the productivity of manufacturing firms. At the same time it appears that regional entrepreneurship in service sectors have the largest influence on the productivity of incumbent service firms.

References

Acemoglu, D., Agion, P., and Zillibotti, F., (2003), 'Distance to Frontier, Selection and Growth'. Journal of the European Economic Association, 1, 630-38.

Acemoglu, D., Agion, P., Lelarge, C., van Reenen, J. and Zillibotti, F., (2006), 'Technology, Information and the Decentralization of the Firm', NBER WP 12206, Cambridge, Ma.

Acs, Z., Audretsch, D., Braunerhjelm, P. and Carlsson, B., (2004), 'The Missing Link. The Knowledge Filter and Entrepreneurship in Endogenous Growth', CEPRDP 4783, CEPR, London

Aghion, P. and Griffith, R., (2005), Competition and Growth: Reconciling Theory and Evidence. MIT Press, Cambridge, Ma.

Aghion, P., Burgess, R., Redding, S. and Zilibotti, F., (2004), 'Entry and Productivity Growth: Evidence From Microlevel Panel Data', Journal of the European Economic Association, 2, 265-276.

Aghion, P., Bloom, N., Blundell, R., Griffith, R. and Howitt, P., (2005), 'Competition and Innovation: An inverted U relationship', Quarterly Journal of Economics, 120, 701-728

Andersson, M and Lööf, H (2011), 'Agglomeration and Productivity – evidence from firm-level data", *Annals of Regional Science,* forthcoming

Andersson, M and Noseleit, F (2011), 'Start-Ups and Employment Dynamics within and across Sectors', *Small Business Economics,* forthcoming

Ardagna, S. and Lusardi, A., (2009), 'Heterogeneity in the Effect of Regulation on Entrepreneurship and Entry Size', NBER WP 15510, NBER, Cambridge, Ma.

Audretsch, D. and Fritsch, F., (2002), 'Growth Regimes over Time and Space', Regional Studies, 36, 113-124.

Baptista, R., Escária, V. and Madruga, P., (2008), "Entrepreneurship, Regional Development and Job Creation: the Case of Portugal", Small Business Economics, 28,

Bartel, A.P and Lichtenberg F.R. (1987), "The Comparative Advantage of Educated Workers in Implementing New Technology", *Review of Economics and Statistics,* 69, 1-11

Blanchflower, D., (2000), 'Self-Employment in OECD countries', Labor Economics, 7, 471-505.

Bosma, N. and Harding, R., (2007), Global Entrepreneurship Monitoring 2006. Summary Results, Babson College and London Business School, Boston and London.

Bosma, N. and Nieuwenhuijsen, H., (2002), "Turbulence and Productivity: An Analysis of 40 Dutch Regions in the Period 1988-1996", EIM SCALES-paper N200205, Zoetermer.

Bosma, N., Stam, E. and Schutjens, V., (2006), "Creative Destruction and Regional Competitiveness", EIM SCALES-paper N200206, Zoetermer.

Braunerhjelm, P. and Johansson, D., (2003), "Determinants of Spatial Concentration of Production in Sweden 1975–1993. Linkages, Scale Economies or Trade Costs?, Industry and Innovation, 10, pp. 41–63.

Braunerhjelm, P. and Borgman, B., (2004), ‘Geographical Concentration, Entrepreneurship and Regional Growth: Evidence From Regional Data in Sweden, 1975-99’, Regional Studies, 38, 929-948.

Braunerhjelm, P., Acs, Z., Audretsch, D., Braunerhjelm, P. and Carlsson, B., (2009), ‘The Missing Link. Knowledge Diffusion and Entrepreneurship in Endogenous Growth’, Small Business Economics, 34, 105-125.

Braunerhjelm, P., (2010) “Entrepreneurship, Innovation and Economic, “Growth Interdependencies, irregularities and regularities”, in Audretsch, D., Falck, O. and Heilbach, P. (eds.), Handbook of Innovation and Entrepreneurship, forthcoming from Edward Elgar

Braunerhjelm, P. and Thulin, P., (2010), “Nyföretagande i kristid. Tre kriser, tre dynamiker”, Ekonomisk Debatt, fortgcoming.

Callejon, M. and Segarra, A., (1999), ‘Business Dynamics and Efficiency in Industries and Regions: The Case of Spain’, Small Business Economics, 13, 253-271.

Carreee, M. and Thurik, R., (2008), ‘The lag Structure of the Impact of Business Ownership on Economic Performance in OECD Countries’, Small Business Economics, 30, 101-110.

Chun, H., Kim, J-W., Morck, R. and Yeung, B., (2007), ‘Creative destruction and Firm-Specific Performance Heterogeneity’, NBER WP 13011, Cambridge, Ma.

Ciccone, A. and Papaioannou, E., (2006), ‘Red Tape an Delayed Entry’, CEPR DP 5996, CEPR, London.

Cohen, W. and D. Levinthal, (1990), ”Absorptive Capacity: A new perspective on learning and innovation,” *Administrative Science Quarterly*, 35, 128–152.

Dachs, B., B. Ebersberger and H. Lööf (2008), “The Innovative Performance of Foreign-owned Enterprises in Small Open Economies”, *Journal of Technology Transfer*, 33, 393-406

Dejardin, M., (2009), ‘Linking Net Entry to Regional Growth’, Small Business Economics, online version

Djankov, S., La Porta, R., Lopes de Silanes, F. and Schleifer, A., (2002), ‘The Regulation of Entry’, Quarterly Journal of Economics, 117, 1-37.

Durnev, A., Morck, R. and Yeung, B., (2004), ‘Value-enhancing Capital Budgeting and Firm-Specifik Stock Return Variation’. Journal of Finance, 59, 65-105.

Feldman, M. and Audretsch, D., (1999), ‘Innovation in Cities: Science-Based Diversity, Specialization and Localized Competition’, European Economic Review, 43, 409-429.

Fölster, S., (2002), ‘Do Lower Taxes Stimulate Self-Employment?’, Small Business Economics, 19, 135-45.

Fritsch, M (2011), “The effect of new business formation on regional development - Empirical evidence, interpretation, and avenues for the further research”, in Fritsch, M (ed.) *Elgar Handbook of Research on Entrepreneurship and Regional Development*, Edward Elgar, Cheltenham (forthcoming)

Fritsch, M and Mueller, P (2008), ‘The Effect of New Business Formation in Regional Development over Time: The Case of Germany’, *Small Business Economics*, 30, 15-29

Fritsch, M., (1996), “Turbulence and Growth in West Germany: A Comparison of Evidence by Regions and Industries”, Review of Industrial Organization, 11, 231-251.

Fritsch, M., Brixy, U. and Falck, O., (2006), ‘ The Effect of Industry, Region and Time on New Business Survival - A Multi-Dimensional Analysis’, Review of Industrial Organization, 28, 285-306.

Fritsch, M. and Mueller, P., (2007), ”The Persistence of Regional New Business Formation-Activity Over Time – Assessing the Potential of Policy Promotion Program”, Journal of Evolutionary Economics, 17, 299-315.

Geroski, P., (1995), ‘What Do We Know About Entry’, International Journal of Industrial Organization, 13, 421-440.

Glaeser, E., (2007), ‘Entrepreneurship and the City’, Discussion Paper no. 2140, Harvard

Institute on Economic Research, Cambridge, Ma.

Glaeser, E. and Kerr, W., (2009), ‘Local Industrial Conditions and Entrepreneurship: How Much of the Spatial Distribution Can We Explain?’, Journal of Economics and Management Strategy, 18, 623-633.

Glaeser, E., Kerr, W. and Ponzetto, G., (2009), ‘Clusters of Entrepreneurship’, NBER WP 15377, NBER, Cambridge, Ma.

Glaeser, E., Kallal, H., Scheinkman, J. and Shleifer, A., (1992), ‘Growth of Cities’. Journal of Political Economy, 100, 1126-1152.

Gordon, R., (2004), ‘Why Was Europe Left at the Station When America’s Productivity

Locomotive Departed?’, NBER WP 19651, NBER, Cambridge, Ma.

Grek, J., Karlsson, C. And Klaesson, J., (2009), ‘Market Potential and New Firm Formation’, Cesis WP 202, Royal Institute of Technology, Stockholm.

Gries, T. and Naudé, W., (2008), ‘Enterpreneurship and Regional Economic Growth’, UNU-Wider Research Paper 2008/70, UNU-Wider, Helsinki.

Haltiwanger, J., Jarmin, R and Miranda, J., (2010), “Who Creates Jobs? Small vs. Large vs. Small”, Working Paper CES, 10-17, August.

Henderson, V.J (2003), “Marshall’s Scale Economies”, *Journal of Urban Economics*, 53, 1-28

Henderson, V. and Thisse, J.-F. (eds.), (2004), Handbooks of Regional and Urban Economics, Elsevier, Amsterdam.

Holtz-Eakin, D. and Kao, C., (2003), Enterpreneurship and Economic Growth: The Proof is in the Productivity, Syracuse University, Syracuse.

Johnson, P. and Parker, S., (1996), ‘Spatial variations in the Determinants and Effects of Firm Births and Deaths’, Regional Studies, 30, 679-688.

Johnson, S., McMillan J. And Woodruff, C., (2000), ‘Entrepreneurs and the Ordering of Institutional Reform: Poland, Slovakia, Romania, Russia and Ukraine Compared’, Economics of Transition, 81, 1-36.

Jovanovic, B. and Rosseau, P.L., (2005), ‘General Purposes Technologies’, in Aghion, P. and Durlauf, S. (eds.), Handbook of Economic Growth, Elsevier, Amsterdam.

Keeble, D. and Walker, S., (1994), ‘New Firms, Small Firms and Dead Firms: Spatial Patterns and Determinants in the United Kingdom’, Regional Studies, 28, 411-427.

Kirzner, I., (1973), Competition and Entrepreneurship, University of Chicago Press, Chicago.

Klepper, S., (2002), ‘The Capabilities of New Firms and the Evolution of the U.S. Automobile Industry’, Industrial and Corporate Change, 11, 645-666.

Lingelbach, D., de la Vina, L. and Asel, P., (2006), ‘What’s Distinctive about Growth-Oriented Entrepreneurship in Developing Countries?’, Center for Global Entrepreneurship, WP 1, College of Business, San Antonio

Lucas, R.E., (1988), ‘On the Mechanisms of Economic Development’. Journal of Monetary Economics, 22, 3-42.

Michelacci, C. and Silva, O., (2007), ‘Why So Many Local Entrepreneurs?’, Review of economics and Statistics, 89, 615-633.

Miracky, W., (1993), Economic Growth and Business Cycles in Cities: The Role of Local Externalities, MIT thesis, MIT.

Naudé, W., Gries, T., Wood, E. and Meintjes, A., (2008), ‘Regional Determinants of Entrepreneurial Start-Ups in a Developing Country’, Entrepreneurship and Regional Development, 20, 111-124.

Nickell, S.J., (1996), ‘Competition and Corporate Performance’, Journal of Political Economy, 104, 724-746.

Manjón-Antolín, M., (2004), ‘Firm Size and Short-Term Dynamics in Aggregate Entry and Exit’, mimeo, Tilburg University, Tilburg.

Phaffermayr, M and C. Bellak (2002), “Why Foreign-owned Firms are Different: a conceptual framework and empirical evidence for Austria”, in R. Jungnickel (ed.), *Foreign-owned Firms: are they different?*, Palgrave Macmillan, 13-57

Rebelo, S., (1991), ‘Long-Run Policy Analysis and Long-Run Growth’, Journal of Political Economy, 99, 500-521.

Reynolds, P., (1999), ‘Creative Destruction’, in Acs, Z., Carlsson, B. and Karlsson, C. (eds.), Entrepreneurship, Small & Medium-sized Enterprises and the Macroeconomy, Cambridge University Press, Cambridge.

Reynolds, P., Storey, D. and Westhead, P., (1994), ‘Cross-National Comparisons of the Variation in New Firm Formation Rates’, Regional Studies, 28, 443-456.

Robinson, C., Leary, B. and Rincon, A., (2006), 'Business Start-ups, Closures and EconomicChurn: A Review of the Literature', Enterprise Directorate, BERR, UK.

Romer, P., (1986), 'Increasing Returns and Long Run Growth', Journal of Political Economy, 94, 1002-1037.

Rosenthal, S. and Strange, W.C., (2003), 'Geography, Industrial Organization and Agglomeration', The Review of Economics and Statistics, 85, 377-393.

Rosenthal, S. and Strange, W., (2009), 'Small Establishment/Big Effects: Agglomeration, Industrial Organization and Entrepreneurship', forthcoming in Glaeser, E. (Ed.), Economics of Agglomeration, University of Chicago Press, Chicago.

Schumpeter, J., (1911/34), The Theory of Economic Development, Harvard University Press, Cambridge, Ma.

Segerstrom, P., (1991), 'Innovation, Imitation and Economic Growth', Journal of Political Economy, 99, 190-207.

Segerstrom, P., Anant, T.C. and Dinopoulos, E., (1990), 'A Schumpeterian Model of the Product Life Cycle', American Economic Review, 80, 1077-1091.

Stam, E., (2007), 'Why Butterflies Don't Leave: Locational Behaviour of Entrepreneurial Firms', Economic Geography, 83, 27-50.

van Stel, A. and Storey, D., (2004), 'The Link Beteen Firm Birth and Job Creation: Is There an Upas Tree Effect?', Regional Studies, 38, 893-909.

van Stel, A. and Suddle, K., (2008), 'The Impact of New Firm Formation on Regional Development in the Netherlands', Small Business Economics, 30, 31-47.

Sutter, R., (2009), The Psychology of Entrepreneurship and the Technological Frontier – A Spatial Econometric Analysis of Regional Entrepreneurship in the United States, Ph D Dissertation manuscript, George mason, Washington.

Weyh, A., (2006), 'What Characterizes Successful Start-Up Cohorts?', in Fritsch, M. And Schmude, J., Entrepreneurship in the Region, Springer Verlagh, Berlin and New York.

Appendix

Descriptive statistics for the variables in the empirical model

Table A1. Descriptive statistics for variables in the empirical model

	Mean (1998-2004)	Std. deviation
lnY (value-added)	7.108	0.959
lnC (capital)	5.071	1.681
lnL (number of employees)	1.249	0.931
K (education level of employees)	0.119	0.272
Entry_rate_manu	0.001	0.000
Entry_rate_LE	0.002	0.001
Entry_rate_HE	0.003	0.001
Turbulence_manu	0.167	0.037
Turbulence_LE	0.248	0.042
Turbulence_HE	0.331	0.044
lnreg_size	12.113	1.505
Non-affiliated*	0.849	0.358
Domestic corporation*	0.139	0.346
Swedish MNE*	0.008	0.088
Foreign MNE*	0.004	0.067

Note: Descriptive statistics are based on the period 1998-2004 for firms with less than 50 employees and no exports. *K* refers to the fraction of employees with a long university education $\geq$ 3 years. Manu, le and he are abbreviations for manufacturing, low-end services and high-end services, respectively. Entry rate and turbulence are as defined in the text. These variables refer to the region in which the firms are located in. Regional size is measured as the total number of employees in the region the firms are located in. * indicates dummy variables taking the value 1 if the firm belongs to the ownership category in question and 0 otherwise. There are four ownership categories: (i) non-affiliated, (ii) affiliated to a domestic corporation, (iii) affiliated to a Swedish MNE and (iv) affiliated to a foreign-owned MNE.