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## Methods of analyzing the relationship between new business formation and regional development

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# JENA ECONOMIC RESEARCH PAPERS



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## **Methods of analyzing the relationship between new business formation and regional development**

by

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## Methods of analyzing the relationship between new business formation and regional development<sup>1</sup>

Michael Fritsch

November 2012

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*Handbook of Research Methods and Applications in Economic Geography*, Cheltenham: Elgar.

### Abstract

The paper reviews the approaches that have been followed for analyzing the effect of new business formation on regional development. It begins with an outline of how start-ups may affect regional development. In dealing with different ways of empirically assessing these effects, I particularly stress the importance of indirect effects and of accounting for sufficiently long time lags. Finally, I discuss the issue of causality as well as avenues for further research about this important topic.

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

Keywords: Entrepreneurship, new business formation, employment, regional development

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## 1. Motivation and overview

It is widely believed that new business formation leads to economic growth.<sup>2</sup> However, the theoretical as well as the empirical foundation for this belief are remarkably weak. Empirical research on the issue started late and only recently have researchers begun to assess the effects of new businesses on economic development in detail.

This article provides an overview of methods for empirically analyzing the relationship between new business formation and regional development. One of the chief reasons for focusing on regions is that geographical units of observation are much better suited for such an analysis than are industries. If industries follow a lifecycle (Klepper, 1997), then the number of entries and the start-up rate will be relatively high in the early stages of the lifecycle when the industry is growing, and comparatively low in later stages when the industry is in decline. In such a setting, the positive correlation between the start-up rate and industry development in subsequent periods can hardly be regarded as evidence of a positive effect of entry on growth, but may be more appropriately viewed as a symptom of industry development.<sup>3</sup> Another reason for taking a regional perspective is that policy measures aimed at stimulating new business formation are most often directed at regions, not industries.

Starting with an outline of how start-ups may affect regional development (Section 2), I review different ways of empirically assessing these effects (Section 3). Section 4 deals with the issue of causality—Are new businesses a source or a symptom of growth? The final section (Section 5) summarizes main results and suggests several important avenues for further research.

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<sup>2</sup> See, for example, Wennekers and Thurik (1999), OECD (2003), Commission of the European Communities (2003, 2010), Reynolds et al. (2005), and the contributions in Audretsch, Grilo, and Thurik (2007), and Leitao and Baptista (2009).

<sup>3</sup> Indeed, entirely different results are found when the relationship between the level of start-ups and subsequent employment change is analyzed at the regional level instead of at the industry level, for example (Fritsch, 1996; see also Bos and Stam, 2011).

## 2. Possible effects of new business formation on regional development

Understanding whether and, if so, how new businesses affect economic development is essential to fully comprehend the benefits and shortcomings of the different empirical approaches employed to investigating this relationship. New firms introduce new competition and new capacities into the market and are, therefore, an essential element of the market process. Evolution of the newcomers as measured by, for example, how many employees they have or their market share, may be termed the *direct effect* of entries. Two types of market exit can result from the entry of new businesses. First, a considerable share of new businesses fails to be sufficiently competitive and thus is forced to exit the market. Second, those new businesses that do succeed in the market may displace incumbents. Such crowding-out effects can occur in the output market because the entrants gain market share, as well as in the input market due to the additional demand for resources made by new businesses that can lead to scarcity of inputs and increasing factor prices. The overall effect of new business formation on economic development is based in this competitive process, and includes not only development of the start-ups—the direct effect—but also development of incumbent firms due to entry of newcomers—the *indirect effect* (Figure 1). These indirect effects are influenced by diverse factors that can be specific to the respective firms, markets, or regions.<sup>4</sup>

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<sup>4</sup> There may also be “second-round” indirect effects in that regional growth caused by new business formation may lead to agglomeration economies and diseconomies. Furthermore, regional growth due to new business formation could stimulate additional start-up activity in the region, and so forth. I limit my discussion to the consequences of new businesses for growth and ignore possible “second-round” effects of growth on new business formation here

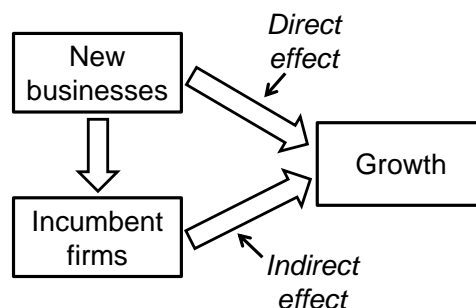


Figure 1: Direct and indirect effects of new businesses on growth

A great deal of empirical work shows that the indirect effects of new business formation on incumbents tend to be considerably larger than the direct contribution of start-ups (for an overview, see Fritsch, 2013). Hence, ignoring these indirect effects on incumbents is not a minor oversight, but an error of such magnitude that renders the analysis meaningless! The indirect effects of new business formation on growth include not only the actual displacement of incumbents, but all development of the incumbents induced by the newly founded businesses, particularly that which is the result of competition between the newcomers and the incumbents such as higher efficiency and product innovation.

How will competition between new businesses and incumbents impact economic development? Given that competition and market selection are based on survival of the fittest, firms with relatively high productivity will remain in the market, whereas those with low productivity will either have to reduce their output or exit. This type of market selection leads to an overall productivity increase, so that fewer resources are needed to produce the given amount of goods and services. Hence, for regional output to remain constant, the increased productivity due to new business formation should cause a decline in employment instead of the creation of additional jobs. Thus, the effect of new business formation on the number of jobs will not necessarily be positive but could just as well be negative.

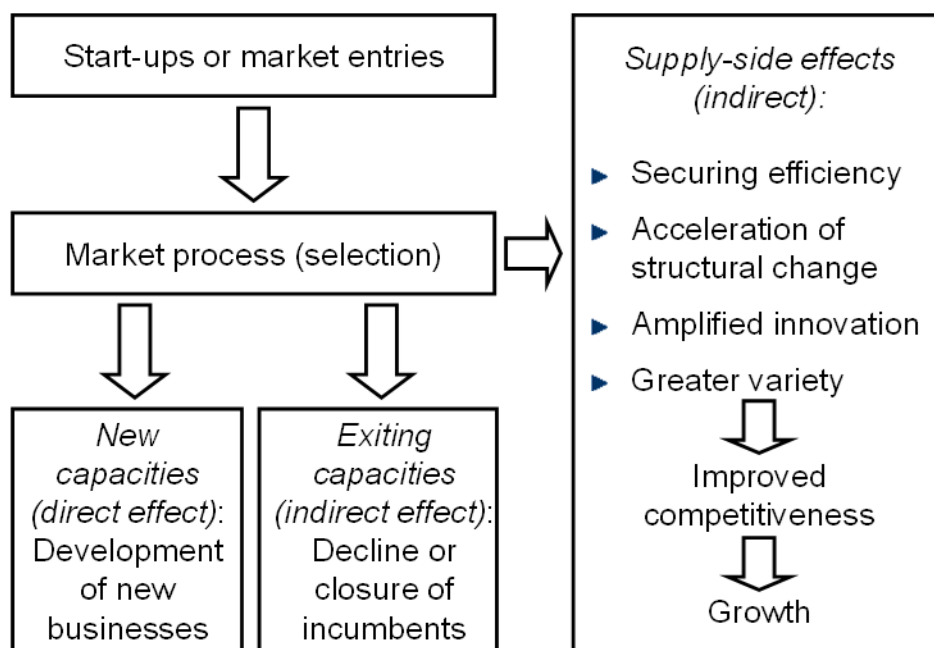


Figure 2: New business formation and the market process

However, a well-functioning market process is not a zero-sum game in which the gains of one actor are necessarily at the expense of the other actors. There are several ways that new business entry can stimulate competitiveness on the supply side of the economy. Such supply-side improvements can increase demand, leading to higher output and employment. Some of these supply-side effects of entry are listed below (cf. Figure 2).

- *Securing efficiency and stimulating productivity by contesting established market positions.* Not only actual entry but sometimes just the threat of entry can force incumbents to perform more efficiently (Baumol, Panzar, and Willig, 1988).
- *Acceleration of structural change.* Frequently, structural change is mainly accomplished by a turnover of economic units, that is, by the entry of new firms and the simultaneous exit of established incumbents. This occurs because incumbents have not made the internal changes necessary to ensure their survival and so are

replaced by newcomers.<sup>5</sup> This type of process is emphasized in J. A. Schumpeter's (1911/1934, 1942) concept of creative destruction and by Alfred Marshall's (1920) analogy of a forest in which the old trees must fall to make way for new ones.

- *Amplified innovation*, particularly the creation of new markets. There are many examples of radical innovations introduced by new firms (Baumol, 2004).
- *Greater variety of products and problem solutions*. If the newcomer's products are different from those of the incumbents, or if an entrant introduces significant process innovation, the result will be a greater variety of available goods and problem-solving methods. Such increased variety implies a higher probability of customers finding a better match for their preferences. Increased variety due to new products may intensify the division of labor, as well as follow-up innovation, and, therefore, may generate significant economic development (Boschma, 2004; Saviotti and Pyka, 2004). Greater variety may have the further effect of diversifying the regional industry structure and the respective knowledge base, thus making the region more resilient to external shocks (Boschma and Frenken, 2011).

Like the displacement effects, the supply-side effects are indirect in nature. They are not necessarily limited to the industry to which a start-up belongs, but may occur in completely different industries, such as those that use the improved product as an input. Similarly, these effects are not necessarily restricted to the region in which entry occurs; they can manifest in other regions, for example, regions where competitors are located. The indirect supply-side effects drive competitiveness in the respective industries and regions, which may

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<sup>5</sup> Such a process was observed in the transformation of the former socialist economies of Central and Eastern Europe, where new firms—the bottom-up component—had a considerably strong impact on structural change (cf. Brezinski and Fritsch, 1996; Pfirrmann and Walter, 2002).



result in employment growth and generally enhanced welfare by attracting additional demand.

In many cases, the incumbents' reaction to the challenge posed by newcomers is not immediate, but takes considerable time to manifest. There are two reasons for this. First, it may take some time before the incumbents become aware of the challenging new competitors. Second, incumbents may need time to devise an effective reaction, for example, they may need to conduct a certain amount of R&D. Accordingly, empirical research finds that many of the indirect effects of new business formation take several years to become effective (Caves, 1998; Disney, Haskell, and Heden, 2003; Fritsch and Mueller, 2004, 2008; Fritsch and Noseleit, 2012b), and this lag needs to be accounted for in any analysis of these indirect effects. An empirical analysis that does not sufficiently account for such time lags runs the risk of missing important effects of new business formation on economic development.

Given that important indirect effects of new business formation emerge through their challenge to competitors, these effects may critically depend on the intensity of the challenge. How strong a challenge a start-up will pose involves several factors, such as the founder's entrepreneurial skills, the new business's resources, including the knowledge and qualifications of its personnel, and its innovativeness. Therefore, one can expect that the entry of innovative businesses led by well-prepared entrepreneurs who have the requisite knowledge and necessary resources will lead to stronger effects and, particularly, larger supply-side improvements than entry by non-innovative businesses run by persons lacking appropriate skills and unsuccessful at accessing the relevant factors of production. It can further be expected that highly challenging start-ups, that is, those exhibiting many of these positive qualities, will show considerable growth.

This overview of the different effects of new business formation makes very clear that the evolution of the start-ups is only a fraction of

their total effect on economic development. Many of the important influences that start-ups have on growth and employment are of an indirect nature and occur on the supply side of the market. Under a properly functioning market regime, new business formation may induce important growth-enhancing improvements on the supply side. If, however, market selection is not working as it should and allows the survival of relatively unproductive competitors, the economy's competitiveness will decline and there may be negative supply-side effects.

### **3. Methods of analyzing the effects of new business formation on regional development**

The following overview of different approaches to empirically assessing the contribution that new business formation makes to regional development begins with a discussion of cohort analyses and analyses of job turnover (Section 3.1). Section 3.2 deals with approaches that regress indicators for regional development on measures for new business formation. Section 3.3 introduces ways of identifying indirect effects. Finally, I review approaches for analyzing regional differences in the effects of new business formation (Section 3.4).

#### **3.1 Cohort analyses and analyses of job turnover**

The earliest empirical studies of the effect of new business formation on development (e.g., Birch, 1979, 1981) follow the development of groups (cohorts) of businesses over time. A crucial issue in this type of analysis is sample selection as the sample needs to be representative of the entire population of firms. This requires datasets containing information about the businesses at several points in time, i.e., panel data. Simple surveys that gather data on current and previous performance at only one point in time are not sufficient for such an analysis because even if the information is representative of all businesses at the time the survey is conducted, information about

businesses previously in existence but not defunct will nearly always be unavailable. Calculating average growth rates only for firms active in both periods, the “survivors,” overestimates development of the cohort as a whole and thus suffers from “survivor bias.” Hence, cohort analyses of the development of new businesses also require information about those businesses that were active for a period and then exited the market.

Following cohorts of start-ups and incumbent firms over time provides a fascinating look at the considerable heterogeneity among economic units with regard to survival and growth (for such an analysis, see Birch, 1987). In particular, analyses of start-up cohorts can result in very detailed assessments of the direct effects of new business formation. The indirect effects may then be assessed based on information about cohorts of incumbent firms that were in existence when the start-ups entered the market (see Section 3.3).

Job-turnover analyses focus on employment gains and losses in different categories of firms or establishments, such as start-ups, incumbent firms of different size or from different industries, and the like. The strength of this approach is that it reveals the anatomy of employment change, particularly the immense gross changes that are often behind a relatively small net change, thereby informing about turbulence within economic aggregates such as regional or industry employment. In principle, this type of approach is well suited to investigations of competition caused by new businesses, particularly the indirect effects of new businesses on incumbents. However, without accounting for sufficiently long time lags, nearly all these approaches neglect larger parts of the indirect effects and, therefore, are more similar to a descriptive job-growth accounting exercise than an assessment and analysis of the effects of start-ups on economic development (e.g., Davis, Haltiwanger, and Schuh, 1996; Spletzer, 2000; Neumark, Zhang, and Wall, 2006). A severe problem of cohort and job-turnover analyses is that they require detailed data that are rarely available, particularly at the regional level.

### **3.2 Regressing regional growth on new business formation**

A much simpler way of analyzing the overall effects of new business formation on economic development—direct and indirect—is to relate the level of new business formation activity to some aggregate performance measure such as change in employment, gross domestic product, or productivity in the country or region. Such an analysis requires a measure for the regional level of new business formation as well as an indicator for regional development. The following section (Section 3.2.1) discusses such measures. Section 3.2.2 then demonstrates the importance of accounting for time lags when analyzing the effects of new business formation on regional growth, and Section 3.2.3 discusses the use of new business formation as an indicator for entrepreneurship in a regional production function.

#### **3.2.1 Measuring new business formation and economic performance**

To be meaningful, a comparison of regions of different size or different economic potential must, of course, account for these differences. An easy way to fulfill this requirement is to calculate a start-up rate that relates the number of start-ups to a measure of regional size. Most commonly, the number of employees, the regional workforce (including the unemployed), or the regional population of working-age persons is chosen as the denominator of the start-up rate, what Audretsch and Fritsch (1994) call the “labor market” approach. This kind of start-up rate is based on the notion that each member of the workforce is faced with the decision of either working as an employee, being unemployed, or starting his or her own firm. According to the labor market approach, the entry rate may be viewed as the propensity of a member of the regional workforce to start an own business. Because start-ups are usually located close to the founder’s residence (Stam, 2007; Dahl and Sorenson, 2009), the regional workforce can be regarded as an appropriate measure of the number of potential entrepreneurs. Many analyses of the effect of new business formation on regional

development use sector-adjusted start-up rates that account for the fact that start-up rates differ systematically across industries.<sup>6</sup> Sector-adjusted start-up rates often lead to somewhat clearer results and higher levels of determination than do estimates using the non-adjusted start-up rate, but the basic relationships are usually unchanged.

Most empirical studies that analyze the impact of new business formation on the development of regions or countries employ gross entry as indicator of the level of new business formation activity. Sometimes, net entry, calculated as the change in the number of businessowners, is used, mainly for reasons of data availability (e.g., Carree and Thurik, 2008; Dejardin, 2011). Another variant is to analyze the effect of turbulence, defined as the number of entries plus the number of exits, on economic development (e.g., Bosma, Stam, and Schutjens, 2011), which can be regarded as an indicator of the level of creative destruction in the region. Most studies based on data from the Global Entrepreneurship Monitor (GEM) (e.g., Bosma, 2011) use “total entrepreneurial activity” (TEA), which is the percentage of population between 18–64 years old that is either actively involved in starting a new venture or is the owner/manager of a young business (for details, see Reynolds et al., 2005). Some of the studies based on GEM data

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<sup>6</sup> For example, start-up rates are higher in the service sector than in manufacturing industries. This means that the relative importance of start-ups and incumbents in a region is confounded by the composition of industries in that region. If this fact is not appropriately taken into consideration, the result will be an overestimation of the level of entrepreneurship in regions that are home to a large number of industries for which start-ups play an important role, and an underestimation of the role of new business formation in regions that are home to a high share of industries characterized by relatively low start-up rates. To correct for the confounding effect of the regional composition of industries on the number of start-ups, a shift-share procedure is employed to obtain a sector-adjusted measure of start-up activity (for details, see Audretsch and Fritsch, 2002, Appendix). This sector-adjusted number of start-ups is defined as the number of new businesses in a region that could be expected if the composition of industries were identical across all regions. Thus, the measure adjusts the raw data by imposing the same composition of industries upon each region. This procedure leads to somewhat clearer results and higher levels of determination than the estimates using the non-adjusted start-up rate, but the basic relationships are unchanged. Including variables for the regional industry structure would not provide the same type of control because the overall industry structure is dominated by incumbents, not by start-ups.

analyze the TEA of sub-groups such as “opportunity,” “necessity,” or “high-growth expectation” entrepreneurship.

To date, work on the effects of new business formation on economic development mainly focuses on employment creation, possibly due to the importance policymakers place on job generation and the prevention of unemployment. Another reason may be the better availability of employment data as compared to other performance indicators. Other performance measures frequently used in empirical studies of the effects of new business formation are changes in gross domestic product and productivity. The results for these different performance measures can vary considerably. For instance, while market selection according to survival of the fittest may cause a reduction of employment, as argued above (Section 2), it should also lead to an increase of productivity.

### **3.2.2 The importance of time lags**

It was emphasized above (Section 2) that many of the effects of new business formation will not occur immediately but, instead, take considerable time to manifest. Indeed, empirical research shows that including such time lags is very important and identifies a significant effect of new business formation on regional growth for periods of up to 10 years (for an overview, see Fritsch, 2013). Including longer time lags, however, runs up against the problem that regional levels of start-up activity tend to be persistent over time (Andersson and Koster, 2011; Fritsch and Wyrwich, 2012) with the consequence that start-up rates for successive years are highly correlated. Hence, the coefficients for lagged start-up indicators may not reflect the “true” lag structure of the effects.

To deal with this problem, many analyses follow van Stel and Storey (2004) and Fritsch and Mueller (2004) by applying the Almon polynomial lag procedure. This method attempts to approximate the lag structure with a polynomial function (for a detailed description, see Greene, 2008). This type of analysis requires that an assumption be

made about the order of the polynomial to be used for estimating the lag structure. Assuming a third- or a higher-order polynomial, Fritsch and Mueller (2004) for West Germany, as well as a number of analyses for other countries, identify a typical “wave” pattern of the effects. Figure 3 depicts the original regression coefficients found by Fritsch and Mueller (2004) without application of the Almon lag procedure as well as the coefficients that result from this Almon lag procedure when assuming a third-order polynomial. The resulting smoothed lag structure suggests that new business formation in the current year has a positive impact on employment change. For years  $t-1$  to  $t-5$ , the effect is negative, with a minimum in  $t-3$ . For entries in years  $t-6$  to  $t-9$ , a positive relationship is found, with a maximum between years  $t-7$  and  $t-8$ . The magnitude of the effect then decreases and becomes statistically insignificant for periods more distant than  $t-10$ .

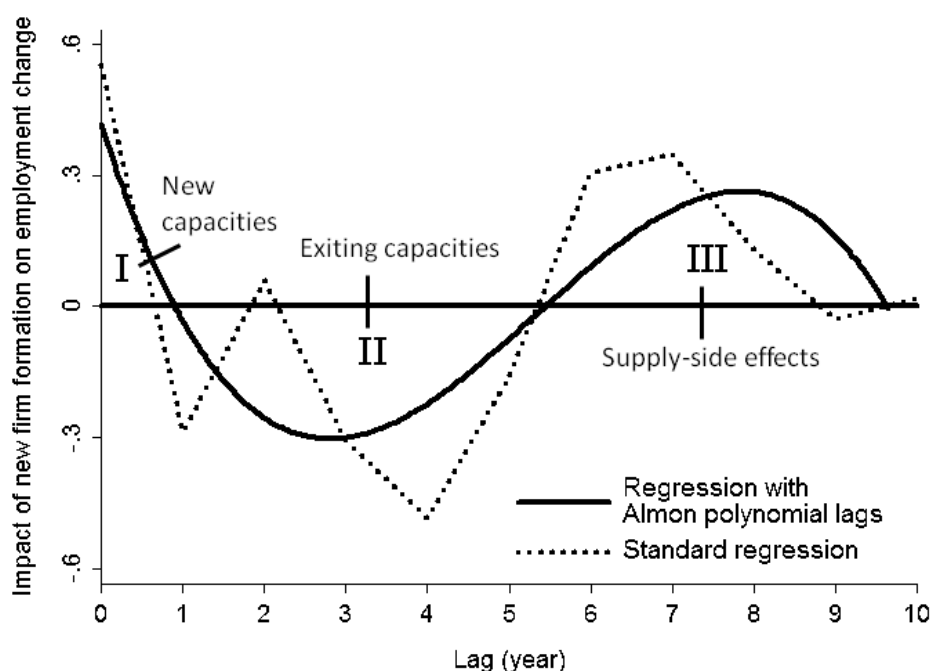


Figure 3: Effects of new business formation on employment change over time in West Germany—regression coefficients for start-up rates and the results of the Almon lag procedure assuming a third-order polynomial

Fritsch and Mueller (2004) suggest an interpretation of this wave pattern that builds on the systematization of direct and indirect effects, as discussed in Section 2. According to this interpretation, the positive employment impact of start-ups in the current year can be understood as the additional jobs created by the newly founded businesses at the time of inception. This direct employment effect is indicated in Area I of Figure 3. It is well known from a number of analyses that employment in entry cohorts tends to be stagnant or even declines from the second or third year onward (Schindele and Weyh, 2011). Therefore, new firm formation activity in year  $t-3$  and more distant time periods should not lead to any significant direct employment effect from the cohort as a whole. The negative impact of the start-ups in years  $t-1$  to  $t-5$  (Area II in Figure 3) is probably a result of market exit, that is, new businesses that fail and incumbents that exit or downsize. The positive impact of new business formation on employment for years  $t-6$  to  $t-10$  (Area III in Figure 3) is probably due to a dominance of indirect supply-side effects, i.e., increased competitiveness of regional suppliers resulting from market selection. After about nine or ten years, the impact of new business formation on regional employment fades away.<sup>7</sup>

The wave pattern of the effects of new business formation found in many empirical analyses makes very clear that the largest part of the positive employment effects of new business formation occur only with a considerable time lag. Hence, empirical analyses that do not account for sufficiently long time lags must be viewed as seriously flawed. Presently, most analyses of the lag structure deal with the employment effect of new business formation. However, when analyzing the effect of net entry on change in GDP and productivity for a sample of 23 OECD countries, Carree and Thurik (2008) also identify a wave pattern

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<sup>7</sup> In some cases, the curve for the lag structure estimated by applying the Almond polynomial lag procedure shows negative coefficients for the last one or two years of the period under inspection. These negative coefficients in later periods should be regarded an artifact of the estimation procedure. It is difficult, if not impossible, to plausibly argue that there are negative employment effects of new business formation after the supply-side effects have phased out.



with some negative coefficients for the first years after net entry; however, these are not statistically significant.

### **3.2.3 Entrepreneurship in a regional production function**

Most empirical studies of the overall effect of start-ups on regional development simply regress a performance measure on an indicator of new business formation activity, with or without control variables. However, a few studies employ an explicit production function framework that also contains indicators for the contribution of other inputs to growth (Audretsch and Keilbach, 2004; Audretsch, Keilbach, and Lehmann, 2006; Mueller, 2007; Wong, Ho, and Autio, 2005). In this type of approach, entrepreneurship is regarded as a production factor that introduces resources such as initiative and opportunity recognition, as well as willingness and ability to take risk, into the model. Analyzing the contribution of entrepreneurship within the framework of a production function, as compared to a simple regression of measures for economic development on indicators for entrepreneurship, has the advantage of more systematically accounting for other determinants of growth. Moreover, such an approach finds a firm foundation in production theory. However, entrepreneurs do not accomplish success and growth by spirit and initiative alone; they must hire labor and make capital investments. Hence, in a production function framework that includes the inputs of labor and capital, part of entrepreneurship's impact on development is due to these other factors, that is, the entire impact is not simply due to the entrepreneur who made the decisions regarding their use. Therefore, the effect of entrepreneurship may well be underestimated in this sort of analysis. In contrast, those empirical studies that more or less solely relate the start-up rate to growth are in danger of overestimating the effect of entrepreneurship due to the neglect of other factors.

A serious problem with the production function approach involves the data to be used. For example, data on capital stock are generally of

questionable reliability and, in many countries, are not even available at the regional level. Moreover, causal interpretation of these results can be problematic if the empirical analyses are related to the *level* of GDP or productivity, not to its development. To date, none of the available approaches based on a production function framework uses longer time lags of the entrepreneurship indicators.<sup>8</sup> To compare the effects of different types of input, such an approach should also include time lags for the input of other factors, particularly estimates for net investment or the capital stock. Presumably, the correlation between the indicators for new business formation and other inputs as well as the correlation of the input variables over time will introduce not additional, not easily overcome, multicollinearity problems.

### **3.3 Identifying indirect effects of new business formation on regional development**

There have been a number of attempts to identify indirect effects of new business formation. Below, I first review two methods of identifying the indirect effects on employment (Section 3.5.1) and then turn to the assessment of other effects (Section 3.5.2).

#### **3.3.1 Indirect employment effects**

To identify indirect effects of new business formation on employment, Fritsch and Noseleit (2012b) apply a decomposition procedure. Using information on total employment change ( $\Delta EMP_{total}$ ) and employment in new businesses ( $\Delta EMP_{new}$ ), they calculate the employment change of incumbents as

$$\Delta EMP_{inc} = \Delta EMP_{total} - \Delta EMP_{new}.$$

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<sup>8</sup> Moreover, most of the available approaches that analyze the effects of entrepreneurship in a production function framework are based on cross-section estimates and therefore may neglect the effect of region-specific factors on growth that are not explicitly taken into account. Hence, a fixed-effects panel approach that controls for such unobserved regional effects may lead to quite different estimates of how much entrepreneurship contributes to economic development.

Incumbent employment encompasses all employees in businesses that are more than 10 years old. Young businesses and their employment are those that were set up in the preceding 10 years. The period of 10 years was chosen because Fritsch and Mueller's (2004, 2008) analyses for Germany find significant effects of new business formation for this length of time (see Section 3.2.2). The employment change in incumbent businesses encompasses the indirect effects of new businesses formation—displacement and supply-side effects—as well as other influences that are not caused by the start-ups.

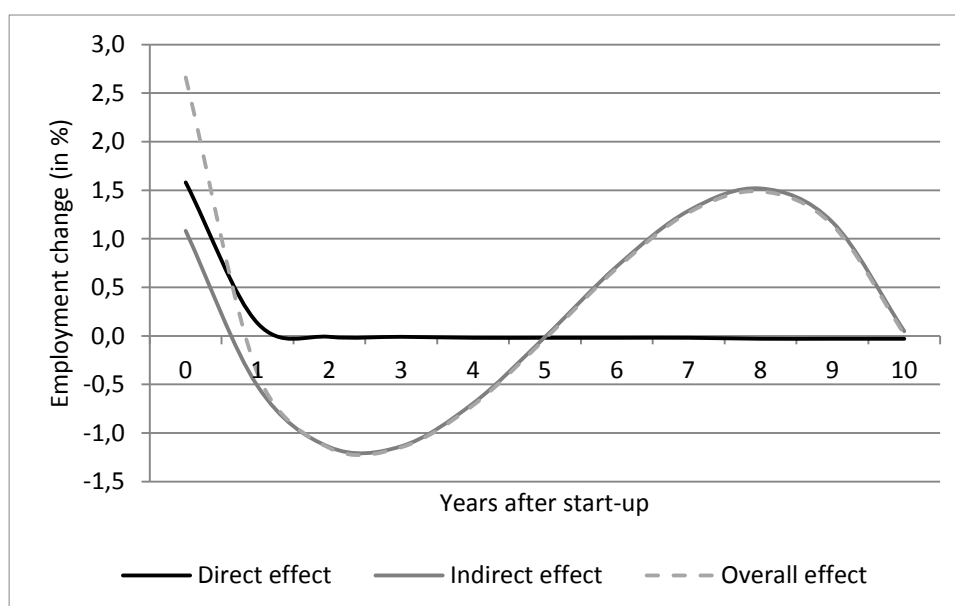


Figure 4: Impact of start-ups on regional employment change—direct and indirect effects (Fritsch and Noseleit, 2012b)

Applying the decomposition procedure described above, the lag structure for the indirect effect of new business formation can be identified by means of a regression with change in incumbent employment as the dependent variable and the start-up rate of the preceding 10 years as the independent variable. Using data for West Germany, Fritsch and Noseleit (2012b) find a wave pattern for the indirect effects (see Figure 4) that corresponds well to the findings of earlier studies for West Germany displayed in Figure 3. With regard to the direct employment effects of new business formation, Fritsch and Noseleit (2012b) estimate that in the year the start-ups enter the

market, they account for an employment increase of about 1.5 to 1.8 percent. In the first year after entry, this effect continues to be positive but is much smaller. Because the start-up cohorts tend to experience an employment decline in later years, their direct contribution to employment change becomes slightly negative. Hence, the largest direct contribution of start-ups to employment change occurs in the year they are set up. As Figure 4 clearly shows, the largest part of the overall employment induced by new businesses is due to indirect effects on incumbents.

Fritsch and Noseleit (2012b) estimate that the start-ups of a certain vintage have on average led to a 3.8 percent increase in regional employment over a period of 11 years. About 40 percent of this increase is attributable to employment in new businesses and constitutes their direct employment effect. The other 60 percent is due to the indirect effects. Hence, nearly two-thirds of the employment change generated by new business formation arises from the interaction between newcomers and incumbents. Performing the analysis for different types of regions, they find that most of the differences in overall effects are explained by the effects on incumbents.

Another method of identifying and assessing the indirect employment effects of new business formation and of comparing them with the direct effects is to regress overall regional employment change, employment change in new and young businesses, and employment change in incumbents on the average start-up rate of the previous 10 years (Fritsch and Noseleit, 2012a). If employment change, as well as the start-up rates, are included with their logarithmic values, the estimated coefficients can be interpreted as quasi-elasticities, thus making it easy to compare different models. These coefficients represent the relative employment change in incumbent and new/young

businesses that can be explained by the new business formation.<sup>9</sup> Based on this approach, Fritsch and Noseleit (2012a) find a pronounced positive effect for employment change in the incumbents, indicating that positive supply-side effects of new business formation outweigh their displacement effects. The estimated coefficient for the link between new business formation and employment change in the young businesses is considerably smaller than the coefficient for the effect of the start-up rate in the model for employment change in incumbents. This again suggests that the indirect employment effects of new business formation on incumbents are more pronounced than the relationship between start-up activity and employment created in the new and young entities.

Another way of identifying indirect employment effects of new business formation is to regress employment change in a certain sector of the economy on new business formation in other sectors. This method is employed by Andersson and Noseleit (2011) in an analysis of Swedish regions. The study reveals that there are indeed pronounced indirect effects that were strongest for start-ups in manufacturing, followed by start-ups in low-end services, with high-end service industries bringing up the rear.

### **3.3.2 Other types of indirect effects**

There are many other kinds of developments that may be regarded as indirect effects of new business formation. One such effect that reflects the dynamics of the competitive process is market mobility. A measure of regional market mobility—change in the ranking of regional establishments in terms of employment size—is used by Koster, van Stel, and Folkeringa (2012) and Koster and van Stel (2011). In a regression analysis based on data for the Netherlands, these authors

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<sup>9</sup> The models control for the effect of regional human capital, population density, the distance-weighted sum of total population in all other regions (“market potential”), and regional industry structure. They also account for unobserved time-invariant region-specific characteristics by applying fixed effects panel regression.

find a pronounced positive effect of the start-up rate on the measure of market mobility, indicating that entry has significant consequences for the regional market structure. In their analysis, the regression coefficient for the start-up rate was considerably higher when the current value was replaced by the start-up rate of about five years earlier, suggesting that the effect of entry on market mobility only manifests after a considerable period of time. Including the start-up rate as well as the market mobility measure in a model designed to explain regional employment growth, Koster and van Stel (2011) show a statistically significant effect of both indicators.

Innovation, that is, reorganization and/or the introduction of new processes or products, is another important way incumbents react to the challenge of entries (Aghion et al., 2009). Therefore, the effects of entry may be assessed by measuring the innovation activity of incumbent firms. Given the scarcity of data on innovation, however, assessing this type of effects is not easy and it may not be possible to come to any meaningful conclusions in quantitative terms. It is particularly important in such an attempt that any data on incumbent reaction be representative of the regional population of firms. One example of such an analysis is that conducted by Andersson, Braunerhjelm, and Thulin (2012) for Swedish regions as to the effect of regional entry on the productivity of incumbent firms. In their estimations, they frequently find significantly negative effects of entry and turbulence on incumbent productivity for the current year and for the first two years after entry. After these first years, however, the effect becomes strongly positive in most cases.

Another strand of research deals with the effect of new business formation on regional industry structure. Structural adjustment via turnover of economic units is especially prone to occur when incumbents do not make the internal changes necessary for their survival. New and different businesses can be a vital antidote in such "lock-in" situations. Specifically, innovative start-ups can initiate new markets and industries that may be drivers of regional growth. A study

by Noseleit (2012) of West German regions compares the similarity of industry affiliation between entries and incumbents and the similarity of industry affiliation between entries and exits. Including these similarity indicators in a multivariate regression for regional employment change results in a significantly negative coefficient for both. This suggests that regions experience higher growth rates when entries induce more pronounced changes in the local industry structure.

Another potential indirect effect is the impact of entrepreneurial role models on a region's "culture" of entrepreneurship (Beugelsdijk, 2007; Etzioni, 1987; Fornahl, 2003), which may induce future start-ups. There are clear indications that high levels of self-employment and new business formation in a region have robust self-reinforcing effects over longer time periods. An empirical analysis of such long-run effects requires information about the regional level of entrepreneurship over longer periods of time. This sort of study is rarely undertaken, partly because such data is not often available (but see Andersson and Koster, 2011, and Fritsch and Wyrwich, 2012, for such an analysis).

### **3.4 Analyzing regional differences of the effects of new business formation on regional development**

The simplest way of investigating regional differences in the effects of new business formation on development is to analyze different regions and compare the results. Most such analyses distinguish between regions with high population density (agglomerations) and less populated or rural areas (e.g., Baptista and Preto, 2011; van Stel and Suddle, 2008). Other types of regions analyzed include those with relatively high and relatively low levels of labor productivity (Fritsch and Mueller, 2008), regions with high and low levels of new business formation (Fritsch and Noseleit, 2012b), regions with relatively high and relatively low shares of small business employment, and regions with relatively high and relatively low similarity of industry structure between newcomers and incumbents (Fritsch and Noseleit, 2012a). In general, this work shows that the effect of new business formation on

development can vary substantially across regions. Start-ups may drive driver growth in some regions, but their effect can also be negative in others.

A severe disadvantage of such simple comparisons is that they often contrast the results for two types of regions but pay little or no attention to other potentially relevant factors. For example, productivity tends to be relatively high in regions with a high level of population density and is comparatively low in rural areas. Hence, a comparison of high and low productivity regions may be confounded by the effects of population density. Clearly, a multivariate approach is desirable when investigating the role of regional characteristics in the impact of new business formation.

Such an analysis is conducted by Fritsch and Schroeter (2011) for regions of West Germany. They use the regression:

$$\begin{aligned} \text{Average employment change}_{r, t+2-t_0} = & a + b_1 * \text{average start up rate}_{r, t-1 \text{ to } t-10} \\ & + b_2 * \text{average start up rate}_{r, t-1 \text{ to } t-10}^2 + b_3 * \text{variable I}_{r, t-1} + b_4 * \text{variable I}_{r, t-1} * \\ & \text{average start up rate}_{r, t-1 \text{ to } t-10} + b_5 * \text{variable II}_{r, t-1} + b_6 * \text{variable II}_{r, t-1} * \\ & \text{average start up rate}_{r, t-1 \text{ to } t-10} + \text{industry shares}_{r, t-1} + \text{time dummies} + u_{r, t} . \end{aligned}$$

In this equation,  $r$  indicates the regions and  $t$  time. The *average start-up rate* is calculated as the mean over a 10-year period, i.e., from  $t-10$  to  $t-1$ . A period of 10 years was used to account for the long-term effects found in a number of other analyses. The squared value of the start-up rate was included to account for a nonlinear relationship with employment change. The estimated coefficients of the start-up rates and the potential growth determinants indicate their direct influence on employment change. The coefficients of the interaction terms can be regarded as a measure of the impact the respective variable has on the employment effect of the new businesses. This makes it possible to distinguish between the direct effects of several regional characteristics



and the impact that these potential determinants of regional growth may have through new business formation activity.<sup>10</sup>

A key result of Fritsch and Schroeter's (2011) analysis is that population density has a strong positive influence on the effects of new business formation on regional employment, an influence that appears to be more important than that of other variables.<sup>11</sup> Moreover, they find a positive coefficient for the average start-up rate, but a significantly negative coefficient for its squared value, indicating that the marginal effect of new business formation on regional employment declines with the number of start-ups.

All in all, the extant empirical work clearly demonstrates the importance of the regional environment for the magnitude of the effects of new business formation. However, these regional differences are not yet fully understood.

#### **4. The question of causality: Is new business formation a cause or a symptom of regional development?**

Given that economic growth creates entrepreneurial opportunities, which, in turn, are accompanied by an increasing number of firms, entry may be viewed as a symptom of growth, not its source. If growth stimulates the emergence of new businesses, ignoring this relationship may lead to overestimating the effect that start-ups have on economic development.<sup>12</sup> In an extreme case, new business formation would

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<sup>10</sup> For example, because employment in West German agglomerations grew less than it did in other types of regions during the period of analysis, Fritsch and Schroeter (2011) find a negative coefficient for the effect of population density on employment change. However, interaction of the start-up rate with population density showed a strongly positive relationship, indicating that new business formation has a much larger effect in high-density areas than in rural regions.

<sup>11</sup> A problem with this approach is that including a variable in its pure form and as part of an interaction term may lead to pronounced multicollinearity. This pertains particularly to the start-up rate when it is interacted with several other variables in the same model. In principle, one could test and control for spatial autocorrelation in such an approach by including variables, particularly start-up rates, for adjacent regions.

<sup>12</sup> Economic growth can stimulate new business formation in at least three ways. First, previous growth may generate a relatively large number of new entrepreneurial

simply be a byproduct of growth processes that are occurring independently of new business formation. The question, therefore, is: Does economic growth truly have a significant impact on new business formation and, if so, does this situation lead to overestimating the effect of entry on development in subsequent periods?

A first indication of the extent to which the emergence of new businesses is a result of growth processes can be drawn from studies that analyze the determinants of entry. Many of these studies find such a positive effect of growth, particularly population growth, on entry, but in most cases the relationship was not very strong.<sup>13</sup> Audretsch, Keilbach, and Lehmann (2006) simultaneously estimate the effect of regional performance on the level of new business formation and the effect of new business formation on the growth of regional labor productivity using a production function framework. While they find that the growth of GDP per capita had a statistically significant positive impact on new business formation in subsequent periods, the effect of start-ups on the increase in labor productivity remained statistically significant. This clearly suggests that new business formation has a distinct positive effect on development that is independent of an overall growth trend.

Hartog et al. (2010) employ a simultaneous empirical approach to investigate the possible two-way relationship between changes in the business ownership rate (= net entry) and growth for 21 OECD countries over the period 1981–2006. The authors identify a link between the national welfare level and the business ownership rate, but find that development during the previous periods had no statistically significant effect. Analyzing the effect of changes in the business ownership rate on GDP growth, Hartog et al. (2010) conclude that there are decreasing marginal returns in terms of growth effects to

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opportunities. Second, positive expectations about future growth can encourage individuals to start an own business. Third, overall growth makes it easier for start-ups to survive their first critical years and to establish themselves in the market.

<sup>13</sup> See, for example, Fritsch and Falck (2007), Reynolds, Storey, and Westhead (1994), and Sutaria and Hicks (2004).

entrepreneurship, which confirms results of Fritsch and Schroeter (2011) for German regions. A main limitation of Hartog et al.'s (2010) study is that it contains no information on gross entry and thus nothing can be learned about how the number of entries affects turbulence in the stock of businesses and the consequent effects on economic development.

In summary, work to date has not identified any, or only a relatively weak, effect of growth in previous periods on the level of new business formation; the effect of new business formation on economic development, however, is found to be considerably pronounced. Based on this evidence, it can be concluded that start-ups do have a distinct impact on growth independent of any already existing long-term growth trajectory. However, assessing the effect of new business formation on economic development without simultaneously accounting for a possible effect of growth on the level of start-ups may lead to some overestimation of the effects of start-ups. Clearly, there is still a great deal to learn about these relationships and more differentiated analyses would be welcome.

## **5. Summary and outlook**

Recent research into how new business formation contributes to regional development shows that large parts of this contribution are of an indirect nature and become visible only after several years. Hence, an empirical analysis of the overall growth effect of new business formation needs to account for these indirect effects and, especially, allow for longer time lags. As many of the approaches aimed at assessing the effects of new business formation on regional development do not fulfill these criteria, there is considerable room for improvement in this field of study.

Although our knowledge about the effects of new business formation on regional development has expanded considerably in recent years, many questions remain to be answered. For example,

most analyses of the effect of new business formation on regional development use employment change as a measure of performance. Very few studies use GDP-based indicators such as GDP growth or productivity. Since there are good reasons to expect that using different indicators will give rise to different results, future analyses should also use alternative output measures.<sup>14</sup>

Another important avenue for further research is to analyze several types of start-ups that differ with regard to the challenge that pose to incumbents, e.g., innovative versus purely imitative start-ups. A another open question has to do with how certain characteristics of competition, such as its type and intensity, as well as characteristics of output markets, influence the effects of new business formation. Output market characteristics could be particularly important for the magnitude of the indirect effects. As of yet, however, not much is known about these types of indirect effects and their determinants. Moreover, the question of causality should be further investigated. Work in this direction would benefit from more and better data, particularly longer time series.

Finally, we need to know more about regional differences in the effects of new business formation and the reasons behind them. The available evidence clearly indicates that the effects of new business formation are considerably larger in high-density areas than they are in sparsely populated rural regions. Why this is the case, however, is not clear. Hence, much more research could and should be done into the effects of new businesses on regional development. Moreover, nothing is known about how new business formation in one region affects other regions. It is plausible to expect that other regions will experience some

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<sup>14</sup> For example, since productivity can be regarded a catch-all variable that should particularly reflect improvements in performance that do not result in more employment (e.g., labor-saving process innovations), the effect of new business formation on productivity should be more pronounced than the effect on employment. Moreover, since the wave pattern that is found for the effect of new business formation on employment change suggests that market selection begins to work soon after entry, the positive effect of entry on GDP and productivity should occur considerably earlier than the effect on employment.

degree of “spill-over” effects, especially those regions host to other suppliers of the respective industry. Indeed, this potential for spill-over effects offers a wide range of interesting research questions, including their magnitude and its determinants, how geographic distance influences the effect, and what characteristics of the spill-over region are most conducive to generating beneficial effects.

## References

- Aghion, Phillippe, Richard W. Blundell, Rachel Griffith, Peter Howitt, and Susanne Prantl (2009), 'The Effects of Entry on Incumbent Innovation and Productivity'. *Review of Economics and Statistics*, **91**, 20-32.
- Andersson, Martin, Pontus Braunerhjelm, and Per Thulin (2012), 'Creative Destruction and Productivity—Entrepreneurship by Type, Sector and Sequence'. *Journal of Entrepreneurship and Public Policy* **1**.
- Andersson, Martin and Sierdjan Koster (2011), 'Sources of Persistence in Regional Start-Up Rates—Evidence from Sweden'. *Journal of Economic Geography*, **11**, 179–201.
- Andersson, Martin and Florian Noseleit (2011), 'Start-ups and employment dynamics within and across sectors'. *Small Business Economics*, **36**, 461-483.
- Audretsch, David B. and Michael Fritsch (1994), 'On the Measurement of Entry Rates'. *Empirica*, **21**, 105-113.
- Audretsch, David B. and Michael Fritsch (2002), 'Growth Regimes over Time and Space'. *Regional Studies*, **36**, 113-124.
- Audretsch, David B., Isabel Grilo, and Roy Thurik (eds.) (2007), *Handbook of Research on Entrepreneurship Policy*. Cheltenham: Edward Elgar.
- Audretsch, David B. and Max Keilbach (2004), 'Entrepreneurship capital and economic performance'. *Regional Studies*, **38**, 949–959.
- Audretsch, David B., Max Keilbach and Erik Lehmann (2006), *Entrepreneurship and Economic Growth*. Oxford: Oxford University Press.
- Baptista, Rui and Miguel Torres Preto (2011), 'New Firm Formation and Employment Growth: Regional and Business Dynamics'. *Small Business Economics*, **36**, 419–442.
- Baumol, William J. (2004), 'Entrepreneurial Enterprises, Large Established Firms and Other Components of the Free-Market Growth-Machine'. *Small Business Economics*, **23**, 9–21.
- Baumol, William J., John C. Panzar and Robert D. Willig (1988), *Contestable Markets and the Theory of Industry Structure*, revised edition. San Diego: Harcourt Brace Jovanovich.
- Beugelsdijk, Sjoerd (2007), 'Entrepreneurial Culture, Regional Innovativeness and Economic Growth'. *Journal of Evolutionary Economics*, **17**, 187–210.
- Birch, David L. (1979), *The Job Generation Process*. Mimeo. Cambridge, MA: MIT Program on Neighborhood and Regional Change.

- Birch, David L. (1981), 'Who Creates Jobs?' *Public Interest*, **65**, 3-14.
- Birch, David L. (1987), *Job Creation in America: How Our Smallest Companies Put the Most People to Work*. New York: Free Press.
- Bos, Jaap W. B. and Erik Stam (2011), *Gazelles, Industry Growth and Structural Change*. Working Paper RM/11/018. Maastricht: Maastricht University School of Business and Economics.
- Boschma, Ron (2004), 'Competitiveness of Regions from an Evolutionary Perspective'. *Regional Studies*, **38**, 1001-1014.
- Boschma, Ron and Koen Frenken (2011), 'The emerging empirics of evolutionary economic geography'. *Journal of Economic Geography*, **11**, 295-307.
- Bosma, Niels (2011), 'Entrepreneurship, Urbanisation Economies and Productivity of European Regions'. In Michael Fritsch (ed.), *Handbook of Research on Entrepreneurship and Regional Development*, Cheltenham: Elgar, 107-132.
- Bosma, Niels, Erik Stam and Veronique Schutjens (2011), 'Creative Destruction and Regional Productivity Growth: Evidence from the Dutch Manufacturing and Services Industries'. *Small Business Economics*, **36**, 401-418.
- Carree, Martin and Roy Thurik (2008), 'The Lag Structure of the Impact of Business Ownership on Economic Performance in OECD Countries'. *Small Business Economics*, **30**, 101-110.
- Caves, Richard E. (1998), 'Industrial Organization and New Findings on the Turnover and Mobility of Firms'. *Journal of Economic Literature*, **36**, 1947-1982.
- Commission of the European Communities (2003), '*Green Paper Entrepreneurship in Europe*'. Brussels: COM(2003) 27 final.
- Commission of the European Communities (2010), '*EUROPE 2020 – A Strategy for Smart, Sustainable and Inclusive Growth*'. Brussels: COM(2010) 2020.
- Dahl, Michael S. and Olav Sorenson (2009), 'The Embedded Entrepreneur'. *European Management Review*, **6**, 172–181.
- Davis, Steven J., John C. Haltiwanger and Scott Schuh (1996), *Job Creation and Destruction*. Cambridge (MA): MIT Press.
- Dejardin, Marcus (2011), 'Linking Net Entry to Regional Economic Growth'. *Small Business Economics*, **36**, 443-460.
- Disney, Richard, Jonathan Haskell and YlvaHeden (2003), 'Restructuring and Productivity Growth in UK Manufacturing'. *Economic Journal*, **113**, 666-694.
- Etzioni, Amitai (1987), 'Entrepreneurship, Adaptation and Legitimation'. *Journal of Economic Behavior and Organization*, **8**, 175–199.
- Fornahl, Dirk (2003), 'Entrepreneurial activities in a regional context'. In Dirk Fornahl and Thomas Brenner (eds.): *Cooperation*,

*Networks, and Institutions in Regional Innovation Systems*, Cheltenham: Edward Elgar, 38–57.

- Fritsch, Michael (1996), 'Turbulence and Growth in West-Germany: A Comparison of Evidence by Regions and Industries'. *Review of Industrial Organization*, **11**, 231-251.
- Fritsch, Michael and Pamela Mueller (2004), 'The effects of newbusinessformation on regional development over time'. *Regional Studies*, **38**, 961–975.
- Fritsch, Michael and Oliver Falck (2007), 'New Business Formation by Industry over Space and Time: A Multi-Dimensional Analysis'. *Regional Studies*, **41**, 157-172.
- Fritsch, Michael and Pamela Mueller (2008), 'The Effect of New Business Formation in Regional Development over Time: The Case of Germany'. *Small Business Economics*, **30**, 15-29.
- Fritsch, Michael and Alexandra Schroeter (2011), 'Why Does the Effect of New Business Formation Differ Across Regions?' *Small Business Economics*, **36**, 383-400.
- Fritsch, Michael and Florian Noseleit (2012a), 'Indirect Employment Effects of New Business Formation Across Regions: The Role of Local Market Conditions'. *Papers in Regional Science* (forthcoming).
- Fritsch, Michael and Florian Noseleit (2012b), 'Investigating the Anatomy of the Employment Effects of New Business Formation'. *Cambridge Journal of Economics*, DOI: 10.1093/cje/bes030.
- Fritsch, Michael and Michael Wyrwich (2012): The Long Persistence of Regional Entrepreneurship Culture: Germany 1925–2005, *Jena Economic Research Papers # 036-2012*, Friedrich Schiller University and Max Planck Institute of Economics Jena.
- Fritsch, Michael (2013): New business formation and regional development—A Survey and Assessment of the Evidence, *Foundations and Trends in Entrepreneurship*, 9 (forthcoming).
- Greene, William (2008), *Econometric Analysis*. 6th edition, Upper Saddle River: Pearson Prentice Hall.
- Hartog, Chantal, Simon Parker, André van Stel, and Roy Thurik (2010), The Two-Way Relationship Between Entrepreneurship and Economic Performance. Scales Report H200822. Zoetermeer: EIM.
- Klepper, Steven (1997), 'Industry Life Cycles'. *Industrial and Corporate Change*, **6**, 145-181.
- Koster, Sierdjan and André van Stel (2011), The Relationship Between Start-Ups, Market Mobility and Employment Growth: An Empirical Analysis for Dutch Regions. SCALES Research Report. Zoetermeer: EIM.



- Koster, Sierdjan, André van Stel, and Mickey Folkeringa (2012), 'Start-Ups as Drivers of Market Mobility: An Analysis at the Region-Sector Level for the Netherlands'. *Small Business Economics*, **39**, 575–585.
- Leitao, Joao and Rui Baptista (eds.) (2009), *Public Policies for Fostering Entrepreneurship - A European Perspective*. Dordrecht: Springer.
- Marshall, Alfred (1920), *Principles of Economics*, 8<sup>th</sup> edition. London: Macmillan.
- Mueller, Pamela (2007), 'Exploiting entrepreneurial opportunities: The Impact of Entrepreneurship on Growth'. *Small Business Economics*, **28**, 355–362.
- Neumark, David, Junfu Zhang and Brandon Wall (2006), 'Where the Jobs Are: Business Dynamics and Employment Growth'. *Academy of Management Perspectives*, **20**, 79–94.
- Noseleit, Florian (2012), 'Entrepreneurship, Structural Change, and Economic Growth'. *Journal of Evolutionary Economics*, DOI 10.1007/s00191-012-0291-3.
- Organisation for Economic Co-operation and Development (OECD)(2003), *The Sources of Economic Growth in OECD Countries*. Paris: OECD.
- Reynolds, Paul D., David J. Storey and Paul Westhead (1994), 'Cross-national Comparisons of the Variation in New Firm Formation Rates'. *Regional Studies*, **28**, 443–456.
- Reynolds, Paul D., Niels Bosma, Erkki Autio, Steve Hunt, Natalie De Bono, Isabel Servais, Paloma Lopez-Garcia and Nancy Chin(2005), 'Global Entrepreneurship Monitor: Data Collection Design and Implementation 1998–2003'. *Small Business Economics*, **24**, 205-231.
- Saviotti, Pier Paolo and Andreas Pyka (2004), 'Economic development, variety and employment'. *Revue Économique*, **55**, 1023-1049.
- Schindele, Yvonne and Antje Weyh (2011), 'The Direct Employment Effects of New Businesses in Germany Revisited - An Empirical Investigation for 1976–2004'. *Small Business Economics*, **36**, 353-363.
- Schumpeter, Joseph A. (1911/1934), *Theorie der wirtschaftlichen Entwicklung*, Leipzig 1911: Duncker & Humblot; revised English edition *The Theory of Economic Development*. Cambridge, MA: Cambridge University Press.
- Schumpeter, Joseph A. (1942), *Capitalism, Socialism and Democracy*. New York: Harper & Row.
- Spletzer, James R. (2000), 'The Contribution of Establishment Births and Deaths to Employment Growth'. *Journal of Business and Economic Statistics*, **18**, 113–126.

- Stam, Erik (2007), 'Why Butterflies Don't Leave: Locational Behaviour of Entrepreneurial Firms'. *Economic Geography*, **83**, 27-50.
- Sutaria, Vinod and Donald A. Hicks (2004), 'New Firm Formation: Dynamics and Determinants'. *Annals of Regional Science*, **38**, 241–262.
- van Stel, André and David J. Storey (2004), 'The Link Between Firm Births and Job Creation: Is There a Upas Tree Effect?'. *Regional Studies*, **38**, 893–909.
- van Stel, André and Kashifa Suddle (2008), 'The Impact of New Firm Formation on Regional Development in the Netherlands'. *Small Business Economics*, **30**, 31–47.
- Wennekers, Sander and Roy Thurik (1999), 'Linking Entrepreneurship and Economic Growth'. *Small Business Economics*, **13**, 27-55.
- Wong, Poh Kam, Yuen Ping Ho and Erkkö Autio (2005), 'Entrepreneurship, Innovation and Economic Growth: Evidence from GEM Data'. *Small Business Economics*, **24**, 335–350.