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Growth of new firms: Which factors influence post-entry performance? : An empirical analysis based on Swiss firm data

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Arbeitspapiere/ Working Papers

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Which Factors Influence Post-Entry Performance?
An Empirical Analysis Based on Swiss Firm Data

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Which Factors Influence Post-Entry Performance? An Empirical Analysis Based on Swiss Firm Data

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Abstract

The aim of this study is to shed light on the factors which determine the post-entry performance of new firms. It is often argued that new firms are the driving force of structural changes and sometimes they are even characterized as an “engine” of economic growth. Nevertheless, the empirical evidence is mixed. Taking into account the high exit rate of new firms, a specific founding cohort does not contribute substantially to new jobs. In this paper, we analyse the contribution of new firms concerning the ability of creating jobs. Furthermore, we investigate the main determinants of post-entry performance, which we derive from existing theoretical concepts based on industrial economic approaches, learning models and founding characteristics. The endogenous variable is employment development. We test our model with data from the Swiss cohort of start-ups of 1996/1997. The results reveal that the important and robust factors determining the post-entry performance are changes in demand, innovation behaviour, human capital, self-financing, seed capital, consultancy and support, assets, legal form, and motives for founding a new firm, such as the possibility to implement own ideas coming from research at university or to escape from unemployment.

Key Words: New firms, employment growth, performance

JEL Classification: L25, J23, D21

1. Introduction

In periods of weak economic growth and stagnation new firms draw the attention in political and academic discussions. It is expected that new firms act as catalysts for structural changes. Furthermore, their post-entry performance produces a lively interest because new firms are considered to create new, mostly high skilled jobs. Innovative start-ups are claimed to be a necessary precondition to enhance growth (Picot et al. 1989). However, in some ways this view contradicts Schumpeter's view. He argued that innovations derive primarily from large incumbents because these firms are able to gain an advantage of prevalent scale effects.

Do new firms play a decisive role in the economy? Are they the main actors in creating new jobs? To date, these questions have rarely been investigated for the Swiss economy. With an original data set from the Swiss cohort of the start-ups of 1996/97 we try to shed light on this topic. We have had the opportunity to observe the survival rate of this cohort and to survey the firms that survived until 2000 and until 2003.

The aim of this paper is to investigate the survival rate of this specific Swiss start-up cohort and to scrutinise their post-entry employment growth. On the basis of different theoretical approaches and empirical studies, we compile a set of variables that hypothetically have an impact on employment growth of new firms. We test our hypotheses with a comprehensive econometric model, keeping in mind that we can only observe data for firms, which had survived and participated in our surveys (selection bias).

The next chapter gives a short survey of the theoretical approaches of post-entry performance and the consequential hypotheses. Then we focus on the data collecting process and how the missing values are handled in our data set. In chapter four the survival rate and employment growth are presented in a descriptive way. In chapter five we derive the so-called "double selection" or "three step selection model" and define the variables. Finally the results are shortly discussed and summarised.

2. Theoretical Issues

Theoretical Background

There is no unique theoretical model that explains the post-entry performance of new firms. Many theoretical and empirical papers, therefore, have been devoted to the identification of determinants of new firm success using and combining various approaches. Special attention was paid on the division between industrial economic approaches, learning models, founding characteristics, and life cycle approaches in the last years (Nerlinger 1998). The first three approaches are relevant to this paper and hence we shortly address their main features.

The focus of *traditional industrial approaches* is the optimal size of a one-product firm. The representative firm embarks on a strategy of profit maximisation. The optimal size is assigned based on the long term average production costs, which typically shows an U-form characteristic. Increasing firm size stands for decreasing costs up to a cost minimum and beyond this point, costs increase again. Reasons for this characteristic are disproportionally increasing management and administration costs, which results from increased bureaucracy of larger firms (Williamson 1981). This supports the hypothesis that larger firms have minor growth possibilities than smaller firms at the time of foundation. The growth potential up to the optimum size is smaller for large firms. However, empirical results often show a violation of the "U-form cost curve"-assumption. Hart (2000) for example stresses

that the U-shaped average cost curve is a purely theoretical concept, empirical cost curves are more likely to be L-shaped.

The negative correlation between start-up size and post-entry growth rate is more persuasively explained in terms of the so-called “minimum efficient size“. A new firm seeks to reach the size with profitable production rapidly, e.g. because of the existence of economies of scales (Scherer and Ross 1990). The minimum efficient size of a firm can vary in industry and time. Two hypotheses are often deduced from the concept of minimum efficient size. Firstly, larger start-up firms have a smaller growth potential since they are closer to the optimum than small firms. Secondly, a higher market growth facilitates a higher post-entry growth rate of firms (Audretsch 1995).

Most of the *learning approaches* start from the seminal paper of Jovanovic (1982) and the process of “learning by doing“. The longer a new firm remains in the market, the more it learns about its true costs and relative efficiency and the less likely it is to fail. In the passive learning model of Jovanovic, a new firm enters a market without knowing its cost function, what means its relative efficiency. After entry, the firm learns about its own profitability potential. By continually updating their learning effects based on information from realised profits, entrepreneurs who discover that their firm is efficient will survive and expand. Entrepreneurs who discover that their firm is inefficient will contract and finally exit. In the active learning model of Ericson and Pakes (1995), a firm explores its environment actively and then invests to enhance its capability to profits. The inter-temporal uncertainty of output decreases with the increasing age of the firm, which means that new and small firms inhere a high volatility of growth. Given the age of a firm, small firms show higher growth rates.

“*Founding characteristics*” approaches assume a direct impact of founding conditions on survival and post-entry performance of new firms (Brüderl et al. 1996, Stinchcombe 1965). Founding characteristics are often partitioned in human capital or entrepreneurial characteristics, organisational characteristics and environmental characteristics (Brüderl et al. 1992). Particular person-specific determinants exhibit a long tradition (see the considerations by economists, such as Jean-Baptiste Say, Alfred Marshall, Joseph Schumpeter or Frank Knight) and are used frequently (van Praag 2003). Our specification of an empirical model in chapter five is based on these various theoretical approaches.

Hypotheses

According to the various theoretical approaches discussed above, we classify the determining factors in five groups. On the basis of an extract of the existing theoretical and empirical works we dispose a set of hypotheses which are intended to be tested in chapter six.

Hypotheses related to “firm performance”

- High market demand, used here as a proxy for turnover growth, has a positive impact on firm growth.
- Higher employment qualification and skills enhance the firm growth (Brüderl et al. 1996, Schiller and Crewson 1997) (hint: a lot of firms are one-person-firms, so the human capital of the employment is equivalent to the founder’s human capital).
- Producing new products and offering new services can have a competitive advantage and thus increase the probability of firm success.
- R&D efforts can improve the market opportunities and – in the end – the success of a firm, but they can also increase business risks. Thus the expected impact of R&D on employment growth is not obvious.

- To be embedded in an external knowledge network has a positive impact on the firm performance (Arvanitis and Hollenstein 2001), but the impact on employment growth is not *a priori* evident. Knowledge network has rather a long-term effect and thus the expected sign for our multivariate regression is blurred.
- Exports provide new firms with the opportunity to increase the turnover and finally the option to be commercially successful. The correlation between export share and employment growth might be positive.
- Asymmetric information stresses the difficulties of small and new firms in having access to bank loans. Thus, the importance of self-financing has a positive impact on employment growth.

Hypotheses related to “market environment”

- Organisational ecology approaches deal, among other things, with the evolutionary processes between firms. One of the important factors of survival and growth of new firms are the competitiveness conditions. The impact of high competition on firm growth is discussed controversially. We postulate a positive sign for quality and innovation competition as these two forms rather increase the demand for products and services and therefore raise employment. No *a priori* assumption is made for price competition.

Hypotheses related to “founding conditions”

- Small start-ups have a higher post-entry growth rate (Caves 1998, Evans 1987, Jovanovic 1982, Sutton 1997).¹
- Solid initial capital at the time of foundation will enhance the chances of the firm's success (Cooper et al. 1994).
- Founding a start-up and still working part-time with another firm has a positive impact on firm growth (Storey 1994).
- Financial support by public promotion facilitates employment growth (Steil 1999).
- Having some good consultancy enhances the probability of success (Brüderl et al. 1996); the growth of a firm is higher for start-ups that make use of professional advisors (Colombo and Delmastro 2002, Cooper et al. 1994).
- Self-employment is chosen if the net gain of self-employment is higher than salaried employment (Pfeiffer 1994). Thus, we state that motives, such as “implementation of own ideas coming from professional experience” or “...from research at university” have a positive impact on firm performance (see also Hinz and Ziegler 1999).
- Founders that have been pulled rather than pushed into the job have higher chances to be successful (van Praag 2003), thus entrepreneurs starting a new business from a situation of unemployment are less successful (Smallbone 1990).
- A firm whose founder declares more time flexibility as an important founding motive has a minor post-entry performance.

¹ This hypothesis contradicts the validity of Gibrat's law, which states that firm growth in one period should be independent of growth in the previous period (or in the stricter version, Gibrat's law implies that, over a period of time, all firms have equal chances for the same amount of proportionate growth).

Hypotheses related to “entrepreneurial characteristics”

- Team founders are more successful than one-man-founders (Friar and Meyer 2003, Lechler and Gemünden 2003).
- Growth of firms is lower for female entrepreneurs (Harada 2001, Wanzenböck 1998).
- Previous experiences have a positive impact on firm performance (Harada 2001, Vivarelli 2004).
- Real estate property or other assets owned by the founder facilitate a “healthy” post-entry performance of new firms, since this properties can be seen as a guarantee for turbulent times.

Hypotheses related to “control variables”

- Firms with limited liabilities are more successful compared to sole proprietorship (Almus et al. 1999, Brixy and Kohaut 1999, Harhoff and Stahl 1995).
- Firms in dynamically growing industries, mostly high-tech industry and modern service firms, have also a high dynamic in employment growth (Hampe and Steininger 2001).

3. Data

The Data

The data used in this paper were collected from three surveys by the Swiss Federal Statistical Office (SFSO) and the Swiss Institute for Business Cycle Research (KOF). All Swiss firms which had taken up their activities in 1996/97 and had conducted the business activities at least twenty hours a week, were surveyed with a short questionnaire by the SFSO. This means that start-up firms were recorded independently whether they were enrolled in the Swiss Commercial Register or not. The SFSO however eliminated mergers, acquisitions and spin-offs. It was shown by the SFSO that in the two years (1996/97) 7'112 *ex-nihilo* firms had been founded.

Due to diligent investigations and clarifications on the part of the SFSO and the KOF, we were able to identify those firms which had survived until January 2000. In spring 2000, the KOF carried out a postal survey by sending an extensive questionnaire to all new firms founded in 1996/97 and had survived until 2000.² We repeated the procedure in 2003 by investigating which firms had survived until spring 2003. If the firm had survived and participated in the survey of 2000, it received another questionnaire in spring 2003.³

3'282 new firms had survived until spring 2000. 1'626 of them completed the questionnaire of 2000. Thus, the rate of return came to a remarkable value of 49.5%. Our investigation in 2003 and the feedback of the founders had shown that 1'342 of the 1'626 firms still existed in 2003. In the survey of 2003, the rate of return was a formidable value of 70.5%. Thus, we state that in our data set there are 946 firms founded in 1996/97, which survived until spring 2003 and participated in the surveys of 2000 and 2003.

² The questionnaire was structured as follows: a) general information about the new firm, b) market conditions, c) products and services of the firm, d) research and development activities, e) information concerning co-operation, f) financing and capital structure, g) personal information about founders and their motives, h) the formation environment. The questionnaire is downloadable from www.kof.gess.ethz.ch.

³ The questionnaire 2003 was only little modified in comparison to 2000.

Imputation

Our data set contains 1626 observations from 2000 and 946 from 2003. However, not every question in the questionnaire was filled out by the founders (item-non-response problem). Possible reasons for not answering a specific question might be lack of knowledge or motivation. An answer is often refused if the statement refers to sensible data, such as turnover or revenue. In statistical analysis an accumulation of refusals for specific answers can lead to biased results. The representativity might be violated and in case of multivariate analysis the loss of observations can be considerable.

Several methods have been developed to draw inferences from data sets with missing values. The multiple imputation framework suggested by Rubin (1987) is an attractive option (Rässler 2000). In our data set, we applied a so-called multiple imputation method in order to eliminate the item-non-response problem, namely the method of “Approximate Bayesian Bootstrap” (ABB, see i.e. Donzé 2001).

The ABB-method generally enables to allocate an existent value of the data set to each missing value. The first step is to look for potential respondent (founders which filled out the specific question), which are as close as possible to the non-respondent concerning the specific question. A prevalent procedure is to estimate propensity scores. To estimate the scores, the non-respondent is assigned by a value “0” and the respondent by “1”. Then the probability of responses is estimated by using a logit model. The independent variables are mostly – for reasons of data availability – structural variables. In our case thirteen dummies for the industry sector, seven dummies for the region and five dummies for the legal form were used. By using backward selection all variables are eliminated which have no significant impact on the respondent behaviour of the founder. In the next step, the scores are ranked and then cells are created, in our case five (quantiles). We randomly draw one existing value for each missing value in a cell. Instead of filling in a single value for each missing value, Rubin’s (1987) multiple imputation procedure replaces each missing value with a set of plausible values that represent the uncertainty about the right value to impute. In our case, we imputed five times. The values are five times the same if the founder has answered the question. If not, the data set contains five potentially different values for the specific question.

In a statistical analysis, the multiple imputation must be taken into consideration. Calculating a mean for all observations, one should firstly compute all five means and then, secondly, generate the mean of the means. One can proceed the same way by using multivariate regression. In the first step, all five equations are estimated and then the mean is calculated for each coefficient (see Rubin 1987):

$$\bar{\beta} = N^{-1} \sum_{i=1}^N \hat{\beta}_i \quad (3.1)$$

where N denotes the number of imputation (in our case five), $i=1\dots N$ and β are the estimated coefficients. To implement a reliable test statistic, one also has to correct for the variance (V). The formula on this is:

$$\bar{V} = N^{-1} \sum_{i=1}^N V_i + (1 + N^{-1}) \left[(N-1)^{-1} \sum_{i=1}^N (\hat{\beta}_i - \bar{\beta})^2 \right] \quad (3.2)$$

In appendix table A1 we present means and standard deviations for imputed data and compare these results with non-imputed data.

Firm Classification in Five Industry Sectors

We classified the new firms in five sub-sectors, namely in high-tech industry, low-tech industry, construction, modern services, and traditional services. The definition of the two industries is a minor modified classification based on the sectoral approach of the OECD. This classification refers to the intensity of research and development of the branches (Hatzichronoglou 1997). The following branches are among high-tech industry: chemical industry, rubber industry, non-electrical and electrical machinery, transport equipment, optical instruments, and precision instruments (except watches). Our classification in the service sector is, on the one hand, based on the KIBS (knowledge intensive business services) classification and, on the other hand, on ad hoc considerations. These considerations take into account the value added growth rate and/or the use of information and communication technology of Swiss firms. Accordingly we classified financial intermediation, insurance, computer & related activities, R&D, and most of the other business activities (without detective offices, cleaners...) as modern services. Telecommunication has not been classified as a modern service because telecommunication start-ups in Switzerland were not possible until the market deregulation in 1998.

4. Survival and Performance of New Firms: A Descriptive View

7'112 new firms were founded in Switzerland in 1996/97 (Table 1). 84% of the foundations took place in the service sector, 8.5% in the construction sector and only 7.5% in the industry. 3'282 of these new firms were still operating three or four years after their foundation, which correspond to a survival rate of 46.2%. In the industry sector exactly half of the firms survived and there was not a big difference between the two sub-sectors high-tech and low-tech industry. The survival rate of 53.7% in the construction sector was above overall average. The construction sector was having a deep crisis in 1996/97. It seems that everybody who dared to venture into self-employment in that time must had been convinced of his business – possibly one of the reasons for the high survival rate. The firms in the modern services show a distinctly higher survival rate compared to the traditional service sector (51.1% vs. 40.6%).

The rather high firm mortality rate was reduced in the following years. 2'705 of the 1996/97 founded firms were still operating in the beginning of 2003. Thus, the survival rate between 2000 and 2003 is 82.3%. Within six to seven years (1996/97-2003), 62% of the new firms had left the market. The lowest survival rate was found in the service sector, in particular traditional firms (survival rate of 33.1%). Comparable high survival rates could be found in the low-tech industry (44.7%) and construction sector (44.9%).

Table 1 Survival rates of the firms founded in 1996/97

	Number of firms in 1996/97	Survived until 2000 (in %)	Survived until 2003 (in %)
High-tech industry	154	48.7%	42.4%
Low-tech industry	385	50.6%	44.7%
Construction	601	53.7%	44.9%
Modern services	2593	51.1%	41.7%
Traditional services	3379	40.6%	33.1%
Total	7112	46.2%	38.0%

How did the employment of the firms, which had survived until 2003 and for which extensive data are available, grow? The 946 firms which remained in our sample had 1'600 workers (employees incl. founder, see table 2). The average firm size was 1.7 workers. 771 full-time jobs were created during the years 1998 and 1999 and between the beginning of 2000 and 2003 there appeared another 718 new jobs.

The innovative sub-sectors (high-tech industry and modern services) show an employment growth rate above overall average between the end of 1997 and the beginning of 2000. During this time, the Swiss economy experienced a favourable economy climate. The change rate in the high-tech industry was 76% and in the modern service sector 53%, whereas the low-tech industry growth was 32% and that of the traditional service sector was 43%. There is no great difference of the employment growth rates between the high- and low-tech industries within the period of 2000 to 2003 – a time with a rather disappointing economic development in Switzerland. However, more jobs were created in the modern service sector compared to the traditional services.

Table 2 Employment growth of new firms

	Number of employment in the end of 1997 ^{a)}	Employment growth rate 1997-2000	Employment growth rate 1997-2003
High-tech industry	62	75.8%	109.7%
Low-tech industry	66	31.8%	61.6%
Construction	180	51.1%	100.5%
Modern services	687	53.0%	109.2%
Traditional services	605	42.5%	74.2%
Total	1600	48.8%	93.1%

a) Number of employment in full-time equivalent. Number of firms: 946 (firms which survived until 2003)

5. Specification of the Empirical Model

Methodological Issues

The performance of new firms has many facets. Employment is an easily measurable indicator and we – as most of the other empirical studies – use employment growth rate as a proxy for success and performance of firms. We specify our dependent variable as

$$y_i^{\Delta B} = \ln B_{i,t+j} - \ln B_{i,t}$$

where B is the numbers of full-time employment, i is an index for firm i, t is an index for the year of foundation and j an index for the year of survey. This dependent variable can only be observed if the firm has survived and taken part in the survey(s). Therefore, we have to take into consideration a potential selection bias, which is typically eliminated by one of the two procedures proposed by Heckman: i) using full information maximum likelihood or ii) two steps by using the so-called inverse Mills ratio to correct for the bias (Heckman 1976, 1979). Let us first have a look at the two-step model⁴ – for didactical reasons, because we will go a step further and depict afterwards a three-step or double-selection model:

$$y_i^* = x_i' \beta + \varepsilon_i \quad i = 1.., N \quad (5.1)$$

$$d_i^* = z_i' \gamma + v_i \quad i = 1.., N \quad (5.2)$$

$$d_i = 1 \text{ if } d_i^* > 0 \quad d_i = 0 \text{ otherwise} \quad (5.3)$$

$$y_i = y_i^* \times d_i \quad i = 1.., N \quad (5.4)$$

where y_i^* is a latent endogenous variable with observed counterpart y_i , d_i^* is a latent variable with associated indicator function d_i ; x_i and z_i are vectors of exogenous variables; β and γ are vectors of unknown parameters; ε_i and v_i are zero mean error terms with $E[\varepsilon_i | v_i] \neq 0$. The primary equation of interest is 5.1 and equation 5.2 is the reduced form for the latent variable capturing sample selection.

Let us assume that ε_i and v_i are independently and identically distributed $N(0, \Sigma)$ where

$$\Sigma = \begin{pmatrix} \sigma_\varepsilon^2 & \sigma_{\varepsilon v} \\ \sigma_{\varepsilon v} & \sigma_v^2 \end{pmatrix} \quad (5.5)$$

and (ε_i, v_i) are independent of z_i .

As we only observe firms with $d_i=1$, an ordinary least squares approach of equation 5.1 will lead to inconsistent estimation if

⁴ See Vella (1998).

$$E[\varepsilon_i | z_i, d_i = 1] \neq 0. \quad (5.6)$$

That means, the conditional mean of y is misspecified. The strategy proposed by Heckman is to overcome the problem in equation 5.6 through the inclusion of a correction term for $E[\varepsilon_i | z_i, d_i = 1]$. Equation 5.1 can be expressed in terms of conditional expectation

$$E[y_i | z_i, d_i = 1] = x_i' \beta + E[\varepsilon_i | z_i, d_i = 1]. \quad (5.7)$$

Using 5.5 and 5.7, note that

$$E[\varepsilon_i | z_i, d_i = 1] = \frac{\sigma_{\varepsilon v}}{\sigma_v^2} \left\{ \frac{\phi(z_i' \gamma)}{\Phi(z_i' \gamma)} \right\} \quad (5.8)$$

where ϕ is the probability density function and Φ the cumulative distribution function of a normal standard distribution. The term in curly brackets is called the inverse Mills ratio, here denoted with λ_i .

To obtain an estimate of the inverse Mills ratio we have to estimate the unknown parameters δ and γ . The first step of the two-step procedure is to estimate $\frac{\gamma}{\sigma_v}$ over the entire sample by a probit model and then to construct the Mills ratio. The second step consists of estimating the equation of interest including the estimated inverse Mills ratio, $\hat{\lambda}_i$, as an additional regressor

$$y_i = x_i' \beta + \mu \hat{\lambda}_i + \eta_i \quad (5.9)$$

Equation 5.9 can now be estimated by ordinary least squares. If a t-test indicates $\mu \neq 0$ then sample selection bias is given.

As mentioned above, our data set is based on two potential selection biases. We have complete data for firms, which had survived and participated in our surveys. Thus, we are to extend the Heckman two-step model as follows:

$$y_i^* = x_i' \beta + \varepsilon_i \quad (5.1.a)$$

$$d_i^* = z_i' \gamma + v_i \quad (5.2.a)$$

$$g_i^* = w_i' \xi + \psi_i \quad (5.2.b)$$

where equation 5.2.a is the “survival equation” and 5.2.b is the “participation equation”. Equation 5.5 is to extend as follows:

$$\Sigma = \begin{pmatrix} \sigma_{\varepsilon}^2 & \sigma_{\varepsilon V} & \sigma_{\varepsilon \psi} \\ \sigma_{\varepsilon V} & \sigma_V^2 & \sigma_{V \psi} \\ \sigma_{\varepsilon \psi} & \sigma_{V \psi} & \sigma_{\psi}^2 \end{pmatrix} \quad (5.5a)$$

Then equation 5.7 can be written as

$$E[y_i | z_i, d_i = 1, g_i = 1] = x_i' \beta + E[\varepsilon_i | z_i, d_i = 1, g_i = 1] \quad (5.7a)$$

Now, what is the correct specification? According to Tunali (1986) we estimate our equation of interest, i) including the “survival estimation“ Mills ratio, $\hat{\lambda}_i^a$, and ii) including the “participation estimation“ Mills ratio, $\hat{\lambda}_i^b$.^{5,6}

$$y_i = x_i' \beta + \mu \hat{\lambda}_i^a + \tau \hat{\lambda}_i^b + \eta_i \quad (5.10)$$

These estimations rely heavily on the normality assumption. Normality is mostly assumed but the estimates are inconsistent if normality fails. An alternative, which allows to drop the normality assumption, is to use another distribution⁷ or to use non- and semi-parametric methods (see e.g. Cosslett 1991, Newey et al. 1990). Cosslett uses a dummy variable selection correction. The value-ordered index $z_i \gamma$ (see equation 5.2) is cut in M sections. For each section, a dummy is defined and included into the equation of interest instead of the inverse Mills ratio. To compare our results estimated by the Tunali approach we followed Hussinger (2003), who applied the Cosslett method. The results of the different methods are shown in appendix, table A4.

Furthermore, one should consider the panel structure of our data set. Let us point out that panel estimations do not significantly change the below mentioned results. We therefore do not address the issue of panel estimation in this paper.⁸

⁵ An alternative approach is to estimate equations 5.1.a, 5.2.a and 5.2.b simultaneously by maximum likelihood.

⁶ For an application of Tunali's approach see Wetzels and Zorlu (2003) or Zweimüller (1992), who applies a two-step procedure which involves the estimation of a bivariate probit model with partial observability.

⁷ As an example for using another distribution see Olsen (1980), who implemented a linear correction instead of a probit in the selection equation.

⁸ A Hausman specification test shows the appropriateness of a random effects model rather than a fixed effects model. However, the error term indicates that we can use a OLS model or in our case a selection model. For a panel approach with selection bias see Dustmann and Rochina-Barrachina (2000).

Specification of the Independent Variables

As mentioned above, the growth and success of firms presumably depend on various factors. In chapter 2 we classified the factors in five groups and disposed different hypotheses. The following table lists the independent variables, which are designated to test these hypotheses. The last column of table 3 shows the expected signs of the independent variables on employment growth.

Table 3 Variable definition and expected signs

Variable	Definition	Expected signs
1. Firm performance		
Demand	Increase of demand (in 1996/97-2000 and 2000-2003) (dummy*)	+
Highqual	High skilled workers as a share of total employment (employees educated to a degree level, such as universities, technical and business colleges)	+
Newprod	Development and launch of new products and services (dummy)	+
R&D	In-house research and development activity (dummy)	?
Exknow	High relevance of external knowledge for own innovation activities (dummy*)	?
Export	Exports as a share of turnover (in 1999 and 2002)	+
Selffin	High relevance of self-financing from i) personal savings, ii) retained profits and iii) shareholder financing (sum of three dummies*)	+
2. Market environment		
Pricecomp	High competition intensity in terms of price (dummy*)	?
Qualcomp	High competition intensity in terms of quality (dummy*)	+
Innocomp	High competition intensity in terms of depth of innovation of new products (dummy*)	+
3. Founding conditions		
Employ	Number of employment at the time of foundation (Full-time equivalent)	+
Start	Start-up capital (invested capital at the time of foundation, in Mio. CHF)	+
Full	Full-time activity of the founder at the time of foundation (dummy)	-
Public	Received public financial support (at the time of foundation or in 2000-2003) (dummy)	+
Consul1	Using of consultancy/support from technoparcs, "Gründerzentren", "Technologie-transferstellen", "Start-up-Initiative Bund", venture capital companies (dummy)	
Consul2	Using of consultancy/support from business and tax consultancy, attorney, trusts and federations (dummy)	+
Pmotiv	High relevance of the foundation motive "implementation of own ideas coming from professional experience" (dummy*)	+
Rmotiv	High relevance of the foundation motive "implementation of own ideas coming from research at university" (dummy*)	+
Umotiv	High relevance of the foundation motive "Unemployment" (dummy*)	-
Tmotiv	High relevance of the foundation motive "more time flexibility" (dummy*)	-

Table 3 (Cont.)

Variable	Definition	Expected signs
4. Entrepreneurial characteristics		
Team	Number of founder members	?
Gender	Gender (dummy, Male = 1)	+
Exper	Professional experience before the foundation (in years/100)	+
Expersq	Professional experience squared /10000	-
Estate	Owner of real estate at the time of foundation (dummy)	+
Assets	Owner of other assets at the time of foundation (dummy)	+
5. Control variables		
Plc	Public company (dummy)	+
Ltd	Limited public company (dummy)	+
Other	Other legal forms (dummy)	+
Hightech	Sub-sector "High-tech Industry" (dummy)	+
Lowtech	Sub-sector "Low-tech Industry" (dummy)	-
Modserv	Sub-sector "Modern Services" (dummy)	+
Tradserv	Sub-sector "Traditional Services" (dummy)	-
Dummy*: We generated a binary variable from a five-point Likert scale (values 4 and 5 = 1; values 1, 2 and 3 = 0).		

6. Estimation Results

Table 4 presents our regression results based on the Tunali approach. Since the Breusch-Pagan test indicates heteroskedasticity, we ran our regression with White-corrected standard errors. The dependent variable in the first estimation is the log of firms growth between the time of foundation and the first survey in 2000. The second equation considers a longer period of firm performance, namely from the foundation to the beginning of 2003. A first look shows that a selection bias exists in the shorter period for the survival selection (positive sign) as well as for the participation selection (negative sign). However, it seems that the longer period could be estimated by ordinary least square as the two Mills ratios are not significant.

Higher market demand (*Demand*) shows the expected positive impact on firm performance. An increase in demand has a positive effect on turnover and finally on employment growth. Contrary to theoretical expectation, higher qualifications and skills (*Highqual*) are negatively correlated with employment growth. A scrutiny shows a higher education level of the founder for 40% of all one-man firms. One needs high skills for working in these firms since their products and especially services are at high level. But the recruitment of high skilled workers can be difficult. Employing them is relatively costly. The barrier to employ workers in these firms is higher than in firms with low skill requirements and this might be a reason why we observe the negative correlation.

In the period after the foundation, the input-oriented innovation measure "*R&D*" shows a positive sign. At the beginning of an innovation project, new firms apparently depend on employees with specific knowledge and thus employ relatively more people. This relation does not hold for the long period between 1996/97 and 2003. The importance of self-financing (*Selffin*) primarily shows consequences in the first years after the start-up. The longer the firm exists the more information about its efficiency is available. Thus, a successful firm has fewer impediments to receive dept capital.

Market environment factors seem to play a minor role in explaining employment growth of new firms. More important determinants are the founding conditions. Start-up capital (*Start*) influences the employment growth in younger firm days but the effect attenuates in the long period. Successful firms have already generated surpluses after a few years and their prosperity is therefore becoming less dependent on start-up capital. The same argument holds for the variable “*Full*”. The wholeheartedness of the founder, which means among others that the founder gets involved hundred percent at the kick-off, appears to be indispensable for the prosperity of the firm. But for a longer period, “the start-up imprinting” is losing relevance. As we will see below, the number of employment at time of foundation (*Employ*) is positively correlated with the probability of survival (see table 5), but has no significant impact on the employment growth. This means that Gibrat’s law (see footnote 1) can not be rejected in our sample.

Consultancy pays off in the long period if the consultant is specialised in start-ups (*Consul1*). General consultancy (*Consul2*) however shows a negative relation to employment growth in the long run. The estimation indicates the expected signs for the different motives. The possibility to implement own ideas coming from university research affects the post-entry performance in a positive way (*Rmotiv*). Whereas founding a firm out of a unemployment situation results in a relatively lower firm growth (*Umotiv*). To have more time flexibility as a motive for firm founding is negatively correlated with post-entry performance (*Tmotiv*).

We obtain a rather surprising result with respect to entrepreneurial characteristics. Contrary to the many other studies focussing mainly on entrepreneurial characteristics, we found no significant relation between firm performance and team founders, gender, work experience and real estate property. *Assets* have a significant relation to firm growth – but a negative one. It can be argued that founders with assets are rather risk averse, and on account of this, prefer to operate in a small and clearly arranged firm. Or they might not need a successful firm since their wealth is so high that they treat the firm rather as sideline than as source of earnings.

Our regression shows that firms with limited liabilities (*Plc. Ltd*) are more successful compared to sole proprietorship. It seems that construction firms display the highest growth rate, especially in the first year of existence. However, further investigation has to be done for new firms in Switzerland. It is *a priori* unclear whether these results are due to a structural or a business cycle phenomenon.

Table 4 Employment growth results (double selection, robust estimation)

Variable	Δln00 - ln96/97			Δln03 - ln96/97		
	Coeff	s.e.		Coeff.	s.e.	
Firm Performance						
Demand	0.102	(0.037)	***	0.174	(0.054)	***
Highqual	-0.178	(0.044)	***	-0.260	(0.068)	***
Newprod	0.049	(0.037)		-0.016	(0.151)	
R&D	0.101	(0.047)	**	0.037	(0.072)	
Exknow	0.013	(0.036)		0.074	(0.052)	
Export	0.077	(0.093)		0.178	(0.146)	
Selffin	0.081	(0.025)	***	0.050	(0.033)	
Market environment						
Pricecomp	-0.012	(0.036)		0.078	(0.059)	
Qualcomp	0.046	(0.037)		0.106	(0.059)	*
Innocomp	-0.037	(0.041)		0.033	(0.056)	

Table 4 (Cont.)

Variable	$\Delta \ln 00 - \ln 96/97$		$\Delta \ln 03 - \ln 96/97$	
	Coeff	s.e.	Coeff.	s.e.
Founding conditions				
Employ	0.009	(0.029)	-0.016	(0.052)
Start	0.376	(0.119) ***	0.385	(0.244)
Full	0.129	(0.054) **	0.074	(0.080)
Public	-0.037	(0.076)	0.167	(0.204)
Consul1	0.121	(0.088)	0.289	(0.158) *
Consul2	-0.039	(0.034)	-0.107	(0.054) **
Pmotiv	0.017	(0.035)	-0.032	(0.051)
Rmotiv	0.264	(0.086) ***	0.439	(0.152) ***
Umotiv	-0.123	(0.045) ***	-0.218	(0.069) ***
Tmotiv	-0.079	(0.034) **	-0.135	(0.050) ***
Entrepreneurial characteristics				
Team	-0.001	(0.026)	-0.043	(0.041)
Gender	-0.026	(0.039)	0.064	(0.057)
Exper	0.400	(0.581)	-0.047	(0.968)
Expersq	-1.137	(1.458)	-1.019	(2.442)
Estate	0.005	(0.037)	0.015	(0.057)
Assets	-0.082	(0.038) **	-0.120	(0.060) **
Control variables				
Plc	0.501	(0.075) ***	0.631	(0.107) ***
Ltd	0.131	(0.044) ***	0.227	(0.065) ***
Other	0.013	(0.051)	0.136	(0.152)
Hightech	-0.626	(0.179) ***	-0.327	(0.272)
Lowtech	-0.328	(0.100) ***	-0.145	(0.125)
Modserv	-0.342	(0.088) ***	-0.332	(0.214)
Tradserv	-0.630	(0.194) ***	-0.518	(0.367)
Constant	-1.227	(0.565) **	-0.551	(1.008)
Survival-Mills-ratio	2.201	(0.870) **	1.531	(1.578)
Participation-Mills-ratio	-0.514	(0.259) **	-0.381	(0.594)
Number of observations	1230		719	
F(35, 1194); F(35, 683) ¹⁾	7.17		5.18	
Prob > F ¹⁾	0.000		0.000	
R2 ¹⁾	0.186		0.244	

Three-step selection model. Standard errors in brackets. Level of significance: * 0.1, ** 0.05, *** 0.01. Reference group for legal forms: sole proprietorship; for sub-sector: construction. Definition of the variables: see table 3, selection equation: see table 5. 1) Values of the first-imputation-regression.

Table 5 shows the estimated results of the selection equations by Probit.⁹ Firms with more employees at time of foundation have a significant higher survival probability (Column 1 and 3). Furthermore, the empirical results confirm the results of table 1, i.e. traditional firms in the service sector have a relatively low survival rate. Column 2 and 4 shows a significant negative correlation between survey participation and number of employees at time of foundation. Smaller firms are rather disposed to complete the questionnaires. Although the questionnaires were available in German, French and Italian, firms in the German part of Switzerland exhibit a significant higher rate of participation (dummies Espace, Northwest, Zurich, East and Central of Switzerland).

Table 5 Selection equations (Probit models)

	Survival_00	Participation_00	Survival_03	Participation_03
Employ	0.043 *** (0.007)	-0.022 ** (0.009)	0.036 *** (0.007)	-0.024 *** (0.011)
Geneva	-0.065 (0.082)	0.126 (0.127)	-0.021 (0.083)	-0.025 (0.147)
Espace	0.073 (0.081)	0.538 *** (0.125)	0.114 (0.082)	0.348 ** (0.142)
Northwest	0.016 (0.082)	0.508 *** (0.127)	0.023 (0.084)	0.186 (0.146)
Zurich	0.088 (0.080)	0.537 *** (0.123)	0.093 (0.081)	0.270 * (0.141)
East	0.043 (0.084)	0.610 *** (0.129)	0.048 (0.085)	0.333 ** (0.147)
Central	0.025 (0.085)	0.512 *** (0.131)	0.073 (0.087)	0.257 * (0.149)
Hightech	-0.155 (0.114)	0.136 (0.162)	-0.097 (0.114)	0.231 (0.179)
Lowtech	-0.070 (0.082)	0.127 (0.114)	-0.004 (0.082)	-0.034 (0.129)
Modserv	-0.053 (0.057)	0.220 *** (0.079)	-0.073 (0.057)	0.268 *** (0.089)
Tradserv	-0.325 *** (0.056)	0.002 (0.078)	-0.305 *** (0.056)	0.036 (0.089)
Constant	-0.022 (0.089)	-0.531 *** (0.134)	-0.252 *** (0.091)	-0.697 *** (0.154)
Number of observations	7112	3288	7104	2702
LR chi2(11)	131.31	98.74	105.48	58.37
Prob > chi2	0.000	0.000	0.000	0.000
Log likelihood	-4843.8	-2229.5	-4666.0	-1720.4
Pseudo R2	0.0134	0.0217	0.0112	0.0167

Standard errors in brackets. Level of significance: * 0.1, ** 0.05, *** 0.01. Reference group for sub-sector: construction; for region: Tessin.

⁹ Data availability does not allow to achieve the requirement that explanatory variables of the growth regression are a strict subset of explanatory variables of selection regression.

In appendix table A2 results are presented for applying alternative econometric methods. In the first column the double selection method is showed again. The next three columns present versions of a single selection model (survived yes/no), assuming the participation decision is random. The last column presents a model without selection equation (Ordinary least squares estimation). All four versions depict similar results compared to the double selection method, albeit the significance can change by some means or other. The most important difference pertains the variable “*Employ*”. Double selection- and FIML-estimations indicate evidence for Gibrat’s law, whereas 2-step-, Cosslett- and OLS-estimation shows a significant negative correlation between employment growth and employment level indicating a rejection of Gibrat’s law. An explicit conclusion concerning Gibrat’s law would go beyond the scope of this paper. Future research however needs to pay attention to the appropriate method.

7. Summary and Conclusion

The aim of this study was to shed light on the factors, which determine the post-entry performance of new firms. Do new firms really play the decisive role in the economy as asserted by some policy makers? We used an original data set from the Swiss cohort of the start-ups of 1996/97. In these two years 7’112 new firms were founded whereof 46% survived until 2000 and 38% until 2003. The average size of the firms at time of foundation was about 1.7 employments, measured in full-time equivalents. The average growth rate of the surviving firms was 49% for the period of 1996/97-2000 and 93% for the period until 2003.

We classified the determinants of employment growth and profits in five theoretically based sections and estimated the model using a double selection approach for eliminating the bias for survival and participation. A high market demand has a positive impact on the growth of a firm while the market environment seems to play a minor role in explaining employment growth. Furthermore, input- and output-oriented performance indicators generally show no significant impact on the dependent variable. A high qualification of the personnel has, contrary to theoretical considerations, a negative correlation with employment growth. While the impact of most of the founding conditions weakens in the long period (1996/97-2003) compared to the short period (1996/97-2000), consultancy seems to become more important in the long run. We found a rather weak relationship between entrepreneurial characteristics and post-entry performance while the form of organisation is important for employment growth.

Striking a balance for Switzerland shows that though new firms are an important factor for a dynamic and high developed economy, their contribution to employment growth is ultimately rather disillusioning. Concerning the determinants of post-entry performance, we detected some pivotal factors, but further research has to be done, as we have only analysed in detail one of many performance dimensions.

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Appendix

Table A1 Imputations and descriptive statistics

	Number of observations	Number of observations with imputed data	Means without imputations	SD without imputation	Means with imputations	SD with imputation
Dependent variable						
Δ ln96/97- ln00	1604	16	0.220	(0.602)	0.220	(0.602)
Δ ln96/97- ln03	939	9	0.337	(0.701)	0.338	(0.703)
Profit_02	946	48	0.775	(0.418)	0.777	(0.417)
Results from the survey 2000: Firm performance and market environment						
Demand	1625	71	0.623	(0.485)	0.621	(0.485)
Highqual	1625	73	0.513	(0.445)	0.510	(0.445)
Newprod	1625	39	0.496	(0.500)	0.494	(0.500)
R&D	1625	21	0.263	(0.440)	0.264	(0.441)
Exknow	1625	80	0.421	(0.494)	0.421	(0.494)
Export	1620	36	0.095	(0.242)	0.101	(0.249)
Selffin	1625	36	2.595	(0.744)	2.597	(0.744)
Pricecomp	1625	122	0.421	(0.493)	0.423	(0.494)
Qualcomp	1625	122	0.560	(0.497)	0.559	(0.497)
Innocomp	1625	122	0.417	(0.493)	0.414	(0.493)
Results from the survey 2003: Firm performance and market environment						
Demand	946	88	0.353	(0.478)	0.354	(0.479)
Highqual	946	31	0.513	(0.426)	0.511	(0.426)
Newprod	946	62	0.449	(0.497)	0.546	(0.517)
R&D	946	16	0.212	(0.409)	0.211	(0.408)
Exknow	946	95	0.438	(0.497)	0.432	(0.496)
Export	936	38	0.089	(0.236)	0.089	(0.235)
Selffin	946	38	2.657	(0.773)	2.597	(0.771)
Pricecomp	946	116	0.502	(0.500)	0.490	(0.500)
Qualcomp	946	116	0.517	(0.500)	0.514	(0.500)
Innocomp	946	139	0.380	(0.486)	0.382	(0.486)
Founding conditions						
Employ	7112	0	1.738	(2.177)		
Start	1625	181	0.088	(0.173)	0.088	(0.170)
Full	1625	37	0.829	(0.376)	0.830	(0.376)
Public (survey 2000)	1625	16	0.053	(0.225)	0.054	(0.226)
Public (survey 2003)	946	43	0.022	(0.147)	0.022	(0.146)
Consul1	1625	46	0.045	(0.207)	0.045	(0.207)
Consul2	1625	46	0.602	(0.489)	0.602	(0.490)
Pmotiv	1625	176	0.537	(0.498)	0.536	(0.499)
Rmotiv	1625	176	0.035	(0.182)	0.033	(0.178)
Umotiv	1625	176	0.144	(0.351)	0.144	(0.351)
Tmotiv	1625	176	0.346	(0.478)	0.341	(0.474)

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	Number of observations	Number of observations with imputed data	Means without imputations	SD without imputation	Means with imputations	SD with imputation
Entrepreneurial characteristics						
Team	1625	33	1.656	(0.935)	1.657	(0.935)
Gender	1625	398	0.738	(0.440)	0.744	(0.437)
Exper	1246	25	0.162	(0.095)	0.160	(0.097)
Expersq	1246	25	0.035	(0.036)	0.035	(0.037)
Estate	1625	500	0.460	(0.499)	0.474	(0.500)
Assets	1625	477	0.605	(0.489)	0.629	(0.483)
Control- and selection variables						
Plc (survey 2000)	1625	0	0.164	(0.371)		
Ltd (survey 2000)	1625	0	0.257	(0.388)		
Sole proprietorship (2000)	946	0	0.484	(0.499)		
Others (survey 2000)	1625	0	0.095	(0.293)		
Plc (survey 2003)	946	0	0.184	(0.388)		
Ltd (survey 2003)	946	0	0.264	(0.441)		
Sole proprietorship (2003)	946	0	0.513	(0.500)		
Others (survey 2003)	946	0	0.039	(0.194)		
Geneva	7112	0	0.165	(0.371)		
Espace	7112	0	0.178	(0.382)		
Northwest	7112	0	0.150	(0.357)		
Zurich	7112	0	0.216	(0.411)		
East	7112	0	0.132	(0.339)		
Central	7112	0	0.116	(0.321)		
Tessin	7112	0	0.043	(0.202)		
Hightech	7112	0	0.022	(0.146)		
Lowtech	7112	0	0.054	(0.226)		
Construction	7112	0	0.085	(0.278)		
Modserv	7112	0	0.365	(0.481)		
Tradserv	7112	0	0.475	(0.499)		

Table A2 Alternative approaches: employment growth (ln03 - ln96/97)

	Double selection	Heckman FIML robust	Heckman two- step	Cosslett two- step	OLS robust
Firm performance					
Demand	0.174 *** (0.054)	0.146 *** (0.052)	0.174 *** (0.051)	0.174 *** (0.053)	0.176 *** (0.054)
Highqual	-0.260 *** (0.068)	-0.200 *** (0.064)	-0.261 *** (0.067)	-0.273 *** (0.069)	-0.259 *** (0.068)
Newprod	-0.016 (0.151)	0.015 (0.149)	-0.015 (0.149)	-0.015 (0.134)	-0.014 (0.146)
R&D	0.037 (0.072)	-0.024 (0.066)	0.028 (0.065)	0.044 (0.067)	0.033 (0.071)
Exknow	0.074 (0.052)	0.107 ** (0.049)	0.076 (0.053)	0.072 (0.055)	0.074 (0.052)
Export	0.178 (0.146)	0.085 (0.138)	0.175 (0.114)	0.195 (0.119)	0.188 (0.146)
Selffin	0.050 (0.033)	0.058 * (0.032)	0.052 (0.033)	0.053 (0.034)	0.049 (0.033)
Market environment					
Pricecomp	0.078 (0.059)	0.085 (0.052)	0.078 (0.057)	0.075 (0.058)	0.075 (0.059)
Qualcomp	0.106 * (0.059)	0.107 ** (0.054)	0.113 * (0.059)	0.098 (0.061)	0.109 * (0.059)
Innocomp	0.033 (0.056)	0.040 (0.052)	0.035 (0.056)	0.036 (0.058)	0.032 (0.055)
Founding conditions					
Employ	-0.016 (0.052)	-0.038 (0.022)	-0.053 *** (0.015)	-0.080 *** (0.024)	-0.057 ** (0.023)
Start	0.385 (0.244)	0.318 * (0.191)	0.390 * (0.202)	0.326 (0.218)	0.382 (0.246)
Full	0.074 (0.080)	0.090 (0.071)	0.072 (0.071)	0.076 (0.073)	0.075 (0.080)
Public	0.167 (0.204)	0.116 (0.162)	0.163 (0.169)	0.131 (0.175)	0.171 (0.205)
Cons1	0.289 * (0.158)	0.246 ** (0.112)	0.292 ** (0.120)	0.271 ** (0.124)	0.288 * (0.159)
Cons2	-0.107 ** (0.054)	-0.064 (0.049)	-0.102 * (0.053)	-0.102 * (0.055)	-0.105 ** (0.053)
Pmotiv	-0.032 (0.051)	-0.023 (0.048)	-0.032 (0.051)	-0.034 (0.053)	-0.035 (0.051)
Rmotiv	0.439 *** (0.152)	0.405 *** (0.144)	0.438 *** (0.135)	0.460 *** (0.139)	0.444 *** (0.151)
Umotiv	-0.218 *** (0.069)	-0.208 *** (0.070)	-0.217 *** (0.069)	-0.220 *** (0.072)	-0.214 *** (0.069)
Tmotiv	-0.135 *** (0.050)	-0.119 *** (0.045)	-0.136 *** (0.052)	-0.141 *** (0.053)	-0.140 *** (0.050)

Growth of New Firms: Which Factors Influence the Post-Entry Performance?

	Double selection	Heckman FIML	Heckman two-step	Cosslett two-step	OLS robust
Entrepreneurial characteristics					
Team	-0.043 (0.041)	-0.042 (0.034)	-0.042 (0.031)	-0.046 (0.032)	-0.044 (0.041)
Gender	0.064 (0.057)	0.054 (0.054)	0.064 (0.058)	0.067 (0.060)	0.066 (0.057)
Exper	-0.047 (0.968)	-0.209 (0.833)	-0.094 (0.957)	0.045 (0.984)	-0.037 (0.969)
Expersq	-1.019 (2.442)	-0.032 (2.192)	-0.919 (2.444)	-1.217 (2.513)	-1.050 (2.451)
Estate	0.015 (0.057)	0.004 (0.050)	0.019 (0.059)	0.011 (0.061)	0.016 (0.058)
Assets	-0.120 ** (0.060)	-0.091 (0.055)	-0.118 ** (0.059)	-0.122 ** (0.060)	-0.123 ** (0.059)
Control variables					
Plc	0.631 *** (0.107)	0.546 *** (0.096)	0.623 *** (0.086)	0.652 *** (0.090)	0.625 *** (0.106)
Ltd	0.227 *** (0.065)	0.222 *** (0.060)	0.226 *** (0.066)	0.233 *** (0.068)	0.226 *** (0.065)
Others	0.136 (0.152)	0.016 (0.159)	0.127 (0.123)	0.131 (0.127)	0.129 (0.152)
Hightech	-0.327 (0.272)	-0.170 (0.211)	-0.160 (0.182)	-0.139 (0.202)	-0.151 (0.189)
Lowtech	-0.145 (0.125)	-0.164 (0.147)	-0.181 (0.143)	-0.155 (0.141)	-0.148 (0.124)
Modserv	-0.332 (0.214)	-0.141 (0.122)	-0.177 * (0.102)	-0.189 * (0.111)	-0.184 * (0.111)
Tradserv	-0.518 (0.367)	-0.380 *** (0.119)	-0.251 ** (0.110)	-0.145 (0.176)	-0.185 * (0.105)
Constant	-0.551 (1.008)	-1.152 *** (0.240)	0.000 (0.412)	1.402 ** (0.619)	0.436 (0.202)
Selection variables					
Survival-Mills-ratio	1.531 (1.501)				
Participation-Mills-ratio	-0.381 (0.559)				
Survival-mill-ratio (two-step)			0.284 (0.254)		
Cosslett_1				-0.973 (0.624)	
Cosslett_2				-0.946 (0.588)	
Cosslett_3				-0.941 (0.584)	
Cosslett_4				-0.976 * (0.579)	

Growth of New Firms: Which Factors Influence the Post-Entry Performance?

	Double selection	Heckman FIML	Heckman two-step	Cosslett two-step	OLS robust
Cosslett_5				-0.883 (0.569)	
Cosslett_6				-1.020 * (0.555)	
Cosslett_7				-1.211 ** (0.588)	
Cosslett_8				-0.357 (0.822)	
Cosslett_9				-0.887 (0.632)	
Number of observations	7112	5121	5121	5121	719
Censored observations	6393	4402	4402	4402	
Uncensored observations	719	719	719	719	
F(35, 683); F(42, 676) ¹⁾	5.18			5.44	5.51
Prob > F ¹⁾	0.000			0.000	0.000
R2 ¹⁾	0.244			0.253	0.243
Wald chi2(33); (38); (33) ¹⁾		183.05	241.63		
Log pseudo-likelihood ¹⁾		-2715.5			
Prob > chi2 ¹⁾		0.000	0.000		
Selection bias (Wald-Test rho=0; chi2(1)) ¹⁾		83.475			
Prob > chi2 ¹⁾		0.000			

Standard errors in brackets. Level of significance: * 0.1, ** 0.05, *** 0.01. Reference group for legal forms: sole proprietorship; for sub-sector: construction. Definition of the variables: see table 3. 1) Values of the first-imputation-regression.