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Business Survival and Success of Young Small Business Owners: an Empirical Analysis[*]

C. Mirjam van Praag[1]

ABSTRACT

Little empirical evidence provides insight in person-oriented drivers of business survival and success of small business owners. In this paper I perform a duration analysis of business survival amongst young white (self-employed) small business owners in the US. Compulsory exits are distinguished from voluntary exits. This enables an alternative definition of business success: the longer one can survive and prevent *in*voluntary exit, the more successful one is.

Potential drivers of *survival* are derived from recent empirical evidence in related studies. The potential drivers of *success* are also derived from historical economic thinkers such as Marshall and Schumpeter. The estimated hazard rates are affected by characteristics of the small business owner and business conditions.

JEL codes: C41, G33, J23, M13

Key words: self-employment, entrepreneurship, business survival, small business, and success

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Introduction

…the requisite capacity and talent limit the number of competitors for the business of entrepreneurs. Nor is this all: there is always a degree of risk attending such undertakings; however well they may be conducted, there is a chance of failure; the entrepreneur may, without any fault of his own, sink his fortune, and in some measure his character (Say, 1803;1971)

An effective government policy to decrease unemployment is to stimulate the number of new businesses. A well-known problem with new businesses is their high dissolution rate. Of every 100 start-ups only 50 firms survive the first three years. Hence, authorities should not only stimulate business start-ups, but also strive to minimize the number of business dissolutions. It is therefore highly relevant to investigate and understand the individual determinants of business survival.

Business survival determinants are not only interesting to authorities. Commercially oriented institutions involved in new businesses, for example banks, might benefit from understanding these determinants as well when the determinants are used for the decision which starting enterprises to support with a loan.

The objective of this paper is to quantify the *person*-specific determinants of survival duration and of success in business. I focus on the person-specific determinants rather than on the business-specific determinants because I presume that it is the man who makes the difference: he sets the conditions, the boundaries, the characteristics and, ultimately the value creating ability of the newly founded firm. Chandler and Hanks (1994), Peteraf and Shanley (1997), and Reuber and Fischer (1999) explicitly mention that for new ventures, the firm can be considered to be an extension of the founder. In one of the most seminal papers in the subject field of "The Theory of the Firm", Nicholas Kaldor (1934), who defines the business owner as "the coordinating ability of the firm", already puts this as follows:

On this definition, firms whose coordinating ability changes, while preserving their legal identity, would not remain the same firms; but then all the theoretically relevant characteristics of a firm change with changes in coordinating ability. It might as well be treated, therefore, as a different firm.

This focus on the individual as the level of analysis also enables to cope with the growing recognition that entrepreneurship may be a "habitus" rather than a single-event action (Wright and Westhead, 1998).

The unit of analysis in a person-oriented *duration* analysis is the duration in business of the individual, not of the venture. Exits are associated with moving out of self-employment to (un)employment.

Quantification of the person-specific determinants of survival duration and of success in business is achieved by estimating a duration model on a sample consisting of young males who became self-employed between 1985 and 1989.[2] [3]

Success in self-employment has no unique definition or measure. It has been measured in empirical (business) economics[4], psychology, and sociology. Performance measures have been defined in terms of observed self-employment earnings (see for instance Schiller and Crewson, 1997),[5] as firm size, as firm growth, and moreover as the probability that one has remained self-employed for a certain while (see Bates (1990), Cooper et al (1994), Schiller and Crewson (1997) and Brüderl et al. (1998)). Acceptance for the (growth in the) number of employees as a measure of business success was only recently developed (Cooper et al, 1994; Van Praag, 1996; Van Praag and Cramer, 2001; Sapienza and Grimm, 1997; Brüderl et al., 1998). The same goes for subjective empirical measures of individual business success (Luk, 1996; Sapienza and Grimm, 1997). Brüderl et al. (1992) and Pennings et al (1998) define success as duration in business.

However, the mere duration of a venture could have little to do with success in business, since a large part of business dissolutions is voluntary (see the data section for its frequency). The present study uses an alternative, and in my opinion more appropriate, definition of success in business.

This definition is enabled by the estimation of a model that distinguishes between compulsory exits from membership in the self-employed community, failures, and voluntary exits. Estimating such a competing risks model is possible since the data are informative about exit routes. Only compulsory exits are associated with lack of success.

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[2] The terms "self-employed" and "small business owner" are both used and may be interchanged. The term "entrepreneur" is not used in order not to imply that anyone who starts a business is an entrepreneur (see Timmons, 1994 for a distinction between an entrepreneur and any other small business owner).

[3] The econometric analysis of duration data has found wide application in issues of (un)employment spells (Lancaster 1992, Green and Riddell 1997). The extreme scarcity of the application of such techniques to understand business survival is astonishing.

[4] See Van Praag (1996) for an overview.

[5] Measurement errors are probably large when measuring self-employment earnings and not only because (perceived) definitions vary, but also because entrepreneurs tend to underreport their earnings due to tax shelter considerations, or to overreport as a consequence of feelings of pride or shame.

In this manner, person-oriented determinants of successful small business ownership can be estimated. The exact definition of business success is given below along with a few others.

A *compulsory exit*, after, say, a period of length T in business, is due to a lack of sufficient (financial) opportunity to continue in business. This exit route is associated with *business failure*. A *voluntary exit* after a period of length T in business, on the other hand, is due to a lack of willingness or motivation to continue in business. A better outside option is encountered in the labor market, evidently before the business owner is forced to exit. A *business dissolution* can be either a voluntary or a compulsory exit out of self-employment. The *business survival duration* is defined as the (at $t=0$) expected period of length T in business, which will eventually end in either of the exit routes out of self-employment. The indicator for *business success* is the (at $t=0$) expected period of length T' in business after eliminating the voluntary exit route (thereby treating voluntary exits as right censored observations). Hence, only compulsory exits are considered in measuring business success; the longer T', the more successful is the small business owner.

In line with these definitions, estimating the single risk model renders the determinants of business survival. Estimating the competing risks model leads to the measurement of individual success determinants together with the determinants of "motivation" to continue in business.

The paper is organized as follows. It first deals with the choice of explanatory variables. The next section describes the sample. In the sequel, the model, the estimation results, and conclusions are discussed.

Determinants of Survival and Success in Business

The objective of this section is to derive from either theory or empirical research hypotheses about the determinants of survival and success in business. The potential regressor variables of the aggregate model explaining business survival are derived in the subsection below.

In the subsection that follows, the success determinants to be used in the competing risks model are assembled. As quantitative empirical evidence on the direct determinants of success in business is relatively scarce and since a rich historical knowledge base about successful entrepreneurship exists, I derive these success determinants by also reviewing important historical contributions to the theory of entrepreneurship. The relevant ideas of Jean-Baptiste Say, Alfred Marshall, Joseph Schumpeter and Frank Knight are translated to empirically useful success determinants.

Determinants of Survival in Business

There is relatively little theoretical or empirical literature about the person-specific determinants of the duration of a business venture. Exceptions are Bruderl et al (1992), Cooper et al. (1994) and Pennings et al. (1998). However, there is ample empirical evidence that points to the effect of person-specific regressor variables on the probabilities of:

- Becoming self-employed in a certain period, Pr(Inflow)= Pr(*IF*)
- Exiting self-employment in a certain period, Pr(Outflow)=Pr(*OF*)
- Being part of the stock of self-employed at a certain moment, Pr(*SE*)

given the size of the labor force. Combining the empirical evidence pertaining to these probabilities by means of a simple statistical relationship developed for this purpose (see Appendix A), results in hypotheses about the qualitative effect of regressor variables on self-employment duration, the dependent variable in the aggregate model.

Statistical Relationship: Inflow, Stock and Duration

Suppose that the total inflow into the stock of small business owners is equal to the total outflow and that the economy is in a steady state, such that

$$\log[\mathrm{E}(T)] = \log(\Pr(SE)) - \log(\Pr(IF)) \qquad (1)$$

where E(*T*) is the mean (completed) self-employment duration (in months)[6]. I wish to derive the relationships between effects of particular regressor variables on these quantities. Whereas it is possible to observe for each small business owner within a sample the (in)complete duration of his (individual) venture, it is not possible to observe the *probabilities* Pr(*SE*) and Pr(*IF*) of equation (1) for each individual. I only observe the dichotomous outcome of the individual to be self-employed (*SE*) or to become self-employed (*IF*). The dichotomies are explained by sets of regressor variables. The predicted values of Pr(*SE*) and Pr(*IF*) can be calculated for each individual by means of the regression equation.

For the moment it is assumed that Pr(*SE*) and Pr(*IF*) are explained by the same set of regressor variables. Denote the *j*th element of the set of regressor variables $\vec{x}$ by x_j. Taking partial derivatives with respect to x_j in equation (1) renders

$$\gamma_j = = \frac{\partial}{\partial x_j} \log(\mathrm{E}(T)) = \frac{1}{\Pr(SE)} * \left(\phi(\vec{x}' \beta_{SE})\beta^j{}_{SE} - \phi(\vec{x}' \beta_{IF})\beta^j{}_{IF}\,\mathrm{E}(T)\right) \qquad (2)$$

where β_{SE} and β_{IF} denote vectors of parameters and where Pr(*SE*) and Pr(*IF*) are a function of $\vec{x}'\beta_{SE}$ and $\vec{x}'\beta_{IF}$, respectively. β^j_{SE} and β^j_{IF} denote the *j*th elements of the parameter vectors and correspond to the effect of x_j on the respective probabilities. Finally, ϕ depends on the specification applied and is non-negative.

Equation (2) reduces to a numerical expression for the predicted effect of each particular regressor on log(E(*T*)), the expected length of business survival, if (average) sample characteristics are known along with the parameter estimates. Consequently, imputing the already existing empirical evidence about the coefficients β^j_{SE} and β^j_{IF} into this relationship renders the hypotheses that we are seeking for, the expected effect of x_j on business survival.

I will cautiously restrict the predictions to the *qualitative* effect of a regressor on E(*T*). This caution is appropriate not only because of the strict assumptions underlying equation (1), but also because I establish the predicted on the basis of estimated β's from different samples, derived in various models with different sets of regressor variables. Table 1 results from inserting all possible combinations of positive, negative and zero β_{SE}'s and β_{IF}'s into equation (2). It serves as a theoretical a priori table. Applying the relation of equation (2) to already existing empirical evidence about Pr(*SE*) and Pr(*IF*) leads to a framework which can be used as a tool for the selection of regressor variables.

[6] See Ridder (1987) for a similar formulation.

- Insert Table 1 –

The interpretation of Table 1 can be intuitively clarified. Suppose that we are looking for a hypothesis about the effect of former self-employment experience on the hazard out of self-employment. Moreover, suppose that we have some empirical evidence about the effect of this variable on the probability that someone *is* self-employed, β_{SE}, as well as on the probability that someone has switched to self-employment, β_{IF}. The probability that one is found to be self-employed is a combination of the probability that one has become self-employed (P(IF)) and that one has remained so (duration). So if for instance former self-employment experience affects P(SE) positively, then it should affect either the probability to start or the probability to remain self-employed positively, or both. If former experience is simultaneously known to affect the probability to start in self-employment, P(IF), insignificantly or even negatively, then we can conjecture by means of the logic developed above that self-employment experience increases duration (and decreases the hazard out of self-employment).

Outflow and Duration

Binary outflow studies explain a (time-independent) hazard of exit from self-employment during a certain time interval. Thus, it may simply be stated that the estimated effect of regressors on exit, β_{OF} and on duration have reverse signs, apart from the effect of time varying covariates.

The Empirical Relationships

The relevant empirical evidence pertaining to Pr(*IF*), Pr(*SE*), Pr(*OF*) and E(*T*) has been classified in Table 2.[7] It contains variables that will be included in the model that explains individual self-employment durations.

- Insert Table 2 here –

[7] References to the empirical sources of each and every sign as well as explanations about the various sample characteristics and, where necessary, variable definitions are available from the author on request. Empirical findings for several countries, years and subgroups and with various definitions for regressor variables have been brought together. The resulting tables show some regularities, summarized in Table 2, where U.S.-empirics are shown separately. Variables without any significant effects are omitted.

Determinants of success in business

There are few subjects in economics and business which are backed up by such a rich historical knowledge base as is the case with the current subject of venture performance and the business founder's impact on success. Since the relevant parts of entrepreneurship theories by Schumpeter, Marshall, Say, and Knight have seldom been put to an empirical test, it is an interesting exercise to do so by means of the current data.[8]

These historical contributions are not only an extremely interesting source of information on the personal determinants of business founders' success. They are necessary sources as well, since the modern theoretical and empirical knowledge base is quite limited.

Being pushed and pulled by these reasons, I will basically use the classic theoretical knowledge base to obtain hypotheses on the determinants of successful business founding. These are discussed first in this subsection. A brief discussion on more contemporary (empirical) findings on success in business founding and its determinants follows.

The Classic Theoretical Knowledge Base

The Classical economist Jean-Baptiste Say (1803;1971) states that success in entrepreneurship requires qualities such as *"judgement, perseverance and a knowledge of the world as well as of business"* (1803;1971, p330). Furthermore, success requires knowledge of the industry and the occupation gathered through experience. But an entrepreneur may also fail "*without any fault of his own"*. This chance of failure depends on good luck and general business conditions.

The successful entrepreneur as defined by the Neo-classical economist Alfred Marshall (1890;1930) has command over general abilities, specialized abilities, capital and good fortune. General ability depends on family background, education and talent. Specialized ability involves vast knowledge of a specific trade as well as of leadership qualities. Additionally, a businessman with own capital surely has an advantage in running a business. Finally, good fortune is also important for the Marshallian entrepreneur.

Furthermore, Table 2 does not include variables, which have been included only in "inflow"-studies before. Inflow-studies by themselves do not generate relevant predictions.

The function of Joseph Schumpeter's (1911;1934) entrepreneur is to innovate, and firms who cease to innovate will not survive. Successful innovations require leadership. Success in entrepreneurship requires strong and scarce motivations to innovate, prior to the start of an entrepreneurial endeavor.

Success as a Knightian entrepreneur requires *"the power of effective control"* (1921;1971, p269) and intellectual capacity. Furthermore, it requires self-confidence and a disposition to act on one's own opinion. An entrepreneur should be venturesome and have foresight. The need for ability to forecast varies with production sectors depending on the time length of the production process and on the variability of consumer wants the product satisfies; the more basic the wants and therefore stable and predictable they are, the higher the probability of success. A successful entrepreneur should also have superior managerial ability and, belief in one's good luck.

A comparison of these classical views on the capability, conduct, attitude, and asset ownership required for the successful business founder leads to some observations on how they complement and partly contradict each other. Say and Marshall give both much weight to certain abilities related to the managing function of the business founder. They also stress capabilities related to leadership and industry-specific abilities. Schumpeter, who stresses the leadership function of the business founder (but considers the managerial function as irrelevant), emphasizes a certain attitude, a willingness to show deviating behavior. Psychological factors are much more important than human capital factors, according to Schumpeter. His view thereby almost completely contradicts the (neo-)classical views of Say and Marshall. Knight integrates (Schumpeter's) psychological requirements in the (neo-)classical ability requirements. On the other hand, Say and Schumpeter agree that capital ownership is not a requirement for successful business ownership, thereby contradicting Marshall's and Knight's view that capital ownership *is* a factor affecting performance.

Contemporary Empirical Knowledge

From the modern empirical knowledge base about the person-specific determinants of small business success, several hypotheses result concerning person-oriented drivers of entrepreneurial success:

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[8] A more detailed and extended report about classic views on entrepreneurship and their relation to modern empirical studies is found in Van Praag (1999).

I. Relevant previous experience (in self-employment, the same industry or occupation) affects success as a business founder (Reuber and Fischer, 1999; Brüderl et al., 1998; Luk, 1996; Cooper et al., 1994).

II. The younger the business founder is, the better his performance will be, given the level of relevant experience (Sapienza and Grimm, 1997; Van Praag, 1996).

III. The more own capital is available, the more successful will the small business owner be (Brüderl et al., 1998; Cooper et al., 1994)

IV. Small business owners that have been pulled into the job, rather than pushed, have higher chances to be successful. In other words, a positive motivation at the start affects performance positively, whereas individuals who consider self-employment as their last resort will be less successful (Van Praag, 1996; Van Praag and Cramer, 2001).

V. Higher educated business founders perform better (Schiller and Crewson, 1997)

Table 3 summarizes these hypotheses as well as (empirical translations of) the classical views along with the relevant variables available in the sample. As can be seen from the Table, the empirical evidence is for most variables in line with (some of) the classic insights. The evidence for the "age" variable is an exception.

- Insert Table 3 -

These determinants of business failure and success will empirically be tested along with the determinants of voluntary business dissolutions due to a lack of motivation to continue in business. The latter is assumed to depend on variables that determine both the accessibility and desirability of outside options such as general experience, age and education.

Data

The sample is drawn from the *National Longitudinal Survey of Youth* (NLSY). The first interview amongst the approximately 12,000 respondents was held in 1979 when they were between 14 and 22 years old. Afterwards these extensive interviews have been repeated annually. The last year at our disposal is 1989. I use a subsample of white males for homogeneity reasons. All observed switches to self-employment are sampled and for these the duration of the self-employment spell is recorded. This results in a sample of 271 observed durations in self-employment where the self-employed are white males aged 20 to 32 who have become self-employed in their own (un)incorporated businesses between 1985 and 1989. 145 observations were right censored; these young men were still self-employed at their last interview. Note that inflow into the class of self-employed took place continuously during the time interval under analysis. As a consequence, the observed duration of right censored observations may be anything between one month and five years.

Though interviews took place at intervals of approximately a year, the duration variable used is measured in months and treated as continuous. This smaller unit of measurement has been obtained by utilization of employer supplements for every observation each survey year. This search also gave the opportunity to trace back whether exits were voluntary or compulsory. The survey includes a question to people who terminated a particular occupation (either employed or self-employed) about the reason for termination. I consider the categories: "bankruptcy of the firm" and "fired" as compulsory. Though phrasing of reasons for terminating a job is not particularly suitable for self-employed persons in the NLSY-survey, the question applies to them too. "Quits" and the like are considered as voluntary exits. There is perhaps a natural tendency to report an exit as voluntary versus compulsory. I therefore treat "voluntary" exits as compulsory whenever they are succeeded by a period of compulsory unemployment of at least two months, where two months is an arbitrary choice.

The 126 observed exits are divided in 55 (44%) compulsory and 71 (56%) voluntary exits. Of course, the choice and interpretation of this variable is open to criticism. Fortunately, I will have an opportunity to verify whether the usage of this variable to discriminate among two different exit routes makes sense or not: I will empirically check whether the two alternatives differ significantly from each other or not. If they do, it would be quite improbable that the source of the information on exit

routes, the answers to a particular (and quite unclear) question from the questionnaire, is completely unreliable.

A wide variety of potential exogenous variables are included in the NLS. However, an adequate indicator of business conditions is not included. An indicator of macroeconomic business conditions is a potentially important regressor variable in a business hazard equation. The 1992 Statistical Abstract of the United States Databook is used to remedy this omission. One macroeconomic indicator is the business failure rate that measures the number of business failures per 10,000 concerns by industry for each calendar year. This variable has been included as a macroeconomic time-varying covariate together with the unemployment rate. They both capture variations in general business conditions.

All other exogenous variables are treated as time independent and are included in the NLS. These variables take on the values that are reported during the last interview prior to the switch to self-employment. This decision rule aims at preventing problems with endogeneity. Industry and occupation dummies are, however, recorded after the switch to self-employment.

Model

The appropriate method to study durations of any kind is estimating a survival model. As in an Ordinary Least Squares (OLS) Regression model, a dependent variable is explained by means of a set of independent regressor variables. Survival models deviate a little from Ordinary Least Squares Models due to some unique features of the problem that they are employed for. A duration is explained and it might be possible and it is actually the case in the current application that the values of some independent variables vary over that time period. Survival or hazard models can cope with that variation. Furthermore, one should also be able to deal with the possibility that the hazard itself (the dependent variable of the model) varies over time. Survival models as employed here are able to deal with that aspect too.

In the survival model, T is defined as a continuous random variable denoting the number of months a small business owner remains in business.[9] Time as it passes is denoted by t in the model, irrespective of calendar time. Hence, all self-employed start their businesses at $t=0$. The probability density function of T is $f(t)$, its distribution function $F(t)$. The survivor function is defined as $S(t) = 1 - F(t) = \Pr(T \geq t)$. The hazard $\theta(t)$ specifies the (conditional) probability that someone, who has remained in business for a period from 0 to t, exits in the short interval $(t, t+dt)$, and is defined as (cf. Lancaster,1992, p8)

$$\theta(t) = \frac{f(t)}{S(t)} \tag{3}$$

The hazard function is modeled as a function of a set of exogenous person-specific regressors, the vector $\vec{x}$, and of time t to permit duration dependence. Assuming the absence of regressors, the hazard is a non-monotonic function of t. The assumption was shown to hold by a first inspection of the duration data. A simple hazard specification that permits non-monotonic behavior is the log-logistic (see Lancaster, 1992, p44),

$$\theta(t, \vec{x}) = \frac{k(\vec{x})\alpha t^{\alpha-1}}{1 + k(\vec{x})t^{\alpha}} \tag{4}$$

I specify $k(\vec{x}) = \exp(\vec{x}'\beta)$. Given this, taking the partial derivative of equation (4) with respect to a regressor x_j, and rearranging, we obtain

[9] I know that no other transition has taken place within any month due to the manual way of obtaining these durations. Therefore, observations are complete and a continuous model in months is appropriate.

$$\beta_j = \left(S(t,\vec{x})\right)^{-1} \frac{\partial \log \theta(t,\vec{x})}{\partial x_j} \tag{5}$$

where $S(t,\vec{x}) = \exp\left(-\int_0^t \theta(s,\vec{x})\mathrm{d}s\right) = \left(1+k(\vec{x})t^{\alpha}\right)^{-1}$ and,

$\log\theta(t,\vec{x}) = \vec{x}'\beta + \log\alpha + (\alpha-1)\log t - \log\left[1+\exp(\vec{x}'\beta)t^{\alpha}\right]$

thus giving the proportional effect of each explanatory variable on the conditional probability of leaving self-employment.

Consequently,

$$\gamma_j = \frac{\partial \log(T)}{\partial x_j} = -\frac{\beta_j}{\alpha} \tag{6}$$

This equation specifies the relationship between the β_j's found when estimating the hazard function $\theta(t,\vec{x})$ and the γ_j's resulting from estimation of log(*T*) and which are referred to in Tables 1 and 2.

I modify $\vec{x}$ to $\vec{x}(t_i)$ to permit the inclusion of (calendar!) time varying regressors; the macroeconomic indicators of business conditions. These conditions vary over both calendar time and observations.[10] The danger of unacknowledged endogeneity pertaining to time-varying covariates is obviously absent in this particular application. The sample is taken from the flow of entrants to the state "self-employment". Since this sampling scheme is uninformative about *t*, the Loglikelihood to be maximized follows as

$$L_i = d_i \log\theta_i(t_i) - \int_0^{t_i} \theta_i(u)\mathrm{d}u \tag{9}$$

where d_i=1 if individual *i*'s exit is observed at t_i and d_i=0 if *i*'s length of time in business is right censored. The parameter estimates resulting from maximizing this likelihood are denoted as the results of *Model I*, the single destination or single risk model.

In the second model, *Model II*, I utilize the available information on destinations after business dissolution. I allow for different hazards: θ_w, the hazard for a transition due to a lack of willingness to continue in self-employment; and θ_o, the hazard for exiting the self-employment state due to a lack of opportunity to continue. This approach to modeling multiple destinations is referred to as a *competing risks model*. I adopt it as *Model II* where $\theta(t) = \theta_w(t) + \theta_o(t)$.

[10] Note that entries are observed over the entire period of observation; the sample is not a cohort.

Define M^* as the number of destinations that is parametrically specified and d_{im} as a dummy variable equal to one if individual i is observed to make a transition to state m and zero otherwise. Lancaster (1992, p162) derives the Loglikelihood as

$$L = \sum_{m \in M^*} L_m \tag{10}$$

where,

$$L_m = \sum_{i=1}^{N} \left[d_{im} \log \theta_{im}(t_i) - \int_0^{t_{im}} \theta_{im}(u) \mathrm{d}u \right] \tag{11}$$

This representation of the problem is a great simplification as the problem may be decomposed into a set of M* different sub-problems with a single destination, and right censoring for all observations that did not reach this destination. The estimators of all sub-problems are distributed independently.

I shall test whether the two specified hazards are statistically distinct or whether the competing risks model reduces to the single risk model. I do so by means of a Likelihood ratio test as in Lindeboom and Theeuwes (1991). As noted before, this test also gives insight in the validity and discriminating power of the empirical measure for exit routes.

Finally, I shall not formally test for the presence of unobserved heterogeneity. The reason is that many complications arise due to the inclusion of time-varying regressors. I excluded these time-varying regressors in order to test for the presence of unobserved heterogeneity in a usual way (by means of introducing a Gamma mixing distribution). This way however, I did not find evidence of unobserved heterogeneity.

Estimation Results

Table 4 shows the estimation results. The first column pertains to the single risk model, the others to the competing risks model. The hazard for a transition to any state out of the self-employment state is denoted by θ, where θ depends on individual-specific covariates and time. The hazard for a transition to "compulsory exit" is denoted by θ_o, while θ_w denotes the hazard for voluntary exits. To obtain estimated effects of regressors on log-duration, reverse the sign of the given parameter estimate and divide by $\hat{\alpha}$.

- Insert Table 4 here –

Age

Table 4 shows that age affects all hazards (significantly) negative: the older one starts, the longer one survives (the lower the hazard). The lower hazard in the single risk model is shown to be a combined effect: both voluntary and forced exits are more probable for business owners that started at a younger age. The variable "age squared" is an additional significant factor for explaining the hazard of compulsory exit. The total effect is as follows: age affects the hazard negatively below a starting age of 32. Above that age, the effect is positive. The optimal starting age would therefore be 32 (exactly the same finding as in Van Praag (1996)). However, the current finding only pertains to an age group between 20 and 32. Therefore, the only observed part is the negative effect. This result was obtained while controlling for experience.

The effect of the variable "age" on the hazards of the competing risks model, θ_o and θ_w, might shed some light on the source of the relative disadvantage of the very young entrepreneurs. As is deduced from the negative coefficient of age in the θ_w-equation, the very young starters from this sample are more likely than the more mature ones to find (better) outside opportunities and thereby voluntarily exit. The also negative coefficient of age in the θ_o-equation shows that these youngsters are also more likely to fail due to a lack of leadership or "knowledge of the world" as Schumpeter, Say, and Marshall put it.

These results are largely in line with expectations based on Table 2 and 3. The empirical evidence for the United States shows that age does not affect the probability to

become self-employed, while older people face a significant higher probability to belong to the pool of self-employed, and a lower probability to exit the self-employment status. Combining this with Table 1 leads to the hypothesis that age affects θ negatively and duration positively. The result in the first column of Table 4 confirms the hypothesis based on empirical evidence: younger starters have lower survival probabilities than older starters. The fact that this is mainly so as a consequence of an increased hazard of compulsory exit is in accordance with the classical economists, but not with the empirical findings of today. The latter should be a consequence of the young age group that we consider.

Experience

Experience in the same industry as the business venture gives better chances, and so does experience within the same occupation. Experience in the industry affects all hazards significantly negative. Experience in the occupation becomes only significant as a combined effect of compulsory and voluntary exits. These findings are in line with the collected evidence (see Tables 2 and 3) that relevant experience helps to become a successful business owner (and to survive). They support (especially Say's) classical theory too.

Another estimate in line with the collected evidence, but contradicting common belief, is the effect of former self-employment experience on business survival.[11] Experience in self-employment does not significantly influence the length of a business venture, nor does it alter the hazard rate of compulsory exit. The latter effect, though, was expected based on empirical findings.

The zero effect of the regressor "general labor experience" (in years) is interesting and contradicts the empirical knowledge base (Table 2 suggests a negative effect of experience in wage employment on θ). The most interesting part of the findings with respect to general labor experience, is its positive effect on the hazard for voluntary exits. General labor market experience does significantly increase the hazard for voluntary exits. The more labor experience, the more outside options one has, and higher will be the probability that these options compare favorably to self-employment. General labor market experience does not influence success or failure in business. The experience is apparently not to be classified as "relevant", unlike experience in the same industry as the venture is started.

Financial Variables

Parameter estimates for financial variables are insignificant in all three equations. People starting with their own capital are as successful as those who start with debt capital. Although banks select small business founders whom they grant with a loan very carefully, they have not succeeded in making this selected group more successful than the group of entrepreneurs starting with their own business capital. This result is in line with Table 2 as long as one does not consider coefficients in the exit-equation which are estimated from a sample of inheritance receivers (Holtz-Eakin, 1994b). It is, however,

contradicting the contemporary knowledge base on success determinants (Table 3). The classical theories by Marshall and Knight are rejected too. Say and Schumpeter already argued that own capital should not be an issue (in a perfect and complete capital market).

Motivations to start a business

The type of incentive that people experience to start a business importantly influences θ. Young men who start a business while or perhaps because they are unemployed have a higher propensity to leave this state at any moment.[12] And good prepared young Americans, who already started their business (on a part time base) while they were employees, have a better chance to stick it out. The pull factors generate far higher survival probabilities than the push factors.

The competing risks model obviously sheds light on this result. It turns out that men who have started while unemployed are significantly less successful in their business ventures. They fail before they find another opportunity in the labor market as shown by the far higher coefficient in the compulsory exit- equation than in the voluntary exit-equation. Males who started their business while they were still employed have a significant lower (than average) hazard of exit. This lower hazard of exit is caused by a lower probability of voluntary exit. Hence, this latter distinction selects the small business owners most motivated to continue rather than those that are the most successful.

Industry Dummies and Macroeconomic Variables[13]

All industry dummies turned out to be insignificant, except for the industries named in Table 4. Starting a business in the agricultural or business and repair services industries affects the survival probability of the entrepreneur. These industries have a negative effect on the hazard. A remark is in order. The time-varying covariate "business failure rate" (not yet discussed) varies over industries, is highly significant, and was not part of any previous study.[14] The results for industry dummies for the US (and Germany)

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[11] The result reported is for self-employment experience in years. Replacing this with a `mere self-employment experience' dummy does not alter this result.

[12] See Meager (1992) for a discussion on the relationship between unemployment and self-employment. I have the unusual advantage of the availability of both a personal and a macro-measure of unemployment.

[13] The Appendix Table gives a flavor of the industries and occupations the small business starters came from and in which industry and occupation they start their businesses.

[14] Furthermore, I know that it is usually believed that farmer-entrepreneurs are so different from others that they should be analyzed separately. However, a dummy referring to the occupation `farmer' was insignificant, as were all dummies referring to occupations. Farmers are included in this particular analysis because we have no reason to exclude them. Moreover as can be seen in the Appendix Table less than 10%

in Table 2 are different. However, our results perfectly match the Dutch results (De Wit and Van Winden, 1989).

It is notable that the industry "business and repair services" decreases θ through its positive effect on "willingness to continue". While failure perspectives are average within this industry (the coefficient in the θ_o -equation is not significantly different from zero), the motivation to continue in business is significantly higher. Outside options appear to be significantly less attractive or accessible in this industry compared to one's current position.

The (calendar) time-varying unemployment rate does not affect duration in self-employment. The business failure rate measures the number of business failures per 10,000 existing concerns for each industry and every year. A very significant relationship exists between the business failure rate and hazard rates; the higher the business failure rate, the higher the individual hazard out of self-employment. Macroeconomic variables are, to my surprise, scarcely used in this type of studies; and this highly significant indicator of business conditions has not been used before. Controlling for such a significant macroeconomic source of variance importantly increases the quality of results pertaining to individual effects.

The business failure rate does not only affect θ_o, but also θ_w, though to a lesser extent. Poor business conditions apparently decrease the relative attractiveness of remaining self-employed as compared to outside options.

Comparison of the (historical) success indicators to the results for θ_o

The current US-situation fits the ideas of Say, Marshall, Schumpeter and Knight remarkably well.[15] On the whole, Marshall's ideas are most deviating. Education, capital and family background are all insignificant in the analysis. The insignificant results for the Rotterscore (a measure for internal-locus-of-control beliefs) and for self-esteem (see below) contradict the views of Schumpeter and Knight. The industries "agriculture" and "business and repair" are Knight's easy industries insofar as they satisfy the more basic human needs.

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of the entrepreneurs is active in the agricultural business, and only 2.5% of the total number of entrepreneurs is active in the occupation "farmer". It will be no surprise with such a small fraction of farmers that the results found are not significantly altered when the group of farmers is excluded from the analysis.

[15] Provided the NLS-variables that are matched to these historical success indicators represent the same ideas.

Insignificant Results

The absence of several variables from Table 4 in the analysis should be noted. Due to the relatively small number of observations, I was not in a position to simultaneously insert all regressor variables. I opted for gradually including all variables mentioned in Tables 2 and 3 and excluding them if their results were insignificant. Some insignificancies which I consider of interest to explicitly report in Table 4 form the exception.

Excluded variables (mentioned in Table 2 but not in Table 4) are: variables measuring parental background, such as the educational and job levels of father and mother as well as information concerning the composition and home language of the family the entrepreneur comes from. Moreover, the business founder's own family situation was recorded, his education level as well as his health conditions. In addition, some other characteristics of labor market history (such as military experience, number of job changes and experience in the public sector) turned all out to have insignificant impact on the hazard out of entrepreneurship. The potential effect of three psychological measures was measured. Social psychologists strongly believe that a measure of internality of an individual's locus-of-control beliefs is a determinant of successful entrepreneurship. The Rotterscale (1966) is such a measure. The lower an individual's score on this Rotterscale, the less internal are his locus-of-control beliefs and the more he perceives the outcome of an event as beyond his personal control. The dichotomous Rotterscale measure derived from the current dataset is equal to 1 for more internal individuals. It turned out to be insignificant. Because we interpreted the Rotterscore as a proxy for Knight's variable "disposition to act", this insignificant effect also contradicts Knight's theory relevant to this item. (See Table 3). The same insignificant outcome was obtained for a related dummy that differentiates men who were extremely extraverted children from the more shy ones. Knight's conjecture concerning the effect of "self-confidence" was tested by means of the available information on "self-esteem". This turned out to have an insignificant effect on entrepreneurial success.

Moreover, location variables (Urban or SMSA dummies), and business characteristics such as number of co-starters, industry and occupational category of the business also appeared to be insignificant for the explanation of business survival and success.

Duration Dependence

Figure 1 shows how the estimated (aggregate) hazard function varies with time in business. θ increases from zero at the origin to a maximum at 27 months and then approaches zero as $t \to \infty$. The probability to survive is high in the first period; new business owners do not give up that easily. However, up to the point of 27 months in business, the probability to exit the community of the self-employed increases. When people are settled in business (after more than two years) the probability to stay a business owner increases. This declining part of the hazard curve is qualitatively consistent with Jovanovic's (1982) famous Bayesian learning theory, which implies that a business owner learns "on the job" how to become a better one and thereby how to increase chances to survive.

Figures 2 and 3 show how the competing risks model behaves over time. The estimated median duration if voluntary exits do not exist is 46.5 months (s.e.=7.1). On the other hand, when looking only at voluntary exits, assuming that business failures do not occur, the estimated median duration in business is 33.5 months (s.e.=3.0). It is logical that the estimated median duration increases whenever one of the two exit routes is assumed away. For instance, if voluntary exits would not occur, then every entrepreneur continues with this activity up until failure. This is due to the fact that the realized voluntary exits that are assumed away would have always occurred before the expected date of compulsory exit.

Because all α's are significantly larger than 1, all θ's have an inverse U-shaped relation with time; the three peaks are at 27, 44 and 38 months, respectively.

- Insert Figures 1, 2 and 3 here -

Goodness of Fit

The estimated median duration of self-employment ventures is 23.8 (standard error=1.5). The sample median of 23.8 clearly lies within the confidence interval of the estimate. The robustness of the parameter estimates is striking. Whatever functional form is assumed or whichever set of regressors is included, the parameter estimates show little variation.

Moreover, the hazards for compulsory and voluntary transitions can be proven to be statistically distinct. The test that renders this result can be described as follows.

The absolute value of the Loglikelihood of the competing risks model is 602. This value

is compared to the Loglikelihood of the single risk model to find out whether the competing risks are significantly distinct. However, the single risk model is not nested in the competing risks model. I therefore apply the Likelihood Ratio Test as presented in Lindeboom and Theeuwes (1991) which is designed especially for this purpose. It tests the null hypothesis that $\theta_o(t) = \theta_w(t) = \frac{1}{2}\theta(t)$. The value of the Likelihood Ratio Test statistic is 36, implying that the hazards for compulsory and voluntary transitions are statistically distinct. The competing risks model adds value.

Predicted Durations and Sensitivity Analysis

Table 5 shows the variation in mean predicted durations upon changes in the values of several significant regressors. It shows predicted durations rather than predicted hazard rates because the latter depend also on time.[16] The predicted durations for the reference individual of Table 5 are shown in the second row of Table 5. These values pertain to a male individual with an average amount of assets, average education, average age and experiences (in self-employment, the industry, the occupation and in general) and who works in a region within a sector and year with average unemployment rate and business failure rate. He was employed prior to his start in business but did not hold a job during the start. He had no real estate and his business is neither in the agricultural sector nor the business and repair sector. The predicted duration of self-employment is 18 months.

- Insert Table 5 here –

If, however, voluntary exits are excluded (treated as censored) and the only remaining risk is "compulsory exit", then the expected lifetime of his venture is much longer: 41 months. On the other hand, if compulsory exits are left out, the predicted duration of self-employment is nearly two years.

The other rows in Table 5 indicate the sensitivity of duration to changes in the various exogenous variables. Some remarks are worth noting. Industry experience has a clear positive influence on the predicted duration, especially because experience in the industry decreases the probability of business failure. Furthermore, a low business failure rate is a very important external circumstance for low individual failure probabilities.

[16] The predicted durations do not depend on the amount of time passed. I insert average values for the time varying variables. These values are averaged over the (calendar) period in business and also over persons.

Young men working in the agricultural sector face a(n almost implausible) longer predicted duration in business, due to the fact that both of the competing risks are lower. An unemployed young man faces a lower predicted duration in self-employment than his working counterpart mainly because unemployment prior to the start increases the likelihood to fail. General experience changes the predicted duration in the second column favorably. However, it has the opposite effect in the third column. The more general labor experience, the more easily self-employment is ended by means of voluntary exit (probably due to better outside options) rather than business failure.

Summary and Conclusion

The objective of this study has been to find and to quantify individual-specific empirical determinants of self-employment duration and success in business. I estimated both a single risk and a competing risks model on a sample of young white male self-employed in the United States (from the NLS-survey). All conclusions can at most be generalized to this group. The (statistically) distinct exit destinations are compulsory and voluntary exits out of self-employment.

The selection of regressors has largely been based on the empirical evidence pertaining to related types of studies. We still lack a fully developed theoretical and empirical knowledge base of person-oriented determinants of self-employment duration. This study, which takes for granted that individuals have started in self-employment, can be related to more frequently performed classes of empirical studies. I have developed a simple statistical relationship between regressor effects in the more frequently performed stock and entry studies on the one hand and regressor effects in a duration model on the other. Another class of empirical studies that gives some insight in duration determinants is the class of self-employment exit studies. Of course, the evidence collected on self-employment duration has also been taken into consideration while searching for potential determinants in this study.

The explanatory variables for the hazard for compulsory exits (i.e. business failures) in the competing risks model are basically derived from classical theories of business success and failure by economists such as Say, Marshall, Schumpeter and Knight. Some hypotheses about determinants of business success are derived from the (quite limited) empirical knowledge base to date.

The estimation results of the single risk model are more or less in line with the hypotheses derived from these other classes of self-employment studies. The business hazard varies with age, within-industry and within-occupation experience and not with the other usual human capital determinants of wages such as education and general labor market experience. And the most important individual determinants of entry into self-employment, years of self-employment experience and assets (see Van Praag and Van Ophem, 1995), play no significant role for self-employment duration. However, the motivation and enthusiasm with which a business venture is started influences its estimated duration significantly.

While one's individual (un)employment situation at the start of a venture affects its length significantly, the regional unemployment rate is of no importance at all for the hazard rate. Entry, on the contrary, appeared to react to these macro and micro measures of unemployment the other way around (Van Praag and Van Ophem, 1995). Hence, the important relationship between self-employment and unemployment depends on whether a macro or micro indicator of the latter is selected. Only for self-employment stock studies would this choice be irrelevant. The business failure rate, a straight measure of business conditions, is a highly significant determinant of the duration of an individual's business venture. The hazard for exit out of business ownership is an increasing function of calendar time up until 27 months and then decreases.

The results of the competing risks model, which distinguishes compulsory from voluntary exits, could be useful for initiating policy measures aiming at longer lasting business ventures. The model shows in which cases business hazards are high through a lack of motivation to continue and in which cases compulsory exits should be prevented.

References

Alba-Ramirez A. (1994). "Self-employment in the Midst of Unemployment: The Case of Spain and the United States", *Applied Economics* 26, 189-204.

Bates, T. (1990). "Entrepreneur Human Capital Inputs and Small Business Longevity", *The Review of Economics and Statistics* 4, 551-559.

Bates, T. (1995). "A Comparison of Franchise and Independent Small Business Survival Rates", *Small Business Economics* 7, 377-388.

Blanchflower, D.G., and B.D. Meyer (1994). "A Longitudinal Analysis of the Young Self-employed in Australia and the United States", *Small Business Economics* 6, 1-19.

Blanchflower, D.G., and A.J. Oswald (1998). "What Makes an Entrepreneur?"*, Journal of Labor Economics* 16(1), 26-60.

Blau, D.M. (1985). "Self-employment and Self-selection in Developing Country Labor Markets", *Southern Economic Journal* 52, 351-363.

Borjas, G.J., and S.G. Bronars (1989). "Consumer Discrimination and Self-employment", *Journal of Political Economy* 97, 581-605.

Brock W.A., and D.S. Evans (1986*). The Economics of Small Businesses. Their Role and Regulation in the U.S. Economy*. New York, Holmes & Meier Publishers.

Brüderl, J., P. Preisendorfer, and R. Ziegler (1992). "Organizational Survival"*, American Sociological Review* 57, 227-242.

Brüderl, J., and P. Preisendorfer (1998). "Network Support and the Success of Newly Founded Businesses"*, Small Business Economics* 10, 213-225.

Chandler, G., and S. Hanks (1994). "Founder Competence, the Environment and Venture Performance", *Entrepreneurship, Theory and Practice* 18(3), 77-89.

Cooper, A.C., F.J. Gimeno-Gascon, and C.Y. Woo (1994). "Initial Human and Financial Capital as Predictors of New Venture Performance", *Journal of Business Venturing* 9, 371-395.

De Wit, G., and F. Van Winden (1989). "An Empirical Analysis of Self-Employment in the Netherlands", *Small Business Economics* 1, 263-272.

Evans, D.S., and L.S. Leighton (1989). "Some Empirical Aspects of Entrepreneurship", *American Economic Review* 79, 519-535.

Evans, D.S., and B. Jovanovic (1989). "An Estimated Model of Entrepreneurial Choice under Liquidity Constraints", *Journal of Political Economy* 97, 808-827.

Gill, J. (1988). "Choice of Employment Status and the Wages of Employees and the Self-employed: Some Further Evidence", *Journal of Applied Econometrics* 3, 229-234.

Green, D.A., and W.C. Riddell (1997). "Qualifying for Unemployment Insurance: An Empirical Analysis', *Economic Journal* 107, 67-84.

Holtz-Eakin, D., D. Joulfaian, and H.S. Rosen (1994a). "Entrepreneurial Decisions and Liquidity Constraints", *Rand Journal of Economics* 25(2), 334-347.

Holtz-Eakin, D., D. Joulfaian, and H.S. Rosen (1994). "Sticking it out: Entrepreneurial Survival and Liquidity Constraints", *Journal of Political Economy* 102, 53-75.

Jovanovic, B. (1982). " Selection and the Evolution of Industry", *Econometrica* 50, 649-670.

Kaldor, N. (1934). "The Equilibrium of the Firm", *Economic Journal* 44, pp60-76.

Kidd, M.P. (1993). "Immigrant Wage Differentials and the Role of Self-employment in Australia", *Australian Economic Papers*, pp92-115.

Knight F.H. (1971). *Risk, Uncertainty and Profit*. Chicago, University of Chicago Press (first edition 1921).

Lancaster, T., 1992, *The econometric analysis of transition data*. Cambridge, Cambridge University Press.

Lindeboom, M., and J. Theeuwes (1991). "Job Duration in the Netherlands: The Co-existence of High Turnover and Permanent Job Attachment, *Oxford Bulletin of Economics and Statistics* 53, 243-264.
Luk, S.T.K. (1996). "Success in Hong Kong: Factors Self-reported by Successful Small Business Owners", *Journal of Small Business Management* 34(3), 68-74.
Marshall, A. (1930). *Principles of Economics.* London: Macmillan and co (first edition 1890).
Pennings, J.M., K. Lee and A. van Witteloostuijn (1998). "Human Capital, Social Capital and Firm Dissolution", *Academy of Management Journal* 41(4), 425-440.
Peteraf, M., and M. Shanley (1997). "Getting to Know You: A Theory of Strategic Group Identity", *Strategic Management Journal* 18, 165-186.
Rees, H., and A. Shah (1986). "An Empirical Analysis of Self-employment in the U.K.", *Journal of Applied Econometrics* 1, 95-108.
Reuber, A., and E. Fischer (1999). "Understanding the Consequences of Founders' Experience", *Journal of Small Business Management* 37(2), 30-45.
Ridder, G. (1987). *Life cycle patterns in labor market experience, a statistical analysis of labor market histories of adult men* PhD-thesis, University of Amsterdam.
Rotter , J.B. (1966). "Generalized expectancies for internal versus external control of reinforcement", In *Psychological Monographs: General and Applied,* whole 609 80(1).
Sapienza, H.J., and C.M. Grimm (1997). "Founder Characteristics, Start-Up Process, and Strategy/Structure Variables as Predictors of Shortline Railroad Performance", *Entrepreneurship: Theory & Practice* 22(1), 5-24.
Say, J-B. (1971). *A Treatise on Political Economy or the Production, Distribution and Consumption of Wealth.* New York, A.M. Kelley Publishers (first edition 1803).
Schiller, B.R. and P.E. Crewson (1997). "Entrepreneurial Origins: A Longitudinal Inquiry", *Economic Inquiry* 35, 523-532.
Schumpeter, J. (1934). *The Theory of Economic Development.* Cambridge, Mass.: Harvard University Press (first edition 1911).
Timmons, J.A. (1994). *New Venture Creation: Entrepreneurship for the 21st Century.* Chicago: Irwin.
Van Praag, C.M., and H. Van Ophem (1995). "Determinants of Willingness and Opportunity to Start as an Entrepreneur", *Kyklos International Review for Social Sciences* 48, 513-540.
Van Praag, C.M. (1996). *Determinants of Successful Entrepreneurship.* Amsterdam: Thesis Publishers.
Van Praag, C.M. (1999). "Some Classic Views on Entrepreneurship", *De Economist* 147(3), 311-335.
Van Praag, C.M., and J.S Cramer (2001). "An estimated equilibrium model of business formation and labor demand by entrepreneurs", *Economica* 269 pp45-62.
Wright, M., and P. Westhead (1998). "Habitual Entrepreneurs and Angel Investors", *Entrepreneurship: Theory & Practice* 22(4), pp5-21.

Appendix: description of industries and occupations

Appendix Table Industries and Occupations before and after the start as a small business owner		
Variable	*Before*	*After*
Industry		
Agriculture	5.7%	9.4%
Construction	25.9%	34.0%
Manufacturing	13.8%	6.7%
Transport/Communication	2.7%	5.1%
Trade	22.6%	12.5%
Business and Repair	8.8%	15.5%
Professional Services	7.7%	5.7%
Others	12.8%	11.1%
Occupation		
Professional/Technical	9.1%	11.1%
Managers	9.4%	14.8%
Craftsmen/Foremen	34.7%	40.7%
Operatives	12.5%	9.4%
Farmers	2.6%	2.5%
Sales	6.7%	4.7%
Service Workers	7.7%	4.7%
Other	17.3%	12.1%

Table 1

Predicted Sign of γ, the Hazard Rate, Given the Signs of β_{SE} and β_{IF}

		$\rightarrow$	β_{SE}	$\rightarrow$
Sign of		**+**	**0**	**-**
$\downarrow$	**+**	?	-	-
β_{IF}	**0**	+	0	-
$\downarrow$	**-**	+	+	?

Table 2
Summary of Existing Evidence on β_{IF}, β_{SE}, β_{OF} and γ

Variable	P(Inflow)		P(Stock)		P(Outflow)		E(*T*)
	US	other	US	Other	US	other	Europe
Age	0	+	+	+	-	0	
Age squared	0	-	-	-	+		
Education	0	-	+/0	+/0	?	+	+
Handicap (dummy)	0		?	-			
Veteran (dummy)	-		+				
(Wage) experience	0		+	0	?	?	+
Industry experience							+
Self-employment expr.	+						0
Unemployment (expr.)	+/0	+	+				
Job changes	0/+	0	+				
Children	-		+	0	0		
Married (dummy)	?	0	0	0	0	0	
Urban (dummy)	0		-				
Rotterscore (dummy)	0		+				
Assets	+			+	-		
Assets squared	0				+		
Home owner (dummy)	0/+				+		
Income	0/-				0		
Industry dummies:							
Agriculture	+	+		+	0	0	
Trade	+				0		-
Business/repair	0			+	0		
Personal services	+				0		
Transport/communic.	0	-			0	0	-
Occupation dummies:							
Professional		0	+			0	
Manager	0	0	+		+		
Sales		-	+				
Craft			+				
Farmer	0	0	+		0		
# of co-founders							+

The several entries in the table should be interpreted as follows:

+	A positive effect was found in all the empirical studies available.
-	A negative effect was found in all the empirical studies available.
0	An insignificant effect was found in all the empirical studies available.
+/0	Some studies report a positive, some a zero effect.
-/0	Some studies report a negative, some a zero effect.
?	Some studies report a positive, some a zero effect
	Not included in any study

Sources: Alba-Ramirez (1994), Bates (1990), Bates (1995), Blanchflower and Meyer (1994), Blanchflower and Oswald (1998), Blau (1985), Borjas and Bronars (1989), Brock and Evans (1986), Brüderl et al. (1992, 1998), Cooper et al. (1994), De Wit and Van Winden (1989), Evans and Leighton (1989), Evans and Jovanovic (1989), Gill (1983), Holtz-Eakin et al. (1994a,b), Kidd (1993), Rees and Shah (1986), Van Praag and Van Ophem (1995).

Table 3

Modern and Classical Success Determinants

NLS-variable	Empirical evidence	Say	Marshall	Schumpeter	Knight
Age	Younger founders	Knowledge of the world	Leadership	Leadership	
Self-employment experience	Relevant experience	Knowledge of business			
Within industry experience	Relevant experience	Knowledge of industry	Knowledge of trade		
Within occupation experience	Relevant experience	Knowledge of occupation			
Education	Education		Education		Intellectual capacity
Assets	Own capital		Own capital		(Ability to obtain) capital
Industry dummies					'Easy industries'
Business failure rate, Unemployment rate		General business conditions			
Family background			Background		
Start as unemployed				Motivation	
Rotterscore				Motivation	Disposition to act
	Self-esteem				Self-confidence

Table 4

Estimation Results Hazard Model of Self-Employment

	Single Risk		**Competing Risks**			
	θ		θ_o		θ_w	
$\hat{\alpha}$	2.37**	(10.67)	1.91**	(5.96)	2.35**	(8.11)
Human capital variables						
Age	-0.41**	(2.78)	-0.57**	(2.71)	-0.39**	(2.20)
(Age squared)/10	0.05	(1.43)	0.09*	(1.73)	0.05	(1.06)
Labor experience	0.11	(1.45)	-0.04	(0.37)	0.25**	(2.45)
Within industry experience	-0.30**	(3.14)	-0.25**	(1.96)	-0.29**	(2.33)
Within occupation experience	-0.64*	(1.92)	-0.37	(0.80)	-0.61	(1.59)
Experience in self-employment	-0.13	(0.99)	-0.07	(0.39)	-0.16	(0.84)
Financial variables						
Assets ($1,000) prior to start	-0.00	(0.17)	-0.00	(0.23)	-0.00	(0.15)
Home owner (dummy)	-0.62	(1.58)	-0.44	(0.86)	-0.58	(1.19)
Motivations at the start						
Started while unemployed	0.85**	(2.35)	1.15**	(2.42)	0.11	(0.25)
Started during employment	-0.55*	(1.86)	-0.01	(0.02)	-0.86*	(1.81)
Industry dummies						
Agriculture	-2.88**	(5.47)	-2.52**	(3.35)	-2.55**	(3.92)
Business and repair services	-1.09**	(3.17)	-0.51	(1.20)	-1.69**	(3.44)
Macroeconomic variables						
*Unemployment rate	-0.35	(1.23)	-0.27	(0.74)	-0.32	(0.90)
*Business failure rate	0.03**	(6.07)	0.03**	(5.25)	0.02**	(3.41)
Minus Loglikelihood	532		602			
Estimated median (months)	23.8		46.5		33.5	
Sample median (months)	24.3		57.0		42.5	

Absolute t-values in parentheses; ** indicates significant at (at least) 5%-level; * indicates significant at (at least) 10%-level; '*' before a variable name indicates a time-varying covariate.

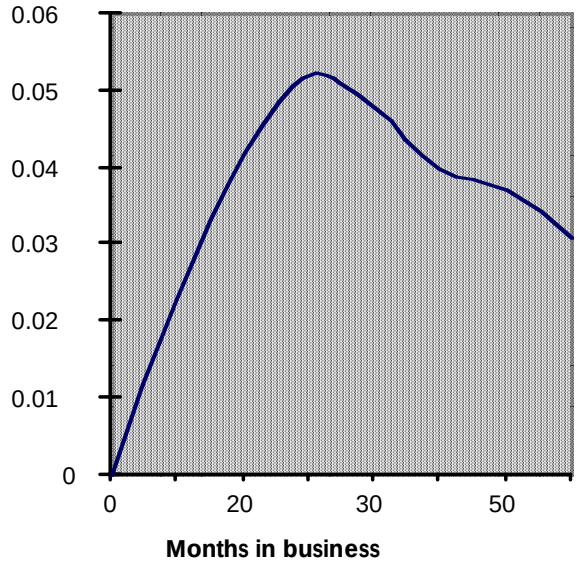
Table 5

Predicted Business Durations (in Months)

Values of exogenous variables	Both exit risks present	Compulsory exits	Voluntary exits
1 Sample means	23.8	46.5	33.5
2 Mean sample individual; modal dummy values	18.3	41.4	23.2
3 As 2 but age + 5	23.0	46.2	29.6
4 As 2 but 3 years more within industry expr.	26.6	61.1	33.4
5 As 2 but a 20% higher business failure rate	14.6	30.8	19.4
6 As 2 but in agricultural sector	61.6	155.4	68.7
7 As 2 but started while unemployed	12.7	22.7	22.1
8 As 2 but 5 years more general labor expr.	14.4	45.8	13.6

The results in the second column, *compulsory exits*, are obtained by treating voluntary exits as right censored observations. The results in the third column, *voluntary exits*, are obtained likewise: by treating compulsory exits as right censored observations.

Figure 1: Parametric estimate of the aggregate hazard rate



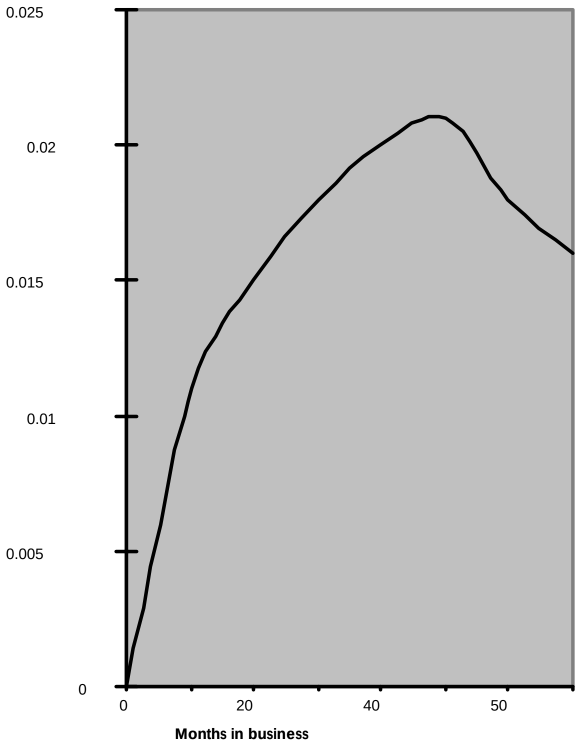

0.025
0.02
0.015
0.01
0.005
0
0
20
40
50
Months in business

Figure 3: Parametric estimate of the "voluntary" hazard rate