cef.up
Centro de Economia e Finanças da UPorto

cef.up working paper
2013-12

SERIAL ENTREPRENEURSHIP, LEARNING BY DOING AND SELF-SELECTION

Vera Rocha
Anabela Carneiro
Celeste Amorim Varum

Centro de Economia e Finanças da UP
www.fep.up.pt

Serial entrepreneurship, learning by doing and self-selection*

Vera Rocha
Universidade do Porto, CEF.UP† and CIPES

Anabela Carneiro‡
Universidade do Porto and CEF.UP

Celeste Amorim Varum
Universidade de Aveiro, DEGEI and GOVCOPP

July 11, 2013

Abstract

It remains a question whether serial entrepreneurs typically perform better than their novice counterparts owing to learning by doing effects or mostly because they are a selected sample of higher-than-average ability entrepreneurs. This paper tries to unravel these two effects by exploring a novel empirical strategy based on continuous time duration models with selection. We use a large longitudinal matched employer-employee dataset that allows us to track almost 220,000 individuals who have left their first entrepreneurial experience. Over 35,000 serial entrepreneurs are identified and followed in their second business, in order to evaluate how entrepreneurial experience acquired in the previous business improves persistence by reducing their exit rates. Our results show that serial entrepreneurs are not a random selection of ex-business-owners. The positive association found between prior experience and serial entrepreneurs' survival is mainly due to selection on ability, rather than the result of learning by doing.

Keywords: Serial Entrepreneurship, Entrepreneurial Experience, Learning, Selection

JEL Codes: D83, J24, L26

*We acknowledge GEP-MSSS (Gabinete de Estratégia e Planeamento – Ministério da Solidariedade e Segurança Social) for allowing the use of Quadros de Pessoal dataset. The first author also acknowledges Fundação para a Ciência e Tecnologia (FCT) for financial support through the doctoral grant SFRH/BD/71556/2010.

†CEF.UP – Centre for Economics and Finance at the University of Porto is funded by Programa Compete – POFC (Fundação para a Ciência e Tecnologia and European Regional Development Fund); project reference: PEst-C/EGE/UI4105/2011.

‡Corresponding author: Anabela Carneiro, Faculdade de Economia, Universidade do Porto, Rua Dr. Roberto Frias, 4200-464 Porto, Portugal. E-mail: anacar@fep.up.pt

1 Introduction

Most of the seminal theories of industry evolution that incorporate entrepreneurship as a means of market entry assume that exit is a final event: once it has occurred, reentry (into the same or a different industry) is not an option (e.g., Jovanovic, 1982; Hopenhayn, 1992; Jovanovic and MacDonald, 1994). Nevertheless, not only there is a growing awareness that entrepreneurship is not solely confined to the creation of a new business as a single-action event (Ucbasaran et al., 2006; Plehn-Dujowich, 2010; Sarasvathy et al., 2013), as also empirical evidence confirms that a significant part of entrepreneurial activity around the world is conducted by serial (or renascent) entrepreneurs.[1,2]

As a result, serial entrepreneurs have been gaining an increasing attention of scholars and, especially, policymakers, who have enlarged entrepreneurial incentives so as to target both experienced and novice entrepreneurs (see Westhead et al., 2003, 2005a, 2005b). Moved by the widespread beliefs that serial entrepreneurs will perform better owing to the learning effects from past entrepreneurial experiences (Cope and Watts, 2000; Minniti and Bygrave, 2001; Cope, 2005, 2011), many European countries in particular have launched new programs to promote a fresh restart of entrepreneurs who performed poorly in the past and who would, otherwise, feel prevented to try again due to the so-called "stigma of failure" (European Commission, 2002, 2011).

However, and despite the early recognized value of studying serial entrepreneurship (e.g., MacMillan, 1986), empirical research on this topic is still at the beginning stage due to the lack of suitable data (Zhang, 2011; Parker, 2012; Sarasvathy et al., 2013), as most data collection efforts cover only one of a series of businesses, or track firms rather than entrepreneurs. Consequently, most of the existing research on serial entrepreneurship is by and large descriptive, based on case studies (e.g., Ucbasaran et al., 2003) or using small samples of individuals to establish comparisons between serial and nascent entrepreneurs (e.g., Westhead et al., 2005a, 2005b; Li et al., 2009; Ucbasaran et al., 2010; Robson et al., 2012; Kirschenhofer and Lechner, 2012).

While a more recent stream of work has been particularly more concerned with the determinants of reentering into entrepreneurship (see Hyytinen and Ilmakunnas, 2007; Stam et al., 2008; Amaral et al., 2011; Hessels et al., 2011), substantial knowledge about how – or whether – entrepreneurs effectively learn with past experience is still lacking. On the one

[1] Serial entrepreneurs have been broadly defined as individuals who have sold or closed a business in which they had a minority or majority ownership stake in the past, and who currently own (alone or with others) a different independent business that is either new, purchased or inherited (Westhead et al., 2005a).

[2] The increasing relative importance of serial entrepreneurs around the world has been documented by several studies: see, for instance, Westhead and Wright (1998) and Westhead et al. (2005a) for UK, Wagner (2003) for Germany, Hyytinen and Ilmakunnas (2007) for Finland and Headd (2003) for USA.

hand, latest empirical results have offered little confidence on significant learning by doing effects (e.g., Gompers et al., 2010; Nielsen and Sarasvathy, 2011; Parker, 2012; Frankish et al., 2012). On the other hand, an emerging concern about self-selection among serial entrepreneurs is blurring the broad expectations about true entrepreneurial learning (Chen, 2013). Accordingly, it remains a question whether serial entrepreneurs typically perform better than their novice counterparts because they have learned about running a business and have improved their entrepreneurial skills with their past experience or, instead, mostly because they are a selected sample of high-ability entrepreneurs.

Accordingly, this study contributes to the current debate and tries to unravel these two effects by exploring a novel empirical strategy. Using the methodology developed by Boehmke et al. (2006), we estimate continuous time duration models that account for selection bias to study how previous entrepreneurial experience influences the survival of serial entrepreneurs in their second business. The analysis is based on a large longitudinal matched employer-employee dataset for Portugal, where serial entrepreneurs constitute an important component of the entrepreneurial activity in the country, by accounting for more than 20% of all new businesses created over the most recent years. About 220,000 ex-business-owners are identified, out of which 35,202 have tried again, by becoming serial entrepreneurs. Our results confirm that serial entrepreneurs are not a random sample, which significantly moderates any learning by doing effects that might be transferred between subsequent entrepreneurial experiences. To the best of our knowledge, this is the first comprehensive study employing duration models with sample selection and using such a unique and rich dataset that attempts to evaluate entrepreneurial learning and self-selection issues among serial entrepreneurs.

The remaining sections of the paper are organized as follows. Section 2 briefly presents prior literature on serial entrepreneurship and entrepreneurial learning and exposes the research design of the paper. Section 3 describes the data and the methodological procedures. The empirical results are presented and discussed in section 4. Section 5 concludes.

2 Previous Literature and Research Design

The belief that entrepreneurs learn from experience is not recent (see Von Hayek, 1937), and this idea has been expressed in several highly influential models on dynamic industrial organization over the last thirty years (e.g., Jovanovic, 1982; Frank, 1988; Hopenhayn, 1992; Ericsson and Pakes, 1995). As Minniti and Bygrave (2001: 7) explicitly state, "entrepreneurship is a process of learning, and a theory of entrepreneurship requires a theory of learning". Consequently, several theoretical and conceptual attempts were developed dur-

ing the last decade, trying to identify the mechanisms through which entrepreneurs learn (e.g., Cope, 2005; Parker, 2006; Petkova, 2009; Plehn-Dujowich, 2010; Ucbasaran et al., 2012). In contrast, learning and its implications were largely ignored for long time (Fraser and Greene, 2006; Parker, 2007), mainly in empirical work due to data limitations (Zhang, 2011; Sarasvathy et al., 2013).

Early studies, largely relying on small samples of entrepreneurs, self-reported data and simple statistics, tried to show that experienced entrepreneurs have all the conditions to perform better than their novice counterparts, by being more able to access financial resources, more alert to business opportunities and better endowed with a larger set of skills – particularly with those acquired through entrepreneurial experience – which make them offer more attractive growth prospects than first time entrepreneurs (Wright et al., 1997; Westhead and Wright, 1998; Westhead et al., 2003, 2005a, 2005b). Additional comparisons between experienced and nascent entrepreneurs performed by more recent studies have also shown that the former are better at developing networks (Li et al., 2009), more likely to quickly gain access to venture capital (Zhang, 2011), more prone to take risks and pursue innovative activities (Robson et al., 2012), and also more capable of building more effective and diversified teams (Kirschenhofer and Lechner, 2012).

While these studies have significantly contributed to our knowledge about how different are serial and novice entrepreneurs, they have offered no systematic empirical test of learning effects resulting from entrepreneurs' experience. Some of the most recent studies have been trying to address the issue of entrepreneurial learning, either by comparing the outcomes of entrepreneurs with and without experience (Frankish et al., 2012), or by evaluating how serial entrepreneurs' performance in one venture is related to their performance in a subsequent venture (Gompers et al., 2010; Nielsen and Sarasvathy, 2011; Parker, 2012; Chen, 2013). Nevertheless, none of their results has undoubtedly supported that serial entrepreneurs perform better owing to their accumulated experience.

Both Frankish et al. (2012) and Nielsen and Sarasvathy (2011) have analyzed the 3-year survival rate of new businesses for UK and Denmark, respectively. While the former found no significant survival differences between those who have previously owned a business and those without such experience, the latter concluded that some form of absorptive capacity (in terms of education and prior industry background) is necessary for entrepreneurs to benefit from any learning opportunities.

For US, Gompers et al. (2010) showed that entrepreneurs with a track record of success are much more likely to succeed – by being more able to obtain venture capital funding at an earlier stage of their company's development – than nascent entrepreneurs and those who have previously failed. However, they also suggest that such result was, in part, driven by some type of skills of serial entrepreneurs – in particular, their "market timing ability" (p.

19) – which allow them to start a company at the right time in the right industry. Parker's (2012) results, in turn, showed that despite good performance (in terms of firm profits) in one venture appears to be associated with good performance in subsequent ventures, the effects are temporary and depreciate over time.

Finally, also for US, Chen (2013) took a step forward in this issue and tried to disentangle learning by doing from selection effects by combining fixed-effects panel data models and IV estimation for a sample of about 3,200 serial entrepreneurs. She found that self-selection on ability – rather than learning by doing – is the key determinant of the early performance of new businesses (measured by their first-year income), except when such businesses are established in an industry closely related to the individual's past entrepreneurial experience.

Accordingly, not only learning by doing became a questionable hypothesis, as also only more contemporary studies have tried to empirically address the possible coexistence of learning by doing and learning about own ability (e.g., Chen, 2013). Even so, selection on ability as a source of serial entrepreneurship had been early proposed in theory (e.g., Holmes and Schmitz, 1990). Actually, theoretical grounds suggest that unobserved talent shapes entrepreneurial entry (Inci, 2013) and that, moreover, individuals learn and update beliefs about their entrepreneurial ability as they accumulate experience in entrepreneurship (Jovanovic, 1982; Parker, 2006). This is expected to generate a dynamic process where high-skill entrepreneurs tend to shut down businesses of low quality to become serial entrepreneurs, launching and subsequently closing firms until a high quality business is found, while low-skill entrepreneurs are expected to shut down their businesses of low quality to enter the labor market (Plehn-Dujowich, 2010).

In view of that, this paper contributes to this emerging literature by evaluating to what extent serial entrepreneurs learn with past experience, after controlling for potential biases driven by self-selection into serial entrepreneurship. We characterize entrepreneurial experience using three variables: i) the cumulative years the individual has survived as BOs in the first entrepreneurial experience; ii) previous experience in creating a start-up venture; and iii) industry-specific experience. Learning by doing effects are evaluated by studying whether these three particular measures improve the persistence of serial entrepreneurs in their second business, by reducing their exit rates.

According to the literature, we would anticipate positive (negative) and significant effects from each of these variables on serial entrepreneurs' survival (hazards). First, by running a business, entrepreneurs acquire unique specific resources, knowledge, skills and capabilities that can be used to start and/or acquire subsequent businesses. Hence, the longer an individual has been in a business in the past – successful or not – the more s/he is likely to have learned about being an entrepreneur, and the larger the stock of knowledge that may be accumulated about customers and suppliers, networks of contacts, as well as market-

specific information (Cope and Watts, 2000; Ucbasaran et al., 2006; Frankish et al., 2012; Parker, 2012), which may constitute important resources when they decide to try again as entrepreneurs.

Second, the particular experience of founding a firm – given that not all individuals become entrepreneurs by creating a start-up venture (see, Parker and Van Praag, 2011; Bastié et al., 2013; Rocha et al., 2013) – may also deliver greater opportunities to learn about the overall entrepreneurial process. Starting a firm from scratch requires a wide range of skills, and prior firm-founding experience is believed to help an entrepreneur to acquire and enhance such skills (Zhang, 2011). In addition, learning experiences are expected to be mostly relevant during business' infancy, i.e., during the first few years of the firm (Van Gelderen et al., 2005).

Finally, learning by doing may also arise from industry-specific experience (Frankish et al., 2012; Chen, 2013). Individuals becoming serial entrepreneurs by establishing a business in the same industry where they operated in the past may benefit from informational advantages and suffer from lower uncertainty, which may also contribute to their resilience in their second entrepreneurial attempt.

3 Data and Methodological Issues

3.1 Data

This study uses data from Quadros de Pessoal (QP), a longitudinal matched employer-employee administrative dataset from the Portuguese Ministry of Employment. QP is an annual mandatory employment survey that all firms in the private sector employing at least one wage earner are legally obliged to fill in.[3] Requested data cover firms/establishments (e.g., location, employment, industry, sales, ownership, among others) and each of its workers (for instance, gender, age, education, occupational category and skill levels), thus providing very rich information on individual's backgrounds, career paths and transitions between firms and industries. Firms/establishments and individuals (both workers and business-owners) are identified by a unique identification number, so that they can be tracked and matched over time. All these characteristics of the dataset make QP a suitable database for a study on serial entrepreneurship.

Raw QP files are available for the period 1986-2009, though there is a gap for the particular years of 1990 and 2001, for which there is no available information at the individual-level.

[3] For this reason, self-employed individuals without employees are not covered by QP.

For this reason, we restrict our study to serial entrepreneurs reentering into entrepreneurship between 1993 and 2007.[4] Data for the period 1986-1992 was only used to characterize individuals' previous experiences as entrepreneurs.

The entrepreneur definition used in this study corresponds to Business-Owners (BOs) of firms with at least one wage earner (i.e., employers). We identify serial entrepreneurs in particular as those ex-BOs who become BOs again, in a different firm, after leaving their first entrepreneurial experience.

3.2 Identifying the entry and exit of serial entrepreneurs

We started by identifying in QP files all BOs who left their first business ownership experience.[5] From these, portfolio BOs (i.e., those BOs who simultaneously owned two or more firms) were excluded from the current analysis.[6] A total of 219,462 ex-BOs, aged between 16 and 50 years old, were identified and tracked over time, in order to find out who has reentered and became BO in a second firm, and who did not.[7] About 16% of them (precisely 35,202 ex-BOs) have tried a second chance by transiting into serial entrepreneurship during the period 1993-2007.

For each of those 219,462 ex-BOs, we have retained a set of information related to the previous business-ownership experience, namely regarding the time (in years) the individual has survived as BO in the business, the entry mode in the first business (start-up versus acquisition) and the respective industry. Additional information regarding the size of the firm at the moment of exit, the location of the firm, the ownership structure of the previous business and the exit mode[8] adopted by the BO was also gathered, as those variables may

[4] To avoid measurement errors on the time spent until reentry into entrepreneurship – one of the variables to be included in our estimations – we have also excluded those reentries occurring in 2002, as we are not able to ensure whether the reentry occurs in 2001 (for which no data are available at the worker-level) or in 2002. Besides, we exclude reentries occurring after 2007 because, given the criteria adopted to identify business-owner's exit (section 3.2), we need at least two years of available information after his/her reentry to clearly identify individual's exit.

[5] A BO was considered to have left the previous business if s/he has definitely exited the BO status in the previous firm. To consider that a definite exit has taken place, we have imposed an absence of the BO from the firm larger or equal to two consecutive years. Accordingly, the identification of ex-BOs' exits had to stop in 2007, as data for 2008 and 2009 were only used to check the presence/absence of each BO in the respective business. Even so, as this study covers reentries occurring between 1993 and 2007, we must restrict the analysis to ex-BOs who have left their prior business until 2006.

[6] Ex-BOs identified as portfolio BOs in the past were excluded from our analysis because we are interested in particular characteristics of the first business ownership experience – which must be unique – when taking into account the potential non-randomness of the sample of serial entrepreneurs. Even so, portfolio BOs corresponded to less than 1% of all ex-BOs identified, so their exclusion from the analysis has no significant impact on the results.

[7] By imposing the upper limit of 50 years old by the time of the exit from the first business we are minimizing the reentries of serial entrepreneurs after attaining the retirement age. Even so, when performing the analysis with all individuals from all age cohorts, the results were not found to be significantly different.

[8] Regarding the exit mode followed by the BO in the first entrepreneurial experience, QP dataset allows

play a role when explaining the decision of reentering into entrepreneurship (i.e., the selection process of serial entrepreneurs).

We have then followed each of those 35,202 serial entrepreneurs over time, since the moment of their reentry until their last record in QP files, which may either correspond to the moment of their exit from the second business, or to the last year of available information in the dataset – right-censored cases (Lancaster, 1990; Jenkins, 2005). Following the same procedures adopted to identify the exit of the BOs from the first business, we have required an absence of each BO from the firm, or from the BO position, larger or equal to two consecutive years in order to identify serial BOs' exit year.

3.3 Empirical Strategy

As the primary variable of interest is the time spent by serial BOs in their second business, hazard models were considered. The final dataset was thus constructed in a continuous survival time format so as to employ continuous time duration models that correct for selection bias. A spell starts when an ex-BO becomes a serial entrepreneur, by entering a new entrepreneurial experience. The duration of that spell corresponds to the time elapsed until the exit of the entrepreneur. Single-spell duration data were thus obtained by flow sampling, so left censoring is not an issue in our analysis.

We started by testing the suitability of semi-parametric and several parametric survival models (see, for instance, Lee and Wang, 2003; Jenkins, 2005; Cleves et al., 2010) accounting as well for individual-level unobserved heterogeneity, which may produce biased results when ignored (Hougaard, 1995; Jenkins, 2005). All the estimated models were evaluated and compared in terms of their Log-Likelihood, Akaike Information Criteria (AIC) and Cox-Snell residuals. According to these preliminary tests, Weibull proportional hazard model was found to provide a very satisfactory fit to the data.[9]

us to distinguish those who have left by closing down the firm from those who have exited by transferring the business to others. However, despite some studies associate an exit by dissolution to failure and an exit by ownership transfer to a more successful entrepreneurial experience (e.g., Stam et al., 2008; Amaral et al., 2011; Nielsen and Sarasvathy, 2011), we cannot ensure that this was actually the case, as QP does not provide financial data at the firm-level. Actually, as Amaral et al. (2011: 7) also recognize, business failure may be understood as the failure to attain or exceed a performance threshold required by the entrepreneur to keep the business running (Gimeno et al., 1997; McCann and Folta, 2012), which does not necessarily indicate that the business is economically unviable. Consequently, some businesses may be transferred to other entrepreneurs with a lower performance threshold. Accordingly, we do not associate more (un)successful experiences to any of these cases in particular and we use the information on BO's exit mode from the first business just as a control variable when studying individuals' reentry decisions.

[9] Conventional wisdom (e.g., Cleves et al., 2010) suggests that the best-fitting model is the one with the largest Log-Likelihood and the smallest AIC value. In our data, the model fulfilling these two requirements would be an Accelerated Failure Time (AFT) model with a log-logistic distribution for the hazard rate. However, as we are mainly interested in incorporating selection bias in the estimation of duration models,

Accordingly, for each serial BO i, the probability of exit at time t_j, $j = 1, 2, \ldots$, given survival until then, can be defined as

$$h(t_{ij}|\alpha_i, X_i) = \alpha_i p \lambda t^{p-1}, \tag{1}$$

where $\lambda = \exp(X_i^{'}\beta)$ is the Weibull baseline distribution (according to which the hazard rates either increase or decrease over time, whenever the estimated value for p is higher or lower than 1, respectively); α_i corresponds to the time invariant individual-level unobserved heterogeneity term; X_i is a vector of time-invariant variables and β is a vector of unknown parameters to be estimated. Vector X_i includes – besides the three variables used to measure entrepreneurial experience (cumulative years as BO, start-up experience and industry-specific experience) – the time elapsed since the exit from the first business, an indicator variable for reentries into entrepreneurship occurring in times of crises, and a set of characteristics of serial entrepreneurs and their firms. Henceforth, we denote this first estimated model by "Naïve Weibull model", as in Boehmke et al. (2006).

In a second part of our analysis, we take into account that the sample of serial entrepreneurs under observation may be a nonrandom selection of all ex-BOs, which means that there may be factors affecting the survival of serial BOs in their second business that also affected their decision of reentering and starting a second entrepreneurial experience. Accordingly, we use the estimator developed by Boehmke et al. (2006) to estimate a Weibull duration model with selection. Following the approach of existing models for nonrandom sample selection, the idea of this method is to model simultaneously both processes - the selection of individuals into serial entrepreneurship and their survival while serial entrepreneurs.

In this case, not only the probability of exit at each time t_j (given survival until then) is estimated, as also the ex-BO's decision to reenter and become a serial entrepreneur. A selection equation is hence specified and jointly estimated with the duration model, with several independent variables that are expected to influence the decision of reentering into entrepreneurship. The vector of variables included in the selection equation covers a number of ex-BO's characteristics (gender, age and education by the time of exit from the first business), the status of each individual in the labor market before transiting, as well as a set of characteristics related to the previous business owned by each individual (e.g., the location, the industry and the ownership structure of the previous business).

using the estimator proposed by Boehmke et al. (2006), it would not be possible to proceed with a log-logistic AFT model given that the Stata program written by the authors to estimate duration models with selection does not accommodate, so far, this alternative distribution for the duration dependence. For a matter of consistency and comparability of the results obtained with and without selection, we decided to proceed with the Weibull duration model, which also fits the data very satisfactorily. However, the estimations of Weibull and log-logistic AFT duration models (without selection) did not produce significantly different results and conclusions.

4 Empirical Results

4.1 Preliminary Statistics and Unconditional Survival Analysis

We start by performing an unconditional analysis of the survival rates of serial entrepreneurs, without controlling for any observed or unobserved characteristics of individuals and their firms. Figure 1 compares the estimated survivor function of serial entrepreneurs in their first and second businesses, using Kaplan-Meier (KM) estimator (Kalbfleish and Prentice, 1980). In both cases, the unconditional probability of an individual surviving as BO beyond time t was thus computed as follows:

$$\widehat{S}(t_j) = \prod_{j=t_0}^{t} (1 - \frac{d_j}{n_j}), \tag{2}$$

where d_j corresponds to the number of exits in each time interval and n_j is the total number of BOs at risk of exit. Similarly, Table 1 provides comparative estimates of serial BOs' survival rates in the first and second businesses according to the similarity of the industry of both entrepreneurial experiences.

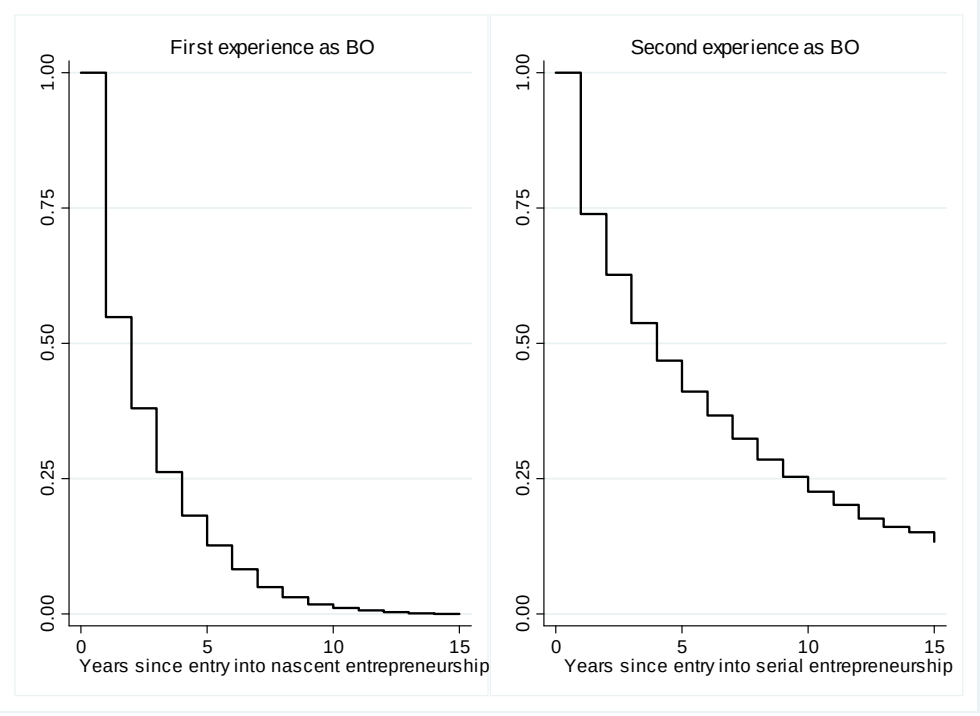

Fig.1. Comparative KM survivor functions in the first and second entrepreneurial experiences (All serial entrepreneurs, Portugal, 1993-2007)

By comparing the survival rates of serial entrepreneurs in their first and second businesses, the results clearly suggest that they performed better in their second attempt, by persisting for longer periods as BOs in the firm. In the first business-ownership experience (i.e., while novice entrepreneurs), over 45% of BOs exited after one year in the business and only 13% of BOs persisted after five years since their entry. Comparing the performance of the same individuals in their second business-ownership experience (i.e., while serial entrepreneurs), the comparable statistics show that 26% of BOs only survived for one year in the business, and 41% of BOs remained in the business five years later. The median survival time was just two years in their first experience, and four years in the second try.

Table 1 also shows that serial entrepreneurs who reentered the same industry where they operated in the past performed even better than the average, by showing higher survival rates, which seems to suggest that industry-specific experience has also played a role on serial BOs' endurance. Overall, 13% of serial BOs remained in their second business for 15 years or more. For those who stayed in the same industry, the comparable survival rate was 14.3%, being somewhat lower for those who tried their luck in a different sector (11.3%).

Table 1. Comparative survival rates in the first and second business (Portugal, 1993-2007)

Years since entry	Serial BOs reentering the same industry (N=20,997)		Serial BOs reentering a different industry (N=14,205)	
	First Business	Second Business	First Business	Second Business
1	0.5672	0.7576	0.5199	0.7097
2	0.3959	0.6503	0.3547	0.5905
3	0.2742	0.5634	0.2434	0.4986
4	0.1904	0.4930	0.1681	0.4303
5	0.1322	0.4332	0.1180	0.3758
6	0.0856	0.3882	0.0789	0.3325
7	0.0500	0.3437	0.0476	0.2939
8	0.0309	0.3019	0.0312	0.2584
9	0.0169	0.2687	0.0171	0.2282
10	0.0117	0.2394	0.0106	0.2053
11	0.0066	0.2143	0.0056	0.1829
12	0.0031	0.1873	0.0025	0.1592
13	0.0009	0.1700	0.0011	0.1466
14	0.0002	0.1592	0.0003	0.1368
15	0.0000	0.1430	0.0000	0.1127

Notes: Given some changes in the classification of economic activities (in 1995 and 2007), we have standardized this classification for every year according to the International Standard Industrial Classification of economic activities (Rev.2). A list of the 2-digit industries can be found in Table A.I, in the Appendix.

In sum, this unconditional analysis points out that serial entrepreneurs performed relatively better in their second round, especially if they tried their luck again in the same industry. Whether this result has arisen because some learning by doing has actually taken place from one experience to another still remains unanswered. Before moving further to our empirical analysis, we present in Table 2 some comparative statistics between serial entrepreneurs who have survived and those who exited their second business. The variables listed in Table 2 correspond to the vector of variables X_i to be included in the estimation of Weibull duration models previously described in section 3.3.

Table 2. Descriptive statistics for serial entrepreneurs (Portugal, 1993-2007)[a]

	All serial BOs (N=35,202)	Survive (N=13,540)	Exit (N=21,662)
Specificities of the first entrepreneurial experience			
Cumulative years as BO	2.698	3.079	2.460
Start-up Experience (%)	0.493	0.495	0.491
Same Sector Experience (%)	0.596	0.613	0.586
Years elapsed between 1^{st} and 2^{nd} exper.	3.377	3.709	3.169
Individual-level characteristics			
Male (%)	0.748	0.758	0.741
Age (years)	39.30	39.74	39.03
Less than 9 years of schooling (%)[b]	0.491	0.491	0.492
9 years of schooling (%)	0.159	0.140	0.170
12 years of schooling (%)	0.209	0.213	0.206
College education (%)	0.141	0.156	0.132
Firm-level characteristics			
Firm size at reentry (No. employees in logs)	1.480	1.432	1.509
Urban location (%)	0.413	0.399	0.421
Shared ownership (%)	0.439	0.439	0.438
Primary sector (%)	0.020	0.022	0.018
Manufacturing (%)[b]	0.162	0.154	0.168
Energy & Construction (%)	0.169	0.172	0.167
Services (%)	0.649	0.652	0.647
Reenter in a year of crisis (%)	0.098	0.093	0.101

Notes: [a] Excluding serial BOs entering in 2001-2002. [b] Variables used as reference categories in estimations. The statistics reported are the mean values. "Start-up Experience"=1 if s/he has established a start-up firm before; 0 if s/he has acquired an existing firm. "Urban location"=1 if the firm is located in Lisbon or Porto; 0 otherwise. "Reenter in a year of crisis"=1 if s/he reentered into entrepreneurship in 1993 or 2003; 0 otherwise.

The data reveal that those who survived in the second business had also persisted for relatively longer periods in the first entrepreneurial experience. Survivors were also, on average, quite more educated than those who have left the second firm. Besides, the former were less frequently located in urban centers and restarted, on average, at a relatively smaller scale.

4.2 Naïve Weibull Estimation Results

Table 3 presents the results from the estimation of "naïve" Weibull proportional hazard model – i.e., without taking into account, for now, potential problems of selection bias in the sample of serial entrepreneurs. Empirical results obtained from the estimation of Model 1 suggest that the experience acquired in the first business significantly reduces the hazard rate in the second business. In particular, one more year spent as BO in the first business seems to reduce the exit risk in the second business by 1.47% $(1 - exp(-0.0148) = 0.0147)$, while those who try again in the same industry are estimated to be about 22% less likely to exit, comparatively to those who moved to a different industry.

However, the longer the time elapsed since the first entrepreneurial experience, the higher the exit risk in the second experience, suggesting that potential learning by doing effects tend to vanish over time (see also Parker, 2012). Accordingly, in Model 2 we allow the effect of cumulative experience as BO and industry-specific experience to vary over the time elapsed since the exit from the first business. The results confirm that both variables reduce the hazard of serial entrepreneurs, though temporarily. The negative effect exerted by the cumulative experience as BO on exit rates is found to disappear after four to five years after leaving the first business, while the survival advantages gained through industry-specific knowledge extinguish after nine years.

Regarding the experience as a start-up founder, results show that those who have established a venture from scratch in the past are actually less likely to survive while serial BOs than those who had not such experience (i.e., those who became BOs for the first time by acquiring an existing firm). Despite starting a firm requires – and helps an entrepreneur to acquire and enhance – a wide range of skills (e.g., Van Gelderen et al., 2005; Zhang, 2011), it is also during business' infancy that the greatest challenges are posed to the business-owner – the so-called *liability of smallness* and *newness*, just to name a few (e.g., Brüderl et al., 1992). As a result, not only may it be more difficult to learn under more unsteady experiences, as also few business are identical – possibly favoring the accumulation of specific rather than general entrepreneurial learning (Chen, 2013) –, so that learning possibilities are modest and difficult to be transferred across different experiences (Frankish et al., 2012), which may explain the results found for start-up experience.

Table 3. Estimation results from the Weibull proportional hazard model

(Portugal 1993-2007)

	Model 1	Model 2
Specificities of the first entrepreneurial experience		
Cumulative years as BO	-0.0148***	-0.0350***
	(0.0055)	(0.0072)
Start-up Experience	0.0803***	0.0792***
	(0.0222)	(0.0222)
Same Sector Experience	-0.2457***	-0.3912***
	(0.0230)	(0.0325)
Years elapsed between 1^{st} and 2^{nd} experiences	0.0408***	
	(0.0046)	
Cumulative years as BO*Years elapsed		0.0079***
		(0.0023)
Same Sector Experience*Years elapsed		0.0431***
		(0.0075)
Individual-level characteristics		
Male	-0.1450***	-0.1466***
	(0.0255)	(0.0255)
Age	-0.1023***	-0.1012***
	(0.0125)	(0.0125)
Age squared/100	0.1331***	0.1320***
	(0.0158)	(0.0158)
9 years of schooling[a]	-0.0192	-0.0191
	(0.0313)	(0.0313)
12 years of schooling[a]	0.1458***	0.1448***
	(0.0299)	(0.0299)
College education[a]	0.1126***	0.1137***
	(0.0350)	(0.0349)
Firm-level characteristics		
Firm size at reentry	-0.0180	-0.0186
	(0.0134)	(0.0134)
Urban location	0.1030***	0.1022***
	(0.0225)	(0.0225)
Shared ownership	-0.1323***	-0.1339***
	(0.0232)	(0.0232)

It continues in the next page...

Table 3. Estimation results from the Weibull proportional hazard model (cont.)
(Portugal 1993-2007)

	Model 1	Model 2
Firm-level characteristics (cont.)		
Primary Sector[b]	-0.1681**	-0.1675**
	(0.0845)	(0.0845)
Energy & Construction[b]	0.0782**	0.0824**
	(0.0385)	(0.0385)
Services[b]	0.0145	0.0181
	(0.0317)	(0.0317)
Reenter in a year of crisis	0.0339	0.0382
	(0.0366)	(0.0366)
Constant	0.1298	0.2433
	(0.2465)	(0.2462)
Number of observations	35202	35202
p (duration dependence)	1.8281***	1.8262***
Log Likelihood	-42267.06	-42259.52
Theta	5.4656***	5.4363***

Notes: Serial entrepreneurs entering in 2001 or 2002 are excluded. All the specifications include an individual-level inverse Gaussian distributed unobserved heterogeneity term. Theta corresponds to the variance of this term. Reference categories: [a] Less than 9 years of schooling; [b] Manufacturing. *, ** and *** denote significant at 10%, 5% and 1% levels, respectively. Values in parentheses correspond to Huber-White standard errors.

Regarding the several individual-level characteristics taken into account in our estimations, results confirm that men survive longer as serial BOs than women, and that serial BOs' age exerts an U-shaped effect on hazard rates.[10] Higher levels of education are found to be associated with greater exit rates, which may be related to the higher opportunity costs that highly educated individuals have by remaining in the business, given that they may also be more likely to find more satisfactory alternatives (in the form of less risk-taking and better remunerated options) in the labor market (Gimeno et al., 1997; Georgellis et al., 2007).

Those reentering into entrepreneurship at a smaller (larger) scale tend to face somewhat higher (lower) hazard rates – in line with the *liability of smallness* argument - though the

[10] Our estimations suggest that exit rates are decreasing in BOs' age until they reach about 38 years old, starting to increase thereafter.

effects are not statistically significant. Being located in an urban center also increases exit rates, probably due to the greater competition characterizing large urban regions (Stearns et al., 1995). As expected, sharing the ownership of the second business with other BO(s), by reducing the risk and potentially increasing the sources of capital and knowledge, is found to reduce entrepreneurs' exit rates. Those who reentered into entrepreneurship in times of crisis seem to have somewhat higher hazards, but the differences are not statistically significant.

Finally, our results show that serial entrepreneurs' exits present positive duration dependence (the estimated value for p is higher than 1), which means that the exit of the entrepreneur becomes more likely as time goes by. However, this result is mainly capturing the relatively higher and increasing hazard rates suffered during the initial years in business, when the *liabilities of newness* and *smallness* play a particularly significant, and thus dominant, role. If, instead, the baseline hazard rate was parameterized according to a non-linear distribution, serial BOs' exit rates would rather show an inverted U-shaped dependence.[11]

4.3 Self-selection and serial entrepreneurs' persistence

We now take into account that serial entrepreneurs may be a nonrandom sample of ex-BOs. As there may be unobserved factors influencing the decision of reentering into entrepreneurship, ignoring possible self-selection of serial entrepreneurs may actually bias the results and overestimate learning by doing effects (Chen, 2013).

A brief characterization of ex-BOs according to their reentry decision is provided in Table A.II in the Appendix. The data show that those who became serial entrepreneurs correspond to i) those who survived for longer periods in the first business; ii) those with more experience as start-up founders; iii) those with higher levels of education on average; and iv) those who owned larger firms at the time of exit from the first business (see Table A.II). In this sense, it becomes crucial to understand whether observed and unobserved factors that have influenced the decision of reentering into entrepreneurship were also correlated with the performance shown by serial entrepreneurs after their reentry.

Table 4 presents the results obtained from the estimation of Models 1 and 2 previously discussed, now using the two-staged Full Information Maximum Likelihood Weibull duration model with selection developed by Boehmke et al. (2006). The results for the estimated selection equation (reported in Table A.III in the Appendix) confirm that those who established a start-up venture before and those who have survived for a longer period in the

[11] Alternative estimations of a loglogistic AFT model showed that the estimated hazard rates would be increasing during the first three to four years of the BO in the firm, starting to decrease thereafter. The remaining results were not significantly different from those obtained with the Weibull model.

first business are more likely to try again and become serial entrepreneurs. In addition, higher levels of education and a larger size of the previous business, among other factors, are also associated with a greater likelihood of reentering into entrepreneurship. Those who (re)entered into paid employment after leaving their first entrepreneurial experience, in turn, are found to be significantly less likely to reenter into entrepreneurship, as they may have higher opportunity costs of becoming entrepreneurs again (see, for instance, Baptista et al., 2012).

These second results attest that selection should not be overlooked, as a negative and significant correlation is found between the error terms (see the estimated values for *rho* at the bottom of Table 4). In other words, there are unobserved factors that positively affect reentry into entrepreneurship and simultaneously decrease subsequent hazard rates. This finding is in line with the theories predicting that those involved in serial entrepreneurship correspond to individuals with higher than average innate ability and skills (Holmes and Schmitz, 1990; Plehn-Dujowich, 2010).

Additionally, accounting for serial entrepreneurs' self-selection has important implications on the conclusions derived from potential learning by doing effects. First, results now show that the cumulative experience acquired in the first business does not exert any significant effect on serial BOs' hazards. The significant negative effects previously found are now shown to be irrelevant (Model 1) or vanishing in a very short period of time (two years after leaving the previous business, according to Model 2). The effects of industry-specific experience are also found to be overestimated when self-selection is ignored – those who tried their luck in the same sector have actually 15% lower hazard rates than those who moved to a different sector, instead of 22% lower hazard rates as suggested by the "naïve" Weibull model (Model 1 from Table 3). Even so, this comparative advantage seems to vanish after eight to nine years elapsed since the exit from the first business.

The presence of self-selection also changes the magnitude of almost all coefficients, which were considerably overestimated in the "naïve" Weibull model. The same is applicable to the duration dependence – serial BOs' hazards are found to increase over time, but at a much lower rate when accounting for self-selection. The constant term also decreases considerably when correcting selection bias, confirming that exit rates of serial entrepreneurs were artificially increased in previous "naïve" Weibull models. In sum, once we account for the decision of reentering into entrepreneurship, the estimated exit rates of serial entrepreneurs decrease, since the negative error correlation biases the baseline hazard rates upwards, when ignored.

Table 4. Estimation results from the Weibull proportional hazard model with selection
(Portugal 1993-2007)

	Model 1	Model 2
Specificities of the first entrepreneurial experience		
Cumulative years as BO	0.0015	-0.0149**
	(0.0039)	(0.0050)
Start-up Experience	0.0796***	0.0792***
	(0.0158)	(0.0158)
Same Sector Experience	-0.1610***	-0.2644***
	(0.0165)	(0.0231)
Years elapsed between 1^{st} and 2^{nd} experiences	0.0314***	
	(0.0032)	
Cumulative years as BO*Years elapsed		0.0062***
		(0.0016)
Same Sector Experience*Years elapsed		0.0304***
		(0.0051)
Individual-level characteristics		
Male	-0.0776***	-0.0788***
	(0.0182)	(0.0182)
Age	-0.0703***	-0.0697***
	(0.0089)	(0.0089)
Age squared/100	0.0900***	0.0896***
	(0.0111)	(0.0112)
9 years of schooling[a]	-0.0096	-0.0086
	(0.0219)	(0.0219)
12 years of schooling[a]	0.1075***	0.1078***
	(0.0212)	(0.0212)
College education[a]	0.0843***	0.0860***
	(0.0254)	(0.0255)
Firm-level characteristics		
Firm size at reentry	-0.0128	-0.0137
	(0.0100)	(0.0100)
Urban location	0.0717***	0.0713***
	(0.0160)	(0.0160)
Shared ownership	-0.0914***	-0.0928***
	(0.0165)	(0.0165)

It continues in the next page...

Table 4. Estimation results from the Weibull proportional hazard model with selection (Portugal 1993-2007) (cont.)

	Model 1	Model 2
Firm-level characteristics (cont.)		
Primary Sector[b]	-0.1303**	-0.1292**
	(0.0615)	(0.0614)
Energy & Construction[b]	0.0582**	0.0616**
	(0.0269)	(0.0269)
Services[b]	0.0056	0.0082
	(0.0223)	(0.0224)
Reenter in a year of crisis	0.0261	0.0303
	(0.0255)	(0.0255)
Constant	-1.0611***	-0.9700***
	(0.1751)	(0.1749)
No. of observations	219462	219462
Uncensored Obervations	35202	35202
p (duration dependence)	1.1777***	1.1766***
Log Likelihood	-151079.18	-151075.82
Rho (error correlation)	-0.1463***	-0.1464***

Notes: Serial entrepreneurs entering in 2001-2002 are excluded. Both specifications have an associated selection equation. The results for the selection equation of the global specification (Model 2) are provided in the Appendix (Table A.III). Reference categories: [a] Less than 9 years of schooling; [b] Manufacturing. *, ** and *** denote significant at 10%, 5% and 1% levels, respectively. Values in parentheses correspond to Huber-White standard errors. All the estimations were performed with the program DURSEL for Stata, for right-censored survival time data, written by F. Boehmke, D. Morey and M. Shannon and available at: http://myweb.uiowa.edu/fboehmke/methods.html (see also Boehmke et al., 2006).

Overall, our results show that neglecting self-selection of serial entrepreneurs may produce biased conclusions about learning by doing effects that might be transferable from past entrepreneurial experiences to the current ones. The positive association between prior experience and the performance of serial BOs in subsequent entrepreneurial attempts is mainly the result of selection on ability, more than the result of learning by doing. Some learning by doing is found only through industry-specific experience (see also Frankish et al., 2012; Chen, 2013). Otherwise, learning effects are really modest.[12]

[12] As robustness checks, additional estimations were performed for particular samples of serial BOs according to their entry mode (start-up versus acquisition) and exit mode from the second business (firm

5 Concluding Remarks

The topic of entrepreneurial learning has been nurturing a growing debate in the midst of both scholars and policymakers over the most recent years. Entrepreneurs are believed to accumulate unique knowledge and skills by creating and running new ventures, and by establishing networks with suppliers, customers and other business-owners. All this know-how accumulated through experience is believed to make serial entrepreneurs more able to run successful ventures than novice (i.e., inexperienced) entrepreneurs. Nevertheless, if on the one hand, the lack of suitable data has prevented in-depth empirical analyses about entrepreneurial learning, on the other hand more recent empirical studies addressing these issues have been finding limited support for entrepreneurial learning hypotheses (e.g., Frankish et al., 2012; Parker, 2012). While the significance of learning by doing remains a question, a new debate has been emerging regarding the potential selection bias associated with the reentry of individuals into entrepreneurship. In fact, do entrepreneurs really learn with their past experience or are those who try again a selected sample of higher-than-average ability entrepreneurs? Whether their outperformance comes from learning by doing or self-selection according to their own innate ability thus remains a pertinent query.

This paper thus contributes to this debate by using a large longitudinal matched employer-employee dataset that allows us to track individuals and their entrepreneurial experiences over time. We evaluated how previous entrepreneurial experience impacts on serial entrepreneurs' persistence in the second business, exploring a novel empirical strategy based on continuous time duration models that take into account selection bias issues.

Our results seem to confirm that serial entrepreneurs are not a random sample of individuals. Instead, they possess some unobserved characteristics that not only make them more likely to try again as entrepreneurs, as also reduce their exit rates in their second entrepreneurial experience. After correcting this bias in their selection process, the cumulative experience as business-owners exerts no significant effect on their survival in the second business. Besides, the comparative advantages associated with industry-specific experience are found to be overestimated when ignoring self-selection problems.

In short, our study does not offer support for the widespread expectations related to significant entrepreneurial learning. While part of the performance shown by serial entrepreneurs may result from the entrepreneurial knowledge acquired in the previous business – especially when the second entrepreneurial try occurs in the same industry –, learning by doing effects seem to be much less important than self-selection effects. Innate entrepreneurial ability seems to play an essential, and possibly dominant, effect.

dissolution versus ownership transfer), and also for a subsample of younger serial BOs. The overall results and conclusions remained consistent across the several sub-samples, being available upon request.

References

[1] Amaral, A. M., Baptista, R., Lima, F. (2011), "Serial entrepreneurship: impact of human capital on time to re-entry", *Small Business Economics*, 37(1), 1-21.

[2] Baptista, R., Lima, F., Preto, M. T. (2012), "How former business owners fare in the labor market? Job assignment and earnings", *European Economic Review*, 56(2), 263-275.

[3] Bastié, F., Cieply, S., Cussy, P. (2013), "The entrepreneur's mode of entry: the effect of social and financial capital", *Small Business Economics*, 40(4), 865-877.

[4] Boehmke, F., Morey, D. S., Shannon, M. (2006), "Selection bias and continuous-time duration models: Consequences and a proposed solution", *American Journal of Political Science*, 50(1), 192-207.

[5] Brüderl., J., Preisendörfer, P., Ziegler, R. (1992), "Survival chances of newly founded business organizations", *American Sociological Review*, 57(2), 227-242.

[6] Chen, J. (2013), "Selection and serial entrepreneurs", *Journal of Economics & Management Strategy*, 22(2), 281-311.

[7] Cleves, M., Gould, W. W., Gutierrez, R. G., Marchenko, Y. (2010), *An Introduction to Survival Analysis using Stata*, 3rd edition. Texas: Stata Press.

[8] Cope, J. (2005), "Toward a dynamic learning perspective of entrepreneurship", *Entrepreneurship Theory & Practice*, 29(4), 373-397.

[9] Cope, J. (2011), "Entrepreneurial learning from failure: An interpretative phenomenological analysis", *Journal of Business Venturing*, 26(6), 604-623.

[10] Cope, J., Watts, G. (2000), "Learning by doing: An exploration of experience, critical incidents and reflection in entrepreneurial learning", *International Journal of Entrepreneurial Behaviour and Research*, 6(3), 104–124.

[11] Ericsson, R., Pakes, A. (1995), "Markov perfect industry dynamics: a framework for empirical work", *The Review of Economic Studies*, 62(1), 53–82.

[12] European Commission (2002). Best project on restructuring, bankruptcy and a fresh start. Enterprise and Industry Directorate-General. Brussels.

[13] European Commission (2011). A second chance for entrepreneurs. Prevention of bankruptcy, simplification of bankruptcy procedures and support for a fresh start. Enterprise and Industry Directorate-General, Brussels.

[14] Frank, M. Z. (1988), "An intertemporal model of industrial exit", *Quarterly Journal of Economics*, 103(2), 333-344.

[15] Frankish, J. S., Roberts, R. G., Coad, A., Spears, T. C., Storey, D. J. (2012), "Do entrepreneurs really learn? Or do they just tell us that they do?", *Industrial and Corporate Change*, 22(1),73-106.

[16] Fraser, S., Greene, F. J. (2006), "The effects of experience on entrepreneurial optimism and uncertainty", *Economica*, 73(290), 169–192.

[17] Georgellis, Y., Sessions, J., Tsitsianis, N. (2007), "Pecuniary and non-pecuniary aspects of self-employment survival", *The Quarterly Review of Economics and Finance*, 47(1), 94–112.

[18] Gimeno, J., Folta, T. B., Cooper, A. C., Woo, C. Y. (1997), "Survival of the fittest? Entrepreneurial human capital and the persistence of underperforming firms", *Administrative Science Quarterly*, 42(4), 750–783.

[19] Gompers, P., Kovner, A., Lerner, J., Scharfstein, D. (2010), "Performance persistence in entrepreneurship", *Journal of Financial Economics*, 96(1), 18-32.

[20] Headd, B. (2003), "Redefining business success: Distinguishing between closure and failure", *Small Business Economics*, 21(1): 51–61.

[21] Hessels, J., Grilo, I., Thurik, R., van der Zwan, P. (2011), "Entrepreneurial exit and entrepreneurial engagement", *Journal of Evolutionary Economics*, 21(3), 447-471.

[22] Holmes, T.J., Schmitz, J. A. (1990), "A theory of entrepreneurship and its application to the study of business transfers", *Journal of Political Economy*, 98(2), 265–294.

[23] Hopenhayn, H. (1992), "Entry, exit, and firm dynamics in long run equilibrium", *Econometrica*, 60(5), 1127–1150.

[24] Hougaard, P. (1995), "Frailty models for survival data", *Lifetime Data Analysis*, 1(3), 255-273.

[25] Hyytinen, A., Ilmakunnas, P. (2007), "What distinguishes a serial entrepreneur?", *Industrial and Corporate Change*, 16(5), 793–821.

[26] Inci, E. (2013), "Occupational choice and the quality of entrepreneurs", *Journal of Economic Behavior & Organization*, 92, 1-21, doi: http://dx.doi.org/10.1016/j.jebo.2013.04.015.

[27] Jenkins, S. P. (2005), Survival Analysis, unpublished Lecture Notes manuscript, Institute for Social and Economic Research, University of Essex. (Available at https://www.iser.essex.ac.uk/files/teaching/stephenj/ec968/pdfs/ec968lnotesv6.pdf)

[28] Jovanovic, B. (1982), "Selection and the evolution of industry", *Econometrica*, 50(3), 649–670.

[29] Jovanovic, B., MacDonald, G. (1994), "The life cycle of a competitive industry", *Journal of Political Economy*, 102(2), 322–347.

[30] Kalbfleisch, J., Prentice, R. (1980), *The statistical analysis of failure data*. New York: Wiley.

[31] Kirschenhofer, F., Lechner, C. (2012), "Performance drivers of serial entrepreneurs: Entrepreneurial and team experience", *International Journal of Entrepreneurial Behavior & Research*, 18(3), 305-329.

[32] Lancaster, T. (1990), *The Econometric Analysis of Transition Data*. Econometric Society Monographs, 17, Cambridge University Press.

[33] Lee, E. T., Wang, J. W. (2003), *Statistical Methods for Survival Data Analysis*, 3rd edition. New York: Wiley.

[34] Li, S., Schulze, W., Li, Z. (2009), "Plunging into the sea, again? A study of serial entrepreneurship in China", *Asia Pacific Journal of Management*, 26(4), 667-680.

[35] MacMillan, I. (1986), "To really learn about entrepreneurship, let's study serial entrepreneurs", *Journal of Business Venturing*, 1(3), 241 –243.

[36] McCann, B. T., Folta, T. B. (2012), "Entrepreneurial entry thresholds", *Journal of Economic Behavior & Organization*, 84(3), 782-800.

[37] Minniti, M., Bygrave, W. (2001), "A dynamic model of entrepreneurial learning", *Entrepreneurship Theory and Practice*, 25(3), 5-16.

[38] Nielsen, K., Sarasvathy, S. D., (2011), "Who reenters entrepreneurship? And who ought to? An empirical study of success after failure", Paper presented at the DIME-DRUID ACADEMY Winter Conference, Denmark, January, 2011.

[39] Parker, S. C. (2006), "Learning about the unknown: How fast do entrepreneurs adjust their beliefs?", *Journal of Business Venturing*, 21(1), 1-26.

[40] Parker, S. C. (2007), "Entrepreneurial learning and the existence of credit markets", *Journal of Economic Behavior & Organization*, 62(1), 37-46.

[41] Parker, S. C. (2012), "Do serial entrepreneurs run successively better-performing businesses?", *Journal of Business Venturing*, DOI: 10.1016/j.jbusvent.2012.08.001.

[42] Parker, S. C., Van Praag, C. M. (2011), "The entrepreneur's mode of entry: Business takeover or new venture start?", *Journal of Business Venturing*, DOI:10.1016/j.jbusvent.2010.08.002.

[43] Petkova, A. P. (2009), "A theory of entrepreneurial learning from performance errors", *International Entrepreneurship Management Journal*, 5(4), 345-367.

[44] Plehn-Dujowich, J. (2010), "A theory of serial entrepreneurship", *Small Business Economics*, 35(4), 377-398.

[45] Robson, P. J. A., Akuetteh, C. K., Westhead, P., Wright, M. (2012), Exporting intensity, human capital and business ownership experience", *International Small Business Journal*, 30(4), 367–387.

[46] Rocha, V., Carneiro, A., Varum, C. A. (2013), "Entrepreneurship dynamics: Entry routes, business-owner's persistence and exit modes", CEF.UP Working Paper No. 2013-10.

[47] Sarasvathy, S. D., Menon, A. R., Kuechle, G. (2013), "Failing firms and successful entrepreneurs: serial entrepreneurship as a temporal portfolio", *Small Business Economics*, 40(2), 417-434.

[48] Stam, E., Audretsch, D., Meijaard, J. (2008), "Renascent entrepreneurship", *Journal of Evolutionary Economics*, 18(3-4), 493-507.

[49] Stearns, T. M., Carter, N. M., Reynolds, P. D., Williams, M. L. (1995), "New firm survival: industry, strategy and location", *Journal of Business Venturing*, 10(1), 23-42.

[50] Ucbasaran, D. Wright, M., Westhead, P. (2003), "A longitudinal study of habitual entrepreneurs: starters and acquirers", *Entrepreneurship & Regional Development*, 15(3), 207-228.

[51] Ucbasaran, D., Shepherd, D. A., Lockett, A., Lyon, J. (2012), "Life after business failure: The processes and consequences of business failure for entrepreneurs", *Journal of Management*, DOI: 10.1177/0149206312457823.

[52] Ucbasaran, D., Westhead, P., Wright, M., Binks, M. (2006), *Habitual Entrepreneurs*. Cheltenham: Edward Elgar.

[53] Ucbasaran, D., Westhead, P., Wright, M., Flores, M. (2010), "The nature of entrepreneurial experience, business failure and comparative optimism", *Journal of Business Venturing*, 25(6), 541-555.

[54] Van Gelderen, M., van der Sluis, L., Jansen, P. (2005), "Learning opportunities and learning behaviours of small business starters: Relations with goal achievement, skill development and satisfaction", *Small Business Economics*, 25(1), 97-108.

[55] Von Hayek, F. A. (1937), "Economics and knowledge", *Economica*, 4(13), 33–54.

[56] Wagner, J. (2003). "Taking a second chance: Entrepreneurial restarters in Germany", *Applied Economics Quarterly*, 49(3), 255–272.

[57] Westhead, P., Ucbasaran, D., Wright, M. (2005b), "Decisions, actions and performance: Do novice, serial and portfolio entrepreneurs differ?", *Journal of Small Business Management*, 43(4), 393-417.

[58] Westhead, P., Ucbasaran, D., Wright, M., (2003), "Differences between private firms owned by novice, serial and portfolio entrepreneurs: implications for policy makers and practitioners", *Regional Studies*, 37(2), 187-200.

[59] Westhead, P., Ucbasaran, D., Wright, M., Binks, M. (2005a), "Novice, serial, and portfolio entrepreneur behavior and contributions", *Small Business Economics*, 25(2), 109–132.

[60] Westhead, P., Wright, M. (1998), "Novice, serial, and portfolio founders: Are they different?", *Journal of Business Venturing*, 13(3), 173–204.

[61] Wright, M., Robbie, K., Ennew, C. (1997), "Venture capitalists and serial entrepreneurs", *Journal of Business Venturing*, 12(3), 227-249.

[62] Zhang, J. (2011), "The advantage of experienced start-up founders in venture capital acquisition: evidence from serial entrepreneurs", *Small Business Economics*, 36(2), 187-208.

Appendix

Table A.I. Classification of Economic Activities (ISIC-Rev.2, 2-digit)

Primary Sector:
(11) Agriculture and Hunting
(12) Forestry and Logging
(13) Fishing
(21) Coal Mining
(22) Crude Petroleum and Natural Gas Production
(23) Metal Ore Mining
(29) Other Mining
Manufacturing:
(31) Manufacture of Food, Beverages and Tobacco
(32) Textile, Wearing Apparel and Leather Industries
(33) Manufacture of Wood and Wood Products, including Furniture
(34) Manufacture of Paper and Paper Products, Printing and Publishing
(35) Manufacture of Chemicals and Chemical, Petroleum, Coal, Rubber and Plastic Products
(36) Manufacture of Non-Metallic Mineral Products, except Products of Petroleum and Coal
(37) Basic Metal Industries
(38) Manufacture of Fabricated Metal Products, Machinery and Equipment
(39) Other Manufacturing Industries
Energy Construction Sectors:
(41) Electricity, Gas and Steam
(42) Water Works and Supply
(50) Construction
Services:
(61) Wholesale Trade
(62) Retail Trade
(63) Restaurants and Hotels
(71) Transport and Storage
(72) Communication
(81) Financial Institutions
(82) Insurance
(83) Real State and Business Services
(91) Public Administration and Defense
(92) Sanitary and Similar Services
(93) Social and Related Community Services
(94) Recreational and Cultural Services
(95) Personal and Household Services
(96) International and Other Extra-Territorial Bodies

Table A.II. Descriptive statistics for ex-BOs, by reentry decision (Portugal, 1993-2007)[a]

	All ex-BOs (N=219,462)	Reenter (N=35,202)	Do not reenter (N=184,260)
Specificities of the first entrepreneurial experience			
Cumulative years as BO	2.288	2.698	2.210
Start-up Experience (%)	0.408	0.493	0.391
Individual-level characteristics			
Paid employment before reentering (%)	0.302	0.184	0.324
Male (%)	0.667	0.748	0.652
Age (years)	36.86	35.96	37.03
Less than 9 years of schooling (%)[b]	0.527	0.512	0.530
9 years of schooling (%)	0.170	0.168	0.171
12 years of schooling (%)	0.185	0.192	0.183
College education (%)	0.118	0.128	0.116
Characteristics of the first business			
Previous dissolved business (%)	0.285	0.384	0.266
Firm size at exit (No. employees in logs)	1.553	1.614	1.542
Urban location (%)	0.416	0.418	0.416
Shared ownership (%)	0.537	0.504	0.543
Primary sector (%)	0.024	0.020	0.025
Manufacturing (%)[b]	0.190	0.189	0.190
Energy Construction (%)	0.140	0.158	0.137
Services (%)	0.646	0.633	0.648

Notes: [a] Excluding reentries occurring in 2001 or 2002. [b] These variables are used as reference categories in our estimations. The statistics reported are the mean values of each variable, observed at the time of exit from the first business. "Start-up Experience" equals 1 if the individual has established a start-up firm in the first experience and 0 if s/he has acquired an existing firm. "Paid employment before reentering" is an indicator variable assuming the value 1 if the individual was registered as paid employee in t-1 or t-2, 0 otherwise (with t corresponding to the year of reentry into entrepreneurship - for those who reentered - or to the last year each individual is observed in the data - for those never reentering into entrepreneurship (right-censored cases)). "Previous dissolved business" equals 1 if the individual has left the first business by dissolving it, 0 if s/he has left by ownership transfer. "Urban location" equals 1 if the first business was located in the districts of Lisboa or Porto, 0 otherwise.

Table A.III. Estimation results for the Selection Equation (Portugal, 1993-2007)

	Probit Model
Specificities of the first entrepreneurial experience	
Cumulative years as BO	0.0516***
	(0.0013)
Start-up Experience	0.1551***
	(0.0060)
Individual-level characteristics	
Paid employment before reentering	-0.3671***
	(0.0065)
Male	0.1914***
	(0.0060)
Age	0.0364***
	(0.0032)
Age squared/100	-0.0684***
	(0.0044)
9 years of schooling[a]	-0.0122
	(0.0078)
12 years of schooling[a]	0.0099
	(0.0077)
College education[a]	0.0649***
	(0.0091)
Characteristics of the first business	
Previous dissolved business	0.2314***
	(0.0064)
Firm size at exit	0.0989***
	(0.0031)
Urban location	0.0140**
	(0.0057)
Shared ownership	-0.0792***
	(0.0060)
Primary Sector[b]	-0.0354*
	(0.0194)

It continues in the next page...

Table A.III. Estimation results for the Selection Equation (Portugal, 1993-2007) (cont.)

	Probit Model
Characteristics of the first business (cont.)	
Energy Construction[b]	0.0340***
	(0.0097)
Services[b]	0.0604***
	(0.0077)
Constant	-1.4377***
	(0.0577)
Number of observations	219462
Number of entries in the selected sample	35202
Log Likelihood	-151075.82
Wald χ^2	8701.73***

Notes: These results correspond to the Selection Equation of Model 2 reported in Table 4. The respective results for Model 1 were not significantly different from these. Reference categories: [a] Less than 9 years of schooling; [b] Manufacturing. *, ** and *** denote significant at 10%, 5% and 1% levels, respectively. Values in parentheses correspond to Huber-White standard errors.