Entry Strategies, Founder's Human Capital and Start-Up Size

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Abstract

This paper provides a detailed insight into the determinants of new born firms' initial size and its employment composition. As survival prospects of young firms are directly linked to a firm's initial size a better understanding of the factors influencing start-up size is crucial. We find that in addition to industry effects initial size and employment composition is considerably influenced by the generic and specific human capital components of the firm's founder(s). Furthermore, firms with an entry strategy which is based on serving the market with new products create more employment than other start-ups.

Keywords: firm start-up size, human capital, firm foundation

JEL-Classification: L11, L26, J24

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Introduction

One of the stylized facts of entry we know is that new firms are typically small. Furthermore, the firm size distribution of new firms is mostly positively skewed.

It is desirable to get a better understanding of firms' start-up size as the results of many studies indicate that initial founding conditions matter for firm success. More precisely, the probability of survival is positively related to the initial firm size (see e.g. Audretsch and Mahmood, 1995). Furthermore, start-up size seems to have a rather persistent effect on survival (Geroski et al., 2007).

Theoretical considerations state that a firm's start-up size is determined by the minimum of its desired (optimal) size and entrepreneur's financial constraints. Optimal firm size is largely determined by the extent of economies of scale in the industry. However, the fact that newly founded firms are mostly established below the optimal size may not only be the case because of binding financial constraints but also because of ability constraints. Founders may be uncertain about their entrepreneurial abilities and therefore aim to keep sunk costs low. Individuals with a higher amount of generic as well as specific human capital are likely to perform better as other entrepreneurs. As a consequence they should be more confident about future performance of their firm and desire a higher initial firm size. Furthermore, it might be more difficult for less educated and inexperienced founders to hire qualified personnel or to look for suitable team members. Thus, as human capital should increase the expected efficiency of a firm, it should increase start-up size, too.

Research on the determinants of young firms' start-up size decision is rather limited up to now. Only a few empirical studies built the basis about the facts we know today. Most of these studies focus mainly on industry characteristics (Resende, 2007; Mata, 1996; Mata and Machado., 1996; Arauzo-Carod and Segarra-Blasco, 2005). They find that firm start-up size is positively influenced by minimum efficient scale, industry growth as well as turbulence inside the industry.

Studies which control for human capital or explicitly investigate the influence of entrepreneurs' human capital are rare (Mata, 1996 and Colombo et al., 2004) and to the best of our knowledge there are still none for Germany.

Colombo et al. (2004) were able to find a crucial influence of entrepreneurs' human capital on start-up size. More educated founders are assumed to be wealthier individuals.

Hence, they suffer to a lesser extent from financial constraints. Using entrepreneur's age and educational level as proxies for wealth Cabral and Mata (2003) found a significant influence on firm's size in early years.

We contribute to the literature on entrepreneurs' human capital and start-up size by conducting the first study about the influence of founders' human capital on initial firm size for Germany which is based on a large sample of newly established firms. Investigating founders' human capital we can furthermore distinguish between different components of generic and specific human capital.

A second focus is put on a firm's entry strategy. The choice of a particular entry strategy has an influence on the resources a firm needs. An entry strategy which is based on high quality products, new technologies or the introduction of a product new to the market is only possible to conduct if firm size is sufficiently high.

Our empirical analysis is based on a newly generated and unique database in Germany, which contains around 5.000 German newly established firms. All those firms were established between 2005 and 2007. Industries are widely covered from manufacturing and services as well in high-tech and low-tech sectors, over constructing up to the retail market. All information about founders' human capital, firm characteristics and market entry strategies were retrieved by computer-assisted-telephone-interviews. As we include in our analysis only very young firms (up to an age of three years) we are not exposed to a survival bias of the surveyed firms.

Start-up size is explained by innovation-based market entry strategies as well as by entrepreneurs' human capital decomposition. We also control for the most important industry variables. In addition to investigating firm's total employment at start-up (including the founders) we look at three specific types of employment which differ in their involvement in the social insurance system and the volume of work (part-time, full-time). Regression results indicate that the effects on start-up size considerably differ between the types of employment analyzed. Specific human capital in terms of entrepreneurial experience has a positive influence on all types of employment whereas the amount of professional experience and generic human capital in terms of a university degree only increase the number of full-time employees subject to the social insurance contribution. An entry strategy based on the introduction of products new to the market is found to be positively related to firm's initial size independent of the type of employment. All in all,

our results show that it is important to account for founder-specific, firm-specific as well as industry specific factors in order to understand the size distribution of new born firms.

Literature Review

Despite the knowledge that a firm's initial size has an crucial influence on start-up's firm performance in the early years following entry, not that much empirical work has been done which investigates the determinants of a firm's size at its founding date.

Theoretically firm's initial size is determined by the minimum of its desired optimal size and founders' financial constraints (Cabral and Mata, 2003). Most of the somewhat rare empirical studies which investigate the determinants of start-up size concentrate on industry characteristics (Resende 2007, Arauzo-Carod and Segarra-Blasco 2005, Görg et al. 2000, Görg and Strobl 2002, Mata and Machado, 1996). This is presumably due to lack of detailed information about founders in firm-level data. Based on a first study by Mata and Machado (1996) those studies relate start-up size to the minimum efficient scale (MES) in the respective industry, the proportion of employment in that industry operating below the minimum efficient scale, the size of the industry, turbulence in the industry and the growth of the industry. MES and turbulence is found to have a significant positive influence. Industry growth is often found to be also positively related to start-up size, but not always in a significant way. The other way around, as expected, the proportion of employment in an industry working at suboptimal scale exerts a negative influence on start-up size. Industry size is usually not found to have a statistically significant effect on a firm's initial size.

Quantile regressions of those studies show that scale economies are more important the larger the entrant. "[I]t seems that small new firms appear everywhere, while relatively large ones only appear where economies of scale make it crucial […]" (Mata and Machado, 1996, p. 1321).

The first study not focusing solely on industry characteristics but taking also the influence of entrepreneur's attributes into account when analyzing the size of new firms was done by Mata (1996). He finds education, measured by the years of schooling, to positively influence start-up size. The influence of founders' age, which is supposed to be a proxy for labor market experience after controlling for education, is found to be inversely

u-shaped. Mata therefore concludes that the size of new firms increases with entrepreneurs' human capital.

Colombo et al. (2004) explicitly focus on entrepreneurs' human capital influence on firms' start-up size. From theoretical reasoning they draw the hypothesis that firms' start-up size is positively related to the human capital of a firm's founders. First, imperfections in capital markets may lead to financial constraints which force the founders to start below their optimal start-up size. Human capital in terms of higher education and longer work experience usually comes along with a higher personal wealth and hence less exposure to financial constraints. Secondly, future earnings of the newly started firm are certainly positively related to the specific components of founders' human capital, e.g. entrepreneurial ability. With higher expected earnings the optimal initial investment in the new firm increases and therefore initial size. Third, more educated people usually have greater confidence in the prospects of the new venture and start operations at a greater scale. Following Becker (1975), Colombo et al. (2004) additionally distinguish between generic human capital and specific human capital and claim the impact of specific human capital to be greater than of generic human capital. Controlling also for industry specific influences on initial firm size they find their hypothesis to be confirmed. Both specific human capital, which they capture by industry-specific working experience, entrepreneurial and managerial experiences, and generic human capital, which is proxied by education and general working experience, positively influence the firms' start-up size measured by the salaried employees (plus founders) twelve month after the firm started operations. The variables reflecting the specific component of human capital are found to exhibit greater explanatory power than those reflecting the generic component.

Åstebro and Bernhardt (2005) analyze the impact of various human capital variables on the start-up capital of firms which can be considered as an alternative measure of initial firm size. Åstebro and Bernhardt find that firm capital is generally increasing with human capital. Similar to the results of Colombo et al. (2004), the effects of variables reflecting specific human capital (here: entrepreneurial ability, managerial experience) are larger in magnitude than the effects of variables reflecting generic human capital (here: education and [general] work experience).

Empirical Analysis

The Data

Our data-set we used for the empirical analysis consists of more than 5,000 young German firms which were established between 2005 and 2007. The data-set is part of the "KfW/ZEW Start-Up Panel", a newly launched panel of German start-ups in various industries, both High-Tech- and Non-High-Tech-Industries.

This project is carried out in collaboration with the "KfW-Bankengruppe", a public owned bank, and CREDITREFORM, Germany's biggest credit rating agency. The underlying population, from which a stratified[1] random sample was drawn, are all start-ups record by CREDITREFORM which are operating in the High-Tech-Industries, as well as in the other manufacturing, the service sectors, construction and the retail sector and which were founded between 2005 and 2007. In the following years those firm formations shall be observed up to an age of six years. In order to have enough observations for viable empirical analyses of high-tech start-ups firms in the high-tech industries were oversampled. The sample is consisting of high-tech start-ups and non-high-tech start-ups in equal share.

For the first survey wave detailed information about the founders, their human capital, firm's labor demand and the characteristics of those newly founded firms was retrieved during a computer-assisted telephone interview in the summer of 2008.

In order to be able to control for industry characteristics we add industry data to each firm observation according to its industry classification code (NACE) and its year of foundation. Industry data was retrieved on the 2 digit level of the annual enterprise statistics of industry, trade and services publicly available from Eurostat and merged with the firm level data of the KfW/ZEW Start-Up Panel according to a firm's 2 digit NACE code and foundation year.

The Estimation Models

In this section, we describe the estimation models and introduce the determinants of start-up size of business foundations within the years 2005-2007 in Germany assuming

[1] Stratification criteria were the year of establishment, the industry and KfW-funding.

an important influence of the human capital of their founders and entry strategies. Due to the fact that more than one half of the firms in our sample have no employees when starting business we define the initial size of the firm by the number of founders and the number of employees at the date of foundation. Further, we differentiate between full-time and part-time employees, who are included in the German social insurance system, and marginally employed persons, who do not earn more than 400 EURO per month and therefore are not included in the social insurance system. Family members, who take an active part within the new born firm, and apprentices determine start-up size, too. Free-lancers, trainee students and subcontracted workers are not taken into account in this study.

We estimate the determinants of firms' start-up size through different models. In the first model, we measure start-up size of firm i - y_i - as the full-time equivalent of the sum of the number of founders and the number of employees in logarithm. The linear model is expressed by:

$$\ln(y_i) = x_i'\beta_1 + z_i'\beta_2 + w_i'\beta_3 + u_i, \qquad \forall\, i = 1\ldots n$$

where n is the number of firms in our estimation sample, x_i are the variables reflecting the human capital of the founders, the vector z_i represents market entry strategies of the firms and w_i is a set of industry specific factors and control variables (see table 1 for a variable description); β_1, β_2 and β_3 are the vectors of parameters to be estimated. The disturbances u_i are assumed to follow a normal distribution $N(0, \sigma_u^2)$. We compute OLS estimates.

Describing human capital of the founders we distinguish between *generic* and *specific* human capital. Generic human capital is measured by the education of the founder or the founding team, respectively: *Graduate* has value 1 if the single founder or at least one member in the team of founders is a university graduate. Otherwise it is zero. The age (or oldest founder's age in case of a team foundation) of the founders (in logarithms: *Log (age)*) approximates the general professional experience (and personal wealth) and is a second factor of generic human capital. These variables reflect working experience of the founders which do not reflect a special know-how be useful in managing an enterprise.

Table 1: Description of variables

Variable	Description
Dependent variables	
Log (total employment)	Logarithm of total employment at firm foundation measured in full-time equivalents
# of full-time employees	Number of full-time employees (included in social insurance system)
# of part-time employees	Number of part-time employees (included in social insurance system)
# of marginally employed persons	Number of part-time employees who do not earn more than 400 EUR a month and therefore are not included in the social insurance system (so-called "mini-jobbers")
Independent variables	
Firm-level variables	
Graduate	Single founder is an university or college graduate / at least one graduate in the team of founders
Restarter	Single founder is a restarter / at least one restarter in the team of founders. The restarter's previous business has become insolvent or has been liquidated.
Portfolio entrepreneurs	Single founder is a portfolio entrepreneur / at least one portfolio entrepreneur in the team of founders. The portfolio entrepreneur's previous business still exists.
Top manager	Single founder has been a top manager / at least one former top manager in the team of founders
Log (professional experience)	Logarithm of the years of professional experience in the same industry
Log (age)	Logarithm of the (oldest) founders' age
Necessity entrepreneurship	Firm foundation was driven by necessity (unemployment or no adequate dependent employment)
Team	Firm foundation by a team of founders
Conducting R&D	Firm is conducting R & D
Market novelties	Firm has market novelties
Industry variables	
Log (industry size)	Logarithm of the number of employees in the same industry (NACE 2 digit level) in the year prior to firm foundation
Log (labor costs)	Logarithm of the average labor cost per employee in the same industry (NACE 2 digit level) in the year prior to firm foundation
MES	Minimum efficient size (average size of a firm in the same industry; NACE 2 digit level) in the year prior to firm foundation
High-tech industry	Firm belongs to the high-tech industries (classified on NACE 4 digit level)

Necessity entrepreneurship suggests that the firm foundation was mainly driven by unemployment or the absence of an adequate dependent employment. This information is also been seen as an aspect of generic human capital.

In contrast, we measure specific human capital by factors indicating experience which can directly be utilized in business operations. One of these factors is the specific professional experience of the founder(s) measured in logarithms of the years of profes-

sional experience in the same industry the new born firm is operating in (*Log (professional experience)*)[2]. In addition, we operationalize managerial experience by three dummy variables: The first indicate that at least one founder has been employed as a top manager in another firm before foundation (*Top manager*), hence has gathered experience as a firm's executive. We further model entrepreneurial experience by a second and third dummy: *Portfolio entrepreneur* denotes that at least one of the founders has been an entrepreneur before foundation and that his previous business still exists (either it is still managed by himself or it has been transferred or sold to someone else). In contrast, *Restarter*s are founders who were entrepreneurs prior to the firm foundation but the previous businesses have become insolvent or have been liquidated. We assume that specific human capital has a greater impact on start-up size than generic human capital (see e.g. Colombo et al., 2004).

As we observe that nearly 30% of the firms in our sample are founded by more than one person (see table 2), we control for team foundations (*Team*) as start-up size of these firms is per definition larger than foundations of single founders. When neglecting this fact, we find significant effects of some exogenous variables which are attributed to the size of the team. For example, the coefficient of *Graduate* turns out to be positive significant. When *Team* is added to the estimation equation, it becomes insignificant. Therefore, we conclude that the founders of team foundations are higher qualified than foundations of a single founder, on average.

We expand our analysis of the determinants of start-up size in examining the role of entry strategies. In detail, we look at entry strategies based on innovation: new technologies or innovative products which allow firms to find a niche position on the market in which they operate. Our survey allows us to operationalize innovations by two variables indicating if the firms carry out R&D and if the firms had introduced a product new to the market. We expect a positive influence on start-up size as the implementation of innovation activities requires an adequate staff size. In our sample, 30% of the firms conducting R&D, 23% of them have produced a market novelty.

The industry variables measure specific characteristics of the environment of the firms and market specific conditions or the extent of competition: *Log (industry size)* is the

[2] In case of a team foundation, we observe the years of experience of those founder who has worked the largest time in the relevant industry.

logarithm of the number of employees and *Log (labor costs)* is the logarithm of the average labor cost per employee in the same industry in the year prior to firm foundation. The minimum efficient scale (*MES*) is measured by the average size of a firm in the same industry in the year prior to firm foundation. Firms belonging to the *High-tech industry* - which are more than a half of our estimation sample - are marked by a dummy to control for special features of these firms which cannot be covered by the other industry variables.

Table 2: Descriptive statistics of the variables included in the estimations

Variable	Mean	Std. Dev.	Min	Max
Dependent variables				
Log (total employment)	0.626	0.717	0	5.651
# of full-time employees	0.775	4.783	0	280
# of part-time employees	0.214	1.283	0	60
# of marginally employed persons	0.645	14.641	0	1000
Independent variables				
Firm variables				
Graduate	0.393	0.488	0	1
Restarter	0.128	0.334	0	1
Portfolio entrepreneurs	0.216	0.411	0	1
Top manager	0.213	0.410	0	1
Log (professional experience)	2.433	0.796	0	4.007
Log (age)	3.636	0.252	2.773	4.522
Necessity entrepreneurship	0.192	0.394	0	1
Team	0.280	0.449	0	1
Conducting R&D	0.290	0.454	0	1
Market novelties	0.227	0.419	0	1
Industry variables				
Log (industry size)	13.681	1.026	9.744	15.051
Log (labor costs)	3.480	0.428	2.359	4.193
MES	18.422	31.822	2.182	364.912
High-tech industry	0.525	0.499	0	1

Source: KfW/ZEW Start-Up Panel and Eurostat, authors' calculations

In the second model, we only look at employment which is created by the new firms, i.d. subtracting the number of founders from start-up size which is the total amount of staff. Therefore, we could measure "real" employment effects – additionally to the working places of the founders - come from firms at the time of foundation. Further, we differentiate between the various kinds of employees. We assume different effects of human capital of the founders and entry strategies on employment when considering the "quality" of jobs. Our hypothesis is that education and the amount of experience of the founders in-

creases the number of full-time employees but decreases the number of marginally employed persons. Presumably, higher educated and professionally experienced founders have better chances of success, feel more confident about their venture and are therefore more willing to offer a relatively costly type of employment, namely full-time employment. Further, we assume that firms belonging to high qualified founders are to a higher degree knowledge-intensive and therefore have a larger demand for high qualified personnel, too. Further, these founders have better opportunities to realize innovations than less qualified entrepreneurs. And innovative activities require appropriate qualification of the staff. Due to this reasons we expect a positive influence of founders' human capital, conducting R&D and market novelties on the creation of working places which require high qualification.

In our sample, we have no information about the qualification of the personnel. We are only able to approximate "job quality" by the working time of the employees. We model three different estimation equations concerning the number of full-time employees, the number of part-time employees and the number of marginally employed persons, respectively.

As the dependent variables are even-numbered we use a count-data model to estimate the parameter of interest. The Poisson regression model might be used to compute estimates. But one assumption of the Poisson model that the variance of the dependent variable equals its mean is violated here. The variances of the number of employment in each category are larger than their means ("overdispersion")[3]. The most common alternative of the Poisson model is the negative binomial model, which relaxes the assumption and generalizes the Poisson model by introducing an individual, unobserved effect into the conditional mean (see Green, 2003, pp 744 ff). We choose the Negbin II model (see Cameron and Trivedi, 1986) to model the conditional variance of the dependent variables:

$$Var(Y_{ji}) = E(Y_{ji}\left|x_{ji}, z_{ji}, w_{ji}\right.)\left[1+\alpha\, E(Y_{ji}\left|x_{ji}, z_{ji}, w_{ji}\right.)\right] \qquad \forall\, i = 1\ldots n, \quad \forall\, j = 1, 2, 3$$

[3] Additionally, we observe a high proportion of zeros as many firms have any employees at the date of foundation. Therefore, we alternatively have to use a zero inflated model. But in general, the negative binomial model could account for an excess of zeros as a high proportion of zeros induce overdisperion, too. We have not yet tested if there is a separate process of the zero and nonzero counts. This would force us to apply a hurdle model, in which zeros and nonzeros come from different distributions.

Y_{ji} represents the number of employees concerning the three different kinds of employment groups ($j = 1, 2, 3$). α is an estimate of the degree of overdispersion. When α is zero, negative binomial has the same distribution as poisson. The larger α is the greater the amount of overdispersion in the data. A test of the Poisson distribution is carried out by testing the hypothesis $\alpha = 0$ using a likelihood-ratio test for each equation (see table 3). For all cases the hypothesis is denied and the negative binomial model should be preferred to the Poisson model.

Estimation Results

First we look at the results concerning total employment as revealed by the OLS regression. The only human capital variable having an effect on total employment is "portfolio entrepreneurs". Having been successful as an entrepreneur previously (in the sense that the prior business still exists) increases the start-up size of the new venture. By contrast, restarters do not start larger businesses. It seems that entrepreneurial experience only gives more confidence about the performance of the new firm und thus leads to a higher initial size if the entrepreneurial activity in the prior business has been successful.

Founders' age has a positive effect on start-up size. This might reflect a wealth effect, since wealth usually increases with age. Wealth relaxes possible financial constraints forcing founders to start their firm below the desired size. The age coefficient might also mirror the effect of general work experience. In consideration of the insignificant effect of professional experience on start-up size this would imply that it is rather general work experience than industry-specific experience which makes founders feel confident about their venture and choose a larger initial size.

If firm foundation was primarily driven by necessity, start-up size tends to be smaller. Founders starting a business first and foremost to avoid unemployment would often prefer to work as paid-employed rather than being self-employed. In this case they will plan to give up their business as soon as they find paid work and consider their current self-employment as a temporary state. Then it is rational for them to keep sunk costs low and to enter at small scale.

Teams start larger businesses than single entrepreneurs. This may reflect a wealth effect as well as a human capital effect. Teams will dispose of more financial capital than single entrepreneurs. They also will cover a broader range of skills and knowledge making them more likely to be successful with their start-up. Both will tend to increase initial firm size.

Table 3: Determinants of start-up size

	log (total employment) OLS			# of full-time employees Neg-Bin II			# of part-time employees Neg-Bin II			# of marginally employed persons Neg-Bin II		
	coeff.		se	coeff.		se	coeff.		se	coeff.		se
Firm variables												
Graduate	-0.023		(0.02)	0.229	**	(0.090)	-0.114		(0.134)	-0.599	***	(0.105)
Restarter	-0.046		(0.029)	-0.111		(0.137)	0.077		(0.188)	0.034		(0.165)
Portfolio entrepreneurs (1)	0.104	***	(0.029)	0.319	**	(0.129)	0.576	***	(0.172)	0.814	***	(0.162)
Top manager	0.026		(0.028)	0.154		(0.125)	0.128		(0.177)	0.109		(0.161)
Log (professional experience)	0.010		(0.013)	0.286	***	(0.060)	-0.045		(0.081)	-0.244	***	(0.071)
Log (age)	0.207	***	(0.042)	0.980	***	(0.203)	0.617	**	(0.273)	0.949	***	(0.251)
Necessity entrepreneurship	-0.120	***	(0.023)	-0.500	***	(0.111)	-0.408	***	(0.154)	-0.288	**	(0.136)
Team	0.691	***	(0.022)	0.314	***	(0.097)	0.026		(0.140)	0.623	***	(0.121)
Conducting R&D	0.050	**	(0.021)	0.076		(0.101)	0.127		(0.136)	0.157		(0.124)
Market novelties	0.085	***	(0.022)	0.203	**	(0.104)	0.534	***	(0.136)	0.521	***	(0.130)
Industry variables												
Log (industry size)	-0.105	***	(0.012)	-0.241	***	(0.056)	-0.250	***	(0.079)	-0.115	*	(0.069)
Log (labor costs)	-0.403	***	(0.036)	-0.806	***	(0.151)	-1.445	***	(0.217)	-1.959	***	(0.177)
MES	0.002	***	(0.000)	0.011	***	(0.002)	0.008	***	(0.002)	0.004	**	(0.002)
High-tech industry	-0.077	***	(0.023)	-0.777	***	(0.104)	-0.547	***	(0.153)	-0.036		(0.129)
Constant	2.476	***	(0.304)	1.232		(1.286)	4.427	**	(1.882)	-4.070	***	(1.596)
Observations	4779			4794			4791			4790		
Adjusted R^2 / Pseudo R^2	0.2893			0.0404			0.0419			0.0773		
α	-			5.844			8.430			7.408		
LR test of α=0	-			0.000			0.000			0.000		

(1) Reference category: no entrepreneurial experience

*** p<0.01, ** p<0.05, * p<0.1, Standard Errors in parentheses

Source: KfW/ZEW Start-Up Panel and Eurostat, authors' calculations

Firms conducting R&D as well as firms producing market novelties start larger than firms without such innovation activities. The implementation of these activities requires personnel. It is thus confirmed that an entry strategy based on new technologies or the introduction of a product new to market leads to a larger initial size.

As to the industry variables, we observe a negative effect of industry size and the average labor costs on start-up size. The impact of MES indicating the extent of economies of scale is positive as to be expected. Firms operating in the high-tech industry tend to start smaller.

Looking at the results of the count data models, we find some striking differences in the effect of the variables on start-up size between the different kinds of employment. First of all, founders who are college or university graduates have more full-time employees subject to social insurance contribution but less marginally employed persons at start-up than less educated founders. Likewise, the amount of professional experience of the founder increases the number of full-time employees but decreases the number of marginally employed persons. One might argue that educated and professionally experienced founders have better chances of success, feel more confident about their venture and are therefore more willing to offer a relatively costly type of employment, namely full-time employment subject to social insurance contribution. They also might find it easier to hire qualified personnel which is usually contracted in this type of employment than entrepreneurs with a lower level of education and experience. The latter have to resort to the typically less qualified “mini-jobbers” to a larger extent. Moreover, they typically have less favorable prospects of success and therefore might also prefer to make use of this flexible, lower-cost type of employment.

We observe a different pattern for portfolio entrepreneurs. They tend to have more employees at start-up than other entrepreneurs in all kinds of employment, where the positive effect on the number of employees is about twice as large for marginally employed persons as for full-time employees. The same holds for firms founded by a team and for firms with market novelties. This is surprising because firms producing products new to market are often engaged in R&D and one would expect them to contract first of all highly qualified personnel on a full-time basis. But often the R&D activities related to the development of a new product during the start-up phase are performed to a large part by the founders themselves. The less demanding jobs to be done at this early stage might as well be carried out by “mini-jobbers”. Moreover, firms producing market novelties may

have a preference for flexible, low-cost type of employment because the success of the new product to be developed is very uncertain at start-up so that these firms are exposed to a high risk of failure.

Another remarkable result is that operating in the high-tech sector significantly decreases the number of employees subject to social insurance contribution at start-up, but no significant effect is observed concerning marginally employed persons. However, it has to be noted that the variable "high-tech industry" is highly correlated with the labor cost at industry level, i.e. wages paid in the high-tech sector are above average (see correlation matrix in the appendix). This can be explained by the fact that the high-tech sector has a strong demand for high-skilled workers. The regression results indicate that the higher the average labor cost in an industry, the lower the demand especially for the (typically lower-skilled) "mini-jobbers". Thus, the labor cost variable captures large part of the negative effect which the belonging to the high-tech sector actually has on the number of marginally employed persons. As a consequence, the corresponding coefficient becomes insignificant.

Conclusions

In this paper we examined how specific and generic human capital of a new born firm's founder(s) affects the choice of initial size. Since it is well known that initial size has a positive impact on early firm survival getting a more detailed picture of the determinants of initial firm size is desirable. As most of the rare literature on initial firm size focuses on industry characteristics we contribute to the understanding of the determinants of initial firm size by drawing attention to firm specific factors such as founders' human capital composition and entry strategies. In addition to investigating firm's total employment at start-up we look at three specific types of employment creation which differ in their involvement in the social insurance system and therefore in quality.

For generic human capital we found that having a university degree does not have an influence on total employment but on employment composition. Graduates create more full-time jobs but employ less marginally employed persons ("Mini-Jobber") who are not included in the social insurance system. However, general work experience which is proxied by the age of the founders has a positive impact on total employment and on all types of employment we investigated. Similar results apply for specific human capital. While professional experience does not have an influence on total employment but a

positive effect on the number of full-time employees and a negative effect on the number of marginally employed persons, successful entrepreneurial experience influences both the magnitude of total employment and the number of all types of employees.

Furthermore, an entry strategy which aims to provide innovative products is related to a higher initial size. In order to provide comparable results we controlled for the most important industry variables. Our results are in line with the existing literature. Industry size and labor costs are found to have a negative effect on start-up size while operations start at a larger scale if this is required by the minimum efficient scale observed in the respective industries.

Our results show that in order to better understand the size distribution of new born firms it is necessary to have a comprehensive model which accounts for founder-specific, firm-specific as well as industry specific factors.

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Appendix

Table 4: Correlation Table

	Log (total employment)	# of full-time employees	# of part-time em-ployees	# of marginally employed persons	Graduate	Restarter	Portfolio entre-preneurs	Top manager	Log (professional experience)
Log (total employment)	1								
# of full-time employees	0.415	1							
# of part-time employees	0.327	0.109	1						
# of marginally employed persons	0.151	0.069	0.153	1					
Graduate	0.141	0.035	-0.006	-0.013	1				
Restarter	-0.014	-0.013	-0.016	-0.007	0.026	1			
Portfolio entrepreneurs	0.245	0.062	0.061	0.036	0.208	-0.201	1		
Top manager	0.217	0.044	0.022	0.032	0.213	0.154	0.573	1	
Log (professional experience)	0.076	0.054	-0.003	-0.017	0.008	0.014	0.105	0.080	1
Log (age)	0.180	0.061	0.023	0.001	0.207	0.065	0.229	0.197	0.470
Necessity entrepreneurship	-0.123	-0.029	-0.015	-0.011	-0.128	-0.018	-0.134	-0.156	0.058
Team	0.478	0.055	0.013	0.029	0.308	0.042	0.329	0.348	0.079
Conducting R&D	0.117	0.023	-0.002	0.020	0.228	0.060	0.181	0.154	0.008
Market novelties	0.127	0.013	0.040	0.031	0.157	0.011	0.144	0.108	-0.017
Log (industry size)	-0.015	-0.022	0.031	0.024	0.047	-0.025	-0.087	-0.073	0.039
Log (labor costs)	-0.091	-0.030	-0.097	-0.038	0.042	0.031	0.084	0.088	0.000
MES	0.098	0.045	0.005	-0.006	-0.001	-0.022	0.072	0.054	0.021
High-tech industry	-0.064	-0.055	-0.072	-0.004	0.241	0.055	0.108	0.120	0.030

... to be continued

... Table 4 continued

	Log (age)	Necessity entre-preneurship	Team	Conducting R&D	Market novelties	Log (indus-try size)	Log (labor costs)	MES	High-tech industry
Log (age)	1								
Necessity entrepreneurship	0.116	1							
Team	0.191	-0.135	1						
Conducting R&D	0.023	-0.134	0.174	1					
Market novelties	0.056	-0.101	0.132	0.320	1				
Log (industry size)	0.078	0.049	-0.055	-0.153	-0.077	1			
Log (labor costs)	-0.078	-0.063	0.080	0.192	0.076	-0.708	1		
MES	0.070	-0.022	0.088	0.113	0.049	-0.166	0.291	1	
High-tech industry	0.031	-0.069	0.115	0.213	0.109	-0.316	0.582	0.1066	1

Source: KfW/ZEW Start-Up Panel and Eurostat, authors' calculations