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von Stefan Schneck

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Herausgeber
Institut für Mittelstandsforschung Bonn
Maximilianstr. 20, 53111 Bonn
Telefon +49/(0)228 / 72997 - 0
Telefax +49/(0)228 / 72997 - 34

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Times are a Changin'? The Emergence of New Firms and Rank Persistence

Stefan Schneck*

January 2, 2018

Abstract

Young firms are known to grow at a faster rate than incumbents. With administrative firm data from Germany, we show that the higher growth rates indeed translate into upward mobility within the firm size distribution. Young firms are therefore not only able to catch up, but also to grow larger in absolute values. Recentered influence function regression results reveal that young firms cause significant rank mobility within the stock of firms, which even holds when the local skewness of the firm size distribution is accounted for. The results clearly indicate a Schumpeterian growth process where young firms challenge established ones.

JEL-Classification: L10, L25, L26

Keywords: competition, entrepreneurship, firm entry, firm growth, sales mobility

*Corresponding author: Stefan Schneck, Institut für Mittelstandsforschung (IfM) Bonn. Maximilianstrasse 20, 53111 Bonn, Germany, e-mail: schneck@ifm-bonn.org. I have benefited from comments by Alex Coad, Sergio Firpo, and participants at workshops in Wiesbaden as well as Siegen. Thanks to Melanie Scheller for assistance with data issues. This study is based on the *Umsatzsteuerpanel* (2001-2011) from the German Statistical Office (Destatis). Remote data access was provided by the Research Data Centre of the German Federal Statistical Office (FDZ der Statistischen Ämter des Bundes und der Länder). All results have been reviewed to ensure that no confidential information is disclosed. The author's program codes will be provided upon request. Any errors are my own. This paper reflects the opinions of the author and not necessarily those of the Institut für Mittelstandsforschung (IfM) Bonn. The author declares that he has no conflict of interest. The author received no financial support for the research, authorship, and/or publication of this article.

"It is inherent in any dynamic capitalist economy that some firms enter, thrive, and grow, while others decline and sometimes exit." (Haltiwanger, 2012, p. 18)

1 Introduction

Entrepreneurship and the emergence of new firms are considered to be responsible for growth, productivity enhancing processes, and the rejuvenation of economies. Indeed, young, innovative, and ambitious firms impose relentless competitive pressure, causing some firms to prosper, while others contract or cease to exist. This perfectly illustrates the steady process of creative destruction (Schumpeter, 1934, also see the introductory quote), in which new firms, markets, products, or organizational structures challenge the established ones. Consider, for example, the market for books. When entering the market, a young firm called Cadabra Inc. (later known as Amazon.com Inc.) introduced an innovative internet-based selling strategy, which caused an increase in competition within this particular market. The new firm quickly gained market shares and managed to not only catch up with the incumbents, but to also become a market leader. Moreover, Amazon.com expanded into other markets and nowadays is a leading company in the retail sector. This success story motivated us to shed more light on the nexus between entrepreneurship and competitive dynamics.

The economic literature so far mainly concentrated on the evolution of the firm size distribution (FSD), the evolution of industries, employment growth, firm growth, and concentration, respectively (e.g., Gibrat, 1931; Hart and Prais, 1956; Adelman, 1958; Mansfield, 1962; Dunne et al., 1989; Sutton, 1997; Caves, 1998; Cabral and Mata, 2003; Bottazzi and Secchi, 2006; Coad, 2009; Henrekson and Johansson, 2010; Neumark et al., 2011; Haltiwanger et al., 2013). Most studies on firm growth yet examined growth rates, whereas a higher growth rate must not necessarily imply that a firm grows faster in absolute values. Young and/or small firms, thus, might not necessarily move upward along the FSD and replace incumbents and/or large companies. We therefore follow Gort (1963) and examine the ability to maintain the relative position as an indicator of competitive intensity. Consequently the objective of this paper is to analyze firm turnover, which is defined as upward or downward mobility of firms along the FSD.[1] Actually, theories about ranks or status are deeply rooted in behavioral economics (Kahneman and Tversky, 1979; Frank, 1985) and the management literature (Powell and Reinhardt, 2010), where it is frequently claimed that decision makers measure success relative to a self-determined reference group. Also managers or other executives tend to measure success by relative standing of the firm in comparison to others. As an example, see John F. Welch Jr. (former CEO of General Electric), whose leadership directives included that GE had to be number one or number two in the industries it participated in.

It is common sense that entry, exit, growth, and decline of firms are inevitable in *healthy* markets. Empirical evidence about the link between entry, firm survival, and exit of firms is well established (e.g., Dunne et al., 1988; Boeri and Cramer, 1992; Disney et al., 2003; Geroski, 1995; Agarwal and Gort, 1996; Ito and Kato, 2016). Literature on turnover, however, is mainly concentrated on a view on the very top positions. Sutton (2007) investigates the duration of industry leadership in 45 industries in the Japanese manufacturing sector. The data covered more than 20 years and the main finding was that persistence in the top rank is common. After 22 years, 27 market leaders were still at the very top while 18 lost the lead position. This result was corroborated by Geroski and Toker (1996), who analyzed transitions between ranks of the top-five companies in 54 three-digit UK manufacturing industries between 1979 and 1986. Market leaders in 1979 were likely to retain the lead position in 1986. In fact, 32 of the 54 market leaders remained in the top position, while almost all remained in the top three ranks. Using Canadian data, Baldwin (1998, p. 93) showed that 64.7% of the largest firms in one of the 167 manufacturing industries held the top position in 1970 and 1979. He additionally presented transition matrices of firms at

[1] In the following, we use the term *sales* to describe firm-specific income from deliveries and other performances in Euro, while *turnover* defines mobility in ranks or relative positions, respectively. Henceforth, turnover is defined as mobility along the FSD.

the four digit industry level for the years 1970 and 1979. More than half of all firms in the first quintile remained within their size quintile, while even more firms stayed within the top quintile. However, he also found significant movement to adjacent positions in the FSD. So far, the results presented in the literature, in general, suggest more movement among the lower and middle ranks compared to the very top positions. The literature, however, lacks an examination of an almost complete sample covering all industries.

The success story of Amazon.com also highlights the fast growth of some young firms, which rapidly expanded into different markets and ascended to leading positions: The business was founded in 1994 (as Cadabra Inc.), sold the first book in July 1995, and sales grew from \$15.7 million in 1996 to \$1,639.8 million in 1999 (Amazon.com, 1999). Significant transitions along the FSD as in the case of Amazon.com, however, are seldom and rarely occur instantaneously. Stonebraker (1979) examined the 100 largest firms between 1909 and 1976 in the U.S.. In fact, only very few firms, which have not been listed among the largest 100 firms were able to enter the top ten positions within the considered decades. Despite the importance of new business formation in the economic as well as in the firm growth literature (Baumol, 1968; Haltiwanger et al., 2013), entrepreneurship and its relation to turnover remain poorly explored in the empirical literature. For this reason, it is unclear how and to what extent the emergence of young firms contributes to mobility along the FSD.

The objective of this paper is to describe turnover with a special focus on new business formation. German census tax data is utilized, which contains annual information on all firms with sales of at least 17,500 Euro within the decade from 2001 to 2011. Mobility along the FSD is measured by changes in percentile rank positions within a four year time horizon. In contradiction to prior studies, we abstain from calculation of the relative standing in narrowly defined sectors, but focus on mobility along the complete set of firms. This is due to the fact that some firms nowadays tend to expand into different markets, while others already operate as diversified conglomerates. Our results corroborate prior results that mobility is lowest among the largest firms. We also show that young firms are more mobile than incumbents. In fact, young firms are more likely to ascend when compared to incumbents. Young firms are thus able to catch up with incumbents. We furthermore estimate recentered influence function regressions (Firpo et al., 2009) to deduce the effect of young firms on rank stability after controlling for investments as well as sector- and time-specific factors. The results reveal that new firms cause a significant degree of turnover.

2 Data and Procedure

2.1 Data

Census data on all firms submitting a sales tax pre-registration form, the German *Umsatzsteuerpanel* ('The German Turnover Tax Statistics Panel'), is utilized. The data set is provided by the Research Data Centre (FDZ) of the German Federal Statistical Office (Destatis) and consists of annual observations within the decade from 2001 to 2011. It contains the tax-relevant information included in the sales tax pre-registration form. The most important information concerns sales in Euro, which are defined as "deliveries and other performances" (Vogel and Dittrich, 2008, p. 663).[2] In accordance with article 19 (1) of the *Umsatzsteuergesetz* ('turnover tax law'), businesses in the data exceed annual sales of 16,617 Euro in 2001, 16,620 Euro in 2002, and 17,500 Euro from 2003 onward (also see Vogel and Dittrich, 2008, p. 664). To harmonize the sample, the minimum sales threshold was set to 17,500 Euro in each period. This sales threshold guarantees that new businesses are observed only after market entry, but not in their (early) development stages.[3]

Highly reliable identifiers such as the tax ID and the sales tax identifier provide the basis for the panel structure (Statistisches Bundesamt, 2009, p. 737). The panel ID is applied to conclude about entry and exit. On the one hand, firm entry occurs when a firm is not

[2] Precisely, sales are "defined as deliveries, other performances and the enterprise's own consumption [...]. In contrast to the majority of primary statistics the [sales] definition includes not only [sales] from operating activities, but also extraordinary income (e.g. from sales of fixed assets)" (Vogel and Dittrich, 2008, p. 663).

[3] For example, we would observe Amazon.com not in the founding year 1994, but in 1995 when Amazon.com achieved sales of $511,000 (Amazon.com, 1998, p. 15).

observed in year $t-1$, but in t. Firm exit, on the other hand, happens when a firm is observed in t, but not in $t+1$. We are thus not able to conclude about firm entry in 2001, the very first year of our sample. Note that there might be some caveats regarding firm entry and exit. Firstly, exit might not necessarily imply that a firm ceased to exist because the ID changes in case of a change in the legal form of the organization or a regional transfer of business. Secondly, at least one firm identifier no longer appears in case of mergers and acquisitions (M&A's). Thirdly, due to the sales threshold, we might observe entry with potential time lags. A firm thus might be founded or might have entered the market before the first appearance in our data. Entrepreneurship or the emergence of firms therefore has to be interpreted carefully. In fact, we describe the first appearance with minimum sales of 17,500 Euro as the period of entry. It is therefore important to note that the terms entrepreneurship, newly founded firms, and young firms are used as synonyms in this article, but generally refer to the first appearance in the data. Fourth, the measure of entry does not allow separation of new ventures, spin-offs, or M&A's.[4] A more comprehensive data description is provided by Vogel and Dittrich (2008).

The primary sector (agriculture, forestry, fishing, and mining industry) as well as private households with service personnel and extraterritorial organizations (sectors A, B, C, P, and Q according to the *WZ2003* classification) are excluded from the analysis. Most enterprises in the agriculture and forestry sector are exempt from submission of the sales tax preregistration form.[5] The fact that some firms enter and exit the sample repeatedly complicates the identification of young firms. We therefore concentrate on firms, which are either observed in one single period or continuously over time to circumvent issues of multiple entry and multiple exit.[6]

[4] Firms impose restructuring measures in the aftermath of M&A's and therefore can be characterized as new forms of organizations. These new entities are a crucial part in the process of creative destruction.

[5] Also note that a fraction of companies in the banking and insurance sector is not covered in our sample because of tax free sales without input tax deduction (Vogel and Dittrich, 2008, p. 662).

[6] This reduces the sample from 5,900,230 firms to 5,392,712 firms. The 90^{th} sales percentile of excluded firms ranged between 224,515 Euros (in year 2008) and 395,576 Euros (in 2001) measured in Euros as of 2010.

2.2 Variables

The measure of relative standing is based on annually determined percentiles, whereas the sample is sorted by firm size and divided into 100 percentile ranks (PCR), each containing an identical number of observations. In each year t, the calculations rely on the entire sample of observable firms with continuous profiles over time to measure relative standing in each year as accurately as possible.[7] Firm size of firm i in period t is measured by sales in Euro as of 2010 ($S_{i,t}$). Note that we abstain from calculation of relative positions by sector to gain a more holistic picture of structural changes in market dynamics. In this regard, note that some innovations, such as e.g. the smartphone, had effects for firms in different sectors. The smartphone combines the characteristics of mobile phones as well as (digital) cameras and music players. For this reason, the ascension of firms might imply sales drops of firms in different sectors.

In the following, we examine changes in positions along the FSD between periods t and

[7]Observations are therefore not balanced over the time horizon. Note that we also include firms that are either observable once or continuously for less than three years to determine the position of firms in each year as precisely as possible. The number of firms in the sample grew moderately from 2,526,288 (in year 2001) to 2,712,195 (in 2011). Classification into different percentiles is thus hardly due to changes in the sample size, but can likely be attributed to firm growth.

$t-3$ (see equation 1).[8]

$$\Delta PCR_{i,t} = PCR_{i,t} - PCR_{i,t-3} \tag{1}$$

The major interest is in the emergence of new firms or entrepreneurship, respectively. Newly founded firms can be identified from year 2002 onward. Under consideration of the three periods time lag, we observe changes in relative positions of this cohort for the first time in year 2005. The final time horizon for our analysis of the effects of entries covers the periods from 2005 to 2011. Consequently, the last cohort of young firms entered the sample in 2008. In total, 2,128,580 new firms founded between 2002 and 2008 are observed (see Table A.1). In total, 56.5% of new firms survived for three consecutive years. These 1.2 million firms define the sample of new firms in the following analysis. The share of surviving entrants was highest in cohort 2005 (58.3%) and lowest in cohort 2002 (54.3%). These numbers are comparable to the ones reported in Schneck and May-Strobl (2015), who consider microenterprises.

The underlying data set is a secondary data source (Vogel and Dittrich, 2008, p. 661) and was originally collected for other research purposes. This imposes limits in the number of potential control variables (see Vogel and Dittrich, 2008, p. 663 for a variable list). We are able to account for investments and intermediate consumption in t ($ICS_{i,t}$, see equation 2). This variable describes the firm-specific need for services as well as the need for inputs to set

[8]The chosen time horizon is not only due to Amazon.com's rapid success, but also inspired by the market for mobile phones and smartphones. In 2007, the world leading producer of mobile phones was Nokia. In that particular year, Apple presented the first mass suitable multifunctional mobile phone (smartphone) – the so-called *IPhone*. Nokia managed to remain market leader until the first quarter of 2011, although its downfall started soon after the presentation of the first smartphone. In the second quarter of 2011, Nokia was outpaced by Samsung as well as Apple. Within one year, Nokia did not just lose the position as market leader, it became an unimportant player with a market share of 7.8% in the first quarter of 2012. Apple and Samsung in turn increased their market shares between Q1-2011 and Q1-2012 from 18.3 to 23.0% and from 11.3 to 28.8%, respectively. This example reveals the powerful market dynamics because four years after the presentation of a disruptive innovation, the former market leader became a small fish in the pond, while the innovative firms ascended. Note that the considered time horizon for transitions in this paper is shorter than the ones considered in Geroski and Toker (1996) or Baldwin (1998) because of four distinctive reasons: 1) This paper addresses all industries and not purely the manufacturing industry, whereas we expect faster transitions in other sectors, especially the service sector. 2) Technological progress, e.g. the digitization, might speed up rise and decay of firms. 3) Increasing pace in financial markets might have speeded up acquisitions and divestiture of establishments or plants, with corresponding consequences for firm turnover. 4) When analyzing the impact of entrepreneurship, one has to keep in mind that more than two in five newly founded microenterprises left the sample within three years after market entry (Schneck and May-Strobl, 2015, p. 237).

up the business, to produce, to stay on the market, and to grow.[9] We apply normalization of $ICS_{i,t}$ by firm size.[10]

$$ICS_{i,t} = \frac{\frac{\text{deductible input tax}_{i,t}}{I(\text{sales tax rate})_t}}{S_{i,t}} = \frac{\text{intermediate consumption}_{i,t}}{S_{i,t}} \tag{2}$$

$$\text{with } I(\text{sales tax rate}) = 0.16 \text{ for } t = [2001; 2006]$$

$$I(\text{sales tax rate}) = 0.19 \text{ for } t = [2007; 2011]$$

The data also contain information on the sector of the firm. The corresponding information is gathered by the first firm-specific record, while classifications are based on the 2-digit *WZ2003* classification.[11] In addition, annual dummy variables are generated. Cohort-related dummy variables however cannot be created for firms, which have been observed before year 2002. We therefore abstain from generating this variable.

2.3 Methodology

The measurement of relative standing and the definition of changes in positions enforces that upward mobility of firms directly leads to downward mobility of others in a balanced panel of firms. Linear regression is therefore not reasonable to study whether smaller firms

[9]Salaries for employees are not covered by this particular variable, but contracts for services (*Werkvertrag*) are included. (Capacity) Investments cannot be separated from intermediate consumption with the underlying data.

[10]Deductible input tax is measured in Euros as of 2010. $ICS_{i,t}$ must not necessarily lie within the unit interval. Especially in newly founded as well as young businesses, intermediate consumption might exceed sales in the early years. However, values larger than one are seldom in our sample (572,712 observations or 4.2% in the final estimation sample). Also note that intermediate consumption might be negative in the data. We replace negative values by zeros in 39,796 cases (0.3% of observations in final estimation sample).

[11]In the raw data, sector information is specified by 5-digit codes. As an example, the 5-digit code 51.47.8 describes "Wholesale of paper and paperboard, stationery, books, newspapers, journals and periodicals", the corresponding 4-digit code 51.47 stands for "Wholesale of other household goods", the 3-digit code 51.4 characterizes "Wholesale of household goods", while the included 2-digit code 51 describes "Wholesale trade and commission trade, except of motor vehicles and motorcycles". Application of the 2-digit codes also maximizes accuracy of the assignment to the *WZ2003* classification because sector-specific categorization in the year 2001 is based on the *WZ1993* classification scheme and is in accordance with the *WZ2008* scheme from 2009 onward. The official conversion keys provided by the German Federal Statistical Office are applied to convert the data to the *WZ2003* scheme. We, furthermore, rely on 2-digit codes for practical reasons: some (young) dynamic firms quickly left their initially narrow fields and expanded into related sectors.

are able to catch up with larger ones. In fact, upward and downward mobility balance each other in a balanced panel.[12] In this article, recentered influence function (RIF) regressions (Firpo et al., 2009) are applied to describe fluctuations in mobility along the FSD. More specifically, we analyze the degree of turnover by the variance of positional changes, whereas high levels of rank mobility are associated with high variance in $\Delta PCR_{i,t}$, while low mobility implies low variance of $\Delta PCR_{i,t}$.

Firpo et al. (2009), define RIF as shown in equation (3):

$$RIF(y_i;\nu) = IF(y_i;\nu) + \nu(F_Y) \tag{3}$$

The influence function of the variance ($IF(y_i;\sigma^2)$) describes the influence of an individual observation (y_i) on the aggregate variance (σ^2, see equation 4):

$$IF(y_i;\sigma^2) = \left(y_i - \int z \cdot dF_y(z)\right)^2 - \sigma^2 \tag{4}$$

In order to obtain the RIF function, we add the observed variance to $IF(y_i;\sigma^2)$ (equation 5).

$$RIF(y_i;\sigma^2) = IF(y_i;\sigma^2) + \sigma^2 \tag{5}$$

Substituting the expected value of ($IF(y_i;\sigma^2)$) results in the original variance (equation (6)).

$$RIF(y_i;\sigma^2) = \left(y_i - \int z \cdot dF_y(z)\right)^2 = (y_i - \mu)^2 \tag{6}$$

The conditional expectation of $RIF(y_i;\sigma^2)$ is modeled linearly with explanatory variables X_i (see equation 7).

$$E[RIF(y_i;\sigma^2) \mid X_i] = X_i\gamma \tag{7}$$

[12] The mean of positional changes is zero and independent of sales mobility (also see Riphahn and Schnitzlein, 2016, p. 17). Note that we would not observe any mobility or variance if no firm would have changed its size rank within the considered three years ($\Delta PCR_{i,t}$=0 $\forall$ i).

RIF-regression coefficients are interpreted as changes in the functional of the distribution of y caused by changes in the distribution of regressors. The estimated RIF regression coefficients $\hat{\gamma}$ hence can be interpreted as partial effects of a change in the distribution of covariate x on the variance of the conditional distribution of y (Riphahn and Schnitzlein, 2016, p. 17). In case of binary regressors, such as the dummy variable for young firms (firm entry observed in t-3 = 1), the estimated coefficient measures the partial effect of a small increase in the population of young firms on the variance of $\Delta PCR_{i,t}$.[13]

3 Results

3.1 Details about firm mobility

We start with a description of mobility patterns by initial relative position (see Figure 1). Among the smallest 10% of firms in $t-3$, 4.25% have forfeit their position and decreased by at least five PCR, 47.21% were immobile or moved to adjacent positions, while 48.53% were upwardly mobile by a minimum of five PCR. Among the largest 10% of firms, firms are rather immobile and likely to stay in their PCR. The Figure also shows that firms in the small business sector are considerably mobile. Up to the seventh decile, more than half of all firms move up- or downward by at least five PCR.

Insert Figure 1 about here

Upward mobility by at least five PCR is negatively correlated with relative standing (see Figure 1). This implies that higher initial ranks are associated with a lower likelihood of ascending by at least five PCR. This can be explained by the substantial skewness of the FSD, which implies that the absolute difference between the first and second firm is much larger than the difference between the second and third firm. In the underlying data, firms

[13] Estimation of the coefficients is conducted with STATA version 12 (StataCorp, 2011) and the corresponding ado-file *rifreg*. Available from Nicole Fortin's homepage (`http://faculty.arts.ubc.ca/nfortin/datahead.html`, downloaded on June 13, 2016).

with sales of at least 22,796 Euro, 28,232 Euro, 1,194,000 Euro, and 2,706,561 Euro belonged to the 5^{th}, 10^{th}, 90^{th}, and 95^{th} percentile in year 2010. Therefore, an increase of about 5,500 Euro is needed to ascend from the 5^{th} to the 10^{th} percentile, while a firm in the 90^{th} percentile needs to rise sales by more than 1.5 million Euro to improve relative standing by five PCR.[14] Downward mobility, in turn, is characterized by an inverted U-shaped relationship. Among the smallest firms, the lower degree of downward mobility might be due to market exit of very small firms, which is not explicitly referred to here. In other words, very small businesses might be likely to exit after sales decreases rather than staying in the market. The lower degree of downward mobility among the largest firms can be attributed to the skewness of the FSD: Firms in very top positions can experience more substantial sales drops than smaller firms before they will lose their initial relative position (also see Baldwin, 1998, p. 92). The basic patterns are similar for young firms (see the right panel of Figure 1). The levels, however, differ distinctively. Young firms are especially likely to ascend, which is in line with Schumpeterian growth processes, where young firms challenge the established ones. Moreover, the likelihood of downward mobility of large entrants is higher than among incumbents. Finally, the probability to remain in the same PCR and mobility to adjacent positions is lower for young firms compared to established ones. In sum, all this clearly indicate higher turnover among young firms than among incumbents.

When compared to the results presented in Baldwin (1998), who showed that most firms move to adjacent positions, our results differ substantially. This might, on the one hand, be due to the fact that the reference-study is restricted to the manufacturing sector, while almost all sectors are considered here. On the other hand, we abstain from calculation of the relative standing by narrowly defined branches. Therefore, no changes would be indicated in Baldwin (1998) if all firms within an industry decline by the same share. Here, in turn, firms in developing markets might outpace the firms in plummeting sectors. For this reason, our methodology is also sensitive to technological or other forms of structural change.

[14] Obviously, the smallest (largest) 4% of firms are not able to descend (ascend) by a minimum of five PCR.

Do downwardly mobile firms suffer sales losses or are ascending firms just growing faster and therefore catch up from below? In Table 1, we show that upward mobility is associated with sales growth. Ascensions by at least five PCR are related to average sales growth of 263,991.80 Euro or 183.58%. Downwardly mobile firms in turn suffer plummeting sales by, on average, 279,000.00 Euro or 44.39%, respectively. Most of these sales losses are expected to be obtained in incumbent firms because of their higher likelihood of being downwardly mobile (see Figure 1). Despite average sales growth, most firms, which have been immobile or changed to adjacent positions, suffered sales decreases (see the median in Table 1). Young firms in general exhibit higher growth rates, which fits into the literature. Our results additionally suggests that the higher growth rates also translate into mobility along the FSD.[15]

Insert Table 1 about here

Entrepreneurship research differs between transformational as well as subsistence entrepreneurship (Schoar, 2010): high growth and innovative firms are of transformational nature, while subsistence entrepreneurs start small and mainly provide jobs for themselves. For this reason, we also examine the likelihood of firms directly ascending into the top decile within four years (see Table 2).[16] Upward mobility into the highest decile is a rare event - especially among the smallest firms. In each of the seven smallest deciles, less than one in hundred firms managed to ascend into the top decile. Even among the upwardly mobile firms, ascensions into the 10^{th} decile are unusual. It is also evident that transformational entrepreneurs are not necessarily new firms. Our results are thus in line with previous literature on the relationship between fast growing firms and firm age (see Henrekson and Johansson, 2010).

Insert Table 2 about here

[15]The average sales growth in Euros of firms changing position by a maximum of four PCR exceeds the one of the upwardly mobile new firms. This is due to sales growth of firms at the very top of the FSD. Although these firms grow significantly in absolute values, they are unable to ascend.

[16]Note that firms belong to the top decile if sales exceed 1,181,415 (2005), 1,217,832 (2006), 1,197,383 (2007), 1,197,795 (2008), 1,154,764 (2009), 1,194,000 (2010), and 1,244,750 (2011) Euro.

In sum, the presented descriptive statistics on mobility reveal a substantial degree of mobility along the FSD. The results suggest that mobility is especially for young firms not necessarily restricted to adjacent positions. Transformational entrepreneurship, however, is seldom (also see Schoar, 2010). Moreover, high growth firms are not necessarily young (also see Henrekson and Johansson, 2010). Finally, we show that downward mobility is associated with substantial losses in sales, while upward mobility is related to considerable sales growth.

3.2 The anatomy of turnover

Before turning the focus on multivariate models, the variance of $\Delta PCR_{i,t}$ is briefly described (see Figure 2). The upper panel describes the variation of positional changes of all firms within four years. There is evidence for a negative trend in the variance of positional changes, implying that rank persistence increased over time. In fact, rank mobility dropped sharply in the aftermath of the financial crisis.

Insert Figure 2 about here

The lower panel of Figure 2 refers only to the newly founded firms in period $t-3$. The variance is about twice as large as in the complete sample, which implies that new firms are a major source of turnover. Cohorts 2002 to 2004 exhibit significantly higher changes in PCR than the firms born later. Turnover of new firms dropped from 2008, the beginning of the financial crisis, onward. The variance of $\Delta PCR_{i,t}$ is lowest in year 2011, which implies that firms of the cohort 2008 exhibit the lowest degree of rank mobility. This cohort of young firms entered the market during times of economic crisis, which suggests to turn the focus on economic conditions at the time of start-up (see Sedlacek and Sterk, 2017).

In the following, we shift the focus from descriptive statistics to the multivariate models. The RIF regression model presented in equation (8) is estimated to explain the impact of entrepreneurship on turnover. The coefficients γ need to be estimated, whereas γ_0 is the constant. To measure the impact of the emergence of new firms, the specification contains a dummy variable for new firms in $t-3$. Differences by investments and the use of intermediate goods are controlled for by $ICS_{i,t-3}$. As technologies advance differently by sector, we also account for sector dummy variables. These dummy variables are also included to account for effects of the rise and decay of firms due to industry-specific life cycles (Klepper, 1996, 1997). Economic conditions are expected to shape the fortune of firms differently by size and year. We hence account for γ^s, γ^t, and γ^d, whereas γ^s describes the set of coefficients related to sector dummy variables, γ^t represents coefficients of annual dummy variables. γ^d stands for coefficients to be estimated for dummy variables describing the relative position (decile of firm i in the base period).

$$E[RIF(\Delta PCR_{i,t};\sigma^2) \mid X_{i,t}] = \gamma_0 + \gamma_1 new\ firm_{i,t-3} + \gamma_2 ICS_{i,t-3} + \gamma^d + \gamma^s + \gamma^t \qquad (8)$$

The final estimation sample consists of a total of 13,582,106 observations, 1,133,109 referring to new firms, which were observable for at least four consecutive years (see Table A.2).[17] As we do not consider a balanced panel of firms, the average firm manages to increase the position slightly. The average firm invests and consumes more than half of all sales ($ICS_{i,t-3}$). Firms in lower deciles in $t-3$ are underrepresented in the final estimation sample, which is due to the fact that firm exit is more likely among smaller firms. This is in line with an up-or-out dynamic among small firms (Haltiwanger et al., 2013).

The estimates suggest that the emergence of new firms in $t-3$ causes significant rank mobility (see Figure 3 and Table A.3). An increase in the number of new firms in the base period therefore increases turnover among the incumbents. More precisely, growth in the proportion of entrepreneurs from 8.34% to 9.34% increases the variance of $\Delta PCR_{i,t}$ by 3.35 points. If we take into account that the variance of $\Delta PCR_{i,t}$ equals 190, the relative effect size amounts to 1.76% ($100\% * 3.35/190$).

Insert Figure 3 about here

[17] The final estimation sample is smaller than the sample considered above because of missing values in control variables.

Comparison of the coefficient of $New\ firm_{i,t-3}$ over time shows that the impact of entrepreneurship was largest in the year 2006 (see Figure 3). This implies that new firms founded in the year 2003 caused the highest degree of rank changes. As most new firms are upwardly mobile, we suggest that the most challenging period for incumbents was between the years 2003 and 2006. The least challenging was the year 2008. New firms of the cohort 2005 therefore had the lowest impact on turnover. The relative effect was equal to 1.67%. In the years after the eruption at the financial markets, turnover induced by entrepreneurs was comparable to the periods 2005 and 2007. The effect of newly founded firms in the year 2008, the starting year of the financial crisis, was not different than the ones estimated for the cohorts 2002, 2004, 2006, 2007. The relative effects of entrepreneurship, however, increased in the aftermath of the crisis because of the decline in variance (see Figure 2). The relative effect of entrepreneurship is equal to 1.89% in year 2011 and increased by about 13.2% when compared to year 2008.

As the FSD is very skewed, we expect few changes in rank at the upper end of the FSD. In lower ranks, in turn, downward mobility seems unlikely because of market exits. We therefore conducted a robustness check and dropped the smallest as well as the largest 10% of firms in $t-3$. The results are in line with a significant degree of rank mobility induced by entrepreneurs (see Figure 4 and Table A.4). We additionally estimated the RIF regressions for each decile separately. The effect of new firms can be interpreted straightforwardly: The presented 95% confidence intervals reveal the impact of the emergence of a new firm in the corresponding decile on turnover. Firms in the 2^{nd}, 3^{rd}, and 4^{th} decile are the most affected by an increase in new firms. In total, our results indicate that rank mobility is more pronounced among firms smaller than the median. The estimates presented in Figure 4 additionally reveal a statistically significant impact of the emergence of new firms on turnover in the highest deciles. These coefficients, however, are substantially smaller than the ones up to the 5^{th} decile. The point estimates of coefficients for $New\ firm_{i,t-3}$ in the 9^{th} and 10^{th} decile are significantly smaller and amount to less than one third and one quarter of the point estimate of $New\ firm_{i,t-3}$ in the 1^{st} decile. This strikingly illustrates the significantly lower degree of turnover in the top deciles when compared to the small business sector. Also the relative effects decrease substantially. When compared to the one obtained for the first decile (0.82%), the relative effects in deciles 9 (0.63%) and 10 (0.72%) decrease by 23.5% and 12.3% respectively. This result is due to the lower degree of variation of mobility, which itself might be explained by the skewness of the FSD.

Insert Figure 4 about here

In sum, the regressions results presented in Figures 3 and 4 corroborate that young firms cause a significant degree of turnover. New firm emergence in the top deciles, however, leads to lower rank mobility, which might at least partly be due to the skewness of the FSD. All specifications show that turnover is higher in lower deciles, which is indicative that rank persistence is lowest in the small business sector (see the estimated coefficients of γ^d presented in Table A.3 in the Appendix). The multivariate results therefore corroborate that business dynamics are largest in this particular sector (e.g., Davis et al., 1996).

3.3 Turnover in the long-term

In the next step, we establish empirical evidence on the long-term relationship between entrepreneurship and rank mobility. For this reason, we consider changes in relative position within the decade between 2002 and 2011 (see equation 9).

$$\Delta PCR_{i,2011} = PCR_{i,2011} - PCR_{i,2002} \tag{9}$$

The propensity to remain in the same percentile rank or move to adjacent positions is considerably smaller in the long-run when compared to the four year time horizon (compare Figures 1 and 5). This also holds for new firms in 2002. We thus find evidence in favor of a higher degree of rank mobility in the long-term. In the long-run, young firms however are less likely to ascend by at least five PCR when compared to the short-run. Downward mobility in turn is higher among the larger new firms from the 6^{th} decile onward.

Insert Figure 5 about here

Transformational entrepreneurship is more common within a decade, but still a rare event (see Table 3). Up to the 6^{th} decile, about one in 100 firms experienced a growth boost and ascended into the top decile. However, more than one in six firms in the 9^{th} decile in 2002 managed to become part of the largest 10% of firms in 2011. This is a remarkable increase of about 50% when compared to the four year time horizon (see Table 2). This suggests that the largest 10% of firms are not free from pressure from below, but are persistently challenged by smaller surviving firms. Also the descriptive statistics of the estimation sample reveal a higher degree of mobility in the long-run when compared to the short-run (see the presented standard deviation of $\Delta PCR_{i,2011}$ in Table A.5 and $\Delta PCR_{i,t}$ in Table A.2).

Insert Table 3 about here

We also estimate RIF regressions, whereas the specification is presented in equation (10). The dummy variables indicating the decile in the base period (γ^d) refer to the position in year 2002. γ^s stands for coefficients to be estimated for dummy variables describing the sector.

$$E[RIF(\Delta PCR_{i,2011};\sigma^2) \mid X_{i,t}] = \gamma_0 + \gamma_1 new\ firm_{i,t-9} + \gamma_2 ICS_{i,t-9} + \gamma^d + \gamma^s \tag{10}$$

The RIF regression results suggest that an increase in new firms significantly fosters turnover within a decade (see Figure 6 and Table A.6). An increase in the share of new firms from 7.51% to 8.51% increases the variance of $\Delta PCR_{i,2011}$ by 3.92 points. As the the variance of $\Delta PCR_{i,2011}$ is equal to 318, the relative effect amounts to 1.23% ($100\% * 3.92/318$). The relative effect is therefore smaller in the long- than in the short-run. A look at the 95% confidence intervals of the coefficients of new entrants by decile reveals that up to the sixth decile, the coefficients of $New\ firm_{i,t-9}$ are comparable in absolute size to the estimated ones for $New\ firm_{i,t-3}$ shown in Figure 4. Within the mentioned deciles, entrepreneurship therefore causes similar rank mobility in the short- as well as in the long-run. An increase of new firms firms in deciles 7, 8, 9, or 10, however, leads to significantly lower rank mobility in the long- than in the short-run. In the two highest deciles, new firms are not capable of inducing a statistically significant degree of turnover any more. This might be indicative that the formation of comparatively large businesses, the emergence of (large) spin-offs, or M&A's do not necessarily improve turnover at the very top of the distribution.

Insert Figure 6 about here

The results on turnover in the long-run suggest that some ascensions of newly founded firms might be transitory rather than permanent. Such transitory mobility seems to be especially likely among relatively large new firms. Especially large incumbents can be expected to respond to the threat of young aspiring firms with a variety of measures, such as acquisition, advertising campaigns, or investments into technology as well as product quality to maintain the relatively high position. Some of the ascending larger firms might therefore not continue on their own fate (Kahle and Stulz, 2017). In addition, the insignificant coefficients of the emergence of new firms in the top deciles indicate that large incumbents respond to the emergence of large competitors in a different way than to the threat of small entrants.

The partial effects of $Deciles_{i,t-9}$ corroborate that that mobility decreases with increasing size (see Table A.6). Our results are therefore in line with results on lower mobility among the largest firms. This paper additionally contributes to the literature by showing that turnover at the very top is unlikely to be affected by the emergence of new large firms in the long-run.

3.4 Turnover induced by new firms and local skewness of the FSD

It is well known that the FSD is highly skewed, hence the absolute difference between the first and second firms is larger than the difference between the second and third firms, and so on. We therefore augment RIF regression equations (8) and (10) by a firm-specific control variable, which measures the skewness of sales of all firms in adjacent percentiles $pc - 1$, pc, and $pc + 1$ in the base period. As an example, for a firm in percentile 25 of year 2006, the variable $Skew_{i,t}$ is determined by the skewness of sales of all firms in percentiles 24, 25, and 26 in this particular year. For percentiles 1 and 100, respectively, $Skew_{i,t}$ is based on the sample of all firms in percentiles 1 and 2 as well as 99 and 100 at time t. This variable then describes the local skewness of the FSD for each firm in each year. The higher $Skew_{i,t}$, the higher the difference in absolute sales between firms, which is expected to make rank mobility less likely.

The results are fairly robust to this form of specification (see Table 4). Neither the coefficients nor the standard errors of the coefficients of interest changed dramatically. In fact, changes in estimated coefficients of $New\ firm_{i,t-3}$ are in fact negligible and sum up to a maximum of 0.825 points after inclusion of $Skew_{i,t-3}$ into the model. Our robustness checks of mobility in the long-term provides robust results on the effect of entrepreneurship as well.

Insert Table 4 about here

The effect of the local skewness in the base period is significantly negative in the full samples as well as in our investigations by years. This implies that lower levels of skewness are associated with a higher degree of firm mobility. This contributes an additional explanation to the results shown above: Rank friction is highest in the small business sector, where the skewness is lower than among the larger firms. With regard to the estimates by deciles, the evidence is mixed. The effects of $Skew_{i,t-3}$ and $Skew_{i,t-9}$ are significantly negative only from decile 6 onwards. Note that also the effects of the coefficients for the dummy variables of $Decile_{i,t-3}$ as well as $Decile_{i,t-9}$ remain fairly robust. Therefore, even after accounting for the skewness of the FSD, our evidence clearly suggests that rank friction is highest in the small business sector.

4 Summary and Reflection

The central finding is that entrepreneurship induces upward and downward mobility, which is in line with Schumpeterian dynamics (Kirchhoff and Phillips, 1988; Aghion and Howitt, 1992; Koster et al., 2012; Aghion et al., 2015). Entry of new firms triggers competition and challenges established hierarchies especially in the small business sector. Our results are robust to the inclusion of a control variable, which measures the local skewness of the FSD. We also show that turnover mainly occurs at the bottom of the FSD. In addition, the results are in line with a certain degree of persistence in leading positions (also see Geroski and Toker, 1996; Baldwin, 1998; Sutton, 2007). Transitional entrepreneurship is found to be seldom, but nevertheless, our results suggest that firms in the top decile are continuously challenged by firms from lower deciles.

According to economic considerations, resources are allocated to their highest-valued use and more productive firms, respectively (Haltiwanger, 2012, pp. 24f). This implies that resources are shifted from the less productive businesses to the more productive ones. Allocative efficiency therefore might constitute upward mobility of more productive firms, while the less productive ones decline or leave the market. We show that especially young firms seem to cause rank mobility. The empirical literature indeed provides evidence that young businesses exhibit higher physical productivity (the quantity of physical units of output produced per unit of input) compared to mature ones (Foster et al., 2008). Efficient allocation of resources, the emergence of firms, and rank frictions hence are suggested to be correlated. As a consequence, missing generations of new firms might have persistent effects on economic activity (Siemer, 2014; Gourio et al., 2016) and turnover.

Newspapers and Magazines are filled with articles about entrepreneurs of fast growing firms. Among the 70% of smallest firms, however, only few managed to catch up with the largest 10% in the first decade of the 21^{st} century. This is indicative that *transformational* entrepreneurship is dominated by *subsistence* entrepreneurship in Germany. While transformational entrepreneurs introduce major product or process innovations leading to high firm growth, subsistence entrepreneurs mainly provide jobs for themselves or might be necessity business founders (Schoar, 2010). Despite the media coverage of fast growing firms and the political believe that entrepreneurs want to grow their firms (Shane, 2009), we observe a rather disillusioning picture of growth potentials in the first decade of the millenium, which corroborates the findings in the literature on growth aspirations of young firms (e.g. Hurst and Pugsley, 2011). The low degree of transformational entrepreneurship might partly be due to the data structure: As the firm identifier changes in case of M&A's, we observe exits, but in fact some of the young firms survived because "small firms [...] often choose the path of being acquired rather than succeeding in public markets" (Kahle and Stulz, 2017, p. 86). Therefore, some small firms prosper within corporate structures rather than grow by themselves. Further research with other data sources, which allow for the distinction of failure, M&A, or other forms of firm exit is therefore encouraged.

Why should we care about the presented evidence and what are the main implications? The evidence presented here clearly draws a picture of a healthy economy, in which firms have the opportunity to climb up the ladder. In addition, the competition induced by young firms also imposes pressure on incumbents to innovate, to improve productivity as well as goods, and to invest in the future. The persistent process of entry rejuvenates not only the stock of firms, but causes competitive pressure and allocative efficiency. We also hypothesize that young firms apply new technologies and therefore help to approach structural changes smoothly over time. Finally, upward mobility, which is especially likely among young firms, stimulates growth, job creation, and innovation spirit, which finally improves economic prosperity in the long-run.

5 Conclusion

Numerous papers stress the importance of entrepreneurship by describing positive effects on society, economic growth, and innovation. In this line, Boeri and Cramer (1992) suggested that entry of establishments drives the trend in employment growth, while employment fluctuations are mainly due to expansion and contraction of existing plants. However, despite its positive effects, entrepreneurship also entails destructive elements. In this line, Haltiwanger (2012) showed that young firms play an exposed role in job reallocation, which is defined by job creation as well as job disappearance. Our study fits into this literature by showing that turnover in sales are substantially affected by new firm entry. Specifically, the analysis of rank mobility reveals that new firms are able to catch up with the established ones, whereas the outpaced (mainly incumbent) firms suffer severe losses in sales. The results, moreover, reveal that turnover is mainly exerted among small firms, which contributes to explaining why the job quality is lower in the small business sector when compared to large firms (Wagner, 1997). Our results on rank friction are robust to accounting for the skewness of the FSD. As upward mobility is comparatively unlikely at the very top of the FSD (also see Geroski and Toker, 1996; Baldwin, 1998; Sutton, 2007), it is suggested that the propensity to prosper is comparatively low in the shadow of big trees. Nevertheless, the occurrence of transitional entrepreneurship indicates that the large trees sometimes make place for the smaller ones.

The major implication of our analysis is that Schumpeterian growth processes are evident. Young firms ascend, while others descend or cease to exist, which causes simultaneous occurrence of value creation as well as value destruction. The observed upward- as well as downward mobility, which is shown to be associated with substantial sales increases and losses, might help to understand why economists frequently find no systematic positive or negative macroeconomic effects of an increase of self-employed individuals (Blanchflower, 2004). In addition, the results reveal a higher degree of rank friction in the small business sector, which is in line with the results presented in Davis et al. (1996): Although small firms create additional net value (or jobs), destruction is also higher among small businesses. These findings might encourage researchers, who are studying the economic consequences of entrepreneurship to turn the focus on 'everyday entrepreneurship' (Welter et al., 2017) rather than concentrating on a narrow set of highly innovative firms. In addition, we should be careful when singing praises about growth of new firms, about the rejuvenation of the economy, and about innovation. Our results clearly suggest that not everyone profits from the emergence of new firms. In this line, the destructive part of entrepreneurship (see, e.g, Baumol, 1990; Komlos, 2017) should -whenever possible- be clearly addressed in research about economic growth and in economic counseling.

The data structure imposes limitations. We cannot straightforwardly distinguish between exits due to M&A's, reallocation into another federal state, or business failure. For this reason, we concentrated on surviving firms without reference to failed firms. Firm contraction, however, should ultimately be related to business failure in future studies. Furthermore, research on the effects of M&A processes as well as divestitures is encouraged. M&A's might contribute significantly to firm size mobility, but not necessarily shape the firm-size distribution (Cefis et al., 2009) or concentration levels (Ijiri and Simon, 1971). Downward mobility, in turn, is potentially affected by divestitures. We therefore encourage utilization of data, which help to concisely distinguish between organic and other forms of growth in future studies. A further promising area of future research on firm size mobility is the analysis of determinants like the management structure (manager- vs. owner-led companies). Managers might not necessarily maximize profits, but also other determinants, such as size (Baumol, 1962; Marris, 1964). In other words, at least for some managers the maximization of personal status by leading the largest firm might be more important than profit maximization.

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Tables included in the text

Table 1: Change in firms size

		$S_{i,t} - S_{i,t-3}$		$\left(\frac{S_{i,t}}{S_{i,t-3}} - 1\right) * 100\%$	
positional change	N	mean	median	mean	median
		All firms			
$\Delta PCR_{i,t} \leq -5$	3,186,320	-279,000.00	-54,126.82	-44.39%	-39.38%
$\Delta PCR_{i,t} \in [-4; 4]$	7,514,983	173,949.90	-3,152.22	0.02%	-3.70%
$\Delta PCR_{i,t} \geq 5$	3,501,093	263,991.80	47,773.23	183.58%	53.39%
Total	14,202,396	94,526.82	-2,446.41	35.31%	-3.16%
		New firms in $t-3$			
$\Delta PCR_{i,t} \leq -5$	160,920	-222,916.40	-35,919.34	-45.84%	-41.32%
$\Delta PCR_{i,t} \in [-4; 4]$	309,482	1,134,996.00	-836.01	7.44%	-1.84%
$\Delta PCR_{i,t} \geq 5$	733,033	364,330.40	59,408.66	363.19%	105.89%
Total	1,203,435	483,993.90	22,704.18	217.01%	40.73%

Considered Time horizon: 2005-2011.
Own calculations.

Table 2: Transformational entrepreneurship

	Number of firms				Shares		
Decile_{t-3}	observed in t	$\text{decile}_t > \text{decile}_{t-3}$	decile_t^{all}=10	decile_t^{young}=10	$\frac{decile_t^{all}=10}{\text{all observable firms}}$	$\frac{decile_t^{all}=10}{\text{decile}_t > \text{decile}_{t-3}}$	$\frac{decile_t^{young}=10}{decile_t^{all}=10}$
1	873,453	433,085	2,818	1,539	0.3%	0.7%	54.6%
2	1,163,987	475,537	3,164	1,488	0.3%	0.7%	47.0%
3	1,305,907	480,049	3,803	1,579	0.3%	0.8%	41.5%
4	1,400,458	472,795	4,767	1,962	0.3%	1.0%	41.2%
5	1,471,148	453,951	5,699	2,326	0.4%	1.3%	40.8%
6	1,526,358	416,120	7,540	3,020	0.5%	1.8%	40.1%
7	1,568,941	373,761	12,257	4,706	0.8%	3.3%	38.4%
8	1,606,064	305,934	27,067	8,509	1.7%	8.8%	31.4%
9	1,632,688	198,625	198,625	19,662	12.2%	100.0%	9.9%

Considered time horizon: 2005-2011.

Own calculations.

Table 3: Transformational entrepreneurship in the long-run

	Number of firms				Shares		
Decile_{2002}	observed in 2011	$\text{decile}_{2011} > \text{decile}_{2002}$	$\text{decile}^{all}_{2011}$=10	$\text{decile}^{young}_{2011}$=10	$\frac{decile^{all}_{2011}=10}{\text{all observable firms}}$	$\frac{decile^{all}_{2011}=10}{\text{decile}_{2011} > \text{decile}_{2002}}$	$\frac{decile^{young}_{2011}=10}{decile^{all}_{2011}=10}$
1	57,404	35,665	572	297	1.0%	1.6%	51.9%
2	88,000	45,737	706	290	0.8%	1.5%	41.1%
3	107,018	49,939	907	322	0.8%	1.8%	35.5%
4	121,869	51,641	1,083	365	0.9%	2.1%	33.7%
5	133,195	51,603	1,412	448	1.1%	2.7%	31.7%
6	143,889	49,649	1,718	507	1.2%	3.5%	29.5%
7	153,141	47,394	2,943	754	1.9%	6.2%	25.6%
8	161,869	41,569	6,431	1,133	4.0%	15.5%	17.6%
9	168,929	30,479	30,479	2,307	18.0%	100.0%	7.6%

Considered time periods: 2011 and 2002.
Own calculations.

Table 4: RIF regression results: robustness checks with regard to the skewness of the FSD

	(1) standard specification (see equations (8) and (10))	(2) Set of control variables augmented by $Skew_{i,t-h}$
Estimates of coefficient for $New\ firm_{i,t-3}$ (short-term) by sample		
Full sample	335.308735***	335.241775***
	(0.581772)	(0.581713)
Year 2005	331.701868***	331.665663***
	(1.572120)	(1.571954)
Year 2006	351.867456***	351.789013***
	(1.575626)	(1.575459)
Year 2007	337.350184***	337.293705***
	(1.556388)	(1.556227)
Year 2008	319.005171***	318.940667***
	(1.481478)	(1.481351)
Year 2009	330.034345***	329.943394***
	(1.522801)	(1.522645)
Year 2010	332.484182***	332.410401***
	(1.537353)	(1.537189)
Year 2011	337.268309***	337.196016***
	(1.526811)	(1.526657)
$Decile1_{i,t-3}$	256.467302***	256.092719***
	(1.726000)	(1.726631)
$Decile2_{i,t-3}$	321.725613***	321.659563***
	(1.352769)	(1.353018)
$Decile3_{i,t-3}$	325.926021***	325.928328***
	(1.200979)	(1.201087)
$Decile4_{i,t-3}$	309.221205***	309.204751***
	(1.131193)	(1.131233)
$Decile5_{i,t-3}$	267.315322***	267.300659***
	(1.165665)	(1.165695)
$Decile6_{i,t-3}$	222.893174***	222.762107***
	(1.362312)	(1.362415)
$Decile7_{i,t-3}$	169.640968***	169.512517***
	(1.680472)	(1.680493)
$Decile8_{i,t-3}$	124.306254***	124.108891***
	(2.132605)	(2.132612)
$Decile9_{i,t-3}$	79.815807***	79.416472***
	(2.617902)	(2.617919)
$Decile10_{i,t-3}$	65.431494***	64.606191***
	(2.836981)	(2.835785)
Estimates of coefficient for $New\ firm_{i,t-9}$ (long-run) by sample		
2002-2011 (full sample)	391.781872***	391.660725***
	(2.707102)	(2.706482)

$Decile1_{i,t-9}$	250.929619***	250.992573***
	(7.802481)	(7.804466)
$Decile2_{i,t-9}$	357.028569***	357.091413***
	(6.082636)	(6.083032)
$Decile3_{i,t-9}$	345.137417***	345.109777***
	(5.457646)	(5.457607)
$Decile4_{i,t-9}$	303.991953***	303.978386***
	(4.979069)	(4.979112)
$Decile5_{i,t-9}$	264.748919***	264.743638***
	(4.982676)	(4.982683)
$Decile6_{i,t-9}$	209.802072***	209.691327***
	(5.422583)	(5.422702)
$Decile7_{i,t-9}$	126.400774***	126.215261***
	(6.414375)	(6.414443)
$Decile8_{i,t-9}$	62.234135***	61.997523***
	(8.169817)	(8.169749)
$Decile9_{i,t-9}$	10.115207	9.746430
	(10.424898)	(10.425800)
$Decile10_{i,t-9}$	11.583498	11.043570
	(11.687533)	(11.678014)

Set of control variables augmented by $Skew_{i,t-3}$ or $Skew_{i,t-9}$, respectively.
Coefficients and standard errors (in parentheses).
+ p<.10, * p<.05, ** p<.01, *** p<.001.
Own calculations.

Figures included in the text

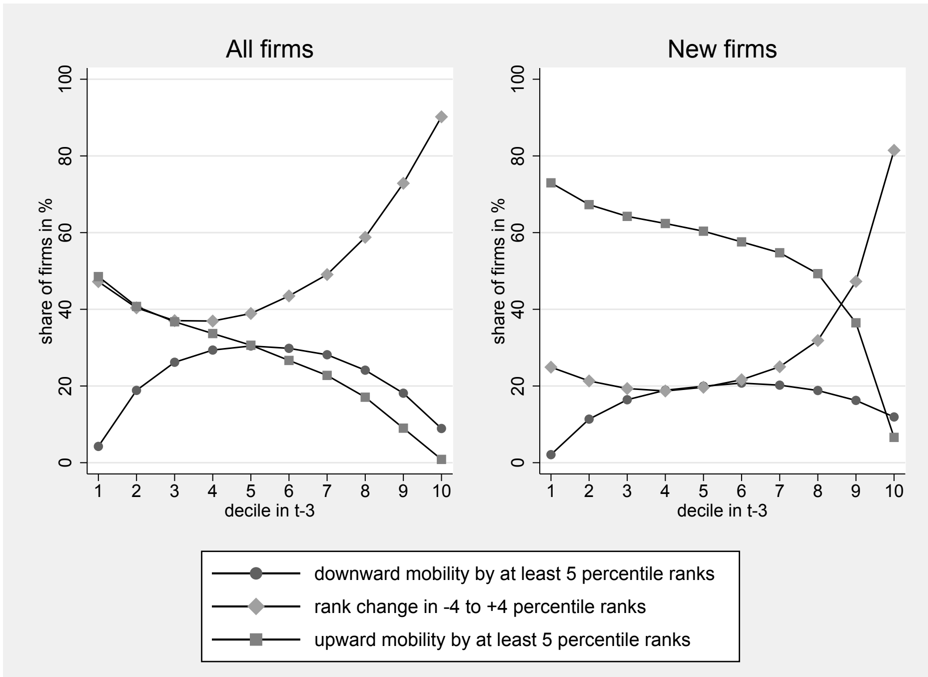

Figure 1: Firm size mobility ($\Delta PCR_{i,t}$)

All firms, which have been observed over three consecutive periods are considered.
New firms have entered the sample in $t-3$.
Considered time horizon: 2005-2011.
Number of observations: 14,202,396 (all) and 1,203,435 (new).
Own calculations.

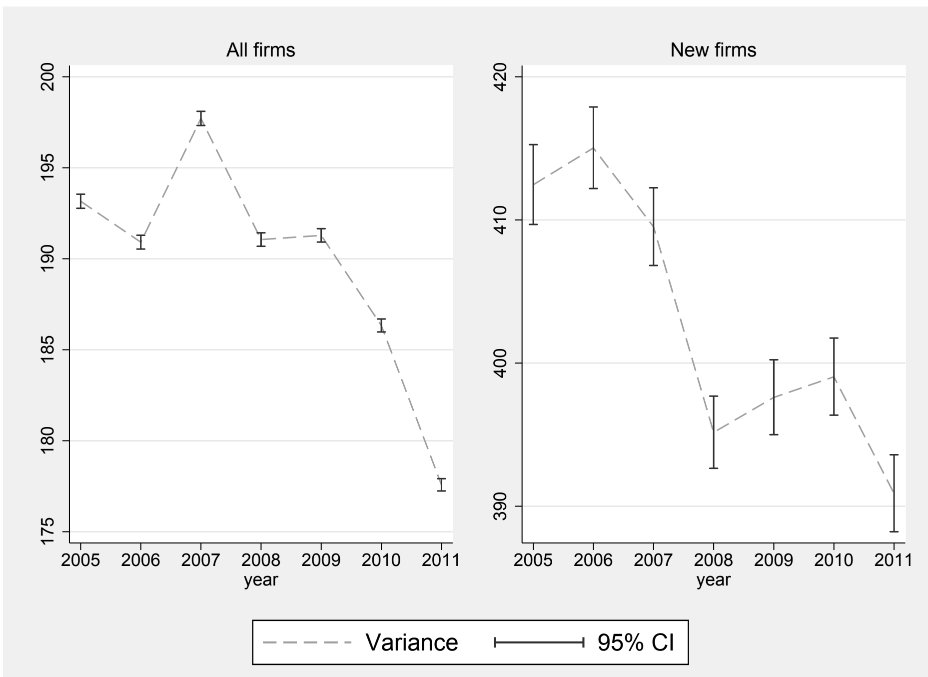

Figure 2: 95% confidence intervals of variance of $\Delta PCR_{i,t}$ over time

We consider all firms, which have been observed over three consecutive periods.
Number of observations: 14,202,396 and 1,203,435 (new).
Own calculations.

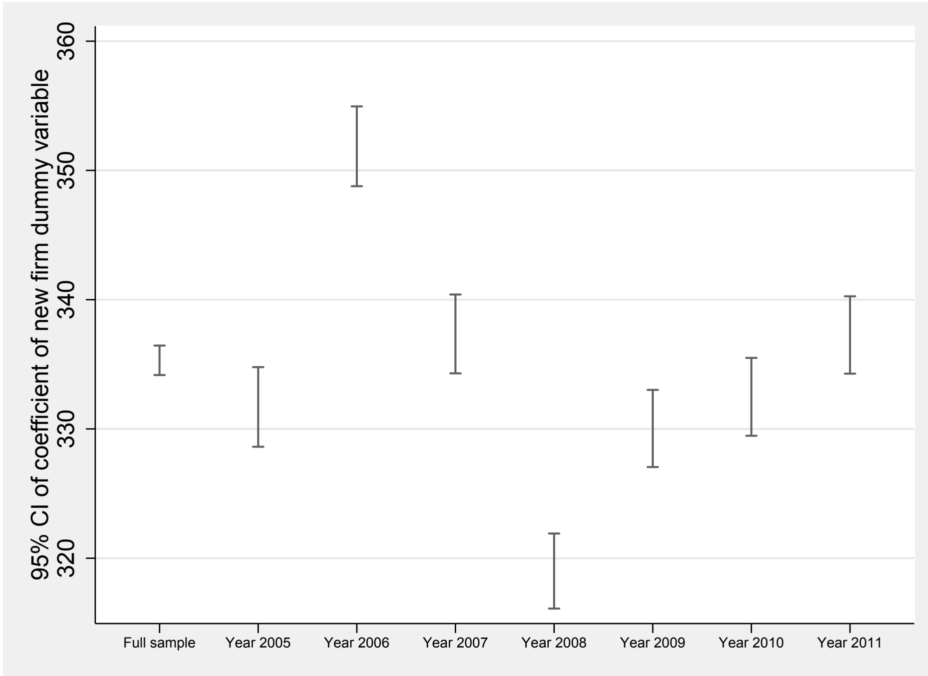

Figure 3: 95% confidence interval of estimated coefficient of $New\ firm_{i,t-3}$

See Table A.3 for further details.
Own calculations.

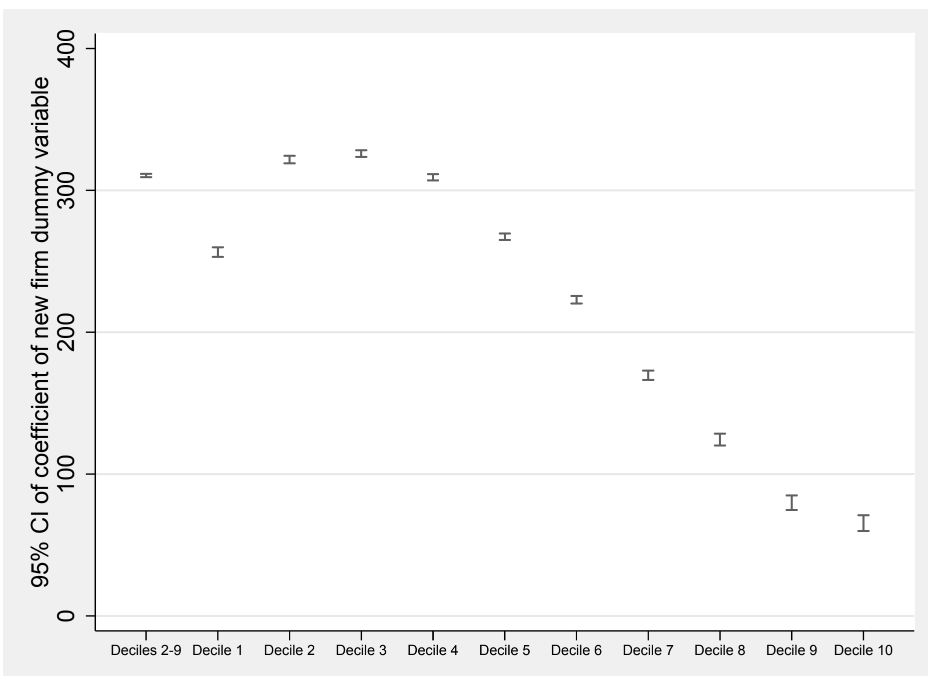

Figure 4: 95% confidence interval of estimated coefficient of $New\ firm_{i,t-3}$ by decile

Considered time horizon: 2005-2011.
See Table A.4 for further details.
Own calculations.

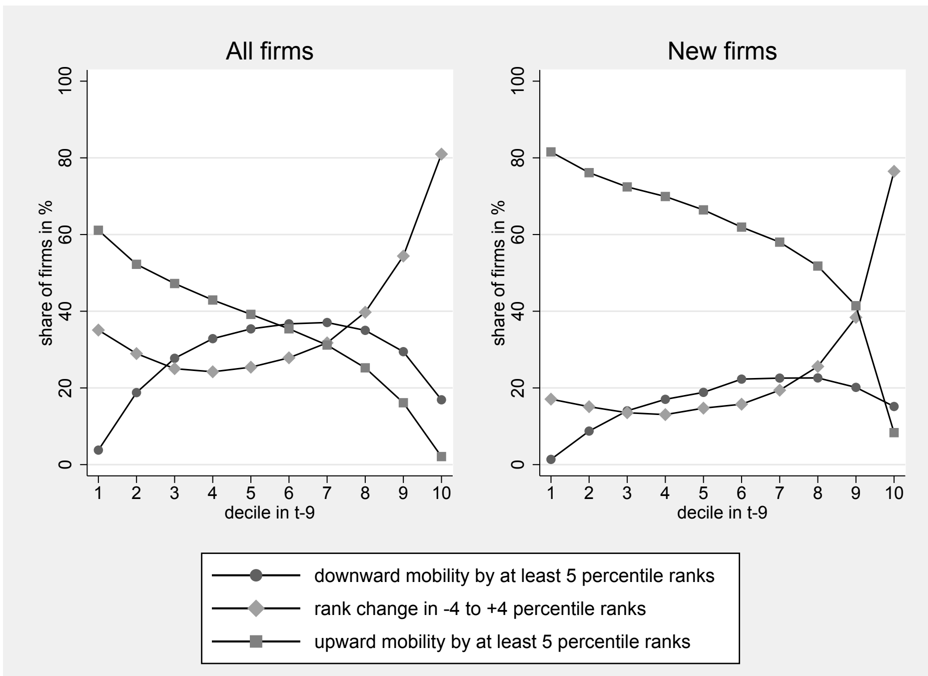

Figure 5: Firm size mobility in the long-run ($\Delta PCR_{i,2011}$)

All firms, which have been observed over nine consecutive periods are considered.
New firms have entered the sample in 2002 ($t-9$).
Number of observations: 1,308,789 (all) and 99,142 (new).
Own calculations.

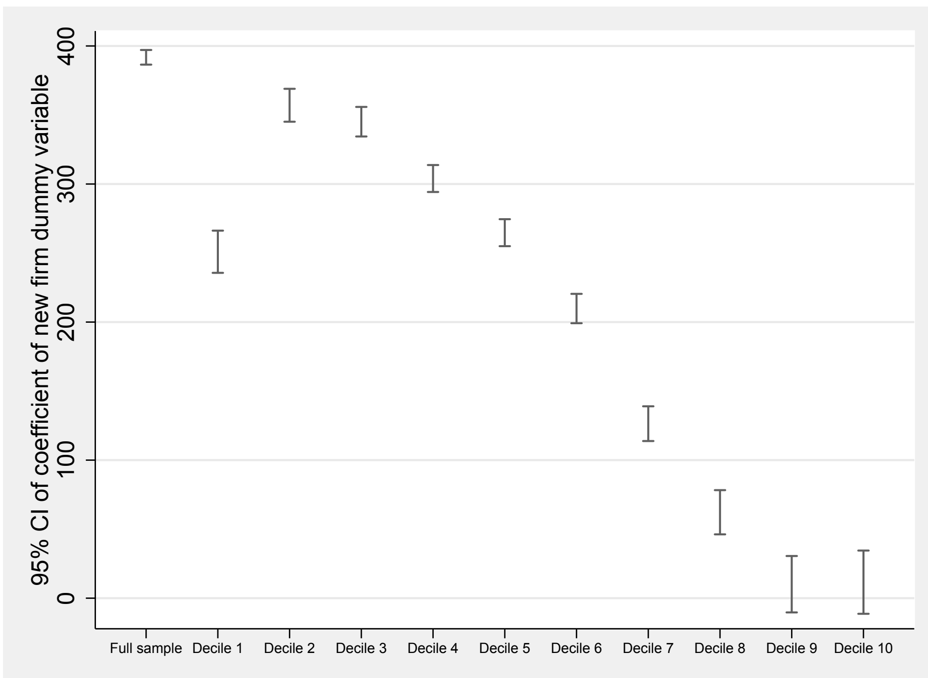

Figure 6: 95% confidence interval of estimated coefficient of $New\ firm_{i,t-9}$. Full sample and by decile

Considered time periods: 2011 and 2002.
See Table A.6 for further details.
Own calculations.

Appendix

Table A.1: Number of new firms and firm survival

	start-up cohort							
Age	2002	2003	2004	2005	2006	2007	2008	Total
0	309,547	290,258	302,724	323,831	311,377	297,677	293,166	2,128,580
1	239,015	227,797	241,175	259,044	248,859	240,043	230,620	1,686,553
	(77.2%)	(78.5%)	(79.7%)	(80.0%)	(79.9%)	(80.6%)	(78.7%)	(79.2%)
2	195,167	187,455	201,134	216,090	207,775	195,692	190,166	1,393,479
	(63.0%)	(64.6%)	(66.4%)	(66.7%)	(66.7%)	(65.7%)	(64.9%)	(65.5%)
3	167,988	163,129	174,861	188,722	177,576	168,652	162,507	1,203,435
	(54.3%)	(56.2%)	(57.8%)	(58.3%)	(57.0%)	(56.7%)	(55.4%)	(56.5%)
4	149,879	145,567	156,697	166,191	157,010	148,069		
	(48.4%)	(50.2%)	(51.8%)	(51.3%)	(50.4%)	(49.7%)		
5	135,856	132,300	140,745	149,614	140,211			
	(43.9%)	(45.6%)	(46.5%)	(46.2%)	(45.0%)			
6	125,137	120,286	128,675	135,510				
	(40.4%)	(41.4%)	(42.5%)	(41.8%)				
7	114,927	110,862	117,888					
	(37.1%)	(38.2%)	(38.9%)					
8	106,607	102,338						
	(34.4%)	(35.3%)						
9	99,142							
	(32.0%)							

Own calculations.

Table A.2: Descriptive statistics for the full estimation sample

	mean	sd	p10	p25	p50	p75	p90
$\Delta PCR_{i,t}$	0.281643	13.789	-12	-4	0	4	13
$New\ firm_{i,t-3}$	0.083427	0.277	0	0	0	0	0
$ICS_{i,t-3}$	0.557606	5.003	0.136	0.285	0.475	0.677	0.843
$Decile\ 1_{i,t-3}$	0.051984	0.222	0	0	0	0	0
$Decile\ 2_{i,t-3}$	0.075709	0.265	0	0	0	0	0
$Decile\ 3_{i,t-3}$	0.088581	0.284	0	0	0	0	0
$Decile\ 4_{i,t-3}$	0.097394	0.296	0	0	0	0	0
$Decile\ 5_{i,t-3}$	0.104224	0.306	0	0	0	0	1
$Decile\ 6_{i,t-3}$	0.109689	0.313	0	0	0	0	1
$Decile\ 7_{i,t-3}$	0.113918	0.318	0	0	0	0	1
$Decile\ 8_{i,t-3}$	0.117360	0.322	0	0	0	0	1

Decile $9_{i,t-3}$	0.119718	0.325	0	0	0	0	1
Decile $10_{i,t-3}$	0.121422	0.327	0	0	0	0	1
$Sector_i$: 15	0.015835	0.125	0	0	0	0	0
$Sector_i$: 16	0.000026	0.005	0	0	0	0	0
$Sector_i$: 17	0.002473	0.050	0	0	0	0	0
$Sector_i$: 18	0.001428	0.038	0	0	0	0	0
$Sector_i$: 19	0.000904	0.030	0	0	0	0	0
$Sector_i$: 20	0.007647	0.087	0	0	0	0	0
$Sector_i$: 21	0.001099	0.033	0	0	0	0	0
$Sector_i$: 22	0.009388	0.096	0	0	0	0	0
$Sector_i$: 23	0.000078	0.009	0	0	0	0	0
$Sector_i$: 24	0.002060	0.045	0	0	0	0	0
$Sector_i$: 25	0.003263	0.057	0	0	0	0	0
$Sector_i$: 26	0.005373	0.073	0	0	0	0	0
$Sector_i$: 27	0.001733	0.042	0	0	0	0	0
$Sector_i$: 28	0.018781	0.136	0	0	0	0	0
$Sector_i$: 29	0.009842	0.099	0	0	0	0	0
$Sector_i$: 30	0.001666	0.041	0	0	0	0	0
$Sector_i$: 31	0.002829	0.053	0	0	0	0	0
$Sector_i$: 32	0.002084	0.046	0	0	0	0	0
$Sector_i$: 33	0.007013	0.083	0	0	0	0	0
$Sector_i$: 34	0.009484	0.097	0	0	0	0	0
$Sector_i$: 35	0.000823	0.029	0	0	0	0	0
$Sector_i$: 36	0.008260	0.091	0	0	0	0	0
$Sector_i$: 37	0.000860	0.029	0	0	0	0	0
$Sector_i$: 40	0.005443	0.074	0	0	0	0	0
$Sector_i$: 41	0.001875	0.043	0	0	0	0	0
$Sector_i$: 45	0.116973	0.321	0	0	0	0	1
$Sector_i$: 50	0.033959	0.181	0	0	0	0	0
$Sector_i$: 51	0.062718	0.242	0	0	0	0	0
$Sector_i$: 52	0.141078	0.348	0	0	0	0	1
$Sector_i$: 55	0.077869	0.268	0	0	0	0	0
$Sector_i$: 60	0.026565	0.161	0	0	0	0	0
$Sector_i$: 61	0.001166	0.034	0	0	0	0	0
$Sector_i$: 62	0.000176	0.013	0	0	0	0	0
$Sector_i$: 63	0.011984	0.109	0	0	0	0	0
$Sector_i$: 64	0.002784	0.053	0	0	0	0	0
$Sector_i$: 65	0.001113	0.033	0	0	0	0	0
$Sector_i$: 66	0.000102	0.010	0	0	0	0	0
$Sector_i$: 67	0.003647	0.060	0	0	0	0	0
$Sector_i$: 70	0.076283	0.265	0	0	0	0	0
$Sector_i$: 71	0.008536	0.092	0	0	0	0	0
$Sector_i$: 72	0.021387	0.145	0	0	0	0	0
$Sector_i$: 73	0.002380	0.049	0	0	0	0	0
$Sector_i$: 74	0.160682	0.367	0	0	0	0	1

$Sector_i$: 75	0.000200	0.014	0	0	0	0	0
$Sector_i$: 80	0.010642	0.103	0	0	0	0	0
$Sector_i$: 85	0.015444	0.123	0	0	0	0	0
$Sector_i$: 90	0.002038	0.045	0	0	0	0	0
$Sector_i$: 91	0.003110	0.056	0	0	0	0	0
$Sector_i$: 92	0.030807	0.173	0	0	0	0	0
$Sector_i$: 93	0.068092	0.252	0	0	0	0	0
Year 2005	0.135050	0.342	0	0	0	0	1
Year 2006	0.137307	0.344	0	0	0	0	1
Year 2007	0.140254	0.347	0	0	0	0	1
Year 2008	0.144384	0.351	0	0	0	0	1
Year 2009	0.146240	0.353	0	0	0	0	1
Year 2010	0.147996	0.355	0	0	0	0	1
Year 2011	0.148769	0.356	0	0	0	0	1
Number of observations			13,582,106				

All variables except $\Delta PCR_{i,t}$ and $ICS_{i,t-3}$ are dummy variables.
Description of sectors: `Link` (accessed on July, 28, 2017).
Own calculations.

Table A.3: RIF regression results ($\Delta PCR_{i,t}$): full estimation sample and by period

	(1) Full sample	(2) Year 2005	(3) Year 2006	(4) Year 2007	(5) Year 2008	(6) Year 2009	(7) Year 2010	(8) Year 2011
$New\ firm_{i,t-3}$	335.308735***	331.701868***	351.867456***	337.350184***	319.005171***	330.034345***	332.484182***	337.268309***
	(0.581772)	(1.572120)	(1.575626)	(1.556388)	(1.481478)	(1.522801)	(1.537353)	(1.526811)
$ICS_{i,t-3}$	5.133483***	3.632721***	3.956132***	10.745091***	6.991952***	3.548077***	12.201527***	6.204864***
	(0.030891)	(0.063669)	(0.072085)	(0.140565)	(0.103855)	(0.062251)	(0.129221)	(0.082747)
$Decile1_{i,t-3}$	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.
$Decile2_{i,t-3}$	-121.397005***	-138.178352***	-124.771552***	-143.133097***	-124.944959***	-108.030081***	-106.020336***	-107.209972***
	(0.884302)	(2.516517)	(2.410510)	(2.367478)	(2.285928)	(2.301295)	(2.260326)	(2.242585)
$Decile3_{i,t-3}$	-154.493116***	-168.051870***	-161.459185***	-182.902893***	-158.341004***	-135.879560***	-136.742751***	-140.816911***
	(0.863170)	(2.449685)	(2.352071)	(2.312190)	(2.235139)	(2.249792)	(2.207889)	(2.186596)
$Decile4_{i,t-3}$	-165.730060***	-181.620419***	-174.960822***	-202.022766***	-172.218152***	-144.765565***	-142.775697***	-145.238793***
	(0.852942)	(2.418278)	(2.323324)	(2.287208)	(2.212552)	(2.224420)	(2.181035)	(2.157850)
$Decile5_{i,t-3}$	-172.955774***	-189.019114***	-186.583050***	-214.060456***	-181.604351***	-147.476307***	-146.341621***	-149.926513***
	(0.846881)	(2.401403)	(2.307310)	(2.270947)	(2.199454)	(2.208592)	(2.164542)	(2.140750)
$Decile6_{i,t-3}$	-182.214109***	-197.409098***	-199.235102***	-230.115916***	-192.049472***	-154.209480***	-152.568545***	-155.132695***
	(0.843254)	(2.390926)	(2.297732)	(2.261436)	(2.190524)	(2.199480)	(2.155016)	(2.130968)
$Decile7_{i,t-3}$	-189.165797***	-203.918659***	-207.049731***	-240.038913***	-201.446831***	-159.611044***	-156.653270***	-161.253734***
	(0.841523)	(2.387796)	(2.295040)	(2.256986)	(2.187051)	(2.195168)	(2.148507)	(2.124446)
$Decile8_{i,t-3}$	-204.876184***	-220.823533***	-224.140685***	-257.258779***	-215.930583***	-174.487116***	-172.034448***	-174.844254***
	(0.841054)	(2.388343)	(2.294094)	(2.255429)	(2.186012)	(2.194285)	(2.146489)	(2.121902)
$Decile9_{i,t-3}$	-226.511446***	-242.709797***	-243.773730***	-279.582534***	-238.668494***	-198.480280***	-193.076954***	-193.731284***
	(0.841900)	(2.390379)	(2.297036)	(2.258689)	(2.188915)	(2.196725)	(2.148356)	(2.122576)
$Decile10_{i,t-3}$	-270.718299***	-285.877208***	-281.187703***	-321.703402***	-280.724516***	-246.389209***	-241.023172***	-240.187014***
	(0.849220)	(2.409961)	(2.315909)	(2.279239)	(2.208172)	(2.216232)	(2.168334)	(2.141457)
$Sector_i$	dummy variables included							
Year 2005	11.341017***							
	(0.580810)							
Year 2006	10.220537***							
	(0.578173)							
Year 2007	15.309105***							
	(0.574929)							
Year 2008	6.516544***							
	(0.570625)							
Year 2009	9.271808***							
	(0.568664)							
Year 2010	6.577079***							
	(0.566902)							
Year 2011	Ref. Cat.							
Constant	355.963384***	381.611993***	382.383985***	398.964708***	367.973200***	342.536736***	333.291686***	332.489137***
	(1.763505)	(4.713931)	(4.623650)	(4.622953)	(4.510438)	(4.531187)	(4.495246)	(4.405223)
Observations	13,582,106	1,834,270	1,864,920	1,904,939	1,961,037	1,986,252	2,010,096	2,020,592
R^2	0.0467	0.0458	0.0495	0.0548	0.0488	0.0433	0.0449	0.0439
$R^{2,adjusted}$	0.0467	0.0458	0.0495	0.0548	0.0487	0.0433	0.0449	0.0438
RMSE	569.0506	578.6729	572.4497	576.1080	567.2772	568.7974	564.2561	551.6411

Standard errors (in parentheses).
+ p<.10, * p<.05, ** p<.01, *** p<.001.
RMSE=Root Mean Squared Error.
Specificantion (1) covers the time horizon from 2005 to 2011.
Own calculations.

Table A.4: RIF regression results ($\Delta PCR_{i,t}$): by decile in $t-3$

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Without 1^{st} &	$Decile_{i,t-3}$									
	10^{th} decile	1	2	3	4	5	6	7	8	9	10
$New\ firm_{i,t-3}$	310.467479***	256.467302***	321.725613***	325.926021***	309.221205***	267.315322***	222.893174***	169.640968***	124.306254***	79.815807***	65.431494***
	(0.591431)	(1.726000)	(1.352769)	(1.200979)	(1.131193)	(1.165665)	(1.362312)	(1.680472)	(2.132605)	(2.617902)	(2.836981)
$ICS_{i,t-3}$	5.235170***	3.587719***	7.107450***	6.606259***	4.667582***	2.798130***	1.595306***	5.941130***	2.638457***	4.052916***	1.938738**
	(0.038149)	(0.054265)	(0.080558)	(0.081878)	(0.070267)	(0.062904)	(0.064226)	(0.204183)	(0.220306)	(0.422710)	(0.612645)
$Decile1_{i,t-3}$	omitted										
$Decile2_{i,t-3}$	Ref. Cat.										
$Decile3_{i,t-3}$	-36.750390***										
	(0.690857)										
$Decile4_{i,t-3}$	-50.219512***										
	(0.678390)										
$Decile5_{i,t-3}$	-58.953020***										
	(0.670905)										
$Decile6_{i,t-3}$	-69.191123***										
	(0.666294)										
$Decile7_{i,t-3}$	-76.612364***										
	(0.664221)										
$Decile8_{i,t-3}$	-92.589418***										
	(0.663685)										
$Decile9_{i,t-3}$	-114.655279***										
	(0.664885)										
$Decile10_{i,t-3}$	omitted										
$Sector_i$					dummy variables included						
Year 2005	10.536025***	37.973996***	15.442709***	18.235665***	11.239234***	11.227681***	10.351711***	12.887085***	9.755874***	6.262391***	7.980367***
	(0.575956)	(3.127718)	(2.010289)	(1.512725)	(1.238807)	(1.124791)	(1.163487)	(1.317594)	(1.533167)	(1.745072)	(1.742951)
Year 2006	8.849497***	40.772242***	25.792117***	22.156137***	14.794541***	10.327942***	4.662839***	5.102133***	0.669667	-1.617922	4.818132**
	(0.573730)	(3.060764)	(1.988537)	(1.503240)	(1.233436)	(1.121243)	(1.160489)	(1.314803)	(1.528676)	(1.741595)	(1.738660)
Year 2007	13.612591***	50.854826***	35.786571***	33.015743***	21.223053***	15.940931***	6.750975***	5.006260***	0.774593	-3.731607*	-1.412121
	(0.570827)	(3.011033)	(1.972428)	(1.493877)	(1.228291)	(1.116234)	(1.155382)	(1.308393)	(1.521355)	(1.732906)	(1.729883)
Year 2008	6.089477***	19.265271***	14.861537***	17.303396***	10.579710***	7.968580***	3.622368**	1.578330	-0.328757	-5.281395**	-1.642229
	(0.566642)	(2.975606)	(1.955653)	(1.481977)	(1.218572)	(1.108458)	(1.146955)	(1.299162)	(1.510991)	(1.720879)	(1.717976)
Year 2009	10.384015***	0.964264	4.288900*	12.601274***	9.724721***	12.426596***	11.259195***	12.206876***	10.344757***	5.347500**	4.196758*
	(0.564637)	(2.982033)	(1.955500)	(1.480425)	(1.215611)	(1.104142)	(1.142296)	(1.292881)	(1.503661)	(1.711688)	(1.708737)
Year 2010	7.093884***	2.286478	3.278408+	6.633315***	5.808673***	7.617247***	7.077609***	9.173268***	7.331203***	4.773385**	4.553769**
	(0.563012)	(2.964052)	(1.948692)	(1.476342)	(1.212078)	(1.100957)	(1.139774)	(1.289171)	(1.498896)	(1.706399)	(1.702901)
Year 2011	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.	Ref. Cat.
Constant	262.623951***	483.436259***	340.352565***	293.992411***	260.918811***	226.555948***	218.449976***	191.856615***	152.232164***	115.780494***	57.417058***
	(1.941570)	(16.617995)	(9.996140)	(6.997283)	(5.157298)	(4.412042)	(4.227215)	(4.243668)	(4.262247)	(3.938927)	(2.845947)
Observations	11,226,879	706,054	1,028,287	1,203,116	1,322,812	1,415,579	1,489,814	1,547,245	1,594,001	1,626,025	1,649,173
R^2	0.0361	0.0502	0.0703	0.0734	0.0675	0.0470	0.0245	0.0123	0.0050	0.0018	0.0017
$R^{2,adjusted}$	0.0361	0.0501	0.0702	0.0734	0.0675	0.0470	0.0245	0.0123	0.0050	0.0018	0.0017
RMSE	513.4988	679.9123	536.1667	439.4447	378.9098	356.4518	378.5053	437.1189	516.1515	593.8811	597.4648

Standard errors (in parentheses).
+ p<.10, * p<.05, ** p<.01, *** p<.001.
RMSE=Root Mean Squared Error.
Specificantions cover the time horizon from 2005 to 2011.
Own calculations.

Table A.5: Descriptive statistics for the estimation sample of the long-term analysis

	mean	sd	p10	p25	p50	p75	p90
$\Delta PCR_{i,2011}$	0.077593	17.830	-18	-6	0	7	18
New firm	0.075070	0.264	0	0	0	0	0
$ICS_{i,t-9}$	0.560927	6.310	0.145	0.289	0.469	0.663	0.820
$Decile1_{i,t-9}$	0,035783	0.186	0	0	0	0	0
$Decile2_{i,t-9}$	0.061004	0.239	0	0	0	0	0
$Decile3_{i,t-9}$	0.078044	0.268	0	0	0	0	0
$Decile4_{i,t-9}$	0.091651	0.289	0	0	0	0	0
$Decile5_{i,t-9}$	0.102122	0.303	0	0	0	0	1
$Decile6_{i,t-9}$	0.112032	0.315	0	0	0	0	1
$Decile7_{i,t-9}$	0.120251	0.325	0	0	0	0	1
$Decile8_{i,t-9}$	0.127840	0.334	0	0	0	0	1
$Decile9_{i,t-9}$	0.133785	0.340	0	0	0	0	1
$Decile10_{i,t-9}$	0.137489	0.344	0	0	0	0	1
$Sector_i$: 15	0.018174	0.134	0	0	0	0	0
$Sector_i$: 16	0.000028	0.005	0	0	0	0	0
$Sector_i$: 17	0.002574	0.051	0	0	0	0	0
$Sector_i$: 18	0.001474	0.038	0	0	0	0	0
$Sector_i$: 19	0.001055	0.032	0	0	0	0	0
$Sector_i$: 20	0.008852	0.094	0	0	0	0	0
$Sector_i$: 21	0.001245	0.035	0	0	0	0	0
$Sector_i$: 22	0.010068	0.100	0	0	0	0	0
$Sector_i$: 23	0.000084	0.009	0	0	0	0	0
$Sector_i$: 24	0.002173	0.047	0	0	0	0	0
$Sector_i$: 25	0.003691	0.061	0	0	0	0	0
$Sector_i$: 26	0.006229	0.079	0	0	0	0	0
$Sector_i$: 27	0.001915	0.044	0	0	0	0	0
$Sector_i$: 28	0.021488	0.145	0	0	0	0	0
$Sector_i$: 29	0.011297	0.106	0	0	0	0	0
$Sector_i$: 30	0.001750	0.042	0	0	0	0	0
$Sector_i$: 31	0.003286	0.057	0	0	0	0	0
$Sector_i$: 32	0.002266	0.048	0	0	0	0	0
$Sector_i$: 33	0.008031	0.089	0	0	0	0	0
$Sector_i$: 34	0.012518	0.111	0	0	0	0	0
$Sector_i$: 35	0.000885	0.030	0	0	0	0	0
$Sector_i$: 36	0.009365	0.096	0	0	0	0	0
$Sector_i$: 37	0.000878	0.030	0	0	0	0	0
$Sector_i$: 40	0.003975	0.063	0	0	0	0	0
$Sector_i$: 41	0.002566	0.051	0	0	0	0	0
$Sector_i$: 45	0.123181	0.329	0	0	0	0	1
$Sector_i$: 50	0.033708	0.180	0	0	0	0	0

$Sector_i$: 51	0.064481	0.246	0	0	0	0	0
$Sector_i$: 52	0.140113	0.347	0	0	0	0	1
$Sector_i$: 55	0.072475	0.259	0	0	0	0	0
$Sector_i$: 60	0.026040	0.159	0	0	0	0	0
$Sector_i$: 61	0.001018	0.032	0	0	0	0	0
$Sector_i$: 62	0.000176	0.013	0	0	0	0	0
$Sector_i$: 63	0.012067	0.109	0	0	0	0	0
$Sector_i$: 64	0.001811	0.043	0	0	0	0	0
$Sector_i$: 65	0.001414	0.038	0	0	0	0	0
$Sector_i$: 66	0.000126	0.011	0	0	0	0	0
$Sector_i$: 67	0.003193	0.056	0	0	0	0	0
$Sector_i$: 70	0.076710	0.266	0	0	0	0	0
$Sector_i$: 71	0.008485	0.092	0	0	0	0	0
$Sector_i$: 72	0.019848	0.139	0	0	0	0	0
$Sector_i$: 73	0.002282	0.048	0	0	0	0	0
$Sector_i$: 74	0.155767	0.363	0	0	0	0	1
$Sector_i$: 75	0.000278	0.017	0	0	0	0	0
$Sector_i$: 80	0.010457	0.102	0	0	0	0	0
$Sector_i$: 85	0.014433	0.119	0	0	0	0	0
$Sector_i$: 90	0.002230	0.047	0	0	0	0	0
$Sector_i$: 91	0.003103	0.056	0	0	0	0	0
$Sector_i$: 92	0.027914	0.165	0	0	0	0	0
$Sector_i$: 93	0.062824	0.243	0	0	0	0	0
Year 2011	1,000000	0.000	1	1	1	1	1
Number of observations				1,258,859			

All variables except $\Delta PCR_{i,2011}$ and $ICS_{i,t-9}$ are dummy variables.
Description of sectors: `Link` (accessed on July, 28, 2017).
Own calculations.

Table A.6: RIF regression results ($\Delta PCR_{i,2011}$): long-term analysis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
		$Decile_{i,t-9}$									
	Full sample	1	2	3	4	5	6	7	8	9	10
$New\ firm_{i,t-9}$	391.781872***	250.929619***	357.028569***	345.137417***	303.991953***	264.748919***	209.802072***	126.400774***	62.234135***	10.115207	11.583498
	(2.707102)	(7.802481)	(6.082636)	(5.457646)	(4.979069)	(4.982676)	(5.422583)	(6.414375)	(8.169817)	(10.424898)	(11.687533)
$ICS_{i,t-9}$	3.689103***	5.173234***	2.035051***	20.291287***	23.938327***	0.725343***	9.397610***	12.923984***	11.074395***	4.413062+	5.404240
	(0.109037)	(0.274237)	(0.176018)	(0.677493)	(0.780270)	(0.089843)	(0.645097)	(1.140426)	(1.822672)	(2.655877)	(3.822522)
$Decile1_{i,t-9}$	Ref. Cat.										
$Decile2_{i,t-9}$	-288.803738***										
	(4.599908)										
$Decile3_{i,t-9}$	-378.936697***										
	(4.437588)										
$Decile4_{i,t-9}$	-433.884804***										
	(4.354578)										
$Decile5_{i,t-9}$	-459.573637***										
	(4.309414)										
$Decile6_{i,t-9}$	-478.530615***										
	(4.276264)										
$Decile7_{i,t-9}$	-484.660304***										
	(4.257936)										
$Decile8_{i,t-9}$	-497.997477***										
	(4.246734)										
$Decile9_{i,t-9}$	-514.870538***										
	(4.240599)										
$Decile10_{i,t-9}$	-578.093428***										
	(4.264203)										
$Sector_i$					dummy variables included						
Constant	752.437712***	712.660693***	622.372935***	486.523709***	431.729230***	376.217807***	351.538968***	321.440321***	242.431470***	200.099625***	125.684950***
	(7.548889)	(71.364334)	(42.936149)	(30.484941)	(21.415438)	(17.103834)	(15.458727)	(15.238561)	(14.896029)	(14.610811)	(10.973398)
Observations	1,258,859	45,046	76,795	98,246	115,376	128,557	141,032	151,379	160,932	168,417	173,079
R^2	0.0485	0.0520	0.0589	0.0620	0.0545	0.0352	0.0223	0.0107	0.0049	0.0018	0.0027
RMSE	771.1298	783.8941	660.4785	564.3003	484.6895	454.0360	461.7344	525.7352	629.2815	768.2122	805.1534

Standard errors (in parentheses).
+ p<.10, * p<.05, ** p<.01, *** p<.001.
RMSE=Root Mean Squared Error.
Own calculations.