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Waiting to start a business venture: Empirical evidence on the determinants and effects of wait time

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**Waiting to start a business venture.
Empirical evidence on the determinants
and effects of wait time.**

by
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JEL-Classification: L27, M13, C41

Keywords: waiting time periods, self-employment, duration model, survival

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Determinants and effects of wait time in the context of previously unemployed founders.

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1. Introduction

Not all venture projects make it to market. In the same manner, start-up projects often take a long journey before they get started. The reasons for the delay of entry may be multicausal and heterogeneous in nature. Often, the conceptualization of a venture simply needs more effort in sales preparation, market screening, or other fields of activity, such as financing. However, we know little about delaying entries in general. From a simple economic perspective, we may describe the waiting situation as a choice between collecting more information to ensure a better implementation of the business option and accelerating the start up to boost income streams.

The decision to wait can be important for the overall development of a business. Following research on strategic management and industrial organizations, we should expect the extent of waiting to have a direct effect on a firm's post-entry success curve (Lieberman and Montgomery 1998; Gastrogiovanni 1996 or Holden and Riis 1994). Empirical research supports this view and shows that pioneers face a greater risk of failure but that that early entry may also lead to increased profit shares by setting up market barriers for future competitors. Furthermore, related research supports the hypothesis that the optimal trade-off between waiting and early entry depends largely on the market context of the venture and firms' resources (see Suarez and Lanzolla 2007; Alvarez 2009; Dencker et al. 2009).

Nevertheless, traditional research on management and industrial organizations focuses on a business context that differs from "ordinary entrepreneurship activity". Usually, greater market

complexity, high diversity in the capability to process information, and real options to actively create market structures are more relevant for big players. In contrast, ordinary, new, small business activity (e.g., self-employment) is associated with a low level of innovation (novelty), a high(er) share(s) of imitative business activity, and a lower level of power to influence market conditions. Most important, self-employed and small business entrepreneurs will focus on maintaining stable income streams rather than developing great market shares.

In the present study, we explicitly account for the context of “ordinary entrepreneurship activity” and study the determinants and outcome of waiting in the context of small business creation. To the best knowledge of the authors, empirical evidence on these issues is missing from the literature.

In our study, we follow the theoretical modeling framework that has been suggested by Lévesque and Shepherd (2002 and 2004), Choi et al. (2008), and Lévesque et al. (2009), who focus on the theoretical reasoning for waiting time periods in the context of opportunity exploitation. Their modeling framework implies that the optimal timing for a venture activity varies with a firm’s resources, a firm’s market strategies, and the quality of the market environment (rivalry, competition, and dynamics). We account for these factors by modeling the waiting time period as a function of a set of covariates, which we relate to local economic attributes and individual characteristics. For the outcome analysis, we question whether the duration of the waiting time period prolongs the duration that the individual is self-employed. Both parts of the investigation are performed by using duration modeling techniques.

The empirical investigation concentrates on a specific population of business founders who have been engaged in starting a new business from the position of unemployment. The advantage of studying this group is that we can focus on a quite homogeneous subset of small business creators in terms of motivation, business strategy, and single firm formation as well as the relevance of financial constraints (see Dencker et al. 2009; Hinz and Jungbauer-Gans 1999; Bhawe 1994). Furthermore, because we include only people who attended a training seminar on planning for their self-employment period, we are able to identify a reliable starting point for the people’s attraction to starting a venture. In addition, by focusing on people who participated in a self-employment training seminar, we also lessen the heterogeneity regarding business preparation in our sample. Finally, the population that we study has attracted growing interest in empirical research in recent decades (see, for example, Meager 1996; Hinz and Jungbauer-Gans 1999;

Pfeiffer and Reize 2000; Böheim and Taylor 2002; Cueto and Mato 2006; Caliendo and Kritikos 2010).

Herein, we briefly discuss recent research and offer a simple theoretical consideration of choosing the optimal waiting time for the population of potentially self-employed individuals. Sections three and four present the methodological framework (the econometric approach and data issues) of the study and are followed by a presentation of the results in section five. Finally, the study closes with a summary and some concluding remarks.

2. Literature review and framework

According to the existing literature, the choice of the entry mode of a business usually reflects its potential outcome. We follow this general idea and develop a framework in which both issues—the determination and the outcome of waiting—are jointly discussed.

Existing literature

According to research of strategic management and industrial organizations, there are two general claims about how delaying market entry may affect the business prosperity of a venture. In one argument, early entries are emphasized to capture higher future profits, to obtain greater options on high market shares, and to have strategic advantages owing to higher operational efficiency (e.g., Gastrogiovanni 1996; Holden and Riis 1994; Andersson and Engers 1994; Rasmusen and Yoon 2008). In contrast, the second argument emphasizes the higher risk of failure due to the higher likelihood of insufficient planning, which, in turn, can lead to insecure investments when market conditions are unstable (e.g., Lieberman and Montgomery 1998; Boulding and Christen 2001). Therefore, learning from others can be beneficial if the market is risky but less dynamic when learning from others is likely.

Although these implications provide only limited support for our research population, it is vital to note that the existing research emphasizes the high importance of the market context for the decision to wait or to boost an entry. Relevant context factors are the level of existing information and firm-specific strategies. As in the Lieberman and Montgomery (1998) framework, a firm's entry choice may strictly depend on the size and age of the market, the extent of market rivalry, and

the firm's strength in addressing the market.¹ Likewise, Aaker and Day (1986) show that the existence of greater option values for accelerated entries holds true only under specific conditions.²

For example, Lévesque and Shepherd (2002) argue that the optimal time of entry is based on the extent of market uncertainty (environmental volatility) and the level of market rivalry (e.g., the level of competition). As they propose, waiting should be shorter with higher market volatility because higher market volatility allows firms to increase their option value for defending a market position.

Of course, firms react to external market conditions to improve the option value from learning periods. For example, Lévesque et al. (2009) note that in addition to market volatility, market dynamics, and the newness of the market, learning hostility is an important factor in the optimization of the waiting time strategy. Hence, a firm's ability to organize new information and to cope with external market dynamics becomes a relevant factor that allows the optimal waiting period to be scaled (Choi et al. 2008; Surez and Lanzolla 2007).

Nevertheless, one must keep in mind that in its most basic form, entrepreneurship is an individual event (e.g., Bates 1990; Robinson and Sexton 1994).³ Hence, individual differences should play an important role in the context of the optimal entry mode. Moreover, the individual perspective becomes even more relevant if we accept that the potential founder is the major input factor for the start-up. It is easy to imagine that the ability to evaluate and utilize external knowledge is strongly associated with the level of prior related knowledge (Cohen and Levinthal 1990) or the pre-entry knowledge and experience of the founders (Dencker et al. 2009).⁴ In general, the level of information and the founder's capacity for processing information can be considered key factors driving the relative outcome of waiting (e.g., see Shane 2000).

Intensive planning may help firms to develop adequate learning tools and strategies to handle information (Dencker et al. 2009). In this context, Simon et al. (2000) argue that entrepreneurs may not be able to fully perceive the riskiness of starting a venture in an early period

¹ For example, early market entries allow greater binding power to customers. Hence, focusing on product innovations may be beneficial for firms in order to enter a market earlier than firms that have a greater comparative advantage in marketing.

² In cases of broad products lines, these authors find that firms benefit from early entries only if they are able to establish strong customer loyalty or to achieve fast learning curves after entering the market.

³ The role of various market entry strategies is not explicitly addressed in this body of literature. For example, Bayus and Agarwal (2007) show that interrelations exist between waiting time and certain strategies. In particular, they find that first movers increase their survival chances if they diversify, but second movers seem to benefit from being specialized.

⁴ For further discussion of the learning perspective in entrepreneurship, see, for instance, Politis (2005), Minniti and Bygrave (2001), and Parker (2006).

of venture creation and that planning may also lead to a higher risk of business failure due to the risk of misplanning. While waiting may help firms to improve planning tools for acquiring information, Townsend et al. (2010) emphasize a different aspect of waiting. In their view, waiting is associated with time-varying motivation and a loss of information accuracy. Hence, waiting too long will increase the risk of a business failure. Evidence for the highly complex effect of planning on business success is given by Liao and Gartner (2006), who find that early stage venture planning tends to enhance business persistence in perceived uncertain and competitive environments and that late business planning seems to be beneficial in (perceived) certain environments.

To summarize, first, the optimal waiting strategy is context dependent. Market dynamics, riskiness, and the competition level are major factors in this context. Second, qualifications and experience also play an important role because they affect the founder's capability to process and organize relevant information. Third, waiting may affect a new venture's chances of survival. In particular, waiting may improve survival chances due to the accumulation of relevant information and valuable adjustments of business strategy. However, waiting may instead have the opposite effect owing to the depreciation of the relevant information or reduced motivation.

Theoretical research context

We will model the aforementioned arguments in a simple theoretical framework (see also Choi et al. 2008). From a theoretical perspective, we consider the choice of the timing of market entry as an optimization problem. For simplicity, we suppress the role of opportunity recognition so that individual learning becomes the core element for choosing the optimal waiting time period given the quality of the market environment (market complexity). If each individual focuses on becoming self-employed by utilizing a single business project, then each project has an initial inherent success probability (E), which is the propensity of the income from the self-employment project (y) to be greater than alternative income options (a). Let income y and a be defined by distinct but unspecified functions of the individual characteristics (c) and external economic conditions (r).

Not exploiting the business opportunity allows others to occupy market shares and is associated with the risk of using obsolete information (scenario I). However, waiting may also be used to improve the implementation set-up of the business opportunity owing to better preparation (scenario II). Both of these arguments imply that the inherent success probability of a project is allowed to vary over time. We model this situation as E by using a time varying variable that is

denoted as E_t . Figure 1 provides a graphical illustration of both scenarios: E_t may be a monotonic decreasing function (scenario I) or may be increasing in the short run but declining in the long run (scenario II). Implicitly, the long-run decrease in E_t implies that the depreciation rate of the option value that is related to the business is greater than that of alternative income options.

The main issues in our setting are that E_t is unobserved and that the individual's choice relies on estimates of E_t . The estimate \hat{E}_t is updated in each period based on the information that was received in the past period. \hat{E}_t allows for an assessment of the quality of the initial estimates and continuously improves over time so that the difference between E_t and \hat{E}_t tends to diminish. Accordingly, Figure 1 shows \hat{E}_t as being a noisy learning process. The grey line reflects the learning, and \hat{E}_t captures the expected value across time. Note, we assume that the learning process is biased toward $E_{t=0}$ in the waiting situation. For simplicity, Figure 1 demonstrates this learning process as a noisy process that converges to $E_{t=0}$. This bias implies that information that is acquired during the waiting time period becomes obsolete as waiting proceeds. Finally, κ is a parameter that simply marks the starting point of guessing.⁵

Figure 1: Illustration of the theoretical framework

Once the individual realizes that $E_t > \mu$ —that is, that the success probability $Prob(a > y)$ is above a threshold value μ^6 —the individual ceases to wait and starts business activities. As long as E_t is assumed to be smaller than μ , the individual keeps waiting and continuously updates information. In other words, an individual processes the evaluation of a business idea until he or she recognizes that the business opportunity is worth being conceptualized and exploited (or not). However, waiting binds effort because it accompanies ongoing market evaluation.

Combining the aforementioned literature review and the brief theoretical discussion, we present the following four propositions that structure our analysis:

⁵ Note that, in Figure 1, κ is assumed to be below $E_{t=0}$, which implies underestimation of the true success probability in t_0 . A value of κ greater than $E_{t=0}$ would indicate overestimation. κ can be understood to be a composite of the personal belief and the accuracy of the initial information that enter the Bayesian learning process (Jovanovic 1982).

⁶ For the underlying idea of the threshold, see Gimeno et al. (1997). For illustrative reasons, imagine a threshold of 0.5 to identify the situation of a “marginal entrepreneur” (see Lucas 1978).

Proposition 1: The likelihood of a market entry decreases as waiting time increases.

Proposition 2: Waiting increases with the complexity of the market.

Proposition 3: Waiting decreases with the qualifications of the founder.

Proposition 4: The effect of waiting on survival depends on the elapsed waiting time period (inverse u-shaped correlation).

Proposition 1 captures the time effect. Because the accumulation of information across time allows for continuously improved estimates of $E_{t=0}$ and because E_t is decreasing in the long run, the number of hazards from self-employment decreases asymptotically. Figure 1 illustrates this pattern with a decreasing margin of the learning curve \hat{E}_t . For example, let μ be below $E_{t=0}$ and greater than κ ; the hazards from self-employment in each time interval should start at a high level and then decrease over time.

Proposition 2 seems to deviate from the literature as stressed by Lévesque and Shephard (2002). However, our proposition assumes that the market power of the agents is low so that entrepreneurs have a low likelihood of benefiting from defending early market positions. Therefore, market complexity will make a reliable assessment more difficult, which should cause a prolongation of the waiting time to result in the collection of sufficient information.

With respect to proposition 3, the comparative advantages that are related to the potential founder's qualifications play a crucial role. The idea is that if the founder's qualifications increase the relative effectiveness of accumulating information, the waiting time should be reduced (κ is closer to E_t , and \hat{E}_t converges more rapidly to E_t). Alternatively, if comparative advantages exist for being self-employed, then accelerated entries will hinder a further depreciation of the individual's existing human capital stock. As a result, higher relative opportunity costs of waiting will pull better qualified people into self-employment more quickly.

Finally, according to proposition 4, we may expect the effect of waiting to have different contributions to survival depending on the elapsed waiting period. One result of our theoretical discussion (\hat{E}_t being biased toward $E_{t=0}$ and E_t decreasing in the long run) is that the likelihood that an unrealized business option can overestimate its success probability ($E_t < \hat{E}_t$) increases as time elapses. Further, overestimation bears the risk of an increasing business hazard. At the limit, only overestimated projects are realized, and they are all expected to fail.

3. Econometric approach

The econometric setting of our analysis can be described as a standard duration time problem where we are interested in the effect of a set of covariates on the likelihood that an event will occur in a certain time interval, given that the individual is observed in this interval (for an introduction, see also Gutierrez 2002). Note that the event of interest may be right censored and is likely to be unobserved in the period of observation.

Let T be a random variable that addresses the duration until a specific event. t is the realization of T . The cumulative distribution function $F(T < t)$ describes the failure function over time. Conditioning the sum of failures on the survivors at t defines the hazard rate h at t . To include individual variation, let the hazard rate h be conditional on a set of covariates x . The function $g(\cdot)$ represents any functional form that allows us to model the relationship among the elapsed time, the covariates, and the failure event. β is a vector that will be estimated:

$$h_j(t, x) = g(t, \beta_0 + x_j \beta_x). \quad (1)$$

Instead of focusing on the hazard rate, we may rewrite (1) in terms of the accelerated failure time metric:

$$\ln(T) = \beta_0 + x_j \beta_x + \varepsilon, \quad \text{with } \varepsilon \sim g(\cdot), \quad (2)$$

where the error term captures the properties that are related to the characteristics of $g(\cdot)$. As denoted above, T is a positive random variable that describes the time (t) until an event occurs ($T < t$). For example, if the survival times describe a Weibull distribution, the error term is assumed to follow an extreme value distribution. The difference from formula (1) is that instead of focusing on the hazard at t , the duration $\ln(T)$ will be modeled. Nevertheless, t and T are defined in terms of the process time and need the definition of a reference point t_0 and an event that is of interest:

Figure 2: Separation of the analysis and the related definition of process time; near here

- a) In the first part of our analysis (see the left side of Figure 2), t and T will be related to the time that elapses from the time at which i is at risk until the time at which he or she

enters self-employment. The individual will enter the risk pool if he or she finishes training. We will denote this waiting process with the waiting time function $w(t)$. The duration T^w is the post-training period (the end of the program is denoted as t^w_0) until (if observed) the individual enters self-employment. Focusing on the end date of the training instead of the start date is important because individuals who are in training are not at risk of becoming self-employed. Right censoring ($T^w > t^w_n$) may be present because not all individuals select self-employment during the time span under observation.

b) The second part of the analysis concentrates on the time that elapses until an individual (if entered) ceases self-employment (see the right side of Figure 2). The time that is spent in self-employment is used to identify the stability (success) of the started venture. We denote this period as the survival time $s(t)$ from the point at which the individual enters self-employment (t^s_0) until a change of status occurs (exit at t^s_n). As already mentioned, in the context of the waiting time to enter self-employment, hazards from self-employment may also be right censored because T^s may be greater than t^s_n .

Note that for both parts of the analysis, T is basically a function of μ and the difference between \hat{E}_t and E_t . Observing $T^w < t^w$ indicates that $\hat{E}_t > \mu$, which represents an entry in a period of self-employment, while $T^s < t^s$ indicates that $E_t < \mu$ which reflects quitting self-employment. Therefore, factors that determine the magnitude of \hat{E}_t and E_t (given μ) will have an influence on the duration of the waiting period (T^w) and the time spent in self-employment (T^s).

For this study, we assume that the underlying income functions y and a (see above), and therefore the functions⁷ $w(t,x)$ and $s(t,x)$, will be sufficiently identified by characteristics that measure the individual's motivation (m), the information level (i), the opportunity costs (o) and the expected performance level (p). Furthermore, let each of these factors be latent measures of time t , individual characteristics c , and external economic conditions (e.g., market complexity) r . As a result, we are able to focus on three sets of nonderivative attributes in the covariate vector: $x \in \{c, t, r\}$. We can thus model both parts of the analysis with a similar set of covariates. However, it is crucial to find attributes that allow us to discriminate between a and y (the expected income differential between the income options y and a).

⁷ Note that the functions $w(\cdot)$ and $s(\cdot)$ are also conditioned to a set of covariates x (see above).

Finally, in studying the impact of waiting time on the duration of self-employment, one should keep in mind that bias due to endogenous correlation may affect the analysis. For instance, endogenous correlation may occur if the optional waiting time may be chosen in a way that optimizes the duration of self-employment given individual characteristics, information, and external economic conditions. We will address this issue in more detail below.

4. Data description and variables

Data sources

For our study, we use a dataset that is based on administrative data that are taken from the German Federal Employment Agency and that cover potential start-ups out of a position of unemployment. The advantage of using these data is that they allow us to study a fairly homogeneous population with respect to different meanings. For example, the data suggests that entering self-employment is mainly motivated by overcoming unemployment for most of the founders. Most of the included founders start alone as small businesses and do not focus on high growth strategies (for empirical evidence see Pfeiffer and Reize 2000; Hinz and Jungbaur-Gans 1999). Furthermore, our sample includes only individuals who have passed a self-employment training seminar, which are based on the same quality requirements in terms of aims, topics, and duration. In total, variance related to issues such as business novelty, business preparation, and planning or related to individual market strategies is rather limited.

The data are drawn from a sample from the Integrated Employment Biographies (IEB) and contain information from four administrative sources.⁸ These data originate from registers of the Federal Employment Service and include employment and benefit histories since 1975 and official registrations for job search, unemployment, and participation in active labor market programs since 2000. The information is organized in records and provides exact start and end dates for each notification. Source-specific information adds data on each individual's schooling, employment type, job characteristics, income, and job search characteristics as well as detailed information on the individual's qualifications. In addition, we supplemented this information with data from the Establishment History Panel (EHP, see Spengler 2008), which allows for the inclusion of firm-

⁸ These data cover nearly 80 percent of all employed individuals in Germany (primarily excluding the self-employed and civil servants) and the total of all employment positions that are captured by the social security system. For a general description of the data, see Jacobebbinghaus and Seth (2007).

level characteristics of past employment episodes. Regional labor market information⁹ is taken from the official statistics of the Federal Employment Services. For a detailed overview of the variables that are used, see Table A1 and Table A2a and b in the appendix.

Construction of the analysis sample

A core challenge in investigating the determinants and outcome of waiting time periods is to find adequate proxies that allow for a sufficiently valid identification of two points in time that make waiting visible: (1) willingness to start training and (2) entry into self-employment. In our research, we will link the first aspect to the point in time at which individuals entered a self-employment training scheme. For the second aspect, we will concentrate on the date on which an individual first received a bridging allowance (*Überbrückungsgeld*) or a start-up subsidy (*Existenzgründungszuschuss, Ich-AG*).¹⁰ Other employment states within the period between the end of the training scheme and entry into self-employment are outside the scope of this study. According to our two-step investigation, we use two constructions of the analysis sample:

- a) For the first part of the analysis, we restrict our sample to individuals who entered a self-employment training scheme. Entries in this sample are included only if the associated promotion period did not exceed more than 96 days (above the 95th percentile) to exclude observations with incorrect information. We further restrict our sample to individuals with only a single self-employment entry because isolating the correct date of entry is not possible if more than one is observed. This restriction results in a sample of less than 220 individuals. Furthermore, we exclude individuals who are more than 58 years of age to eliminate problems that are associated with strategic behavior in bridging periods or the start-up subsidy until retirement ($n = 85$). We also remove observations with extreme local labor market

⁹ Local information focuses on the level of labor market districts, as suggested in Arntz and Wilke (2009) and Oberschachtsiek (2010).

¹⁰ The legal system ensures that individuals are allowed to enter this promotion scheme only if this training will prepare them for a subsequent period of self-employment. Usually, the training is expected to be supported by a scheme called a bridging allowance, which is offered to foster transitions from unemployment to self-employment and which provides a financial subsidy for a period of six months in the amount of the potential unemployment benefit. The start-up subsidy has a slightly different focus in the promotion setting but also provides financial support (here, the duration is three times per year) and also (legally) requires that the individual quit unemployment by entering self-employment. For more detailed information on both schemes, see, for instance, Caliendo and Kritikos (2010).

conditions.¹¹ Finally, 11,348 observations are included in the study, of which 10,999 have nonmissing information on all the variables.

- b) For the second part of the investigation, all of the above restrictions apply. However, this part focuses on only individuals who actually started a venture at some point after the training period. Furthermore, we also focus on only individuals who received a bridging allowance and exclude individuals who received a start-up subsidy. We expect this restriction to more accurately capture business foundations (e.g., Caliendo and Kritikos 2010). Note that potential firm formations (entries) are observable for a period of almost six years after the training. In total, 9,240 individuals decided to enter self-employment; however, because we focused on only self-employment entries that were subsidized with a bridging allowance (and not any other supporting scheme), our final analysis sample for firm survival is reduced to 7,287 entries.

Variables

As emphasized above, the set of explanatory variables that are included in our study should account for individual (c) and regional characteristics (r), which cover qualifications and motivational aspects at the individual level and rivalry and demand at the regional level. At the heart of the latter set of characteristics are those attributes that we use to describe the level of regional economic complexity. Time (t) is used as a control variable for the inflow of information.

Note that we distinguish between attributes that are related to the level of economic conditions and those that refer to the development of the economic conditions. The level is the value of the attribute at time t , and the development (dynamic) is defined as the relative change from t_0 to t , which we standardize to 100 in t_0 . Focusing on the effect of external conditions, there is no reason to assume monotone correlations in duration. Hence, we control for squared effects. We assume high economic dynamics (information volatility), relative risks (firm hazards), and rivalry levels (entries) to be proxies for market complexity.

Demand is measured via the local unemployment rate, the vacancy ratio, and the variation of both these measures over time. The unemployment rate is taken from official statistics and is

¹¹ Observations are excluded from the analysis sample if the local unemployment rate is greater than 25 percent, the observation originates from a region with a local firm hazard that is greater than 15 percent, the unemployment index is greater than 160, or the vacancy lies above 55 percent. We use this restriction to remove potentially influential points. Further details on the reasoning for the restrictions are available from the authors upon request.

defined on a monthly basis. The vacancy ratio is defined as the number of local (officially reported) vacancies divided by the number of unemployed individuals. As discussed above, temporal change is measured by an index that sets the level of unemployment (the vacancy ratio) in t_0 for every individual at 100. In cases of improved labor market conditions, opportunity costs will increase so that assessing business options becomes more difficult (e.g., due to an increasing performance threshold).

The volatility of external wage work options is used as an additional indicator for complexity. We refer to this measure as the indicator of riskiness, as proposed by Parker (1996). We address this information by considering the volatility of the local unemployment rate. In cases of increased variance, we should expect the relative costs of entering wage work to rise, hence reducing the option value of wage work. However, demand may also be affected by increased riskiness, which makes obtaining accurate estimates more difficult.

To approximate competition (e.g., measuring market hostility and market rivalry, see section 2 above), we focus on the local density of the founders who have made the transition from unemployment to self-employment. To standardize the level of entries, we use the number of self-employed individuals (out of unemployment) in a local labor market. Therefore, we define the extent of market rivalry (competition) based on the monthly number of entries in the bridging allowance in relation to the total number of unemployed individuals in each month per region. The reasoning behind this measure is that each labor market has an absorptive capacity that is determined by the pool of unemployed individuals to allow for self-employment entries. High levels of entry make assessing the best entry strategy and evaluating the distance to market saturation difficult.

The proportion of vanishing establishments (exits and movements; firm hazard) per year and region is used as an inverse measure of regional economic prosperity for incumbent firms (addressing the downside loss; for details, see Choi et al. 2008). The reasoning behind this attribute is that firm mobility and firm deaths reflect a decrease in the degree of expected economic prosperity for incumbents in the local market and an increase for new markets of firms that operate in niches. As firm hazards increase, we should expect the cost of assessing the value of the business option to increase (owing to increased complexity).

Finally, consistent with earlier research, we study the individual level by using attributes such as gender, age, formal education, and profession (e.g., Pfeiffer and Reize 2000; Choi et al. 2008; Oberschachtsiek 2012). In addition, data that are related to the individual's employment

background are used to address the individual's productivity (crafts master, management experience, commercial training, and wage premium) and motivation (unemployment duration, minor employment).

Unlike prior research on self-employment and entrepreneurship, our study does not control for information on the business project such as capital structure, industry, or legal form of the venture. However, related research on entering self-employment out of unemployment indicates that these characteristics have relatively low importance for survival (e.g., Hinz and Jungbauer-Gans 1999). In addition, assuming that complexity is positively associated with the founder's human capital, we focus on the individual's qualifications to approximate the complexity of the venture.

5. Determinants and outcomes of waiting

5.1 Determinants of the waiting time function

Descriptive results

The pattern of entries over time is reported in Figure 3. It shows (both graphs) that entries strongly concentrate on the first year after finishing the training scheme. We use a Kaplan-Meier (Kaplan and Meier 1958) procedure to report the cumulative failure function, where a "failure" is defined via entry into self-employment (graph on the left). Almost 72% of the total sample and 83% of the entry population enter self-employment within the first year (see marked line) after finishing the training. We find that the slope of the cumulated failure function increases at a decreasing rate. In addition, the corresponding hazard function displays an almost L-shaped pattern, as seen on the right side of the graph. Following this distribution, we find that t function has with a nonmonotonic slope after a strong decline in the first 20 months of observation. This finding indicates that the likelihood of entering self-employment increases after approximately 50 months of observation.

Figure 3: Time pattern of waiting; near here

Multivariate Analysis

The model selection is performed by using the Bayesian Information Criteria (BIC), which we use to test Weibull, Log-logistic, and Gamma functions for the underlying baseline hazard/duration function. Referring to the BIC, we should focus on the Weibull distribution because it shows the best fit to the data. Support for preferring a Weibull distribution is also given based on testing the shape parameter of the Gamma distribution of the baseline acceleration function ($H_0: \text{Kappa} = 1, \text{Prob} > \text{Chi}^2 = 0.000$; for further details, see Rodriquez 2005 and Raftery 1986).¹² All the modeling approaches generally suggest a decreasing likelihood of observing entries as waiting time elapses (support for proposition 1).

The results of the multivariate analysis are reported in Table 1. Note that the regression estimates are based on the accelerated failure time metric so that the coefficients are interpreted as time scaling factors for the log duration. We distinguish five models for which we focus on the distinct contribution of selected sets of covariates in explaining the waiting time. Following Moulton (1990), we correct the standard errors for intraregional correlations between observations. All the models include a random effects estimator to control for unobserved observation-specific frailty (for details see Gutierrez 2002).

Table 1: Waiting time duration analysis; near here

Model 1 in Table 1 shows the regression results for the model that concentrates on individual characteristics. As expected, the founder's qualifications increase the conditional exit probability (or, in this case, accelerates waiting), which supports the hypothesis that highly qualified individuals have faster learning cycles. In detail, the results show that *crafts masters*, *previous managers*, individuals with a previous *premium income*, and individuals with *short unemployment* periods before entering self-employment training have a statistically significantly (see Table 1 for details) shorter waiting time than individuals without these characteristics. In addition, our findings show that *age* and *gender* have statistically insignificant effects on waiting time, which is contrary to the findings of most other studies that focus on self-employment entries.

¹² The Cox model (Cox 1972), which allows for the most flexible modeling of the hazard function, is not feasible. Tests show that the accuracy of this modeling technique is violated owing to the time-variant and nonlinearity effects of the covariates on the hazard rate. However, parametric modeling tends to underreport hazards in both the mid and long run. Nevertheless, we decided to use parametric modeling because the results do not substantially change if we focus on the results that are based on the Cox model.

However, one should recall that the observations that we investigate in this study cover of a specific population.

Model 2 additionally includes information that is related to external conditions in the empirical model and includes only linear effects. We find statistically significant effects for only the rate of self-employment activities relative to the local unemployment rate (*start-up-unemployment ratio*). The estimated coefficient shows that the likelihood of entering self-employment increases with the level of self-employment activities. To some extent, this finding indicates either that rivalry may have a positive impact on entries due to entry strategies (e.g., market share and competitive displacement) or that a high rate of entry simply tends to reflect the local role models for entries in general and to signal a positive market environment (Wagner and Sternberg 2004). The results are also interesting with respect to other covariates because they show that neither demand (*unemployment rate, vacancy ratio*) nor the vitality of the external option value (*level of variation in local unemployment*) has a significant impact on waiting time. This finding is interesting because it provides ambiguous support for the complexity argument from section 2 (proposition 2).

In Model 3, we also control for nonlinear effects of external characteristics on waiting time to allow for a more complete picture regarding market complexity. However, we find no statistically significant evidence of an overall nonlinear pattern. Relaxing the statistical significance to the 85% level (not reported in Table 1) reveals diminishing marginal effects of *local firm hazard* (positive linear and negative squared term) on waiting, which provides a slight indication of a diminishing marginal effect of the riskiness of entering a period of self-employment. Introducing squared effects causes *higher education* to become statistically significant, indicating a correlation between qualifications and the nonlinearity of opportunity costs. This finding indicates that the elasticity in reacting to external (regional) changes differs across individuals' qualifications.

Models 4 and 5 differ in the way in which they control for regional information. While Models 2 and 3 concentrate on the level of regional economic conditions, Models 4 and 5 focus on the development of regional labor market conditions beginning at the end of self-employment training. Rather than the level of market complexity, these models focus on the market development over time. Therefore, the covariates are standardized to t_0 and vary only if conditions change over time. The results of Model 4 show that increasing *local firm hazard* decreases hazards from self-employment (indicating longer periods until entry into self-employment) and that increasing regional self-employment intensity (indicated by the *start-ups-unemployment ratio*)

shortens the expected waiting time (thereby accelerating entries into self-employment). In turn, lower prosperity and lower rivalry (compared to the initial market situation) make firms wait longer.

Controlling for squared effects in Model 5 reveals that the insignificance of the linear term that is associated with the *unemployment rate* is related to a misspecification of the nonlinear nature of the correlation between local unemployment and waiting time. We find a similar result for regional self-employment intensity. The lack of significance of *local firm hazard* and *the vacancy-unemployment ratio* when we control for squared effects may indicate an overspecification of the model. These results are important, as the statistical modeling shows an improvement in the entropy of the model. Although we did not find statistically significant effects for environmental factors, we can speculate that environmental factors may have a nonlinear effect on waiting periods.

In summary, beyond the asymptotically decreasing likelihood of observing entries across time (support for proposition 1), our results provide strong support for the importance of external economic conditions (level and development) in explaining waiting times (see BIC in Table 1). These results are in line with earlier research (see above). However, the effect of the environmental attributes on waiting time is rather complex.

Our results also highlight the importance of studying not only the option value of the business but also the option value of wage work positions (as related to the opportunity costs argument). We find that if the option value of wage work positions increases, waiting will be longer and that if more entries exist in the local market (from a position of unemployment), then entries are accelerated. Furthermore, we find that if the economic prosperity for business activities worsens (increasing firm hazards compared to t_0), waiting will be longer and that an increase in the external option value (increase in vacancies and decrease in unemployment risk) prolongs waiting periods. In turn, our expectation (proposition 2) is supported by the findings related vacancies and firm hazards. However, the finding that increased competition accelerates entries is inconsistent with our expectation.

5.2 The outcome of waiting on survival in self-employment

Descriptive results

Focusing on the stability of the new self-employment episodes, Figure 4 reports the pattern of survival chances over time. As shown by the graph on the left side of Figure 4, the proportion of survivors shifts heavily downward at the end of the funding period (six months after entry) and then continues to fall with a decreasing margin. The corresponding hazard function (see the graph on the right side of Figure 4) reflects this pattern, with an increasing slope in the early period that falls after six months (resulting in a sickle-shaped hazard function) and then reflects an almost monotone decreasing shape in the hazard rate.

Figure 4: Time pattern of quitting self-employment; near here

As displayed in the graphs in Figure 4, the results regarding hazards from self-employment in this study resemble those usually found in the self-employment and entrepreneurship literature on survival (e.g., Brüderl et al 1992). However, differences emerge regarding the proportion of survivors across time. Studies on individuals who enter self-employment from a position of unemployment often report a much higher percentage of survivors than we found, with rates ranging from 50% to 75% within a period of three years. In this study, we find the percentage of survivors to be less than 45% after a period of 3 years. We interpret this result to indicate that individuals who participate in a training scheme represent a negative selection of the population of potentially self-employed individuals.

Multivariate analysis

Again, as in the waiting time analysis, the selection of the multivariate modeling approach is performed by using a Wald test of the shape parameter of the Gamma specification in the baseline acceleration function, an LR test, and the BIC. Building upon the related statistics, we can reject the idea that Lognormal, Weibull, or exponential models are nested in the Gamma distribution, indicating the superiority of the Gamma specification ($Kappa < 0$). Furthermore, we also directly test Log-logistic and Lognormal model specifications against the Gamma model (H_0 : Lognormal or Log-logistic are nested in Gamma; $Prob > Chi2 = 0.000$). Overall, we achieve the

best fit to the data when we apply a Gamma distribution of the baseline acceleration function. Therefore, we refer to this modeling approach when we discuss the results below.

As discussed earlier, this part of the investigation aims to evaluate the net gain from waiting, but our main interest with respect to the outcome measure is the new venture's chance of survival. Thus, we concentrate on the coefficient β , which provides information on the association between waiting time T^w and the log survival time ($\log T^s$).

However, as mentioned above, focusing on T^w as a regressor on T^s may evoke concerns of endogeneity because variables that jointly influence both T^w and T^s may be unobserved (e.g., only having an influence if expected survival is high). In such cases, the estimate of β would be biased because it would also capture the effect of an unobserved regressor. Two options exist to address a potential endogenous regression estimator. The first and less technical option involves determining the potential direction of the bias by assessing the overall (eventually biased) effect against the potential (nonbiased) effect. The other option involves using a proxy that allows us to control for the omitted variables or to control for the additional but unobserved disturbance that is associated with the choice of waiting. In the classical notion, this option entails a) including further variables to reduce the risk of biased estimates or b) using an instrument (IV approach) to control for the additional disturbance.¹³

Table 2: Survival time duration analysis (coefficient for the effect of waiting time); near here

In this study, we use both approaches jointly to assess the effects of waiting time on the log duration of self-employment. In particular, we use different specifications in modeling the effect of waiting time on duration. The variation in the estimates is then used to assess the direction of the bias. The results of this investigation are displayed in Table 2, which reports the point estimator of waiting time on log duration in self-employment (first column). The remaining columns capture information on the standard error (second column) and modeling approach. Information about the entropy of the statistical model is reported in the last column. Estimates of the coefficients for the control variables are not displayed. Details of the modeling approach are reported in the notes below the table.

¹³ Unfortunately, no methodological solution exists for handling selection bias in the context of a duration modeling framework that allows for the effect of time-varying covariates to be studied (Boehmke et al 2006).

Table 2 shows that the estimates of the relationship between waiting time and the log duration in self-employment are roughly robust with respect to the various modeling approaches. Independent of some differences in magnitude, all the estimations reveal a negative effect of waiting time on survival, which is statistically significantly different from zero. This result indicates that waiting is associated with a shortening of self-employment duration (i.e., reduced longevity). In other words, waiting makes people more prone to quit self-employment early.

Furthermore, Table 2 shows that some variation exists in the point estimator depending on the modeling approach. In this variation, we find that the negative value of the point estimator decreases as the flexibility of the modeling approach increases. When more information and unobserved frailty are controlled for, the point estimate converges to zero. We conclude from this finding that waiting is likely to be associated with a positive bias; that is, people whose self-employment ventures have a higher chance of survival select into waiting. In more detail, if waiting is expected to be beneficial in terms of maximizing survival chances, we should expect a selection effect to appear with a) a reduction of a positive point estimator or b) a decreasing negative effect when less information is controlled for. In the case of a negative selection bias associated with unobserved information, we would expect the opposite. Indeed, the first relation (option b) is exactly what we observe in the results reported in Table 2.

However, the results displayed in Table 2 show only a linear effect of waiting on the log duration in self-employment. Hence, we implicitly assume that the waiting time effect is constantly affecting the acceleration function. Referring to the findings of previous research (see section 2), we may expect both positive and negative effects of waiting if the effect is related to the amount of waiting time. In other words, waiting for a certain amount of time can be expected to be beneficial, but waiting for longer periods becomes a negative determinant for business survival.

Table 3: Survival time duration analysis (nonlinear effects of waiting time); near here

To explore the aforementioned finding more deeply, we separate the continuous waiting time information into a classification of five time intervals and incorporated these new attributes into the statistical analysis (for further details, see Table 3).¹⁴ We find a positive effect of short-term waiting on survival and a negative effect of longer periods of waiting on the log duration of

¹⁴ Please note that the threshold of 90 days should capture a period that might be needed to prepare a simple venture after some basic preparations have already been made. We do not think that varying this period substantially affects our findings.

self-employment, independent whether we control for the amount of information. This finding indicates that an inverse u-shaped relationship exists between waiting time and the chance of survival, supporting proposition 4. Again, our results support the presence of a positive selection into (in particular, very long periods of) waiting (i.e., people who want to stay longer in self-employment wait longer).

Finally, although we find that the statistical significance of the effect of waiting time on survival chances decreases with longer waiting periods, the model that explicitly controls for separate time windows has the highest overall entropy in terms of the BIC. Therefore, given that all the estimates regarding the effect of waiting time on the log duration in self-employment point in similar directions, we can consider the model with separate time windows to be the most appropriate way to explain the effect of waiting on the expected chance to remain self-employed.

6. Summary and conclusions

Summary

This study focuses on two major questions that are related to the length of time that an individual waits before starting a new business. We first address the determination of waiting and study the effects that may prolong or shorten the period of waiting. Presumably, waiting can be considered an optimization problem in which an individual evaluates the potential costs of forgone profits due to the nonactivity of a business project and the potential benefits of improved information for starting the business project. Regarding the theoretical factors that may be relevant, this study examines complexity (e.g., rivalry, relative risks, and volatility), motivation (opportunity costs), and the ability to process information (learning capacity). Consistent with earlier research (Lévesque and Shephard 2002 and 2004; Choi et al. 2008 and Lévesque et al. 2009), we focus on studying the role of time, individual characteristics, and regional economic conditions. We expect that higher founder qualifications may reduce waiting and that the waiting time and lower market complexity may be associated with longer waiting time periods. The second question in our study focuses on the impact of waiting on the post-entry survival chances of the venture (the duration of the self-employment period), which we expect to have an inverse u-shaped correlation with self-employment duration.

Findings and implications

Our results show that entries become less likely as time elapses (as expected) and that higher qualifications are associated with shorter waiting times. This finding indicates that more qualified people tend to start their businesses earlier than less qualified people. Although this finding is in line with our expectations, whether the association between founder qualifications and waiting times is related to higher opportunity costs or the faster learning cycles of highly qualified people remains unclear. Nevertheless, individual characteristics play an important role in explaining waiting time periods (Choi et al. 2008). Furthermore, we also find that information about the regional market conditions is important. In particular, the most important regional factor in explaining waiting is the proportion of start-ups in the market (e.g., approximating rivalry). We find that increasing entry rates shorten waiting periods. This finding is consistent with the proposition stated by Lévesques and Shephard (2002), if one assumes that high entry rates reflect growing markets. However, this finding is inconsistent with our expectation that high entries are an indicator of market complexity. In line with our expectations, we find that if the economic prosperity for business activities worsens (increasing firm hazards compared to t_0), waiting periods will be longer. In more detail, we also find that an increase in the external option value (increase in vacancies and decrease in unemployment risk) prolongs waiting periods. The latter finding is important because it highlights the relative risks of external (wage work) income options.

In the second part of our study, we include waiting time information as an additional regressor in the statistical model and use the dependent variable to capture the right-censored duration until an individual chose to quit self-employment. Because no method exists for handling endogeneity in continuous duration models with time-varying covariates, we use various modeling specifications in which we change the amount of information that we control for. This approach allows us to derive some conclusions regarding the direction of the bias. We find that waiting has a statistically significant negative effect on duration irrespective of the amount of information that is controlled for. This finding supports the argument that waiting is an indication of decreased motivation and diminished information accuracy. However, splitting the continuous waiting time information into five time windows reveals that the effect of waiting on survival differs as time elapses. Consistent with proposition 4, longer periods of waiting are negatively correlated with self-employment duration, and short periods of waiting prolong self-employment survival.

Overall, our findings show that waiting is a complex phenomenon. An important finding of our research is that individual characteristics are the most important factor in explaining waiting

time periods and that opportunity costs seem to play a substantial role in this context. This factor, however, has been excluded from previous modeling approaches. Furthermore, our research supports the idea that external dynamics are important in explaining waiting time periods, as emphasized in previous theoretical work. However, the magnitude of external market conditions related to environmental factors seems to be more significant than the dynamics of external market conditions in explaining waiting. An important finding is that excessively rapid or delayed entries may not lead to more sustainable new ventures. Consistent both our propositions and previous research, our results show an inverse u-shaped correlation between the waiting time period and the self-employment duration.

Limitations and links for future work

Despite its contributions, our study has limitations. For instance, we could not fully observe the quality of the training, the quality of the waiting period, and the quality of the business project. Future research could be more focused on adequately addressing heterogeneity related to the business projects, which we only approximated by studying the founder's human capital owing to our sample restrictions. Furthermore, we were not able to observe the true (learning) behavior during the waiting time. And, the measurements in our empirical investigation may also diverge from the perfect measurement of the economic parameters discussed the original theoretical contributions. In addition, we used only an approximation to the address multilevel nature of the underlying selection process into optimal timing. Future research should take these limitations into account. Finally, our findings show that complex structural and dynamic regional factors determine the optimal waiting time period on an individual level. This finding requires further attention in ongoing empirical and theoretical research, in general.

7. References

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Tables and Figures

Figure 1: Theoretical framework

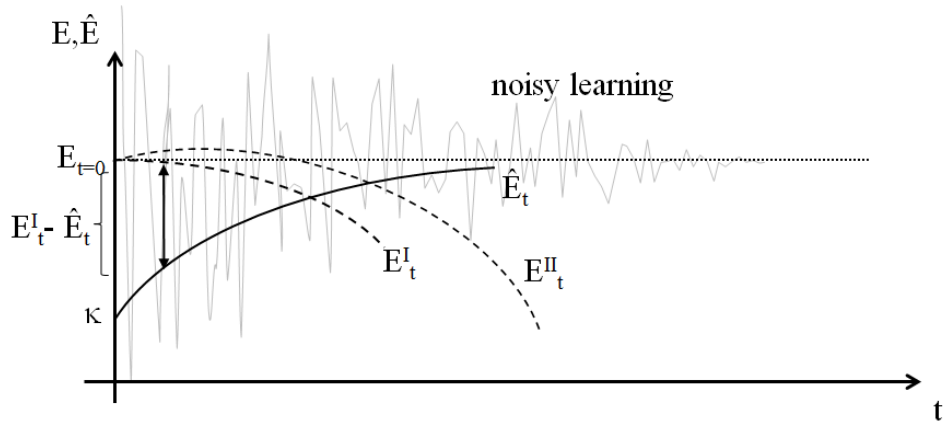


Figure 2: Separation of the analysis and related definition of process time

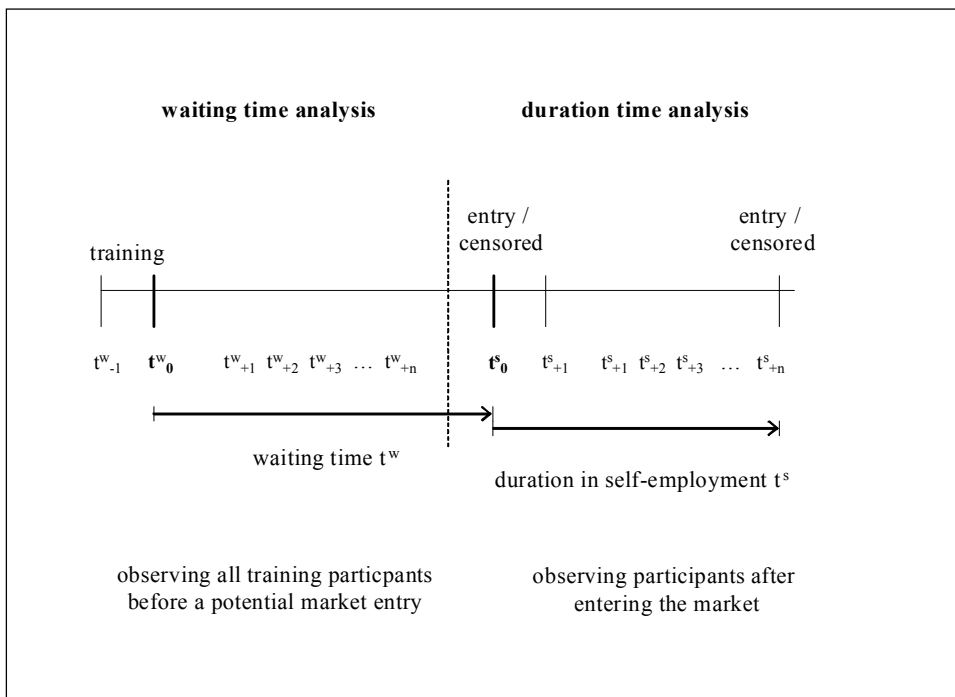
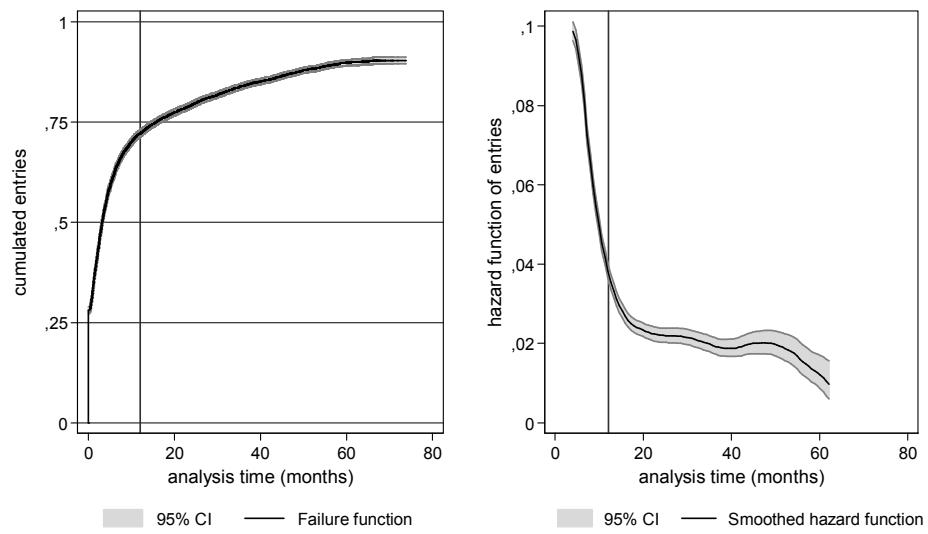


Figure 3: time pattern of waiting



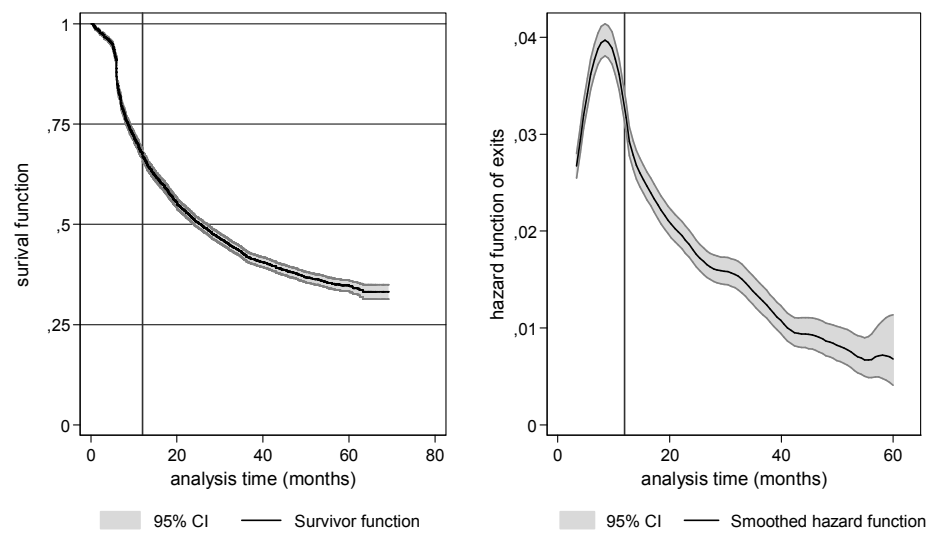
source: ieb, own calculations

Table 1: Waiting Time Duration Analysis (AFT metric, Weibull baseline function)

	Individual Characteristics	Including local economic conditions			
		Level-information		Change-Information	
	Model 1	Model 2	Model 3	Model 4	Model 5
Individual Information					
male	-0,041	-0,012	0,008	-0,03	-0,038
age	0,008	0,01	0,011	0,011	0,011
Higher education	-0,178	-0,183	-0,240**	-0,117	-0,118
College/University degree	-0,041	-0,12	-0,108	-0,1	-0,099
Crafts master	-0,613***	-0,498*	-0,470*	-0,514**	-0,529**
Management	-0,637***	-0,709***	-0,684***	-0,689***	-0,672***
Commercial competence	-0,188*	-0,108	-0,111	-0,108	-0,089
Small Business Background	-0,094*	-0,1	-0,087	-0,120**	-0,111*
Wage Premium	-0,430***	-0,281**	-0,301**	-0,302**	-0,292**
Short unemployment before	-0,281**	-0,179***	-0,184***	-0,260***	-0,253***
Minor employment before	0,243	0,349**	0,333**	0,335*	0,344**
Eastern Germany		-0,036	-0,214	1,018	0,65
Local Level Information (t^w_0)					
Level of variation in local unemployment		-0,49	-1,374	-1,883	-1,98
Level of unemployment (rate)		0,014	0,236		
Local firm hazard		0,413	1,938		
Vacancy / Unemployment ratio		0,065**	0,132**		
Start ups / Unemployment ratio		-2,147***	-1,471		
Local Level Information (squared)					
Level of variation in local unemployment (sq)			0,567		
Level of unemployment (rate) (sq)			-0,005		
Local firm hazard (sq)			-0,077		
Vacancy / Unemployment ratio (sq)			-0,001		
Start ups / Unemployment ratio (sq)			-1,073		
Local Change Information $[(t^w_{0-} - t^w_{+t})/ t^w_0]$					
Unemployment rate Index				-0,061	-0,462***
Local firm hazard Index				0,056**	1,275
Vacancy / Unemployment ratio Index				0,002*	-0,003
Start ups / Unemployment ratio Index				-0,203**	-0,300**
Local Change Information (squared)					
Unemployment rate Index (sq)					0,002***
Local firm hazard Index (sq)					-0,006
Vacancy / Unemployment ratio Index (sq)					0,000
Start ups / Unemployment ratio Index (sq)					0,013
_cons	1,452**	-3,545	-12,905*	1,988	-42,792
ln_p_cons	-0,756***	-0,607***	-0,583***	-0,645***	-0,614***
ln_the_cons	-0,790*	-0,104	-0,042	-0,208	-0,188
N	146933	146933	146933	146933	146933
BIC	51410,667	50970,445	50869,437	51169,127	51086,965

Note: Estimates are based on a Weibull specification of the baseline acceleration function (AFT-metric). Time is measured in days. Models include a gamma distributed observation specific frailty term to capture unobserved heterogeneity (for details see Gutierrez 2002). Legend: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Figure 4: time pattern of quits from self-employment



source: ieb, own calculations

Table 2: Survival Time Duration Analysis (coefficient for the effect of waiting time)

Effect of waiting time (days) on survival time			Baseline specification		Frailty	Included Set of Attributes				
Coefficient	SE	<i>k</i>	Log- normal	Gamma		<i>i_var</i>	<i>local_gr</i>	<i>local_tr</i>	<i>pscore</i>	BIC
-0,00040	0,00008	33	1	0	without	1	1	1	0	17366
-0,00030	0,00008	34	0	1	without	1	1	1	0	17323
-0,00062	0,00010	35	0	1	without, <i>fe_tmax</i>	1	1	1	1	13215
-0,00042	0,00012	35	0	1	without, <i>iv_fe_tmax</i>	1	1	1	1	13228
-0,00031	0,00008	35	0	1	without, <i>haz_t0</i>	1	1	1	1	17326
-0,00031	0,00008	35	0	1	without, <i>iv_weib_tmax</i>	1	1	1	1	17326
-0,00062	0,00010	35	0	1	without, <i>fe_tmax</i>	1	1	1	1	13215
-0,00053	0,00011	36	0	1	Gamma, <i>fe_tmax</i>	1	1	1	1	13166
-0,00031	0,00008	35	0	1	without, <i>haz_t0</i>	1	1	1	1	17326
-0,00024	0,00008	35	1	0	Gamma, <i>haz_t0</i>	1	1	1	1	17219
-0,00015	0,00008	30	0	1	without	1	1	0	0	17309
-0,00032	0,00007	27	1	0	Inverse Gaussian	1	0	1	0	17180
-0,00015	0,00008	30	0	1	without	1	1	0	0	17309
-0,00033	0,00007	27	0	1	without	1	0	1	0	17263
-0,00026	0,00007	23	0	1	without	1	0	0	0	17247
-0,00026	0,00007	23	1	0	Gamma	1	0	0	0	17139

Note: Estimates are based on two specifications of the baseline acceleration function as noted in row 4 and 5 (AFT-metric). The estimates base on different specifications of the statistical model as indicated in the rows 4 to 10. *k* reports the number of parameter included in the model. SE is an abbreviation for the standard error. BIC captures information of the entropy of the statistical model.

The column headed with '*frailty*' describes the way additional frailty (equally used: unobserved heterogeneity) is controlled for: if not labeled "without" the model includes a Gamma or an inverse Gaussian distributed frailty term to capture unobserved heterogeneity (see Gutierrez 2002 for details). The column '*pscore*' indicates whether the statistical model includes a prediction related to the entry probability. The method of this estimation is reported in the frailty-column (in parenthesis: *fe_tmax* = estimate at the last observation before entering self-employment; *iv_fe_tmax* = uses the residual instead the probability prediction; *haz_t0* = includes the initial estimated hazard rate at the first observation of the waiting time; *iv_weib_tmax* = predicted hazard at the last observation before entering self-employment; the indicator *fe* reports that the estimation is based on a panel fixed effects estimator). The column '*i_var*' indicates whether individual characteristics are included also covering a set of dummy variables that capture a one digit job classification. The column '*local_gr*' reports that the model includes time-varying attributes of local economic conditions. The column '*local_tr*' indicates whether attributes of local economic conditions at the begin date of the waiting time are included.

Table 3: Survival Time Duration Analysis (non-linear effects of waiting time)

Effect of waiting time on survival time		Baseline specification		Frailty	Included Set of Attributes					
Coefficient	SE	Log- normal	Gamma		i_var	local_gr	local_tr	pscore	BIC	
Waiting time interval (months); model with $k = 37$										
0<90	reference									
90<183	0,05520	0,04703	0	1	without	1	1	1	0	17348
183<365	0,10044	0,05641	0	1	without	1	1	1	0	17348
365<730	-0,16793	0,07425	0	1	without	1	1	1	0	17348
730<	-0,32400	0,09268	0	1	without	1	1	1	0	17348
Waiting time interval (days); model with $k = 38$										
0<90	reference									
90<183	0,00088	0,05461	1	1	gamma, fe_tmax	1	1	1	1	13166
183<365	0,00603	0,06411	1	1	gamma, fe_tmax	1	1	1	1	13166
365<730	-0,27924	0,08629	1	1	gamma, fe_tmax	1	1	1	1	13166
730<	-0,40410	0,11617	1	1	gamma, fe_tmax	1	1	1	1	13166

Note: Estimates are based on two specifications of the baseline acceleration function as noted in row 4 and 5 (AFT-metric). The estimates base on different specifications of the statistical model as indicated in the rows 4 to 10. k reports the number of parameter included in the model. SE is an abbreviation for the standard error. BIC captures information of the entropy of the statistical model.

The column headed with 'frailty' describes the way additional frailty (equally used: unobserved heterogeneity) is controlled for. The columns labeled with '*Included Set of Attributes*' describe the set of characteristics that are used as control variables. For further details see also the note below Table 2.

Table A1: Definition of the variables

Variable	Description
Male	Sex is male. Source: Employment History.
Age	Age of the founder at the beginning of the self-employment episode. Source: Employment History.
Higher education	Schooling equals high school degree or higher (Germany: “Abitur” or “Fachabitur”). Source: Job Search Register.
College/University degree	The founder holds an academic diploma (university or college). Source: Job Search Register.
Master craftsman	The founder has worked as a crafts master or foreman (job position) in his or her last employment episode before starting the business. Employment episodes with a daily income lower than 5 Euro or lasting less than 60 days (valid employment episode) are excluded. Source: Employment History.
Management	The founder worked in a management position in the last employment episode before starting the business. Source: Job Search Register.
Commercial competence	The founder is experienced and (formally) trained in a commercial profession. Source: Job Search Register (apprenticeship information); Employment History (using the two-digit classification of a selected set of professions; experience).
Small Business Background	Size of the Establishment: Composite value of the number of employees of the establishments during the last five years before setting up the business. Only those employment records that last for more than 3 months with an income greater than zero are included. Source: Establishment History Panel. Small Business: The founder has usually worked (composite value of the last five years) in establishments with less than 20 employees. Source: Establishment History Panel.
Wage Premium	Identifies whether a founder who earned 1.66 times more than the expected monthly wage income in the last valid employment episode. The expected income is a regressed function of the income and a selected set of covariates (e.g., age, schooling, job changes, gender, job position, and size of the establishment) conditional on the type of profession and part- or full-time status. Source: Employment History.
Short unemployment before	The unemployment duration before setting up the business is less than 3.5 months (difference between last employment and beginning of the promoted self-employment episode; missing values are imputed). Source: Employment History.
Minor employment before	Founder worked in a minor employment position during the last valid employment episode before setting up the business. Source: Employment History.
Job classification	Distinguishes seven clusters of professions based on a one-digit job classification related to the last valid employment episode. Source: Employment History.
Eastern Germany	Takes the value of one if the individual lives in Eastern Germany. Source: Job Search Register.
Level of variation in local unemployment	Captures the variation of the monthly unemployment rate for each local labor market district. The index reflects the square root of the squared mean error of time series estimation. Source: Employment Statistics.
Level of unemployment (rate)	Monthly unemployment rate of the local labor market district. This information is merged with the microlevel data after splitting the dataset into three-month periods. Berlin is treated as one region (unweighted average). Source: Employment Statistics.
Local firm hazard	Share (%) of vanishing establishments (local firm hazard): Identifies the share of establishments that are found in t-1 but that do not exist in t in the local labor market district. Source: Establishment History Panel.
Vacancy-Unemployment ratio	Ratio of the number of official registered vacancies to the number of the registered local unemployed people.
Start-up-Unemployment ratio	Ratio of the number of self-employment entries out of unemployment to the number of the registered local unemployed people.
Unemployment rate Index	Time-varying covariate that covers a normalized unemployment rate relative to the starting point (index = $UER*100/UER$). Source: Employment Statistics.
Local firm hazard Index	Time-varying covariate that covers a normalized local firm hazard relative to the starting point. Source: Employment Statistics.
Vacancy-Unemployment ratio Index	Time-varying covariate that covers a normalized vacancy-unemployment ratio relative to the starting point. Source: Employment Statistics.
Start-up-Unemployment ratio Index	Time-varying covariate that covers a normalized start-up-unemployment ratio relative to the starting point. Source: Employment Statistics.

Table A2a: Descriptive Statistics (sample a: waiting time, n = 10999)

Variable	Mean	Std. Dev.	Min	Max
Individual characteristics				
Gender (male)	0,66	0,473	0	1
Age	38,26	8,456	19	58
Higher education	0,31	0,461	0	1
College/University degree	0,17	0,377	0	1
Master craftsman	0,02	0,154	0	1
Management	0,04	0,206	0	1
Commercial competence	0,15	0,355	0	1
firm size working background (0-25)	0,45	0,497	0	1
category 1 (26-50)	0,12	0,322	0	1
category 2 (51-250)	0,27	0,444	0	1
category 3 (251-500)	0,09	0,284	0	1
Cctegory 4 (500-)	0,08	0,265	0	1
Wage Premium	0,26	0,437	0	1
Short unemployment before	0,29	0,454	0	1
Minor employment before	0,06	0,234	0	1
Job classification (group 1)	0,02	0,140	0	1
group 2	0,39	0,488	0	1
group 3	0,33	0,469	0	1
group 4	0,07	0,257	0	1
group 5	0,04	0,195	0	1
group 6	0,07	0,247	0	1
group 7	0,09	0,283	0	1
Eastern Germany	0,28	0,451	0	1
Level of variation in local unemployment	0,42	0,164	0,16	1,01
External economic conditions				
t ₀ (first observation)				
No of entries in bridging allowance	80,02	119,298	1	1548
Level of unemployment	11,85	5,201	4,67	24,91
Local firm hazard	9,72	1,992	6,24	14,89
Vacancy / Unemployment ratio	12,19	8,180	0,6	44,5
Start ups / Unemployment ratio	0,23	0,110	0,003	1,161
t _n (last observation)				
No of entries in bridging allowance	144,47	207,604	1	1548
Level of unemployment	13,14	4,778	5,07	24,79
Local firm hazard	11,61	1,519	6,85	14,89
Vacancy / Unemployment ratio	2,22	3,295	0,1	44,7
Start ups / Unemployment ratio	0,38	0,169	0,003	1,856

Job classification: group 1 "primary sector"; group 2 "craft, manufacturing"; group 3 "commercial, administration"; group 4 "transport, security, post services"; group 5 "medical care"; group 6 "education and social care"; group 7 "else"

Table A2b: Descriptive Statistics (sample b: self-employment duration, n = 7282)

Variable	Mean	Std. Dev.	Min	Max
Gender (male)	0,66	0,472	0	1
Age	38,44	8,426	19	58
Higher education	0,32	0,467	0	1
College/University degree	0,18	0,386	0	1
Master craftsman	0,03	0,160	0	1
Management	0,05	0,212	0	1
Commercial competence	0,15	0,357	0	1
firm size working background (0-25)	0,45	0,497	0	1
category 1 (26-50)	0,12	0,327	0	1
category 2 (51-250)	0,27	0,443	0	1
category 3 (251-500)	0,09	0,282	0	1
category 4 (500-)	0,08	0,265	0	1
Wage Premium	0,26	0,440	0	1
Short unemployment before	0,29	0,454	0	1
Minor employment before	0,05	0,228	0	1
Job classification group 1	0,02	0,142	0	1
group 2	0,39	0,488	0	1
group 3	0,33	0,472	0	1
group 4	0,07	0,247	0	1
group 5	0,04	0,191	0	1
group 6	0,07	0,247	0	1
group 7	0,09	0,285	0	1
Eastern Germany	0,30	0,458	0	1
Level of variation in local unemployment	0,42	0,167	0,16	1,01

Job classification: group 1 "primary sector"; group 2 "craft, manufacturing"; group 3 "commercial, administration"; group 4 "transport, security, post services"; group 5 "medical care"; group 6 "education and social care"; group 7 "else"

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