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SELECTION EFFECTS IN ENTREPRENEURSHIP

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*Ai miei genitori,
a mio fratello*

“Le idee migliori non vengono dalla ragione, ma da una lucida, visionaria follia”

Erasmus da Rotterdam, Elogio della Follia (1509)

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INTRODUCTORY SECTION

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SELECTION EFFECTS IN ENTREPRENEURSHIP

Abstract

My work is positioned within an emerging trend in entrepreneurial research which revises prior work by considering the impact of selection effects. Prior research on the individual-level determinants of start-up size, performance, and exit has ignored that individuals select into entrepreneurship and this might seriously bias our understanding of the post-entry process. I'm particularly well positioned to investigate the nature, the extent, and the consequences of these selection effects because I could access extraordinary data on the Swedish population, which allows me to incorporate information on individuals who were at risk but did not enter entrepreneurship. Yet, the overall contribution of my dissertation goes beyond flagging a selection problem and developing a method to cope with it. It comes up with reexamining and even questioning some of the most prominent theoretical explanations to fundamental issues in entrepreneurship, such as the notion of initial size, the liability of smallness, and the interplay between entrepreneurial performance and firm exit.

Key words: selection effects, start-up size, performance, exit

INTRODUCTION

Firms choose strategies based on their attributes and industry conditions; therefore, strategy choice is endogenous and self-selected.

Shaver (1998: 571)

The Overall Aim of the Dissertation

Entry, exit, and initial size are fundamental notions in entrepreneurship. A common theme is that individual – level characteristics play a central role in determining these different phases of the entrepreneurial process. In particular, prior research has separately considered how founders background characteristics, such as prior job careers and education, impact entry (Elfenbein, Hamilton, & Zenger, 2010; Folta, Delmar, & K. Wennberg, 2010; Gompers, Lerner, & Scharfstein, 2005; Sørensen, 2007); initial size (Colombo, Delmastro, & Grilli, 2004; Cooper, Woo, & Dunkelberg, 1989; J Mata, 1993; P. W. Roberts, Klepper, & Hayward, 2011), and exit (Brüderl, Preisendörfer, & Ziegler, 1992; Geroski, José Mata, & Portugal, 2010; Gimeno, Folta, Cooper, & Woo, 1997; Phillips, 2002).

The preponderance of research in this direction has interpreted these relationships in terms of skills and knowledge that the founder has previously accumulated. The higher the founders' human capital (skills and knowledge) the higher the entrepreneurial outcomes. For example, founders with prior generic work experience are more likely to entry, to start their venture at a greater scale, and are less likely to exit.

It's important to give a closer scrutiny to those findings because prior work has implicitly assumed that initial size, performance, and exit are *independent* of the entry stage. This treatment is paradoxical since the same individual –level determinants of initial size, performance and exit are likely to bear upon the entry decision. A fundamental reason why prior research has ignored these interdependences is that it has largely relied upon samples of new ventures or new entrepreneurs. Those samples are vulnerable to selection bias since we can only observe those firms that were actually founded (Sorensen and Phillips, 2011) , and we can only observe initial size when entry occurred (Mata, 1993). In other words, prior studies lack access to information on those individuals who are at risk of switching to entrepreneurship but *don't*. Therefore, empirical findings from these studies may be called into questions if selection processes that generate the sample of entrepreneurs cause endogeneity in the model (Heckman, 1979). More importantly, if these selection processes at entry influence initial size, performance, and exit, then the above mentioned independence assumption is violated. Consequently, our understanding of the key issues in entrepreneurship may be erroneous. “In general, failure to statistically correct for endogeneity can lead not only to biased coefficient estimates but, more importantly, to faulty conclusions about theoretical propositions” (Hamilton & Nickerson, 2003: 52).

The aim of my dissertation is to revisit prior work fundamental findings as well as theoretical arguments regarding the influence of individual-level characteristics on initial size, performance, and exit, by investigating the nature, the extent, and the origins of selection effects. I suspect that much of the emphasis on treatment (experience)-based

explanations is the results of spurious associations, driven by selection effects. Next paragraph clarifies the notion of selection effects.

The Notion of Selection Effects

Although research in management is becoming more and more concerned with self-selection and endogeneity issues, research in entrepreneurship falls behind. This concern takes on a greater relevance, if the most important notion in entrepreneurship is a choice, i.e. the entry choice. I posit that individuals choose to entry entrepreneurship, as opposed to stay in paid employment, according to their characteristics as well as to industry conditions. Therefore, on the footsteps of Shaver (1998: 572)'s seminal work, an individual's entry decision is endogenous and self-selected. A few recent works have suggested that some detected relationships between prior workplace characteristics and entrepreneurial entry might be the spurious result of selection effects.

A selection effect occurs if individuals self-select into entrepreneurship or into organizations (before entrepreneurship) with certain entrepreneurial attitudes and abilities (Campbell, Ganco, April M Franco, & Agarwal, 2010; Elfenbein et al., 2010; Klepper, 2009; Ozcan & T. Reichstein, 2009; Sørensen, 2007; Sørensen & Fassiotto, 2011). Individuals might self-select in entrepreneurship or in certain employers before entrepreneurship, according to entrepreneurial attitudes, such as preference for autonomy (Halaby, 2003). Elfenbein et al. (2010) label this mechanism as preference sorting. Other individuals might self-select according to their entrepreneurial abilities (Campbell et al., 2010; Jovanovic, 1982). Elfenbein et al. (2010) label this mechanism as ability sorting. Moreover, Sørensen (2007) highlights the process of strategic sorting, for which

individuals might self-select into firms that they believe will provide relevant experience (in terms of human and social capital) to achieve their final goal of becoming a successful entrepreneur. Finally, Sorensen and Fassiotto (2011: 1330) hypothesize that the relationship between individuals' background characteristics and entrepreneurship might not only be the result of selection processes at the point of entry (hire) into an organization, but also at the point of exit from an organization. Employers and, in general work experience, shape an individual' structure of career incentives, and in particular incentives to entrepreneurship. In other words, they set an individual's entry threshold.

In synthesis, very recent studies on entry suspect that many empirical associations between founders' background characteristics or prior employers and entrepreneurial outcomes may arise through selection processes (Elfenbein et al., 2010; Nanda & Sørensen, 2010; Ozcan & Reichstein, 2009; Sørensen, 2007). This suggests that prior findings on entrepreneurial outcomes might be called into question if selection effects produce substantial bias. Despite the importance of this phenomenon and the potential impact on how we interpret prior research, systematic theoretical and empirical examination of the consequences of selection processes on entrepreneurial outcomes is missing. In light of these insights, and motivated by the pursue of a truthful understanding of the micro-level determinants of entrepreneurship, my dissertation investigates the following research questions:

- *Do selection effects at entry impact entrepreneurial outcomes?*
- *Why do selection effects occur?*
- *How do selection effects influence entrepreneurial outcomes?*
- *What are the consequences of ignoring selection effects?*

Theoretical Contribution

The contribution of my dissertation goes beyond proposing a better empirical specification to consider selection effects. It opens the way for improved theorizing around the determinants of initial size, performance, and exit. Overall, my dissertation reveals that ignoring selection effects causes one to overemphasize the role of prior experience as fonts of skills and knowledge. At the same time, it underrepresents the role of entrepreneurial incentives and opportunity costs in determining the individual's threshold not only to entry, but also to initial size, and exit. Our theoretical model blends upon the idea that different incentive structures produce heterogeneous impacts on entry and initial size decisions, which, in turn, affect entrepreneurial performance and exit. This idea is consistent with an emerging view of prior employers as contexts that shape individuals' career opportunities, as opposed to the current view of employers as contexts that induce changes in individuals' characteristics (Sørensen & Fassiotto, 2011).

In detail, my dissertation offers a theory-based structure to reexamine the theoretical explanations that prior research has provided to three fundamental issues in entrepreneurship:

- *The Individual –Level Determinants of Initial Size.* Their role is downplayed. What matters in determining initial size, above and beyond industry conditions, is the way entrepreneurs enter the market, i.e. types of entrants (Helfat & Lieberman, 2002:731), such as spinout or de novo. This type of entrant effect is a selection effect, because founders of different types of entrants have different thresholds to both entry and size.

- *The Individual / Firm –Level Determinants of Entrepreneurial Performance.* The role of initial size is downplayed. Population–level explanations referring to the liability of smallness give way to micro-level explanations. In particular, the previously detected relationship between initial size and performance suffer from endogeneity in start-up size and is actually driven by group-level selection effects (types of entrants).
- *The Interplay between Performance and Exit.* In contrast to the previous Darwinian idea, for which firms that do not fit the competitive environment (low economic performances) are selected out of the market, I consider exit as an individual’s strategic choice where income from entrepreneurship represents only a halved explanation of the phenomenon. Equally central is the role of other sources of income (i.e. those from simultaneous wage work). This finding signals endogeneity in exit decision (entry in wage work might precede and not follow exit).

Transversally, I believe my dissertation is the first study that *jointly* consider the fundamental phases of a new venture lifecycle, in contrast to previous effort which has traditionally treated them as independent of each other’s. This contribution is not only curious but fundamental since the individual-level determinants of entrepreneurial entry influence also the post-entry processes. My dissertation ultimately cautions against investigating these processes separately as it results in a myopic understanding of the whole entrepreneurial process.

Structure of the Dissertation

The dissertation is organized as a collection of three quantitative research papers, which unfold along with the key phases of the entrepreneurial process (Figure 1). All together the three essays aim at providing a sophisticated picture on how selection effects influence these different phases and the interplay among them.

Conceptually, each research paper revises a fundamental finding in entrepreneurship by showing the theoretical and empirical implications of selection processes at entry. Specifically, the first essay examines the determinant of initial size, the second essay pursues a better understanding of the implications of initial size on performance (the liability of smallness), and the third essay investigates the determinants of exit and the interplay with performance. As such, the three research papers contribute to the overall aim of my dissertation, as earlier presented.

Figure 1. *The Phases of the Entrepreneurial Process*



The relationships between the essays in the dissertation are illustrated in Figure 2. The next paragraph introduces to each research paper by providing a short summary.

I. Endogeneity in Start-up Size. Selection Effects among Types of Entrants.

This paper investigates the determinants of start-up initial size, a fundamental issue in entrepreneurial research (initial size is critical because it bears upon future success). Prior research examining initial size suffers from a number of biases, which may undermine confidence in one of the recurrent findings in the literature - that an entrepreneur's human capital and individual characteristics influence initial size. In contrast to previous efforts to model start-up size, this work views initial size as an entrepreneur's strategic choice rather than an outcome of the entrepreneurial process. As such, initial size may be endogenous and self-selected. This essay shows that the way entrepreneurs enter markets, i.e. types of entrepreneurial entry (e.g., spinout or denovo) condition individuals' initial size choices. Such influence is not just straightforward, but as well occurs through selection processes by individuals into these types of entry categories. We demonstrate that prior research overemphasizes the individual-level determinants of start-up size if types of entrants are treated as an all-in-one category. Using matched employee–employer data over eight years, we test the model on a population of Swedish ventures in the knowledge-intensive sector.

II. In & Out. A Selection – Based View of the Liability of Smallness

This second essay represents the logical follow-up of the first essay since it considers the performance implications of endogeneity in start-up size. In particular, this work revisits a pillar of entrepreneurial research: the liability of smallness, i.e. the positive relationship between initial size and entrepreneurial performance, to account for selection effects. One of the key finding from the empirical analysis is that selections effects

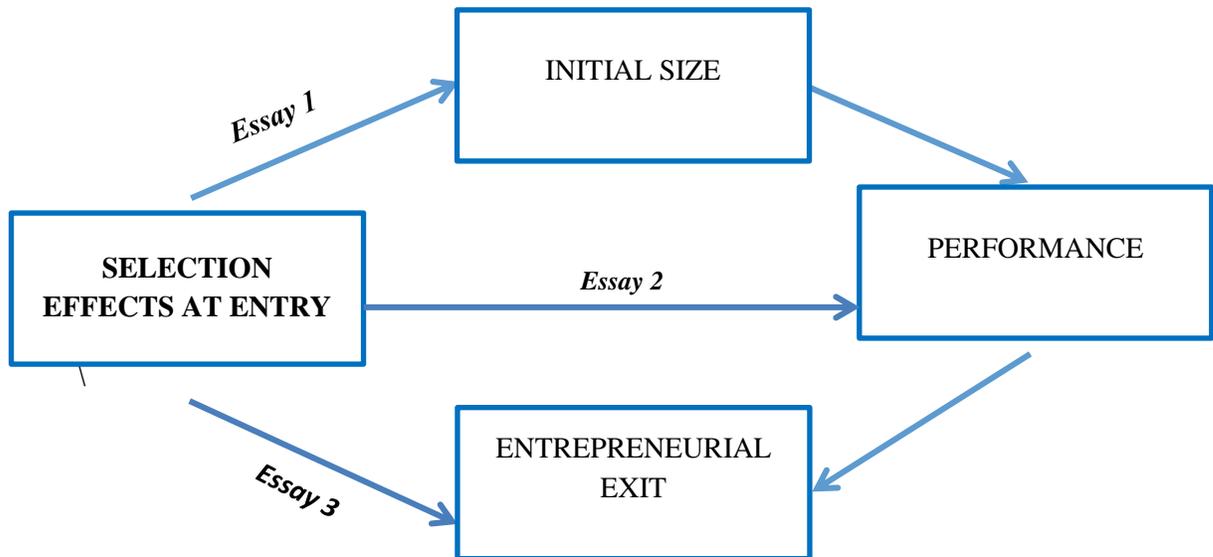
occur, and they occur at group level rather than individual level, i.e. at the level of types of entrants. The theoretical model blends upon the idea that founders of different types of entrants have different incentives to entrepreneurship, as well as different risk propensities. This implies that types of entrants alter two central individuals' decisions: entry and start-up size. Ignoring these selection effects causes one to overemphasize the role of initial size as predictor of performance, in lieu of types of entrants. Using matched employee–employer data over eight years, the model is tested on a population of Swedish wage earners in the knowledge-intensive sector.

III. The Endogeneity of the Entrepreneurial Exit Decision. An Occupational Choice Study

This third essay investigates the last phase of the entrepreneurial process: exit. In contrast to previous work that cast entrepreneurial exit as a dichotomous decision (e.g., exit or not; paid-employment or self-employment), my access to Swedish data suggests that such dichotomies are false. By tracking every occupation of an individual over time, the data reveal that many individuals persist in entrepreneurship even though it may not be their primary source of income. Moreover, this work diagnoses spillover effects between simultaneous instances of wage work and self-employment, which might be referred to as hybrid exit. The key finding from our empirical analysis reveals that a fundamental predictor of entrepreneurial exit is the weight of entrepreneurial earnings relative to the other contemporaneous source of income: wage work. This result has profound theoretical implications for the study of entrepreneurial exit, and highlights that prior research has provided only a halved view of the phenomenon. Using matched

employee–employer data over eight years, we test the model on a population of new Swedish entrepreneurs.

Figure 2. *The Relationship among The three Dissertation Essays*



LITERATURE REVIEW

The Emerging Literature on Organizations as Sources of Entrepreneurship

Research in entrepreneurship has been the playground of a long standing debate between two alternative approaches: dispositional and contextual. The dispositional approach roots in psychology and stems from the idea of entrepreneurs as distinctive individuals, whose stable individual traits lead to entrepreneurial activity, independently of the context. Scholars in this stream have examined the influence on the likelihood to entry of a number of individual personality attributes, such as risk propensity (Cramer, Hartog, Jonkerb, & Van Praag, 2002), preference for autonomy (Halaby, 2003), and overconfidence (Camerer & Lovallo, 1999)¹. On the contrary, the contextual approach roots in sociology and stems from the idea of entrepreneurs as *organizational products* (Freeman, 1986). Organizations are social contexts where individuals acquire the critical psychological and sociological resources necessary to create new organizations (Stinchcombe, 1965; Cooper, 1989; Sorenson & Audia, 2000). Scholars in this stream have examined the influence on entrepreneurial entry of a number of organizational attributes, such as employer size (Sørensen, 2007), employer age (Dobrev & Barnett, 2005), social and geographical networks (Gompers et al., 2005; Saxenian, 1994; Stuart, Sorenson, Alvarez, & Agarwal, 2005).

My dissertation roots in the contextual research, and build upon the emerging literature on where entrepreneurs come from. A number of scholars has begun examining how prior organizations² and, in general prior work experience, condition the likelihood an individual enters entrepreneurship. This literature has the merit to bring the social

¹ For a review of personality traits and entrepreneurship, see Zhao et al. (2006).

² In this work, I will use the notions of prior organization, prior employer, and parent company as synonym.

dimension back in entrepreneurship. In particular, it downplays the common idea of entrepreneurs as exceptional individuals and suggests a more nuanced view of entrepreneurial entry as an ordinary phenomenon, consistent with the frequency with which such transition actually occurs. A second merit of this literature lies in the positivist approach, which helps individuals leveraging on their prior experience to succeed as entrepreneurs. As mentioned earlier, entrepreneurs' prior experiences have been commonly conceptualized in terms of skills and knowledge developed at prior employers. Work experience endows potential entrepreneurs with a set of skills, knowledge, networks and financial resources that represent the new venture stock of resources and capabilities (Klepper, 2002). Such stock varies by types of entrants, such as spinout and de novo (Helfat and Lieberman, 2002: 731). The literature on types of entrants has the merit to highlight the value of founders' *industry-specific* experience. A central finding is that spinouts, defined as "new firms started by individuals who were employees of existing firms in the industry in the year prior to the spin-outs' formation" (Agarwal, Echambadi, April M. Franco, & Sarkar, 2004) on average outperform other types of entrants (Agarwal et al., 2004; April Mitchell Franco & Filson, 2006; Klepper, 2009), because they have developed industry-specific knowhow and skills (Klepper & Slepper, 2005; Franco, 2006).

Next section offers a review of research on founders' background characteristics and entrepreneurship. I will focus more on the determinants of entrepreneurial entry rather than on those of initial size, performance, and exit for two main reasons. First, investigating the impact of selection effects at entry clearly requires an understanding on

what determines an individual's likelihood to entry. Second, a detailed and tailored review of initial size, performance, and exit is included in each research paper.

The Determinants of Entrepreneurial Entry

The preponderance of research on founders' work experience has investigated entrepreneurial entry, commonly defined as the likelihood that an individual switches from paid employment to self-employment (Folta et al. 2010) This paragraph provides an organized and synthetic picture of the several contributions in this direction. I classify research in this area in two main streams: (1) scholars that study founders' experience; (2) scholars that study the organizational characteristics of founders' previous employer.

The former stream has considered how founder's human capital influences entrepreneurial entry. Human capital has been captured through a number of constructs such as formal education, previous entrepreneurial experience, parents self-employment experience (Halaby, 2003), generic work experience, industry experience, and the diversity of the experience (Lazear, 2004). Prior work has systematically found that these factors are positively correlated with entry. Founders' human capital, in general, is assumed to be correlated with founders' entrepreneurial ability and, in turn, to future expected entrepreneurial earnings. Therefore, the higher the extent of individuals' human capital the higher the propensity of these individuals to become entrepreneurs.

The second related research stream has considered this human capital effect with regards to a number of prior employers' characteristics, such as organizational size (Sørensen, 2007), organizational age (Dobrev & Barnett, 2005), the influence of co-workers with previous entrepreneurial experience (Nanda & Sørensen, 2010), and the

nature of organizational know-how (Agarwal et al., 2004; Klepper, 2005). The remaining paragraph will specifically review prior work on employer's *size* because, besides being the most studied attribute in entrepreneurial entry, it represents a parsimonious construct to synthesize the main theoretical rationales behind an individuals' entry decision.

Recently, empirical evidence on a negative relationship between prior employer' size and entrepreneurial entry has systematically emerged (e.g. Sorensen, 2007; Dobrev and Bartnett, 2005; Gompers, Lerner and Scharfstein, 2005; Ozcan and Reichstein, 2010; Wagner, 2004; Eriksson and Kuhn, 2006). Elfeinbein et al. (2010) label such phenomenon "the small firm effect" and identify four classes of explanations for this finding: entrepreneurial human capital, ability sorting, preference sorting, and opportunity costs. I posit that each argument invokes a different theoretical approach that it's useful to explain entry in general (not just entry from small employers). Therefore, I next examine each of them.

Developing entrepreneurial human capital (contextual approach)

As repeatedly highlighted, the most common way to study entry is in terms of human capital previously accumulated. Therefore, much of the literature on the small firm effect posits that working in a small firm helps prospects entrepreneurs developing entrepreneurial skills and increases their exposure to valuable networks of customers & suppliers. The theoretical foundation of this argument traces back to Lazear's (2004) jack-of-all trades model, whose main claim is that entrepreneurs must have or develop generalist skills³, whereas specialist skills are more suitable to employees. Indeed,

³ Prior work has usually measured individuals' generalist skills in terms of number of jobs held (Lazear, 2004; Gimeno et al., 1997; Astebro and Thompson, 2011; Folta et al., 2010).

Gompers et al. (2005) finds out that entrepreneurial companies in compare to large bureaucratic ones spawns more given their greater exposure networks of customers & suppliers and the greater chance to learn entrepreneurial skills.

Ability sorting (dispositional approach)

Sorting may reflect (innate) entrepreneurial ability. Employees with higher ability are more likely to switch to entrepreneurship rather than to established firms, given their greater capability to appropriate and replicate the value of the parent company (Campbell et al., 2010; Carnahan, Agarwal, Campbell, & April M. Franco, 2010; Phillips, 2002). Furthermore, Sorensen and Sharkey (2010) found that the higher the quality of the employee-employer match, the higher the likelihood of entrepreneurial entry, conditional on turnover. Elfeinbein et al. (2010) argue that high-ability workers move to contexts, such as small firms, where there is a tight relationship between wage and individual performance (Garen, 1985). Usually, the construct of employee ability has been measured by an individual's wage (Hamilton , 2002; Campbell et al. 2010; Carnahan et al., 2010).

Central to my analysis of selection effects would be distinguishing between this ability sorting rationale and the entrepreneurial human capital rationale.

Preference sorting (dispositional approach)

Employees may turn into entrepreneurs simply because they prefer to be their own boss (Benz & Frey, 2008; April Mitchell Franco & Filson, 2006; Halaby, 2003; Sørensen, 2007). The theoretical foundation of this argument traces back to Hamilton (2000) who demonstrates that the earning distribution of self-employed individuals has a longer upper

tail – reflecting “big wins” for few and small earnings for most. He explains this evidence by positing that the non-pecuniary benefits of entrepreneurship like, for example, autonomy, reward the wage penalty. Furthermore, Halaby (2003) found that both an individual orientation (entrepreneurial versus bureaucratic) and his attitude toward risk⁴ come from family background, schooling, and gender. Finally, Benz and Frey (2008) showed that job satisfaction is higher for self-employment, controlling for total income and hour worked per week. Nonetheless, finding empirical support for this preference argument is challenging. Sorensen (2007) has indirectly tested this by showing that self-employers’ children are more likely to become entrepreneur.

Opportunity costs (contextual approach)

A fourth rationale behind the small firm effect is that small firms pay lower wages. Therefore, individuals working in small firms have simply lower opportunity costs to entrepreneurship. Other ways to capture individuals’ opportunity costs are wage ceiling and degree of wage inequality. Carnahan et al. (2010) found that employees in high wage dispersed firms are less likely to become entrepreneur because their employer offer them both pecuniary and not pecuniary benefits. Moreover, Sorensen and Sharkey (2010) posit that the entry decision depends on the attractiveness of the opportunities in paid employment. They argue that firms with higher wage ceilings have lower rate of entrepreneurship relative to general turnover, since firms with low wage ceilings (small firms) offer less room for internal career advancement.

⁴ Even if Xu and Ruef (2004) found out that entrepreneurs are more risk-averse than non-entrepreneurs.

The Determinants of Start-up Size

Despite the prominent role that initial size has been playing in the entrepreneurship literature on survival (Agarwal & Audretsch, 2001; Dunne, M. J. Roberts, & Samuelson, 1989; José Mata & Portugal, 1994) and growth (Audretsch, Santarelli, & Vivarelli, 1999; Cabral, 1995; Evans, 1987) not as much has been done on the *determinants* of firms initial size. Two reasons might justify why prior work has neglected this research problem: (1) the conceptualization of initial size as unidimensional construct and not as a strategic choice; (2) methodological and data challenges. Empirical investigation of what determines a firm initial size is challenging for three key reasons: first, it requires pre-entry data on founder's characteristics (e.g. past work experience); second, it involves multiple levels of analysis, namely industry, firm, and individual; third, it requires empirical models that account for the potential bias arising from the fact that we only observe size when entry occurs.

The preponderance of research on the determinants of initial size roots in the industrial economics literature and addresses *industry-level* characteristics (Acs & Audretsch, 1989; Arauzo-Carod & Segarra-Blasco, 2005; José Mata & Machado, 1996). In particular, factors such as minimum efficient scale (MES), suboptimal scale, industry size, industry turbulence, and industry growth have been found to systematically influence firms initial size.

More recently, some works have started exploring how *individual – level* characteristics affect a firm initial size, above and beyond the mentioned industry factors. This stream has emerged on the wake of studies on how founder's experience influence entry (e.g. Klepper, 2005; Sorensen, 2007), start-up performance (Chatterji, 2009;

Elfenbein et al., 2010), and start-up survival (Dahl & Toke Reichstein, 2007; Gimeno et al., 1997). In particular, some works have investigated whether entrepreneurs are financially constrained and how such constraints conditions startup initial size (Dunn and Holtz-Eakin 2000; Colombo et al. 2004; Hvide and Moen 2010). Some other works have investigated the impact of a founder's human capital on initial size (Barkham, 1994; Colombo et al., 2004; Cooper et al., 1989; José Mata & Machado, 1996). These latter argue that an entrepreneur's human capital has a positive impact on startup size because: (1) better qualified individuals suffer to a lesser extent from financial constraints, given that they are wealthier (more work experience) and have easier access to capital (higher credibility); (2) better qualified individuals have greater confidence in their skills and, in turn, in their chances of success as entrepreneurs, therefore, they are not afraid of the initial sunk costs. Those studies refer to both generic and specific human capital. The former includes the level of education, and the extent of work experience, with particular regard to managerial and self-employment experience (Cooper, 1989; Barkham, 1994; Mata, 1996). The latter includes work experience in the same industry of the startup, both in wage work and self-employment (Colombo et al., 2004; Roberts et al., 2011). Colombo et al. (2004) find that industry related experience matters more than education or generic work experience in determining the initial size of the firm.

The Determinants of Entrepreneurial Exit

In contrast to the prolific research stream addressing entrepreneurial entry, much fewer studies have been investigating the relationship between funders' job histories and entrepreneurial exit. As with entry, I classify research in this area in two main streams:

(1) scholars that study founders' experience; (2) scholars that study the organizational characteristics of founders' prior employer right before switching to self-employment.

As concern prior experience, a substantial amount of studies has found a robust negative effect of entrepreneurial experience, industry experience, work experience, and parents self-employment experience on the likelihood of entrepreneurial exit (Brüderl et al., 1992; Gimeno et al., 1997). Again, a human capital explanation has been advocated. However, recently, Arora & Nandkumar (2011) argue that high ability founders incur higher opportunity costs in staying in self-employment because they may have better alternative opportunities in the wage work. As a consequence, founders' with higher human capital are more likely to fail (and, hence, exit) because they pursue aggressive strategies to cash out quickly and be back on the wage work.

Much more ambiguity and mixed evidence have surrounded the second stream of research, the one on prior employer and performance (e.g. Sorensen and Phillips, 2011; Chatterji, 2009). For example, as concern organizational size, scholars are debating on the performance implications of the small firm effect. Some researches has found out a negative relationship between parent company size and the spin-out performance (Sørensen & Phillips, 2011). As a result, it may be argued that the small firm effect transfers to performance. The underlying explanation is that since big firms focus on *exploitation* activities (March, 1991) they provide prospect entrepreneurs with unsuitable skills and routines (Keppler, 2001). Other researchers, conversely, have found a positive relationship between parent company size and spin-out performance. In particular, Burton, Sorensen and Beckman (2002) claim that the entrepreneurial prominence (positively correlated with size) of a parent company affects founders' ability to attract

external financing, since “third parties may infer that founders from more prominent employers possess, on average, greater skills and have a higher probability of success in their new ventures” (Burton, Sørensen, & M Beckman, 2002: 11). In turn, greater access to funding increases new venture survival chances. Another example of controversial results concern the performance implications of the Lazear (2004)’s jack-of-all-trades model. This model suggests that founders with a higher number of prior jobs should perform better, but evidence is mixed (Elfenbein et al., 2010; Frederiksen & Karl Wennberg, 2011; Geraldine & Dokko, 2008). In synthesis, research on prior employers and entrepreneurial exit, is yet to be fully explored. In effect, a growing number of studies have now started digging in this phenomenon, by building upon the prominent work by Gimeno et al. (1997), who first challenge the unidimensionality of the relationship between economic performance and firm exit (DeTienne, 2010; Wennberg & Wiklund, 2010).

Theoretical Summary & Research Questions

The above discussion highlights three issues.

First, prior work has treated initial size, and entrepreneurial exit as *independent* of the entry stage, namely individuals’ entry into self-employment. This treatment is paradoxical since the theoretical rationales behind initial size and exit are likely to bear upon the very entry decision.

Second, scholars studying the determinants of entry suspect that individuals self-select into entrepreneurship or into established firms before entry (Elfenbein et al., 2010; Ozcan and Reichstein, 2009; Sorensen, 2007), but do not examine whether these

selection processes affect entrepreneurial outcomes. If selection effects occur, the assumption of time independence between the different stages of the entrepreneurial process is violated.

Third, prior research on initial size and entrepreneurial exit relies on samples of venture that have already been created. These samples do not allow to adequately control for selection issues because they lack information on individuals who are at risk of becoming entrepreneurs but did not enter.

In synthesis, prior work findings might be questioned if selection processes at entry produce substantial bias in the analysis of entrepreneurial outcomes. Disentangling selection effects from experience effects is fundamental when assessing entrepreneurial performance.

Therefore, the first research question that my dissertation examines is:

- *Do selection effects at entry impact the post-entry process?*

Once examined the magnitude and the direction of selection effects on initial size, performance, and exit, it becomes crucial understanding the causes, i.e. the origins of these effects. A fundamental reason might reside in the fact that founders' background characteristics influencing the individual likelihood to entry affect *also* the post-entry process. As a result, investigating the impact of these attributes on start-up size requires considering the effects that they have on entry, otherwise every detected correlations risk to be spurious. This takes on a greater importance when investigating entrepreneurial performance because it adds a further complexity to the model. Such complexity might be relaxed if omitted variables capturing selection effects are identified. Such factors might not necessarily be at individual level. In

effect, I anticipate a central finding of my dissertation: selection processes occur also at group level, and in particular at the level of types of entrants (such as spinouts, or de novo).

Therefore, a second research question logically comes up:

- *Why do selection effects occur?*

A next step involves considering why these selection effects at entry do actually influence the post entry process. Investigating the underlying explanatory mechanism involves challenging prior work's implicit assumption that the relationship between founders' characteristics and initial size or performance is just the result of a treatment based explanation, (i.e. the learning effect of experience). Challenging the dynamics underlying causal relationships, in Whetten (1989)'s word: "is probably the most fruitful, but also the most difficult avenue of theory development" (Whetten 1989: 493). Sorensen and Fassiotto (2011), suspect the existence of two selection-based mechanisms: at entry and exit from prior employer. I show that different selection-based mechanisms influence not only the entry threshold but also the initial size and exit ones.

Therefore, a third research question states:

- *How do selection effects influence the post-entry process?*

Finally, the issues alluded to above might have profound theoretical and empirical implications for the study of entrepreneurial outcomes. My dissertation ultimately cautions against ignoring selection effects because it might seriously compromise the understanding of fundamental phenomena in entrepreneurship, such as the individual – level determinants of initial size, performance, and exit.

Therefore a final research question is:

- *What are the consequences of ignoring selection effects?*

Each of the three research papers demonstrates a fundamental implication of considering selection effects in entrepreneurship and heterogeneously addresses all these four inquiries.

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RESEARCH PAPERS

ENDOGENEITY IN START-UP SIZE.

SELECTION EFFECTS AMONG TYPES OF ENTRANTS

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Abstract

In contrast to previous efforts to model start-up size, we view initial size as an entrepreneur's strategic choice rather than an outcome of the entrepreneurial process. We show that the way entrepreneurs enter markets, i.e. types of entrants (Helfat & Lieberman, 2002), influences their approach to the initial size choice. Such influence is not straightforward, but occurs through different sorting processes by individuals into organizations and into entrepreneurship. These sorting processes ultimately make the determinants of initial size vulnerable to selection biases. Theoretical arguments are proposed to suggest why types of entrants lead to different initial size predictions, as well as the implications of sorting processes. We demonstrate that prior research may misreport the true effects of the entrepreneurs' characteristics on initial size if types of entrants are treated as an all in one category. Using matched employee–employer data over eight years, we test the model on a population of Swedish ventures in the knowledge-intensive sector.

Key words: *initial size, self-selection, types of entrants.*

1. INTRODUCTION

A central notion in entrepreneurship is the initial size of a firm. A substantial amount of research finds that firms start small, and starting small severely affects new venture survival (e.g. Agarwal & Audretsch, 2001; Audretsch & Mahmood, 1995; Dunne, Roberts, & Samuelson, 1989; Mata & Portugal, 1994) and growth (Audretsch, Santarelli, & Vivarelli, 1999; Cabral, 1995; Evans, 1987). Nevertheless, much less work has focused on the determinants of initial size. We infer this comes from the view of initial size as an *outcome* of the entrepreneurial processes⁵. Understanding the determinants of initial size becomes not only curious, but fundamental if we conceptualize initial size as an entrepreneur's *strategic choice*, since it would suggest reexamining the relationship between initial size and performance.

The preponderance of research on initial size casts it as being primarily determined by the structural forces of the market entered (e.g. Acs & Audretsch, 1989; Arauzo-Carod & Segarra-Blasco, 2005; Mata & Machado, 1996). This view contrasts with evidence of heterogeneity in start-up size within a market (Geroski, 1995). It also diminishes the role of the entrepreneur in shaping the entry process (Baum, Locke, & Smith, 2001; Short, Mckelvie, Ketchen, & Chandler, 2009), implying that one size fits all entrepreneurs (Freeman et al., 1983:693).

In this paper, we theoretically and empirically investigate how the way entrepreneurs enter the market, i.e. types of entrants (Helfat & Lieberman, 2002) conditions their initial size choices. We identify spinoffs, spinouts, and start-ups. Spinoffs are firms partially owned by a parent company, but independently managed and sometimes listed on the

⁵ A number of papers considers initial size as measure of short term performance (e.g. Elfenbein et al., 2010)

various stock markets; the parent company can have different degrees of control based on strategic, financial, and human resources (Ito, 1995: 431-432). Spin-outs are new firms started by individuals who were employees of existing firms in the industry in the year prior to the spin-outs formation (Agarwal et al., 2004:509). Start-ups are new firms whose founders are ascertained to have no previous employment or financial relationship to established firms in the industry (Helfat & Lieberman, 2002: 30). Our contribution goes beyond flagging a problem of omitted variable (i.e. types of entrants). We identify and empirically reconcile three selection processes: (1) size is observed only when entry occurs; (2) the way an entrepreneur enters a market (i.e. spinoff, spinout, or start-ups) is endogenous to the entry decision; (3) individuals self-select into entrepreneurship (Elfenbein, Hamilton, & Zenger, 2010; Sørensen, 2007; Sørensen & Phillips, 2011).

The selection processes alluded to above have profound empirical implications for the study of initial size. Despite the growing attention the phenomenon of spinouts has been receiving (Klepper, 2009), entrepreneurial research on initial size has largely ignored the differences between startups, spinouts, and spinoffs, and treat them as an all in one category (Astbro & Bernhardt, 2005; M. G. Colombo, Delmastro, & Luca Grilli, 2004; José Mata, 1996). Our aim is to caution against this treatment for twofold reasons. First, if the individual-level determinants of initial size do systematically differ across types of entrants, then, combining these entry processes may obscure the true impact of these variables on initial size, i.e. the *average effect* (Hardy, 1993). Second, if sorting processes are at work, i.e. individuals with certain backgrounds self-select into firms before founding their venture, and the entry size threshold for potential entrepreneurs varies across types of entrants, then neglecting these selection processes might seriously bias

our understanding of how entrepreneurial characteristics influence initial size.

We have several objectives in this paper. First, we examine why types of entrants influence the size at which entrepreneurs start their venture. Second, we look at the empirical evidence around these issues by identifying nearly 20,000 new technology ventures in Sweden and tracking the entrepreneurs that founded them between 1994 and 2001. Third, we show the empirical implications of ignoring types of entrants in the entrepreneurial process. Our results support the idea that entrepreneurs undertaking different entry processes enter at significantly different sizes and suggest they have different incentive structures. These findings have important implications not only for how we interpret prior research but also for how we can undertake future research. In particular, we contribute to the promising view of prior employer as influencing individuals' opportunity structures (Sørensen & Fassiotto, 2011).

The remainder of the paper is organized as follows. Section 2 reviews prior theoretical and empirical contributions on initial size. Section 3 examines the theoretical rationales for why types of entrants influence initial size. Section 4 describes the data. Section 5 performs the empirical analysis to test our theoretical model. Section 6 concludes.

2. THE DETERMINANTS OF A FIRM INITIAL SIZE

The preponderance of research on the determinants of initial size is rooted in the industrial economics literature and deals with *industry-level* characteristics (Acs & Audretsch, 1989; Arauzo-Carod & Segarra-Blasco, 2005; Görg, Strobl, & Ruane, 2000; Mata & Machado, 1996). In particular, factors such as minimum efficient scale (MES), suboptimal scale, industry size, industry turbulence, and industry growth have been found

to systematically influence initial size.

More recently, some work has explored how *individual – level* characteristics affect firm initial size, above and beyond industry factors. This stream coincides with research examining the effect of entrepreneurs' background characteristics on the likelihood of entry (Steven Klepper & Sleeper, 2005; Sørensen, 2007), on performance (Chatterji, 2009; Elfenbein et al., 2010), and on survival (Dahl & Reichstein, 2007; Gimeno, Timothy B. Folta, Cooper, & Woo, 1997). Some scholars have investigated whether entrepreneurs are financially constrained and how such constraints impact over firm initial size (Colombo & Grilli, 2005; Holtz-Eakin et al., 1993). More relevant to our purpose, some scholars have investigated the impact of a founder's human capital on startup size (Astbro & Bernhardt, 2005; Barkham, 1994; M. G. Colombo et al., 2004; Cooper, Woo, & Dunkelberg, 1989; José Mata, 1996; P. W. Roberts, S. Klepper, & Hayward, 2011). Their key argument is that an entrepreneur's human capital positively influences initial size because: (1) better qualified individuals suffer to a lesser extent from financial constraints, since they are probably wealthier and have easier access to capital (higher credibility); (2) better qualified individuals have greater confidence in their skills, and, thus, in the likelihood to succeed as entrepreneurs; therefore they are less afraid of bearing the initial sunk costs (under the assumption that individuals' human capital correlates with entrepreneurial ability). Those studies refer to both generic and specific human capital. The former includes the level of education and the extent of work experience, with particular regards to managerial and self-employment experience (Astbro & Bernhardt, 2005; Barkham, 1994; M. G. Colombo et al., 2004; José Mata, 1996). The latter includes work experience in the same industry of the startup, both in

wage work and self-employment (M. G. Colombo et al., 2004; P. W. Roberts et al., 2011). Colombo et al. (2004) have interestingly found that industry related experience matters more than education or generic work experience in determining the initial size of the firm.

Prior job experiences endow entrepreneurs with a set of skills, knowledge, networks, and financial resources that are mirrored in the new venture pool of resources and capabilities (e.g. (Gompers, Lerner, & Scharfstein, 2005; Steven Klepper, 2002). “Resources and capabilities often vary by type of entrants” (Helfat & Lieberman, 2002: 731), and those initial endowments have long lasting effect on performances (Geroski, Mata, & Portugal, 2010; Heirman & Clarysse, 2005). Indeed, to ascertain the effects of those resources and capabilities some studies have examined the performance implications of specific types of entrants, like spinouts (e.g. Klepper, 2009; Phillips, 2002). Despite the encouraging evidence of those studies, none has yet systematically investigated whether and how the way an entrepreneur enters a market influences his decision on initial size. A unique attempt in this direction, as well as a theoretical bridge with the discussed stream on human capital, is offered by Roberts et al. (2011)’s recent work in the context of the Australian wine industry. They categorize new entrants according to the strength of their industry experience, i.e. those with direct industry experience (prior employees and entrepreneurs in the industry), those with indirect industry experience (wine suppliers, retailers, and distributors), and those with no industry experience. Those latter start at the smallest size.

Finally, despite their compelling theoretical contributions, prior empirical work has commonly ignored that entrepreneurs’ decisions on entry and size are interdependent

(Acs & Audretsch, 1989; Arauzo-Carod & Segarra-Blasco, 2005) and that entry is an endogenous and self-selected decision (e.g. Elfenbein et al., 2010; Sørensen, 2007). Nevertheless, to the best of our knowledge, only a couple of papers (Colombo et al., 2004; Mata, 1996) have controlled for sample selection biases by using truncated models as suggested by Bloom & Killingsworth (1985). However, data constraint may make such corrections not completely satisfactory (Maddala, 1983). Their datasets lack observations on individuals that are at risk of switching to entrepreneurship but ultimately do not (non-treatment sample). If there are omitted variables influencing both entry and initial size then the estimation may be biased (Shaver, 1998). Additionally, the lack of longitudinal data prevents them from controlling for individual time-invariant observable and unobservable characteristics (B. H. Hamilton & Nickerson, 2003).

The discussion above highlights three issues. First, prior research has underrepresented the role of entrepreneurs in actively shaping the initial size of their firm. Second, it has treated types of entrants as an all in one category, ignoring the implications in terms of entrepreneurs' approach to the initial size decision. Third, it has overlooked that the decisions on entry and initial size are interdependent and subject to potential sorting processes.

3. TYPES OF ENTRANTS, SELECTION EFFECTS, AND INITIAL SIZE

In this section, we examine why the way entrepreneurs enter markets influences their initial size choices. We consider human, social capital, and sorting processes as sources of heterogeneity.⁶

⁶ We focus our theoretical analysis on the differences between spinouts and startups, leaving spinoffs to an empirical issue, since we are mainly concern with how an entrepreneur *deliberately* chooses the initial size

Human Capital

Individuals that enter as spinouts might easily leverage on the skills and know-how acquired at their parent company, as opposed to startups founders, who are mainly unemployed, or without industry experience. This idea⁷ has been the most popular explanation for the fact that spinouts outperforms other types of new entrants (Klepper, 2009: 163). Such stock of human capital might suggest higher initial sizes for spinouts than for startups. Spinouts' founders are more confident of their entrepreneurial abilities, and hence more concerned with the upside potentials of their new venture rather than the downsides risks (higher risk-propensity). Conversely, start-ups founders are much more concerned with the potential losses of a failure. This reasoning is robust above and beyond industry experience, since skills previously acquired may perish or turn obsolete, especially in fast moving environments such as those of our high-tech sample. Yet, a positive relationship between spinouts and initial size might be suggestive of other explanations, currently underrepresented in the whole emerging literature on prior workplace & entrepreneurship (Sørensen & Fassiotta, 2011).

Social Capital

Prior employers provide prospect entrepreneurs not only with skills and knowledge but also with relevant personal and professional ties: “organizations create their own

of his firm. Spinoffs are viewed as hybrids between new firms (de novo) and diversifying ones (de alio), because they are controlled by established firms, but at the same time they are new entities (Helfat and Lieberman, 2002).

⁷ The debate has regarded the type of capabilities developed, their relative performance effects (e.g. Agarwal et al., 2004; Chatterji, 2009; Klepper & Slepper, 2005; Eriksson and Kuhn, 2006); and how attributes of prior employer (size & performance) influence the development of these skills (e.g. Sorensen, 2007; Dahl and Reichstein, 2007).

competition by providing the skills and background that provide credibility for the entrepreneur” (Freeman, 1986:39). Some scholars suggest that working in a firm exposes prospect entrepreneurs to important networks or relationships with suppliers and customers (Gompers et al., 2005); with colleagues that have prior entrepreneurial experience (Nanda & Sørensen, 2010); with potential investors (Burton, B Sørensen, & M Beckman, 2002; C. Lee, K. Lee, & Pennings, 2001). The impact of this social and reputational capital on initial size may occur through enhanced access to resources and signaling effects (Stuart, Hoang, & Hybels, 1999). When an entrepreneur starts his venture the links to clients, supporters, or customers are not yet established. Networks help entrepreneurs overcome the reluctance of those latter to establish relationship-specific investments (Brüderl, Preisendörfer, & Ziegler, 1992; Gompers et al., 2005). Moreover, prior employer prominence and prior developed ties offer external investors a positive signal on the quality of the new venture, which turns into an easy and timely access to credit (Burton et al., 2002). To sum up, spinouts’ founders start larger than startups’ ones because they can better access resources and attract employees. Despite all individuals are endowed with a pool of personal and professional ties, spinouts’ founders rely on a more valuable set of relationships than startups. Those latter typically leverage on personal ties, usually instable, and more likely to dissolve in case of adverse conditions. Moreover, relationships are vulnerable to time, hence years of unemployment might irreversibly harm the startups stock of social capital.

Sorting Processes

Recently, some work has cautioned against the risk that a relationship between prior workplace characteristics and entrepreneurial entry might spuriously be the result of sorting processes. Individuals might sort into organizations with certain entrepreneurial attitudes and abilities (Elfenbein et al., 2010; Sørensen, 2007; Sørensen & Fassiotta, 2011; Sørensen & Phillips, 2011). For example, Klepper (2009) suggests that the empirical evidence for which better spinouts come from better employers might reflect that better firms attract better employees. This reasoning is validated by Elfenbein et al. (2010)'s *ability* sorting argument. Another kind of sorting process involves individuals with *preference* for autonomy selecting into small entrepreneurial ventures. Finally, Sørensen (2007) highlights the process of *strategic* sorting, for which individuals might sort into firms that they believe will provide relevant experience (human and social capital) to achieve their final goal of becoming a successful entrepreneur. This sorting process may be particularly critical in our empirical analysis since it is reasonable to expect that the size thresholds for prospective entrepreneurs differ systematically by types of entrants. Individuals that start as spinout might substantially differ in terms of entrepreneurial abilities and incentives to entrepreneurship. From a methodological perspective, evidence of these mechanisms would suggest that controlling for types of entrants may not be enough and separate analysis by category might be required.

Theoretical Summary

Prior discussion highlights three issues. First, the way an entrepreneur enters a market influences initial size, above and beyond industry controls. We identify two treatment-based rationales, human capital and social capital. Moreover, recently work on

entrepreneurial entry has provided evidence that individuals self-select into entrepreneurship, but the implications of this selection process on entrepreneurial outcomes have been largely ignored.⁸ Hence, we will assess whether this sorting process influences initial size. Second, if the individual level determinants of initial size interacts with types of entrants, or in other words, are systematically different between spinouts and startups, then combining the two kinds of processes will obscure the true effects of individual level variables on initial size. Third, if sorting processes are at work (i.e. individuals with certain characteristics or experiences self-select into spinouts or startups before founding the new venture) then type of entry is endogenous to the entry decision. Neglecting this selection process might seriously harm the study of initial size. The selection might be attributed to unobserved *time-variant* factors (as well as time-invariant), as shaped by prior experiences, and this might turn into different approaches to the initial size decision. Drawing on the insight for which “the rationality of any given entrepreneur is determined by past experiences” (K. D. Miller, 2007: 68), we view spinouts’ founders as driven by a *profit maximization logic* for which starting small is an inefficient choice, and startups’ entrepreneurs as driven by a *cost-minimization logic*, for which starting small is a valuable option. Startups’ founders are less confident about their entrepreneurial abilities and, hence might rationally limit their initial commitment⁹.

⁸ With the exception of Sorensen& Phillips (2011), on entrepreneurial earnings and survival.

⁹ Close to hybrid entrepreneurs (Folta et al., 2010), this behavior may be considered as a learning option that allows entrepreneurs to reduce the amount of sunk costs borne in case of failure or, alternatively, increase the initial investment if prospects are good . With the differences that hybrids have higher opportunity costs than startups.

4. METHOD

Data and Sample

The data we use are a special (high-technology) extract from a set of three matched longitudinal data sources on the entire Swedish labor market that were gleaned from governmental registers and maintained for research purposes by Statistics Sweden.¹⁰ The first source is LOUISE—which has demographic and financial information for all legal residents of Sweden over the age of sixteen from 1989 onward. The second source is RAMS—which tracks employment flows in the labor market based on an annual mandatory survey for all firms having at least one employee or earning a profit. The third source is SRU—which tracks financial information for each firm and is submitted annually to the fiscal authorities for taxation purposes. The special abstract we use for analysis is called EPRO (Entrepreneurial Processes Database) and was commissioned for a broader project on entrepreneurship in high-technology manufacturing or knowledge-intensive service sectors, which are thought to be important to the Swedish economy. Individuals were identified as working in these sectors if their employer was in an industry that met Eurostat and OECD classifications, which are based on the ratio of research and development expenditures to gross domestic product. The EPRO extract covers any individual who was active in these sectors at any time from 1989 to 2002.

We constructed a risk set based on individuals, between the ages of 22 and 52, who began working as “employed” (and not involved in self-employment) for a high-

¹⁰ Statistics Sweden is a division in the Ministry of Finance with authority over all national statistics for Sweden, including those related to industry and trade. RAMS is an acronym for *Registerbaserad Arbetsmarknadsstatistik*, which in English is equivalent to “Register-based Labor Statistics.” SRU is an acronym for *Standardiserad Räkenskapsutdrag*, which in English is equivalent to “Standardized Accounting Summary.” We believe our data to be comparable to recent studies using matched employee-employer data for Denmark (Sorensen 2007).

technology manufacturer or knowledge-intensive service firm in 1994. A focus on newly employed eliminates problems with left-censoring, which occurs when a person becomes at risk of switching prior to our ability to observe them; and beginning in 1994 enables measurement of labor market experience since 1989 and avoids the worst of the recession in Sweden in the early 1990's. 144,690 individuals become at risk of transitioning from their current job in 1994 to entrepreneurship, unemployment, or another job. They remain at risk until they enter self-employment or unemployment, or become deceased, or emigrate, or the end of the observation period in 2001.

Identifying New Firms and their Entrepreneurs

We identify new entrepreneurial firms using the history of all firms listed in RAMS by identifying whether a firm is listed as new in a year. For all (new) firms we match individuals listed as self-employed in that firm. In cases where there were more than one self-employed individual, we selected the individual having the highest salary coming from the venture, or in cases where multiple people earned the highest salary we randomly selected among them. So, each new firm had one individual designated as the entrepreneur. We eliminated from the risk set all other self-employed individuals in the new firm. This resulted in 19,975 new firms. The sample of new firms consists of both corporations (3,086) and unincorporated ventures (16,889).

Measures

Dependent variable.

We use two measures of firm initial size. The first measure is number of employees in the year of founding (included the founder). This measure has been repeatedly used in literature (e.g. M. G. Colombo et al., 2004; Cooper et al., 1989; Geroski, 1995; J Mata & Machado, 1996), and is available for all new firms in the sample. The second measure is designed to proxy for the initial capital required for start-up, but is only available for the 3,086 corporations among the 19,975 new firms in the sample (15.3 percent). This measure is generated by taking in the year of entry the log of the sum of land assets, capital assets, equipment, intangible assets, write downs on short-term assets for year 1, capital losses in year 1, write offs on long-term assets in year 1, pre-paid operating costs (such as rent), investments in inventory, accounts payable, accrued taxes in year 1, pre-paid operating costs, other current liabilities and total salaries (e.g. Astbro & Bernhardt, 2005; Barkham, 1994; Holtz-Eakin Douglas et al., 1993). In high-tech industries, the two measures are likely to be highly correlated (Colombo et al., 2004). We run results on both measures of initial size to check for robustness.

Independent Variables.

Our variables are defined in the Appendix.

5. RESULTS

In this section, we first examine the distribution of initial size in general, as well as across types of entrants, and note the transition rates from wage work to self-employment. Next, we perform bivariate analysis to provide preliminary evidence for

whether there are systematically different predictors of initial size across types of entrants. Finally, we perform multivariate analysis to investigate whether start-up size suffers from endogeneity, where endogeneity comes from, and what are the implications of ignoring endogeneity when examining initial size.

Rates of Entrepreneurship and Initial Size

Table 1 displays the distribution of entries over the years 1994 to 2001. In 1994 the sample consisted only of wage workers. The table also identifies the number of non-entries, i.e. individuals that are at risk of moving to self-employment but stay in the wage work. Entries are observed in the year an individual leaves employment and switches to the new labor status. Focusing on corporations, there were 3086 entries between 1995 and 2001. Consistent with prior research, entry is a relatively rare event representing a small portion of the entire sample (Nanda & Sørensen, 2010).

Table 2 shows the relevant statistics for our two dependent variables representing the size of the new venture. In our sample, the mean number of employees is 1.95, while the mean amount of capital invested is 1.085.182 kronor. The number of employees seems lower compare to those on in prior studies. A reason may refer to the fact that prior work relies only on restricted samples of startups, whereas our dataset is built on the entire working population, thus it may overstate the economic impact of sole proprietorships (Elfenbein et al., 2010). Additionally, the ratio between the mean startup size and the mean firm size in Sweden is comparable to those of others countries, suggesting Swedish firms are smaller. The distribution of size by deciles suggests that the size variables present high levels of skewness, especially with regard to the number of employees.

Insert Table 1 & 2 about here

Types of entrants and Initial Size

Tables 3a and 3b illustrate the distribution of different types of entrants across levels of initial size, measured, respectively, as number of employees and as amount of capital invested. The distribution of entries over different types of entrants suggests that 50.3 percent are start-ups, 43.3 percent are spinouts, and 6.3 percent are spinoffs. Both tables show considerable variance in our independent variables across different levels of our dependent variables. Moreover, the tables preliminary reveal that types of entrants and initial size are to some extent correlated. In particular, in terms of number of employees, start-ups are more likely to start the smallest, whereas spinoffs are more likely to start the biggest. Interestingly, more than 70% of start-ups have no employees but the founder, suggesting the existence of resource constraints. This general pattern seems to hold true also when initial size is measured by the amount of invested capital. Nevertheless, when considering number of employees, almost 90% of the sample is represented by firms at the bottom of the initial size distribution (one or two employees); conversely, when considering amount of capital invested, the sample follows a more normally distributed pattern.

This bivariate analysis eventually suggests that it may be reasonable to believe that types of entrants significantly influence the initial size of a firm.

Insert Table 3a & 3b about here

Bivariate Analysis

Table 4 compares the mean levels of several of the key independent variables across entrants and non-entrants, and across types of entrants. Column 4 indicates that the determinants of entry are quite different from the determinants of non-entry, as it has been persistently found in the literature.

Columns 5-7 reveal that individuals choosing alternative types of entrants paths are quite different along many dimensions. In particular, a handful of notable differences emerges. First, start-ups have higher hybrid experience compare to the other types of entrants, consistent with the intuition that less confident, therefore less experienced, entrepreneurs choose hybrid entry to limit their sunk cost commitment while learning about their unknown abilities (Folta et al., 2010). Likewise, their relative scarce self-employment and industry experiences support the evidence for which individuals prefer hybrid entry when they have less experience in the entrepreneurial context (Folta et al., 2010). Moreover, not surprisingly, they are more likely than the other categories to be unemployed, and to have lower wages. Second, spinouts' founders have on average less personal wealth than start-ups, providing additional evidences for which (specific) human capital may act as substitute for financial capital (Astbro & Bernhardt, 2005; Dunn & Holtz-Eakin, 2000). Moreover, spinouts are more likely than others to have parents with self-employment experience. If we combine it with the fact that individuals with parental

self-employment experience are more likely to become entrepreneur (Halaby, 2003; Sørensen, 2007), then we can infer that founders of spinouts are the most likely to enter. Third, founders of spinoffs are more likely to come from a small firm. This is consistent with the small firm effect, i.e. the negative relationship between prior employer size and the likelihood to become entrepreneurs (for a thought review of the literature see Elfenbein et al., 2010). Overall, it's worthwhile highlighting that start-ups, spinouts, and spinoffs exhibit ordinal patterns across a host of explanatory variables, suggesting that the extent of parent company influence matters quite a bit.

Insert Table 4 about here

Multivariate Analysis

We now turn to empirically investigate whether the analysis of the determinants of start-up size is vulnerable to endogeneity (Shaver, 1998). Our empirical strategy unfolds through the three following steps:

- I. Replicate prior models on start-up size;
- II. Assess the presence of individual process of self-selection into entrepreneurship (first source of endogeneity in start-up size);
- III. Assess whether omitted variables [i.e. types of entrants] cause bias in coefficient estimations (second source of endogeneity in start-up size).

Table 5 synthesizes the results of such empirical strategy. In particular, Column 1 replicates prior discussed studies on the positive influence of founder's human capital on start-up size, above and beyond the industry effect (found in industrial organization studies). Consistently, we find that the estimated effects of the human capital variables are highly statistically significant. In particular, consistently with Colombo et al. (2004), specific human capital (*entrepreneurial experience* and *industry experience*) as a whole has a stronger influence than generic human capital (*wage experience* and *education*).

We extend the specification and add to this model founder's wealth (column 3), to control for the fact that individuals might be financially constrained (Evans & Jovanovic, 1989). As expected, *household wealth* is statistically significant and positively correlated to start-up size. Despite the preponderance of research on start-up size don't, controlling for founder's financial wealth it's crucial to avoid that a plausible correlation between human capital and financial capital obfuscates the analysis of start-up size (Astbro & Bernhardt, 2005).

After this indispensable preliminary analysis, we turn to the second step of our empirical strategy: the investigation of potential selection bias. Column 2 and 4 re-estimate the models presented in Column 1 and 3 and include a correction term for selection bias (i.e. the *Inverse Mills Ratio*). This term is highly statistically significant meaning that individuals self-select into entrepreneurship due to unobservable factors. More importantly, after correcting for these self-selection processes, we notice that all the human capital variables, but entrepreneurial experience¹¹, dramatically reduce their

¹¹ We explain this result because in the probit model (Table 6) the variable for entrepreneurial experience is the only human capital variable that has a negative sign on entry and a positive sign on start-up size. Therefore, we plausibly argue that the positive effect that human capital has on start-up size is reduced to the extent that human capital has a positive effect on entry. The theoretical explanations underlying the

explanatory power. We obtain the Inverse Mills Ratio from the estimation of a probit model where the dependent variable is a dummy which takes value 1 if the individual becomes self-employed (entry) and 0 if he remains a wage worker. Table 6 reports the estimated coefficients. As we can see, the model closely resembles other studies on entrepreneurial entry (e.g. Elfeinbein et al., 2010; Folta et al., 2010), hence we are confident that the Inverse Mills Ratio we develop from this selection stage is correct. Interestingly, the variables mostly affected by selection bias in start-up size regression are those who are strongly significant *and* in the same direction in the entry model. This suggests that the effect of human capital found in the previous size regression is upwardly biased, since it captures the positive effect that founders' human capital has on entry. In synthesis, our first finding cautions against ignoring self-selection processes when studying initial size.

We now dig into the causes of these self-selection processes by investigating whether the way an entrepreneur enters a market might be considered as the omitted variable of the model. So, column 5 (Table 5) adds the three types of entrants variables, as well as a number of controls that corresponds to the entry choice variable¹². Three findings are worth highlighting. First, as expected, types of entrants have a very strong impact on start-up size (*start-ups*¹³, *spinout*, *spinoffs*). Second, by performing a Log Likelihood test, we found the model fit increased dramatically respect to prior models. Third, more

peculiarity of entrepreneurial experience respect to the others, support the emerging literature on serial entrepreneurship (Westhead, Ucbasaran, Wright, & Binks, 2005).

¹² If all the variables that influence both the entry choice and the performance are included as control variables in the performance equation then the analysis yields unbiased estimates (Hamilton & Nickerson, 2003: 61). However, results (available upon request) show that this is not the case, and adding the observable entry choice variables do not capture the endogeneity in start-up size, suggesting that still is due to unobservable factors (i.e. not yet included in the model).

¹³ We split the start-up category into de novo and unrelated spinouts (employees coming from a firm in a unrelated industry).

importantly for our analysis of endogeneity, the Inverse Mills Ratio becomes insignificant and there's no more evidence that selection effects produce meaningful bias in our estimation. This latter finding strongly suggests that types of entrants is our omitted variable. Hence, self-selection processes occur at *group* level (types of entrants) rather than at individual level (ability sorting or preference sorting). In synthesis, our second finding posit that the implications of treating types of entrants as an all in one category are not only curious (goodness of the model) but fundamental, since the start-up size decision seems to be endogenous to types of entrants. Methodologically, including types of entrants in the analysis allows scholars to skip performing selection models (and, in turn, the need for non-entry sample).

Now we further investigate this evidence of types of entrants as the omitted variable of the model, by replicating the analysis on each category of entrant. Table 7 reports the coefficient estimations of such subgroup analysis¹⁴. We can't compare directly the coefficients among the three subgroups analysis (see Hardy, 2003 for a proposed test to assess the statistical differences in the coefficients of two subgroups), but our main interest here is in the three Inverse Mills Ratios. We compute those terms by following Hamilton and Nickerson (2003)'s procedure described in their Appendix (Hamilton & Nickerson, 2003: 75). We first proceed by running a multinomial logit model (selection equation) on types of entrants (Table 8) and then include the three Inverse Mills Ratios in the subgroups regressions. As expected, *all* the Inverse Mills Ratios are not significant and this strengthen our argument for which all the potential selection processes at entry

¹⁴ We decide to drop the category of spinoff because preliminary evidences from the bivariate analysis suggests the characteristics of spinoffs are more akin to those of established firm rather than the pure start-ups. Furthermore, the sample size is very small compared to the other types of entrants samples.

arise from self-selection into different types of entrants. In conclusion, the start-up size decision is endogenous to the way individuals select into different types of entrants.

Insert Table 5, 6, 7 & 8 about here

6. DISCUSSION AND CONCLUSIONS

What determines the initial size of a firm? The preponderance of research on firm initial size casts it as being primarily determined by industry-level factors, notwithstanding the substantial evidence of heterogeneity in start-up size within a market (Geroski, 1995). This view ignores that there are many ways in which entrepreneurs enter (Helfat & Lieberman, 2002). We believe our study is the first to systematically document the fundamental role of different types of entrants, namely spinout, start-ups, and spinoffs, on initial size.

Our theoretical model and empirical results point to the role of types of entrants on start-up size as not only direct (human capital and social capital) but also indirect (selection processes) and imply that treating types of entrants as an all in one category is problematic. Our work has three broad implications for research on entrepreneurship.

First, types of entrants determine start-up size above and beyond industry controls as well as founders' background characteristics, such as human capital and financial capital. Second, types of entrants is endogenous to the start-up size decision. Our empirical

model suggests that the strong evidence of selection bias found when replicating prior models fades away once we include the types of entrants categories. Therefore, we conclude that types of entrants represent the key omitted variables and in turn the key source of endogeneity and heterogeneity in start-up size.

Third, ignoring types of entrants lead to an overestimation of founder's prior experience on start-up size. Three implications arise. First, this does not imply that individual's human capital has no effect on start-up size, but we suspect that the mechanism through which human capital influences initial size is indirect, through types of entrants. Second, firm-level factors such as types of entrants, and legal status play a greater role than individual-level ones. Third, this points to the distinctiveness of the dynamics of initial size respect to entrepreneurial entry, providing support for a separate but interdependent analysis. Indeed, we provide evidence that the decision process leading an individual to choose the size of his venture is not independent of the entry decision.

Empirically, to the best of our knowledge, our study is the first on the determinants of start-up size which control for the entry stage, and hence produce unbiased results. All prior studies on start-up size rely on sample of new ventures. Those are self-selected samples since they only observe those firms that were actually founded (Mata 1996), and lack information on individuals that are at risk of becoming entrepreneurs but eventually don't. The findings from those studies may be called into questions if individual processes of self-selection into entrepreneurship are at work (Sørensen & Phillips, 2011). Our dataset allows us to appropriately perform sample selection models by providing information on the sample of non-entrepreneur (Heckman, 1979). Furthermore, we

contribute to the recent call for multilevel longitudinal analysis according to the insight for which new venture outcomes are particularly subject to relationships that cross both levels and time at the same time (Holcomb, Combs, Sirmon, & Sexton, 2009). As concern time dependence, finding data sources that provide information on entrepreneurs' prior work experience is challenging (Steven Klepper, 2009; Sørensen & Phillips, 2011). As concern levels dependence (Bliese & Hanges, 2004; Geroski et al., 2010; Short et al., 2009), we managed to account simultaneously for industry, firm, and individual effects, along with the empirical literature on survival, supporting the view for which multi-level factors are jointly at work (Bliese & Hanges, 2004; Brüderl et al., 1992; Short et al., 2009).

In the end, our work encourages scholars to investigate whether and to what extent endogeneity in start-up size impacts the analysis of entrepreneurial performance, and which role types of entrants play with this regard. Our results preliminary suggest a potential interaction between types of entrants and initial size in the analysis of start-up performance, and encourage theoretical development of the mechanisms behind it.

TABLES

TABLE 1. Number and Percent of Entries and Non-Entries by Year

<i>Sample</i>	<i>1994</i>	<i>1995</i>	<i>1996</i>	<i>1997</i>	<i>1998</i>	<i>1999</i>	<i>2000</i>	<i>2001</i>	<i>Total</i>
Non-Entries	133017	132715	132202	131680	131077	130568	129858	129526	1050643
%	99.55	99.7	99.71	99.77	99.8	99.78	99.65	99.71	99.71
Entries	601	403	391	305	261	290	462	373	3086
%	0.45	0.3	0.29	0.23	0.2	0.22	0.35	0.29	0.29
Total	133618	133118	132593	131985	131338	130858	130320	129899	1053729

TABLE 2. Descriptive Statistics of Initial Size upon Entry on Corporations

	<i>Mean</i>	<i>S.D.</i>	<i>10 decile</i>	<i>25th decile</i>	<i>50th decile</i>	<i>75th decile</i>	<i>90th decile</i>
Initial # of Employees	1.9536	4.7432	1	1	1	2	3
log(Initial # of Employees)	0.9104	0.4239					
Initial Capital Invested	1,085,182	3,513,456	192,797	328,475	548,734	949,987	1,813,739
log(Initial Capital Invested)	13.2459	1.0531					

TABLE 3A. Number and Probability of Entry by Types of Entrants across Different Levels of Firm Initial Size (# Employees)

Types of Entrants	Initial Size (Initial # of Employees) Upon Entry								Total
	1	2	3	4	5	6-10	11-20	>20	
Start-ups	1,147	270	62	20	18	24	12	1	1,554
	73.81	17.37	3.99	1.29	1.16	1.54	0.77	0.06	100
Spinouts	841	330	47	51	17	29	12	11	1,338
	62.86	24.66	3.51	3.81	1.27	2.17	0.9	0.82	100
Spinoffs	93	47	19	8	2	10	8	7	194
	47.94	24.23	9.79	4.12	1.03	5.15	4.12	3.61	100
Total	2,081	647	128	79	37	63	32	19	3,086
	67.43	20.97	4.15	2.56	1.2	2.04	1.04	0.62	100

TABLE 3B. Means, Standard Deviations, and Deciles of Initial Size (Initial Capital Invested) by Type of Entry

Type of Entry	Initial Size (Initial Capital Invested) Upon Entry							Total
	Mean	S.D.	10 decile	25th decile	50th decile	75th decile	90th decile	
Start-ups	826,853	2,027,090	163,520	274,279	474,556	816,179	1,484,162	1,360
Spinouts	1116821	4,553,897	230,124	380,648	592,272	985,468	1,688,893	1,150
Spinoffs	2796830	4,181,798	282,253	525,989	1,154,179	3,098,047	7,655,153	184

TABLE 4. Variable Means Across Entry/No entry and Types of Entrants

Variable	Type of Entry						
	No Entry	Entry	Diff	Sign	Start-ups	Spinouts	Spinoffs
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Age	40.253	42.631	***	+	42.935	42.089	43.933
Education Percentile	0.509	0.655	***	+	0.633	0.681	0.655
Entrepreneurial Experience	0.354	0.912	***	+	0.862	0.948	1.048
Hybrid Experience	0.162	0.476	***	+	0.483	0.469	0.466
Married	0.509	0.665	***	+	0.674	0.639	0.768
Children	1.132	1.359	***	+	1.312	1.407	1.407
Sweden	0.906	0.930	***	+	0.929	0.927	0.969
Time Unemployed	0.383	0.453	**	+	0.626	0.293	0.169
Household Wealth	0.733	2.282	***	+	2.360	2.071	3.118
Personal wealth	1.822	2.243	***	+	2.379	1.974	3.009
Wage	11.135	11.469	***	+	11.087	11.837	11.987
Employer tenure	7.052	8.853	***	+	8.999	8.658	9.021
Tot. n. jobs	0.096	1.071	***	+	1.048	1.102	1.031
Industry Experience	4.378	4.597	**	+	2.809	6.384	4.188
Employer Size	7.313	4.803	***	-	5.830	4.019	3.915
Employer Age0_2	0.078	0.191	***	+	0.175	0.214	0.155

Employer							
Age3_6	0.054	0.122	***	+	0.089	0.152	0.170
Employer							
Age6_	0.851	0.659	***	-	0.714	0.599	0.634
Parental Self- employment experience	0.034	0.110	***	+	0.098	0.128	0.088
Number of observations	1,848,511	3086			1554	1338	194

*p<0_05; **p<0_01; ***p<0_001.

TABLE 5. Random Effects Negative Binomial Models on Start-up Size (Initial Number of Employees)

VARIABLES	Baseline	Self-Selection	Financial Constraints	Self-Selection	Types of Entrants	Self-Selection
Age	0.008 (0.010)	0.010 (0.010)	0.009 (0.010)	0.011 (0.010)	-0.006 (0.010)	-0.008 (0.011)
Age Squared	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)
Education Percentile	-0.029 (0.029)	-0.011 (0.029)	-0.034 (0.029)	-0.015 (0.029)	-0.105*** (0.028)	-0.123** (0.039)
Wage Experience	0.020*** (0.006)	0.013* (0.006)	0.019*** (0.006)	0.012* (0.006)	0.012 (0.007)	0.011 (0.007)
Entrepreneurial Experience	0.028*** (0.005)	0.023*** (0.005)	0.028*** (0.005)	0.023*** (0.005)	0.002 (0.005)	0.003 (0.006)
Target Industry Experience	0.004* (0.002)	0.003 (0.002)	0.004* (0.002)	0.003 (0.002)	-0.005* (0.003)	-0.005 (0.003)
Household Wealth			0.004* (0.002)	0.004* (0.002)	0.004* (0.002)	0.004* (0.002)
Spinout ^a					0.190*** (0.025)	0.192*** (0.025)
Spinoff ^a					0.844*** (0.048)	0.844*** (0.048)
Unrelated Spinout ^a					0.103*** (0.024)	0.102*** (0.024)
Married					-0.046** (0.017)	-0.046** (0.017)
Number of Children					-0.008 (0.007)	-0.008 (0.007)
Sweden Citizen					-0.157*** (0.025)	-0.157*** (0.025)
Time unemployed					0.005 (0.004)	0.002 (0.006)
Salary Income					-0.005 (0.003)	-0.003 (0.004)
Employer Tenure					-0.231*** (0.035)	-0.242*** (0.038)
Employer Tenure Squared					0.014*** (0.003)	0.015*** (0.003)

TABLE 5. - Continued

VARIABLES	Baseline (1)	Self- Selection (2)	Financial Constraints (3)	Self- Selection (4)	Types of Entrants (5)	Self- Selection (6)
Employer age 0-2 ^c					0.061** (0.023)	0.065** (0.024)
Employer age 3-6 ^c					-0.005 (0.024)	0.002 (0.026)
Parental self-employment experience					-0.025 (0.023)	-0.041 (0.032)
Employer Size					-0.000 (0.002)	0.004 (0.007)
Number of Partners					0.121*** (0.016)	0.120*** (0.016)
% of Partner Income					-0.966*** (0.079)	-0.967*** (0.079)
Partnership (Legal Status) ^b					0.025 (0.039)	0.025 (0.039)
Corporations (Legal Status) ^b					0.350*** (0.020)	0.350*** (0.020)
Mills ratio		0.054*** (0.014)		0.055*** (0.014)		-0.039 (0.057)
Industry Dummies	yes	Yes	yes	yes	yes	Yes
Year Dummies	yes	Yes	yes	yes	yes	Yes
No. Observations	18,058	18,058	18,058	18,058	18,058	18,058
Log Likelihood	-22707.550	-	-22705.118	-	-	-
		22699.810		22697.188	21788.764	21787.831

Notes. Column (1) replicates prior models on human capital & start-up size. Column (2, 4, and 5) reports coefficients estimates after controlling for selection. compares hybrid entry versus the alternative of no entry.. Column (3) adds the financial constraints. Column (5) adds the types of entrants variable. Robust standard errors are in parentheses.

a Compared against omitted category *De novo*

b Compared against omitted category *Unincorporated Ventures*

c Compared against omitted category Employer Age >6

*p<0_05; **p<0_01; ***p<0_001.

TABLE 6. Probit Model (Self-Employment Entry (1) and No Entry (0))

VARIABLES	ENTRY
Age	0.068*** (0.005)
Age, Squared	-0.001*** (0.000)
Education Percentile	0.549*** (0.013)
Wage Experience	0.041*** (0.004)
Entrepreneurial Experience	-0.048*** (0.003)
Married	-0.004 (0.008)
Number of Children	-0.000 (0.003)
Gender	-0.203*** (0.007)
Sweden Citizen	0.004 (0.013)
Time Unemployed	0.081*** (0.002)
Wealth	0.037** (0.013)
Salary Income	-0.068*** (0.002)
Industry Experience	-0.082*** (0.003)
Industry Experience Squared	0.003*** (0.000)
Employer Tenure	0.302*** (0.015)
Employer Tenure Squared	-0.008*** (0.001)
Employer Size	-0.115*** (0.001)
Employer age 0-2	-0.109*** (0.013)
Employer age 3-6	-0.174*** (0.012)
Parental Self-employment experience	0.489*** (0.013)
	962,218
No. Observations	

Pseudo R-squared	0.175
Log Likelihood	-73988.101

Robust standard errors are in parentheses.

*p<0_05; **p<0_01; ***p<0_001.

TABLE 7. Negative Binomial Subgroup Models on Start-up Size (Initial # of Employees) by Types of Entrants.

VARIABLES	De novo Entrants	Unrelated Spinouts	Spinouts
Age	-0.005 (0.007)	-0.020* (0.009)	-0.017 (0.011)
Age, Squared	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Education Percentile	-0.008 (0.017)	-0.149*** (0.037)	-0.117*** (0.032)
Wage Experience	-0.003 (0.004)	-0.022** (0.007)	-0.011 (0.008)
Entrepreneurial Experience	-0.001 (0.004)	-0.002 (0.006)	-0.005 (0.006)
Target Industry Experience	0.002 (0.001)	0.001 (0.003)	-0.003 (0.003)
Household Wealth	-0.001 (0.001)	-0.005* (0.002)	-0.004* (0.002)
Number of Partners	-0.060 (0.065)	0.149* (0.067)	0.103 (0.080)
% of Partner Income	-0.947*** (0.256)	-0.903** (0.279)	-1.042** (0.340)
Sweden Citizen	0.012 (0.010)	-0.064* (0.032)	-0.087* (0.038)
Parental Self-Employment Experience	-0.030*** (0.009)	0.031 (0.028)	0.003 (0.025)
Partnership (Legal Status) ^b	-0.004 (0.034)	0.033 (0.029)	-0.018 (0.029)
Corporations (Legal Status) ^b	0.095*** (0.024)	0.356*** (0.034)	0.325*** (0.034)
Married	-0.014 (0.010)	-0.043 (0.023)	-0.059* (0.025)
Number of Children	-0.004 (0.004)	-0.001 (0.009)	0.008 (0.010)
Gender	0.005 (0.010)	-0.024 (0.015)	-0.014 (0.017)
Mills Ratio (De Novo)	0.005 (0.009)		
Mills Ratio (Unrelated Spinout)		0.002 (0.001)	
Mills Ratio (Spinout)			0.001 (0.003)
No. Observations	2,182	6,947	5,685
Pseudo R Squared	0.076	0.003	0.040

Robust standard errors are in parentheses.

*p<0_05; **p<0_01; ***p<0_001.

TABLE 8. Multinomial Logit on Entry (No Entry, Entry as Spinout, Entry as De Novo, Entry as Spinout)

VARIABLES	DE NOVO	UNRELATED SPINOUT	SPINOUT
Age	0.077*** (0.023)	0.156*** (0.017)	0.107*** (0.018)
Age, Squared	-0.001** (0.000)	-0.002*** (0.000)	-0.001*** (0.000)
Education Percentile	1.034*** (0.068)	1.140*** (0.049)	1.374*** (0.050)
Wage Experience	0.035* (0.015)	0.144*** (0.014)	0.038** (0.013)
Entrepreneurial Experience	-0.386*** (0.016)	-0.031*** (0.009)	-0.092*** (0.010)
Married	0.028 (0.041)	0.026 (0.028)	-0.100*** (0.029)
Number of Children	-0.041* (0.018)	0.003 (0.013)	0.003 (0.013)
Gender	-0.386*** (0.037)	-0.421*** (0.026)	-0.394*** (0.027)
Sweden Citizen	0.154* (0.062)	0.131** (0.047)	-0.190*** (0.046)
Time Unemployed	0.316*** (0.008)	0.112*** (0.007)	0.174*** (0.009)
Salary Income	-0.365*** (0.006)	0.007 (0.009)	0.052*** (0.009)
Employer Tenure	1.082*** (0.100)	0.648*** (0.097)	0.451*** (0.057)
Employer Tenure Squared	-0.032*** (0.007)	-0.019** (0.007)	-0.009* (0.004)
Employer Size	-0.332*** (0.007)	-0.196*** (0.004)	-0.302*** (0.005)
Employer Age 0-2	-0.827*** (0.065)	-0.621*** (0.047)	0.210*** (0.038)
Employer Age 3-6	-0.833*** (0.068)	-0.539*** (0.044)	-0.044 (0.039)
Parents Self-Employment Experience	1.162*** (0.058)	1.039*** (0.042)	0.957*** (0.041)
Wealth	0.162* (0.073)	0.036 (0.045)	-0.028 (0.046)
Industry Experience	-0.262*** (0.016)	-0.530*** (0.012)	0.238*** (0.011)
Industry Experience Squared	0.011*** (0.002)	0.022*** (0.001)	-0.013*** (0.001)

No. Observations	962,023	962,023	962,023
Pseudo R Squared	0.216	0.216	0.216
Log Likelihood	-84794.961	-84794.961	-84794.961

Robust standard errors are in parentheses.

*p<0_05; **p<0_01; ***p<0_001.

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APPENDIX A

TABLE A1 - Variables Definition

Variable Name	Definition
Wage work	Individual has a primary classification of "employed" and has no secondary classifications in self-employment
Self-Employed	Individual has a primary classification of "self-employed" or "self-employed in incorporation"
Wage	Log of Income from "employed" status
Household Wealth	Log of total household wealth
Personal Wealth	Log of total personal wealth
Married	Dummy variable = 1 if individual is married
Number of Children	# of children under 18 in the household
Education Percentile	Individual's percentile rank in years of education in the sample
Total Number of Jobs	Number of different firms individual has worked with since 1989
Time Unemployed	Log of number of days individual had been in unemployment in the prior year
Age	Individual number of years
Self-Employment Experience	Dummy variable = 1 if individual has at least 1 episode in self-employment in primary labor status classification
Target Industry Experience	Dummy variable = 1 if individual entered <i>Self-Employment</i> or <i>Hybrid</i> in the same industry in which they were a wage earner immediately previous to their entry
Parental Self-Employment Experience	Dummy variable == 1 if at least one parent was previously self-employed
Employer Tenure	Consecutive years individual has worked with current company
Employer Size	Log of the number of employees in the firm in which the individual works
Employer Age 0-2	Dummy variable = 1 if employer is between 0 and 2 years old
Employer Age 3-6	Dummy variable = 1 if employer is between 3 and 6 years old
Employer Age > 6	Dummy variable = 1 if employer is > 6 years old
Swedish Citizen	If individual is a citizen of Sweden
Partners	Number of co-founders
Spinoffs	Dummy variable = 1 if entry = 1 & prior employer has financial stakes

De Novo	Dummy variable =1 if entry = 1 & the firm is classified as “new by employees from unemployment/new on the work market” & parent company financial stake = 0
Unrelated Spinouts ¹⁵	Dummy variable =1 if entry = 1 & the firm is classified as “new by new employees from other organization numbers” & the industry entered is different, at two digit code level, from the prior one.
Spinouts	Dummy variable =1 if entry = 1 & the firm is classified as “new by new employees from other organization numbers” & target industry is the same (2 digit) of the prior one & prior employer has not financial stakes

¹⁵ Note that the combination of de novo and unrelated spinouts represent what we label start-ups. In the empirical analysis we split this category in order to see whether there are significant differences.

IN & OUT.

A SELECTION – BASED VIEW OF THE LIABILITY OF SMALLNESS

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A SELECTION – BASED VIEW OF THE LIABILITY OF SMALLNESS

Abstract

We revisit a pillar of research in entrepreneurship, i.e. the relationship between initial size and performance, to consider selection effects. We demonstrate that this stylized fact is influenced by group-level selection effects, namely at the level of types of entrants, such as de novo or spinout. We theorize and empirically show that the influence of types of entrants occurs through selection-based mechanisms operating in both entry and initial size decisions. In turn, those selection effects compromise the analysis of performance by questioning the role itself of initial size as key determinant. Using matched employee–employer data over eight years, we test the model on a population of Swedish wage earners in the knowledge-intensive sector.

Key words: entrepreneurial performance, initial size, types of entrants, self-selection.

1. INTRODUCTION

Understanding the determinants of new ventures performance is a cornerstone in the entrepreneurship research agenda. A central insight from a large body of literature is a positive relationship between startup size and survival (Rajshree Agarwal & Audretsch, 2001; Audretsch & Mahmood, 1995; Dunne et al., 1989; José Mata & Portugal, 1994). The main theoretical arguments behind this finding build upon population ecology (Brüderl et al., 1992; John Freeman et al., 1983) and industrial organization theories (Geroski, 1995; Jovanovic, 1982) and suggest that this relationship is primarily determined by the macro-level (population and industry) forces of the entered market. This view contrasts sharply with recent empirical evidence that downplays the role of environmental factors in explaining entrepreneurial performance (Short et al., 2009). Moreover, it ignores the role of founders' prior career on both initial size (Astbro & Bernhardt, 2005; M. G. Colombo et al., 2004) and performance (Baum et al., 2001; Brüderl et al., 1992; Shane & Khurana, 2003; Shepherd, Douglas, & Shanley, 2000). Finally, it assumes the effect of founders' prior career on the decision to entry as independent from those on initial size and performance. In this paper, we provide a theory-based structure for understanding the micro-level determinants of the liability of smallness and test them empirically. In particular, consistent with the imprinting effect of firms' attributes at entry (Stinchcombe, 1965), we theoretically and empirically investigate how *and* why the way entrepreneurs enter the markets, i.e. types of entry, influence the relationship between initial size and performance.

Following the types of entry taxonomy on founder's heritage (Helfat & Lieberman, 2002), we distinguish between three classes of purely new entrants: spinouts, unrelated

spinouts, and de novo. *Spin-outs* are new firms started by individuals who were employees of existing firms in the industry in the year prior to the spin-outs' formation (Rajshree Agarwal et al., 2004): 509). *Start-ups* are new firms whose founders are ascertained to have no previous employment or financial relationship to established firms in the industry (Helfat & Lieberman, 2002: 730). We split up this category into: (1) firms whose founders were previously employed in an industry unrelated to the one entered, i.e. *unrelated spinouts*, and (2) firms whose founders are currently unemployed or new to the labor force, i.e. *de novo*.

Our model blends upon the idea that founders of different types of entry might have different incentives and opportunity costs to entrepreneurship (Sørensen & Fassiotta, 2011), as well as different risk propensities. This implies that types of entry alter two central individuals' decisions: entry and start-up size.

The theoretical implications noted above may have profound empirical implications for the study of entrepreneurial performance. First, if types of entry determines both start-up size and performance, then the liability of smallness might turn out to be a liability of types of entry. Therefore, prior work might overemphasize the initial size effect on performance if it treats types of entry as an all in one category. Second, if types of entry also influences individuals' propensities to entry, then the performance effect might be spurious. Distinguishing between selection (at entry) and ability arguments is fundamental when assessing entrepreneurial performance. Third, jointly dealing with individuals' entry, start-up size, and entrepreneurial performance required addressing fundamental empirical challenges. In particular, it involves reconciling three selection processes: (1) individuals self-select into entrepreneurship (Elfenbein et al., 2010;

Sørensen, 2007; Sørensen & Phillips, 2011); size is observed only when entry occurs (J Mata, 1993)¹⁶; (2) types of entry is endogenous to individuals' entry decision.

To perform these empirical tests, we use panel data on nearly 20,000 new technology ventures in Sweden and track the entrepreneurs that founded them between 1994 and 2001. Those data are particularly suitable for our purpose since by virtually including all population we have information on individuals at risk of becoming self-employment which ultimately do not enter (non-entries sample). Moreover, by including only newly hired employees we avoid left censoring concerns since all individuals are at the same time at risk of becoming entrepreneurs. We have several objectives in this paper. First, we provide a theoretical framework which explains why types of entry influence the relationship between initial size and performance and examine the empirical evidence around this issue. Second, we demonstrate the empirical consequences of treating types of entry as an all in one category and of disregarding the entry stage. Third, we show that incorporating initial size in performance analysis introduces a source of endogeneity in the model. Our key finding suggests the liability of smallness is explained by types of entry and further research may even come up with questioning the whole role of initial size as fundamental predictor of entrepreneurial performance. .

The remainder of the paper is organized as follows. Section 2 reviews prior work on the relationship initial size – performance. Section 3 sketches a conceptual framework to analyze selection effects. Section 4 describes the data. Section 5 performs the empirical analysis. Section 6 concludes.

¹⁶ If some individuals are willing to start firms at lower initial size, there will be a self-selection problem that will bias our understanding of how entrepreneurial characteristics influence initial size, and in turn survival.

2. PRIOR WORK

2.1 The theoretical rationales behind the relationship between initial size and survival

Prior work has empirically found a positive relationship between a firm initial size and its likelihood of survival (Rajshree Agarwal & Audretsch, 2001; Audretsch & Mahmood, 1995; Dunne et al., 1989; D. S. Evans, 1987; Geroski, 1995; Geroski et al., 2010). The preponderance of these empirical studies adopt a population level of analysis. Population ecology has labeled this phenomenon as the *liability of smallness* and offered several theoretical explanations (Agarwal & Audretsch, 2001; Aldrich & Auster, 1986; Brüderl et al., 1992; Fichman & Levinthal, 1991; Freeman et al., 1983; Santarelli & Vivarelli, 2007; Schussler & Brüderl, 1990; for a review, Singh & Lumsden, 1990: 172, Table 2).

First, larger startups have advantages in raising capital due to closer contacts with creditors, and better tax conditions. Second, they are better in attracting qualified labor since they can offer long-term stability and internal labor market. Third, governmental regulations have larger impact on small organizations as they attempt to deal with city, county, state, and federal levels of government. Fourth, large firms are assumed to have a better-trained management. Accordingly, the legitimacy and, in turn, the survival of a new venture seems to be driven more by industry conditions than by firm characteristics. Additionally, industrial organization and economics scholars argue that this positive relationship between initial size and performance is caused by the presence of economies of scale and inefficiencies in capital and labor markets that generates cost disadvantages for smaller firms (Rajshree Agarwal & Audretsch, 2001; Luca Grilli, Piva, & Lamastra, 2010). In particular, they posit: (1) larger startups incur lower costs than their smaller

counterparts given that they enter at a suboptimal scale relative to the industry MES (Audretsch & Mahmood, 1995); (2) larger startups have more financial resources to weather bad times or cope with random environmental shocks (George, 2005). As a result, starting large shields new entrants from the competitive and legitimacy pressures of the market entered (Stinchcombe, 1965)

2.2. Theoretical Summary

The above discussion highlights four related issues.

First, despite many scholars have theorized about the origins of the liability of smallness, few have empirically tested those explanations. For example, Agarwal and Audretsch (2001) and Agarwal et al. (2002) have found that the effect of the liability of smallness is not homogeneous, but depends upon industry-level factors, namely the stage of the entered industry lifecycle and the extent of technological intensity in the industry.

Second, prior research has adopted an industry or population level of analysis. Nevertheless, within the common literature on founding conditions (*imprinting effect*) which heads back to Stinchcombe (1965)'s seminal work on the liability of smallness, a stream of research has investigated the influence of individual-level factors, such as founders' prior work experience, on survival (Brüderl et al., 1992; Gimeno et al., 1997). Both this stream and the above discussed stream on the liability of smallness have progressed separately neglecting the role of founders' background characteristics on the liability of smallness. Organization scholars have cautioned against disregarding individual-level factors when analyzing the general relationship between founding conditions and survival (Shepherd et al., 2000). Shane and Khurana (2003) have

responded to this recommendation by investigating the effect of founders' prior experience on the way they face the liability of newness¹⁷. Furthermore, emerging empirical evidence suggests that the macro-level theories that have explained the relationship between initial size (or age) and survival, offer a partial view of the phenomenon and an individual level approach is encouraged (Short et al., 2009).

Third, the preponderance of prior research has implicitly assumed that the effects of the liability of smallness are *homogenous* across firms within an industry or population, and adopted those latter as relevant unit of analysis¹⁸. To the best of our knowledge, only a couple of studies suspect this assumption is violated. Freeman et al. (1983) speculate that the liability of smallness is contingent to types of exit, in particular, they distinguish between exit by closure and exit by M&A. This insight is at the core of Grilli et al. (2010)' work examining how the antecedents of the liability of smallness differ across those two types of exit.

Fourth, one reason why prior research has been prevented from linking macro-level theories to individual-level explanations for firm founding, in general, is the issue of selection bias (Shane & Khurana, 2003). Indeed, prior empirical research on firm founding has largely relied on samples of ventures that have already been created. The lack of information on individuals at risk of transitioning to entrepreneurship but remain wage workers is likely to generate a bias in the coefficients estimations (Heckman, 1979). Recent works on the individual-level determinants of entrepreneurial entry have found evidences for individuals self-selection processes (Sorensen, 2007; Elfeinbein et al.,

¹⁷ Another recent effort to integrate these different theoretical perspectives comes from Geroski et al. (2010).

¹⁸ For a review on the effect of initial size on survival by level of analysis adopted, see Amit and Thornhill (2003: 501)

2010). These latter may in turn affect entrepreneurial outcomes. Sorensen and Fassiotta (2011) have indeed suggested: “*many of the empirical associations between firms [prior employer] and entrepreneurial outcomes may arise through sorting and selection processes*”. Yet to date none has systematically investigated the performance implications of selection effects. Two brand new exceptions are provided by Sorensen and Phillips (2011)’s work on the performance effect of parent company size, and Chen (WP, 2011)’s work on the phenomenon of serial entrepreneurship.

3. CONCEPTUAL FRAMEWORK

From prior discussion we highlight the following baseline hypothesis:

Ho_a: The higher the start-up size the higher the start-up performance.

In this section, we draw a theory-based structure for understanding the role of types of entrants on this focal relationship. Research on types of entrants has mainly focused on a specific category, the spinouts (e.g. Agarwal et al., 2004). A growing literature has been systematically finding that spinouts outperform other types of entrants (for a review, see (Klepper, 2009). The main theoretical arguments behind this result build upon human capital theory and posit that spinouts’ founders have developed skills and knowledge which can be effectively and valuably redeployed in the new entrepreneurial context (A. Franco, 2000; Klepper & Sleeper, 2005). This insight leads us to state our second baseline hypothesis.

Hob: Spinouts outperform other types of entrants (unrelated spinouts and de novo).

Nevertheless, we posit the influence of types of entry on performance might not only be direct but also indirect as result of selection processes which involve initial size. Investigating both theoretically and empirically the micro-level mechanisms explaining the relationship between initial size and performance (*ceteris paribus* the macro-level factors) is a fundamental challenge since it requires disentangling selection effects. Along with the emerging works in entrepreneurial research which re-examines prior findings by considering the impact of selection effects, we argue that the relationship between initial size and performance is influenced by sorting processes. These processes take place not at the level of individuals but at group level, and, specifically, at the level of types of entrants.

We identify different selection processes according to the different strategic decisions individuals face before transitioning to entrepreneurship: entry and initial size. In other words, we suspect that the way an entrepreneur enters a market is endogenous to both entry and initial size decisions. In the next paragraph, we distinctly examine these two mechanisms¹⁹.

3.1 Selection Effects of Types of Entrants at Entry

In their effort to systematize the emerging literature on prior employer and entrepreneurship, Sorensen and Fassiotto (2011), suggest that an underdeveloped but promising perspective is the view of prior employers as fonts of opportunities. For example, different employers spawn entrepreneurs at different rates because differences in incentives and opportunity structures make entrepreneurship relatively more or less

¹⁹ In this first draft, for the sake of clarity we focus our theoretical analysis on spinouts and de novo, and leave the implications of unrelated spinouts to an empirical matter.

attractive. In this case, the contextual effect unfolds by altering an individual' decision making model rather than by inducing changes in individual characteristics (Sorensen and Fassiutto, 2011: 1328; Shane and Khurana, 2003: 529).

Sorensen and Fassiutto (2011) suggest that the study of workplace effects is particularly complicated because they are subject to selections both on the front end [at the point of entry in prior employer] and on the back end [at the point of exit from prior employer]. We speculate that front-end selection effects are more likely to impact the entry decision, whereas back-end selection effects are more likely to impact the initial size decision.

On the back end, founders of different types of entrants have different incentives and opportunity costs. For example, founders of spinouts have the opportunity to pursue an internal career, as well as a number of monetary and non-monetary benefits (Campbell et al., 2010; Folta et al., 2010) hence, their costs of switching to entrepreneurship are higher in compare to de novo founders. Failing to account for this process might lead to spurious results when analyzing entrepreneurial performance²⁰.

H1: Founders of different types of entrants have different propensities to entrepreneurship, and this selection effect impacts the analysis of performance.

²⁰ “Unmeasured variation in these opportunity costs is a plausible alternative explanation for many accounts of the relationship between firm characteristics and entrepreneurial entry rates and outcomes” (Sorensen & Fassiutto, 2011: 1330)

3.2 Selection Effects of Types of Entrants at Initial Size

Start-up size is the result of a tradeoff founders make between the wage they can earn in paid employment and the potential earnings from entrepreneurship; entry occurs if the “desired size” is above this truncated threshold (Mata, 1996:90). We hypothesize that types of entrants have a fundamental role in shaping the “desired size”. In other words, founders of different types of entrants have different size thresholds. In contrast to previous efforts, which conceptualize initial size as an artifact or an outcome of the entrepreneurial process, we view initial size as a strategic choice. As a strategic choice, initial size is influenced by selection processes, in particular, at the level of types of entrants.

As we above mentioned, front – end selection processes are more likely to impact start-up size. Founders of spinouts and de novo ones have striking differences in incentives structure, as well as different approaches to career decision making. For example, spinouts’ founders are exposed to a richer set of opportunities while pursuing their working activities (A. Cooper, Gimeno-Gascón, & Woo, 1997), to co-workers’ entrepreneurial experience (Nanda & Sørensen, 2010) and to social and financial networks (Gompers et al., 2005). Moreover, a fundamental incentive to entrepreneurship for spinouts’ founders comes from their self-confidence because they have learnt about their ability over time. This argument is akin to the ability sorting argument claimed by Elfeinbein et al. (2010) when explaining the selection processes of individuals into small firms before entering entrepreneurship. Furthermore, Chen (2011) distinguishes between two alternative effects: learning by doing (treatment effect) and learning about ability (selection effect). Finally, Klepper (2009) suggests the pattern for which better spinouts

comes from better employers might reflect that better firms attract better employees. In our model, types of entrants represent a pre-existing condition that influence individuals' initial size decision by shaping the relative incentives to entrepreneurship. These latter influence the initial size decision by increasing founders' confidence in their chances of success and, therefore, reduces the risk of committing resources (sunk cost investments) to the new venture.

H2: Founders of different types of entrants have different initial size thresholds, and this selection effect weakens the relationship between initial size and performance.

Our theoretical framework is illustrated in Figure 1 and Figure 2.

Figure 1. Selection Effects of Types of Entrants on Entrepreneurial Entry

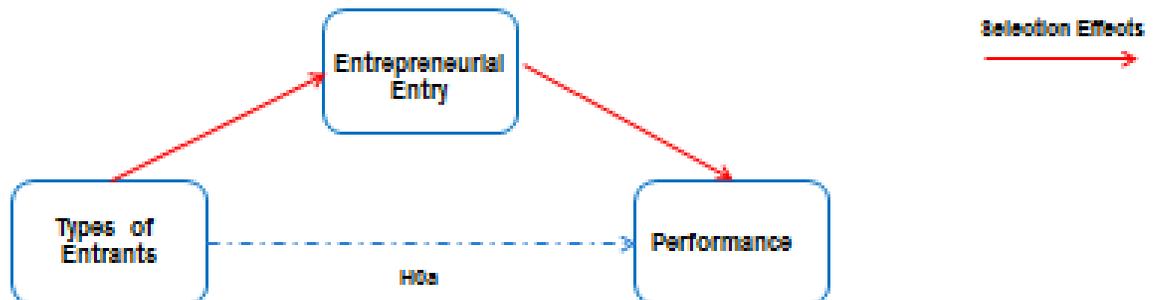


Figure 2. Selection Effects of Types of Entrants on Initial Size



4. METHOD

4.1 Data and Sample

The data we use are a special (high-technology) extract from a set of three matched longitudinal data sources on the entire Swedish labor market that were gleaned from governmental registers and maintained for research purposes by Statistics Sweden.²¹ The first source is LOUISE—which has demographic and financial information for all legal residents of Sweden over the age of sixteen from 1989 onward. The second source is RAMS—which tracks employment flows in the labor market based on an annual mandatory survey for all firms having at least one employee or earning a profit. The third source is SRU—which tracks financial information for each firm and is submitted annually to the fiscal authorities for taxation purposes. The special abstract we use for analysis is called EPRO (Entrepreneurial Processes Database) and was commissioned for a broader project on entrepreneurship in high-technology manufacturing or knowledge-intensive service sectors, which are thought to be important to the Swedish economy. Individuals were identified as working in these sectors if their employer was in an industry that met Eurostat and OECD classifications, which are based on the ratio of research and development expenditures to gross domestic product. The EPRO extract covers any individual who was active in these sectors at any time from 1989 to 2002.

We constructed a risk set based on individuals, between the ages of 22 and 52, who began working as “employed” (and not involved in self-employment) for a high-

²¹ Statistics Sweden is a division in the Ministry of Finance with authority over all national statistics for Sweden, including those related to industry and trade. RAMS is an acronym for *Registerbaserad Arbetsmarknadsstatistik*, which in English is equivalent to “Register-based Labor Statistics.” SRU is an acronym for *Standardiserad Räkenskapsutdrag*, which in English is equivalent to “Standardized Accounting Summary.” We believe our data to be comparable to recent studies using matched employee-employer data for Denmark (Sorensen 2007).

technology manufacturer or knowledge-intensive service firm in 1994. A focus on newly employed eliminates problems with left-censoring, which occurs when a person becomes at risk of switching prior to our ability to observe them; and beginning in 1994 enables measurement of labor market experience since 1989 and avoids the worst of the recession in Sweden in the early 1990's. 144,690 individuals become at risk of transitioning from their current job in 1994 to entrepreneurship, unemployment, or another job. They remain at risk until they enter self-employment or unemployment, or become deceased, or emigrate, or the end of the observation period in 2001.

4.2 Identifying New Firms and their Entrepreneurs

We identify new entrepreneurial firms using the history of all firms listed in RAMS by identifying whether a firm is listed as new in a year. For all (new) firms we match individuals listed as self-employed in that firm. In cases where there were more than one self-employed individual, we selected the individual having the highest salary coming from the venture, or in cases where multiple people earned the highest salary we randomly selected among them. So, each new firm had one individual designated as the entrepreneur. We eliminated from the risk set all other self-employed individuals in the new firm. This resulted in 17,893 new firms. The sample of new firms consists of corporations (3,073), unincorporated ventures (14,178), and partnerships (642). We further exclude from the risk set the selloffs because those firms follow logics akin to those of established firms, therefore they cannot be considered as new entrants.

4.3 Measures

Dependent Variable

Our measure of entrepreneurial performance is entrepreneurial incomes (e.g. Elfeinbein et al., 2010; Sorensen and Phillips, 2011). The Sweden Data does not provide a direct measure of founders' earnings from self-employment, however this value is included in the gross income reported in the LOUISE dataset (LON measure). Therefore, as a first approximation, we measure entrepreneurial income as the reported gross income less reported salary income. Empirical evidence suggests that a substantial portion of entrepreneurs is simultaneously engaged in wage work and self-employment activities, hence, we are confident that our measure is likely to be correlated to entrepreneurial earnings.²²

Independent Variables

Our explanatory variables are initial size and types of entrants.

We use two measures of firm initial size. The first measure is number of employees in the year of founding (included the founder). This measure has been repeatedly used in literature (M. G. Colombo et al., 2004; A. C. Cooper et al., 1989; Geroski, 1995; José Mata & Machado, 1996), and is available for all the new firms in the sample. The second measure is designed to proxy for the initial capital required for start-up, but is only available for corporations. This measure is generated by taking in the year of entry the log of the sum of land assets, capital assets, equipment, intangible assets, write downs on short-term assets for year 1, capital losses in year 1, write offs on long-term assets in year 1, pre-paid operating costs (such as rent), investments in inventory, accounts payable,

²² However, the gross income measure includes also income from passive investment. Therefore, next step will compare the non-salary income in entrepreneurship to the non-salary income reported in the year prior to entry into entrepreneurship, following Sorensen and Phillips (2011).

accrued taxes in year 1, pre-paid operating costs, other current liabilities and total salaries (Astbro & Bernhardt, 2005; Barkham, 1994; Holtz-Eakin Douglas et al., 1993). In high-tech industries, the two measures are likely to be highly correlated (Colombo et al., 2004). We run our results on both measures of initial size to check for robustness.

Our measures of types of entrants are shown in Table 3.

Table 3. *Measuring Types of Entrants*

De Novo Entrants	Dummy variable =1 if entry = 1 & the firm is classified as “new by employees from unemployment/new on the work market” & parent company financial stake = 0
Unrelated Spinouts	Dummy variable =1 if entry = 1 & the firm is classified as “new by new employees from other organization numbers” & the industry entered is different, at two digit code level, from the prior one.
Spinouts	Dummy variable =1 if entry = 1 & the firm is classified as “new by new employees from other organization numbers” & the industry entered is the same, at two digit code level, of the prior one & parent company financial stake = 0
Spinoffs	Dummy variable =1 if entry = 1 & parent company has a financial stake in the new firm.

Control Variables

Our controls are defined in the Appendix.

5. RESULTS

In this section, we first examine the distribution of initial size in general, as well as across types of entrants, and note the transition rates from wage work to self-employment. Next, we perform bivariate analysis to provide preliminary evidence for whether there are systematically different predictors of initial size across types of entrants which might ultimately affect entrepreneurial performance. Finally, we perform

multivariate analysis to investigate three issues: (1) whether the relationship between initial size and performance is affected by types of entrants; (2) whether there is evidence of selection effects; (3) whether types of entrants represent the origin of these effects.

5.1 Descriptive Statistics and Bivariate Analysis

5.1.1 Rates of Entrepreneurship and Initial Size

Table 1 displays the distribution of entries over the years 1994 to 2001. In 1994 the sample consists only of wage workers. The table also identifies the number of non-entries, i.e. individuals that are at risk of moving to self-employment but remain in wage work. Entries are observed in the year an individual leaves employment and switches to the new labor status. There were 17.893 entries between 1995 and 2001. Consistent with prior research, entry is a relatively rare event representing a small portion of the entire sample (Nanda & Sørensen, 2010).

5.1.2 The Relationship between Initial Size and Performance

Table 2 shows empirical evidence around our focal phenomenon: the liability of smallness. A positive relationship between initial size and entrepreneurial earnings is robust on both measures of initial size, namely number of employees and total amount of capital invested, despite the striking differences in the performance distribution (which in part depends on the different size samples those measures are computed on).

Insert Table 1 & 2 about here

5.1.3 Types of entrants and Initial Size

Tables 3 illustrates the distribution of different types of entrants across different classes of initial size, measured as number of employees. The distribution of entries over different types of entrants suggests that 24.5 percent are de novo, 38.1 percent are unrelated spinouts, 36.1 percent are spinouts, and 1 percent are spinoffs. The table shows considerable variance in our two independent variables. Moreover, the table preliminary reveals that types of entrants and initial size are to some extent correlated. In particular, in terms of number of employees, start-ups are more likely to start the small, whereas spinoffs are more likely to start big. Such interdependence will reveal crucial when we analyze entrepreneurial performance.

Insert Table 3 about here

Multivariate Analysis

Our key results are presented in Table 4. We estimated panel data regression models with random effects on entrepreneurial income. Inspections of the data indicate that our dependent variable is highly skewed in its distribution. Therefore, to eliminate heteroskedasticity we logged our measure of entrepreneurial earnings. The models are estimated on longitudinal data covering the entire entrepreneurial lifecycle: from venture creation until the time of exit or right censoring.

In Column 1 we replicate prior models on entrepreneurial performance (Brüderl et al., 1992; Gimeno et al., 1997; for a review, Thornhill & Amit, 2003). To account for macro-level explanations we include industry and years dummies as controls. To account for individual-level explanations, we include a set of demographic covariates, such as *sex*, *age*, *education*, *citizenship*, *household wealth*, as well as variables measuring founders' prior work experience, such as *wage experience*, *entrepreneurial experience*, *industry experience*, *number of prior jobs held*, *parents' experience in self-employment*, *days in unemployment*. Finally, we include our key variable: *initial size* (as measured in number of employees). This first column seems to closely resemble prior studies on entrepreneurial performance and allows us to gain confidence on the robustness of our analysis. In particular, the table shows that initial size has a very significant effect on performance, providing a strong support for the liability of smallness (H0a). Column 2 re-estimates the results accounting for selection into entrepreneurship and include a correction term for selection bias (i.e. *Inverse Mills Ratio*). We obtain the Inverse Mills Ratio from the estimation of a probit model where the dependent variable is a dummy which takes value 1 if the individual becomes self-employed (entry) and 0 if he remains a wage worker. Table 6 reports the estimated coefficients. As we can see, the model closely resembles other studies on entrepreneurial entry (e.g. Elfeinbein et al., 2010; Folta et al., 2010), hence we are confident that the Inverse Mills Ratio we develop from this selection stage is correct. This term is highly statistically significant meaning that individuals strongly select into entrepreneurship due to unobservable factors. Moreover, selection effects severely affect the variable parent self-employment experience, which indeed, becomes significant and positive after correcting for these self-selection

processes. This variable has been employed in studies on entrepreneurial entry as indirect evidence of sorting processes based on preference for self-employment or for autonomy (Halaby, 2003; Sørensen, 2007). This suggests that selection effects are more likely to be due to preference-based arguments rather than ability-based arguments (Elfeinbein et al., 2010). Higher values of the Inverse Mills Ratio are associated with higher entrepreneurial earnings, suggesting that omitted variables influence in the same direction of both entry and performance. However, there is no evidence that the selection effects produces important bias in our estimation of the initial size effect on performance.

We now dig into the analysis by investigating the origins of these selection effects. In particular, we consider whether the way an entrepreneur enters a market represents a central omitted variable of the model. Therefore, we extend the model specification to add our types of entrants variables, without (Column 3) and with (Column 4) correction for selection bias. As expected, our explanatory variables are all strongly statistically significant and in the expected direction. Spinouts outperform both unrelated spinouts and de novo, consistently with our second baseline hypothesis (H0b)²³. Moreover, the model fit has dramatically increased respect to prior models (R-squared has passed from 0.247 to 0.410, without correction for self- selection, and from 0.288 to 0.429, with correction). Finally, but of fundamental importance for our investigation of selection effects, we found: (1) the role of initial size is severely downplayed in both the magnitude of the coefficient and the level of statistical significance; (2) the coefficient of the Inverse Mills Ratio is almost halved, despite still highly statistically significant. The former

²³ The category of spinoffs outperform spinouts. Yet, since spinoffs' founders can strongly rely on the support of prior employer in terms of financial, social, and knowledge-based resources, the entrepreneurial dynamics might substantially different from those of purely new entrants. The inclusion of spinoff should therefore be thought of as just a descriptive evidence.

finding points that the effect of initial size on performance is at least partially the result of a spurious association, and that the liability of smallness might indeed be a liability of types of entrants. The latter finding support our hypothesis of types of entrants as key omitted variable of the model. In synthesis, types of entrants influence entrepreneurial earnings as predicted by our theoretical framework, i.e. at level of initial size (finding 1 – *selection effects in initial size*) and at the level of entry (finding 2 – *selection effects in entry*).

Concluding, our results severely cautioned scholars against ignoring selection effects when including initial size in performance analysis since it introduces a source of endogeneity in the model, which might bias not only the estimation of the initial size effect but also the coefficient estimations of other individual-level explanatory variables which are both correlated with entry and performance.

As robustness check, we run the same analysis on the other measure of initial size, i.e. the total amount of capital invested, available only for our sample of corporations (17% of the sample). The results are displayed in Table 5. Despite some structural differences, we again observe a downplay in the initial size effect and in the Inverse Mills Ratio once we extend the model specification to types of entrants.

Insert Table 4, 5 & 6 about here

6. DISCUSSION AND CONCLUSIONS

Theoretical assumptions behind the stylized fact that starting large results in higher start-up performances are so entrenched in the entrepreneurial tradition that little work has yet to investigate it empirically. The macro-level theories on the liability of smallness are so well established in literature that, to the best of our knowledge, none have tried to link those theories to micro-level explanations of this phenomenon (individual level). As a result, prior research implicitly assumes initial size to be an [initial] outcome of the entrepreneurial process (e.g. Elfeinbein et al., 2010) or an artifact to add in to models of entrepreneurial performance. In contrast to previous effort, we conceptualize initial size as an individual's strategic choice. Accordingly and likewise entry, initial size might be an endogenous and self-selected decision. In this work, we have reexamined the central notion of the liability of smallness in lights of individuals' selection effects at both decision levels of entry and initial size. We are in the position to investigate these issues because we could access Sweden data that allow us to deal with a sample of wage earners which *do not* transition to entrepreneurship.

Our theoretical and empirical results point to a systematic influence of selection effects on the relationship between initial size and performance, and types of entrants play a fundamental role in this process. The way founders enter the market, for example as a spinout or as a *denovo*, determines individuals' propensity to entrepreneurship as well as the threshold of initial size, that is the size at which they are willing to start their ventures. We believe we are the first to systematically document the existence of

selection effects in start-up size, and study their implications on entrepreneurial performance. Our paper has three broad implications for research in entrepreneurship.

First, our longitudinal study on the Swedish wage-earners population has revealed that selection effects severely influence the relationship between initial size and performance but does not determine it. This means that there is still a component of the liability of smallness which might incorporate the population-level arguments on legitimacy. Separating the legitimacy from the selection effect is not only curious but fundamental because it involves revisiting the role of initial size as signal of quality.

Second, the way an entrepreneur enters a market is an important component of these selection effects but do not explain them entirely. Our finding opens up the possibility for future research to consider the existence of different types of selection effects. For example, Elfeinbein et al. (2010) have proposed two selection mechanisms: ability sorting and preference sorting. Sørensen (2007) highlights the process of *strategic* sorting, for which individuals might sort into firms that they believe will provide relevant experience (in terms of human and social capital) to achieve their final goal of becoming a successful entrepreneur. Those mechanisms occur at individual level, whereas we are the first to find a group-level selection effect. Questions such as, what is the interplay among selection effects working at different levels of analysis, and which is a parsimonious construct to capture the preponderance of selection effects, we believe that they will be cutting-edge questions in the next entrepreneurship research agenda.

Third, our results show that, although ignoring selection effects in performance analysis might lead to an over-specification of the initial size role, a more serious error comes up if we treat types of entrants as an all in one category. Our data suggests that the

model fit and the coefficients of the other variables substantially change, if we include types of entrants. This suggests that types of entrants determine entry, and hence, controlling for types of entrants in performance analysis might not be adequate to resolve endogeneity, and the whole entrepreneurial processes (entry, initial size, performance) should be analyzed by types of entrants. The patterns of career mobility differ substantially between spinouts and de novo founders, therefore we strongly caution against an all-in-one treatment of these categories not only ex-post but also ex-ante, at the entry stage.

In addition, our findings corroborate recent evidence on a downplay of macro-level factors in their ability to explain the liability of newness and smallness. The theoretical implication of this insight is our contribution to the recent call for a micro-level perspective to explain the relationship between founding conditions and entrepreneurial performance (Shane and Khurana, 2003).

Although we believe our theoretical and empirical contributions are substantial, there are some limitations worth highlighting. First, we didn't perform a survival analysis²⁴. Building on the fundamental work by Gimeno et al. (1997) who started decoupling economic performance from survival²⁵, we might find striking differences between the two types of analysis. In particular, we might hypothesize that if economic performance and survival are a loosed- couple, selection effects may play a stronger role on survival rather than on economic performance, since the causes of selection effects at entry and at initial size might correlate with those at the core of exit decision. Second, as already

²⁴ In the next draft of this paper such analysis will be included. In particular, we will perform Cox Proportional Hazards Models.

²⁵ Recent works are increasingly supporting this insight, such as Arora and Nandkumur (2010) and Wenneberg et al., 2010.

noted, more can be done to identify and disentangle different sources and types of selection effects. Third, we emphasize that these selection effects do not occur only at entry decision but also at initial size decision. Conceptualizing initial size as a strategic decision rather than an outcome highlights the interdependences between those two decision making processes and may even come up with questioning their temporal sequence (initial size decision precedes entry decision).

TABLES

Table 1. Number and Percent of Entries and Non-Entries by Year

Sample	1994	1995	1996	1997	1998	1999	2000	2001	Total
Non-Entries	131,799	131,212	129,788	129,488	128,955	128,396	127,769	127,722	1,035,129
Entries	1,953	1,878	2,615	2,319	2,216	2,301	2,405	2,206	17,893

Table 2. The Liability of Smallness

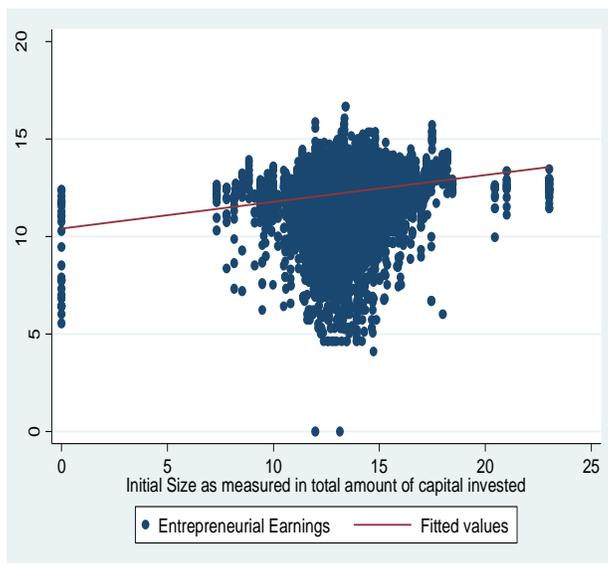
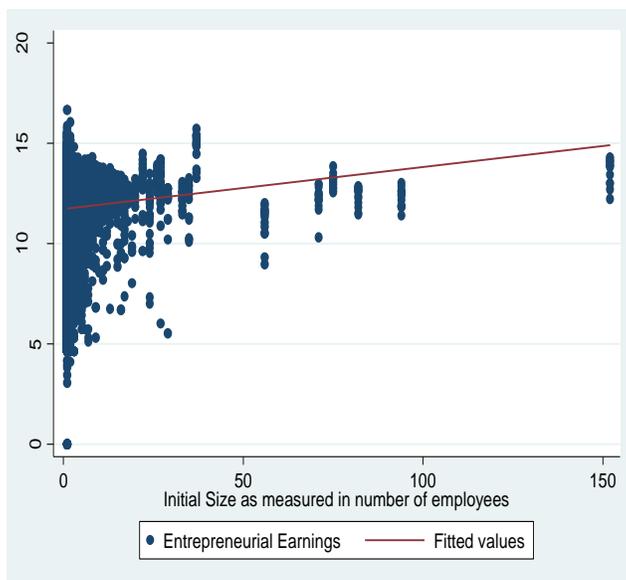


Table 3. Firm Initial Size Distributions (# of employees) by Types of Entry

Types of Entry	Classes of Initial Sizes (# of employees) upon Entry								
	1	2	3	4	5	6-10	10-20	> 20	Total
De Novo	4,264	104	20	3	2	3	0	0	4,396
Unrelated Spinout	6,255	409	66	30	25	28	14	1	6,828
Spinout	5,728	54	62	67	23	32	13	10	6,476
Spinoff	92	48	19	7	2	10	8	7	193
Total	16,339	1,102	167	107	52	73	35	18	17,893

Table 4. Panel Data Regression with Random Effects on Log of Entrepreneurial Earnings (Initial size as measured in number of employees)

VARIABLES	Model 1	Model 2	Model 3	Model 4
Spinouts			1.525*** (0.027)	1.424*** (0.027)
Spinoffs			1.677*** (0.082)	1.619*** (0.081)
Unrelated Spinouts			1.492*** (0.025)	1.418*** (0.025)
Initial Size	0.263*** (0.043)	0.267*** (0.042)	0.066 (0.039)	0.078* (0.038)
Age	0.104*** (0.012)	0.134*** (0.012)	0.070*** (0.011)	0.092*** (0.011)
Age Squared	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
Education	0.442*** (0.037)	0.707*** (0.037)	0.359*** (0.033)	0.549*** (0.033)
Wage Experience	0.165*** (0.009)	0.161*** (0.009)	0.115*** (0.008)	0.115*** (0.008)
Entrepreneurial Experience	0.024*** (0.007)	0.002 (0.007)	0.019** (0.006)	0.004 (0.006)
Target Industry Experience	0.044*** (0.003)	0.032*** (0.003)	0.030*** (0.003)	0.025*** (0.003)
Total # of Jobs	-0.300*** (0.042)	-0.512*** (0.042)	-0.207*** (0.037)	-0.360*** (0.037)
Parents Self-Employment Experience	-0.017 (0.029)	0.280*** (0.030)	0.022 (0.026)	0.229*** (0.027)
Household Wealth	0.012*** (0.002)	0.014*** (0.002)	0.011*** (0.002)	0.013*** (0.002)
Sweden Citizen	0.053 (0.034)	0.064 (0.033)	0.030 (0.030)	0.038 (0.030)
Sex	-0.440*** (0.020)	-0.578*** (0.020)	-0.425*** (0.018)	-0.522*** (0.018)
Time Unemployed	-0.186*** (0.005)	-0.115*** (0.005)	-0.095*** (0.005)	-0.050*** (0.005)
Inverse Mills Ratio		0.710*** (0.023)		0.497*** (0.021)
Industry Dummies	Yes	Yes	yes	Yes
Year Dummies	Yes	Yes	yes	Yes
Constant	7.590*** (0.723)	5.373*** (0.707)	7.065*** (0.640)	5.550*** (0.633)
Observations	16,222	16,222	16,222	16,222
Number of Observations	16,117	16,117	16,117	16,117
r2_o	0.247	0.288	0.410	0.429

Robust standard errors are in parentheses *p<0_05; **p<0_01; ***p<0_001.

Table 5. Regression on Log of Entrepreneurial Earnings on corporations. (Initial Size as measured in total amount of capital invested)

VARIABLES	Model 1	Model 2	Model 3	Model 4
Spinout			0.860*** (0.084)	0.788*** (0.083)
Spinoff			0.746*** (0.101)	0.699*** (0.099)
Unrelated Spinout			0.891*** (0.086)	0.794*** (0.086)
Initial Size	0.187*** (0.029)	0.179*** (0.029)	0.152*** (0.028)	0.148*** (0.028)
Age	0.061* (0.028)	0.080** (0.027)	0.058* (0.027)	0.073** (0.026)
Age Squared	-0.001 (0.000)	-0.001* (0.000)	-0.000 (0.000)	-0.001* (0.000)
Education	0.498*** (0.090)	0.668*** (0.090)	0.358*** (0.088)	0.505*** (0.090)
Wage experience	0.158*** (0.000)	0.163*** (0.000)	0.123*** (0.023)	0.131*** (0.000)
Entrepreneurial Experience	-0.024 (0.015)	-0.035* (0.014)	-0.027 (0.014)	-0.035* (0.014)
Target Industry Experience	0.022*** (0.006)	0.011* (0.006)	0.020* (0.009)	0.010 (0.009)
Total # of jobs	0.391*** (0.089)	0.645*** (0.090)	-0.336*** (0.086)	0.541*** (0.088)
Parents Self-Employment Experience	-0.066 (0.064)	0.187* (0.073)	-0.061 (0.061)	0.138 (0.071)
Household Wealth	0.009* (0.004)	0.012** (0.004)	0.009* (0.004)	0.011** (0.004)
Sweden Citizen	0.112 (0.085)	0.115 (0.086)	0.113 (0.080)	0.115 (0.081)
Sex	0.323*** (0.048)	0.465*** (0.050)	-0.332*** (0.046)	0.443*** (0.048)
Time Unemployed	0.125*** (0.018)	0.076*** (0.019)	-0.098*** (0.018)	0.062*** (0.018)
Inverse Mills Ratio		0.582*** (0.068)		0.460*** (0.069)
Industry Dummies	Yes	yes	yes	Yes
Year Dummies	Yes	yes	yes	Yes
Constant	7.645*** (0.698)	5.901*** (0.707)	7.548*** (0.664)	6.196*** (0.678)
Observations	2,475	2,475	2,475	2,475
R-squared	0.226	0.260	0.291	0.311

Robust standard errors are in parentheses *p<0_05; **p<0_01; ***p<0_001.

Table 6. Probit Model (Self-Employment Entry (1) and No Entry (0))

VARIABLES	ENTRY
Age	0.068*** (0.005)
Age, Squared	-0.001*** (0.000)
Education Percentile	0.549*** (0.013)
Wage Experience	0.041*** (0.004)
Entrepreneurial Experience	-0.048*** (0.003)
Married	-0.004 (0.008)
Number of Children	-0.000 (0.003)
Gender	-0.203*** (0.007)
Sweden Citizen	0.004 (0.013)
Time Unemployed	0.081*** (0.002)
Wealth	0.037** (0.013)
Salary Income	-0.068*** (0.002)
Industry Experience	-0.082*** (0.003)
Industry Experience Squared	0.003*** (0.000)
Employer Tenure	0.302*** (0.015)
Employer Tenure Squared	-0.008*** (0.001)
Employer Size	-0.115*** (0.001)
Employer age 0-2	-0.109*** (0.013)
Employer age 3-6	-0.174*** (0.012)
Parental Self-employment experience	0.489*** (0.013)
	962,218

No. Observations	
Pseudo R-squared	0.175
Log Likelihood	-73988.101

Robust standard errors are in parentheses.
*p<0_05; **p<0_01; ***p<0_001.

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**THE ENDOGENEITY OF THE ENTREPRENEURIAL EXIT DECISION
AN OCCUPATIONAL CHOICE STUDY.**

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Abstract

Prior work has cast entrepreneurial exit as a dichotomous decision (e.g., exit or not; wage work or entrepreneurship). Using matched employee–employer data over eight years on a population of new Swedish entrepreneurs, we reveal that such dichotomies are false. Many individuals not only enter self-employment while simultaneously engage in wage work (Folta et al., 2010) but persist in this status till the decision of exit. We depart from prior research that considers exit as outcome of the entrepreneurial process, and conceptualize it as an individual’s strategic decision among multiple choices (e.g. exit out to wage work). Our central finding points to the endogenous nature of the exit decision. Exit is not just a function of entrepreneurial earnings, but the interplay between different sources of income (i.e. wage work) plays in so much as the same role.

Key words: entrepreneurial performance, initial size, types of entrants, self-selection.

INTRODUCTION

One of the oldest conceptualization of exit in management rests on population ecology studies, and roots in the Darwinian notion of natural selection. Firms that do not fit the competitive environment are selected out of the market (John Freeman et al., 1983). Such view of exit has been at the core of strategic management, and scholars have long employed exit as a measure of [negative] economic performance (Brüderl et al., 1992; Thornhill & Amit, 2003). The implication of this approach on entrepreneurial exit research has been twofold: (1) prior work has treated entrepreneurial exit and start-up performances as mainly driven by the same underlying logics; (2) the investigation of the determinants of exit, above and beyond economic performance, is underrepresented.

Rooting in Gimeno et al. (1997)'s seminal work challenging the *unidimensionality* of the relationship between performance and survival, we depart from the notion of exit as outcome of the entrepreneurial process and conceptualize it as an individual strategic decision. As such, it involves choosing among alternative options (i.e. wage work). Prior work has largely ignored that many individuals start their ventures while working as employees in an established firm (hybrid entrepreneurs, Folta et al., 2010), and, more importantly, they *persist* in this status till exit. This implies that different sources of income, those from wage-work and self-employment, co-exist.

In this paper, we consider the theoretical and empirical implications of the interplay between these two sources of income on entrepreneurial exit. Entrepreneurs might persist in wage work because it provides financial resources to support their venture, or because they are risk-adverse (overturning the popular notion of entrepreneurs as risk-propensity

individuals). Alternatively, this persistence in wage work might spur exit, if career in wage work becomes more attractive than entrepreneurship. This is consistent with a view of entrepreneurship as akin to moves between paid jobs. People pursue entrepreneurial opportunities because in that moment they represent the best way to get ahead in their career (Sørensen & Fassiotta, 2011; Sørensen & Sharkey, 2010). The theoretical implications alluded to above may have profound empirical implications for the study of entrepreneurial exit. Many studies identify exits based on whether a venture is no longer the primary source of income (this latter usually defines the occupational status of an individual), disregarding individuals for whom self-employment is not the primary source of income. This treatment might compromise our truthfully understanding of this phenomenon²⁶, if wage conditions influence the decision of exiting or persisting in self-employment. In other words, the exit decision might be endogenous to the decision of entry or exit from wage work. Adding this complexity to the model, might even come up with questioning the boundaries of exit and entry themselves, and suggest a more blurred view based on the relative weight of entrepreneurship on wage work.

We have several objectives in this paper. First, we provide evidence of individuals that exit out from self-employment but remain in wage work (*hybrid exiters*). In particular, by tracking over time a sample of nearly 20.000 new Swedish entrepreneurs who start their venture in 1994, we diagnose spillover effects between simultaneous instances of wage work and self-employment and discriminate between different exit patterns (e.g. hybrid exit, exit out to unemployment, exit out to a new self-employment, exit out of the labor force). Second, we elucidate different theoretical rationales behind hybrid exit. Third, we replicate prior models on exit to show the implications of ignoring wage work. Our

²⁶ Empirically, we match exit of the entrepreneur with exit of the venture from the market.

central finding strongly supports our theoretical argument on the fundamental role that the *relative* income of paid-employment on self-employment has on exit.

Overall, this study cautions against drawing exhaustive conclusions on individuals' exit decisions based only on factors related to the new venture, because it might result in an incomplete or even biased understanding of this fundamental entrepreneurial issue.

A CRITICAL REVIEW ON THE CONCEPTUALIZATION OF EXIT

The notion of exit is fundamental in many research fields of management, such as population ecology, industrial organization, corporate strategy, and, recently, entrepreneurship (D. DeTienne, 2010; Karl Wennberg, Wiklund, DeTienne, & Cardon, 2010). The next paragraph examines how the concept of exit has evolved in literature.

Exit has been traditionally considered the other side of the survival coin, and survival, a measure of firm performance (e.g. Bruderl et al., 1992; Thornhill and Amit; 2003). Therefore, higher survival chances equate higher economic performances. The key implication of this conceptualization is that all research effort has been devoted to factors enhancing performances, such as founders' human capital and social capital (Pennings, Lee, & Van Witteloostuijn, 1998)

This "*Survival of the Fittest*" view has been first challenged by Gimeno et al. (1997). They observe that firms with low economic performances persist in entrepreneurship, and, vice versa, firms with high performance exit the market. Such empirical regularity contrasts with the equation exit equal to low economic performances. This gap between economic performance and survival has been explained through factors, such as switching costs and psychic income (intrinsic motivation), that are unrelated to the

economic performance of the venture. This influential contribution has redirected research efforts towards the study of non-economic factors that affect exit (e.g. De Tienne et al., 2008).

A further step in the conceptualization of exit comes from recent scholars suspecting that exit might not always be a negative outcome of the entrepreneurial process. McGrath (1999) argues that viewing entrepreneurial exit as a failure, i.e. negative outcome, is biased (the survivor bias). According to her, such bias is the result of an implicit net present value approach which pervades entrepreneurial studies and she advocates a real option lens. Very recently, some studies have shown that entrepreneurial exit may also be a positive outcome (Arora & Nandkumar, 2011; Bates, 2011; Folta et al., 2010). The direct research implications of this conceptualization invokes the study of the conditions under which entrepreneurial exit represents a positive outcome. This research question has encouraged scholars to consider different types of exit strategy and their determinants (e.g. in terms of human capital). Wennberg et al. (2011) posit that: “exit may be the result of failure as well as success, and research should identify which specific route of exit [like sales and liquidation] is utilized rather than assume that exit equates with either failure or success” (Wennberg et al., 2010: 1). Moreover, Arora & Nandkumar (2011) offer an opportunity based explanation of exit as positive outcome. High ability workers are more likely to pursue aggressive strategies and, hence, exit because they are more likely to find an alternative occupation in the job market. In particular, they are more likely to both fail (bankruptcy) and cash-out. Conversely, those who persist in entrepreneurship are those who have lower alternative work opportunities.

Theoretical Summary

In synthesis, the above discussion highlights an evolutionary pattern of the notion of exit over time. Nonetheless, we believe that current conceptualization of exit as an outcome of the entrepreneurial process (either good or bad) is inadequate to fully understand this phenomenon from an individual-level perspective. Therefore, we push forward the Gimeno et al. (1997)'s notion of threshold and view exit as an individual's strategic choice. This raises important implications. First, if exit is a strategic choice then that there should be a value associated to exit, *ceteris paribus* economic performance. Whereas Gimeno et al. (1997) offer a non-monetary explanation to the persistence of under-performing firms on the market, we propose the role of simultaneous employment in an established firm (i.e. wage work). Second, another implication of exit as strategic choice is the importance of examining the post-exit process, in terms of individuals' occupational choices. Few scholars have investigated what happens to the founder after that his venture exits the market. The preponderance of this research has just focused on the phenomenon of exit to start another venture (serial entrepreneurship). Nevertheless, a much more common yet unexplored phenomenon is the exit from self-employment to go back to wage work. Around 50% of founders is back to wage work within 7 years (Evans and Leighton, 1989). Third, prior work has treated entrepreneurs and wage-earners as mutually exclusive categories, and the transition between them as sequential. Folta et al. (2010) are the first to caution against this treatment when examining entrepreneurial entry. This view has implications on prior conceptualization of opportunity costs in entrepreneurship. The influence of opportunity costs on start-up performance has always been considered ex-ante (before entry) and measured in terms of founders' prior work

experience (Arora & Nandkumar, 2011; Elfenbein et al., 2010). If, however, entrepreneurs simultaneously engage in both wage work and self-employment, the role of opportunity costs dramatically increases because these costs change continuously according to the relative weight of the two activities for an individual over time. Since opportunity costs have been often operationalized in terms of wages (e.g. Elfenbein et al., 2010), it directly follows that the opportunity costs for hybrid entrepreneurs are represented by the interplay between the two sources of income. However, the mechanism through which the relative income from wage work influences an individual's decision to exit from self-employment might not be straightforward. On one hand, a wage income provides entrepreneurs with a supplementary source of financial resources that can support the growth of his venture and reduces the loss in case of failure. These arguments predict that the lower the weight of self-employment income over wage-work income the lower the likelihood that an entrepreneur exits from self-employment. On the other hand, earning a wage income means commitment in terms of time and effort to the established firm, as well as a potential for an internal career. These arguments predict that the lower the weight of self-employment income over wage-work income the higher the likelihood that an entrepreneur exits from self-employment. Therefore, a priori, the effect of alternative incomes, i.e. wage, on the likelihood of exit is *theoretically ambiguous*.

Next section investigates this issue empirically to provide preliminary findings on the theoretical foundation of these arguments.

METHOD

Data and Sample

The data we use are a special (high-technology) extract from a set of three matched longitudinal data sources on the entire Swedish labor market that were gleaned from governmental registers and maintained for research purposes by Statistics Sweden.²⁷ The first source is LOUISE—which has demographic and financial information for all legal residents of Sweden over the age of sixteen from 1989 onward. The second source is RAMS—which tracks employment flows in the labor market based on an annual mandatory survey for all firms having at least one employee or earning a profit. The third source is SRU—which tracks financial information for each firm and is submitted annually to the fiscal authorities for taxation purposes. The special abstract we use for analysis is called EPRO (Entrepreneurial Processes Database) and was commissioned for a broader project on entrepreneurship in high-technology manufacturing or knowledge-intensive service sectors, which are thought to be important to the Swedish economy. Individuals were identified as working in these sectors if their employer was in an industry that met Eurostat and OECD classifications, which are based on the ratio of research and development expenditures to gross domestic product. The EPRO extract covers any individual who was active in these sectors at any time from 1989 to 2002.

²⁷ Statistics Sweden is a division in the Ministry of Finance with authority over all national statistics for Sweden, including those related to industry and trade. RAMS is an acronym for *Registerbaserad Arbetsmarknadsstatistik*, which in English is equivalent to “Register-based Labor Statistics.” SRU is an acronym for *Standardiserad Räkenskapsutdrag*, which in English is equivalent to “Standardized Accounting Summary.” We believe our data to be comparable to recent studies using matched employee-employer data for Denmark (Sorensen 2007).

We constructed a risk set based on individuals, between the ages of 22 and 52, who began working as “self - employed” for a high-technology manufacturer or knowledge-intensive service firm in 1994. A focus on newly self-employed eliminates problems with left-censoring, which occurs when a person becomes at risk of switching prior to our ability to observe them; and beginning in 1994 enables measurement of labor market experience since 1989 and avoids the worst of the recession in Sweden in the early 1990’s. 20.676 entrepreneurs become at risk of transitioning from their current job in 1994. They remain at risk until they enter paid-employment or unemployment, or exit from the labor force (become deceased, or emigrate), or at the end of the observation period, i.e. 2002 (right censoring).

Identifying New Entrepreneurs

We identify individuals’ labor status using the occupational classification scheme employed by Statistics Sweden. The scheme distinguishes between “employed,” “not employed,” “self-employed” (i.e., an ownership position in a proprietorship or partnership where they are working), and “self-employed in incorporation” (i.e., an ownership position in an incorporated business where they are working). Individuals are identified by labor status for each source (i.e., employer) of income during a year, and the number of sources is unconstrained. Their “primary” labor activity is determined at the time of the annual survey in November of each year.

We define an individual as entrepreneur if:

- their primary classification is either “self-employed” or “self-employed in incorporation.”

- their primary classification is “employed,” and they have a secondary classification where they are “self-employed” or “self-employed in incorporation”.

In order to identify *new* entrepreneurs in 1994 we eliminate all entrepreneurs who were working in the same workplace as in 1993, whatever rank in sources of income (and thus, whatever number of secondary classification) the self-employment status represented in 1993. This last criterion is imposed because otherwise we might observe that an entrepreneur in 1994 was classified (primary classification) as wage worker in 1993 and consider him as a new entrepreneur. This treatment is incorrect because such individual in 1993 might be working in the same workplace of 1994, but have self-employment income low in the income rank. This occurs because the primary source of income is the criterion for the status classification.

Measures

Dependent Variable

Our dependent variable is exit. In this first draft, we define exit as a dummy variable that takes value 1 if the individual do not report income from self-employment for three consecutive years.

Independent Variables.

Our variables are defined in Figure 1.

Figure 1. Variable Definition

Variable Name	Definition
Household wealth (FOHL)	Log of total household wealth
Self-employment experience	Dummy variable =1 if individual has at least one episode in self-employment in primary labor status classification before 1994
Work experience	Number of years of wage-work experience
Percentage of Income	Continuous variable = the ratio between entrepreneurial income and alternative (wage work) income.
Rank in Source of Income	The rank that entrepreneurial income has on the total number of income sources.
Total Number of Income Sources	Sum of sources of income
Time unemployed	Log of number of days individual has been unemployed in the prior year
Entrepreneurial Income	Log of income from “self-employed” status

RESULTS

In this section, we provide some preliminary findings to support our theoretical arguments. Table 1 displays the distribution of exits over years. Consistent with prior findings on the liability of newness (Schussler & Brüderl, 1990), we find an inverse relationship between age and exit over time. The yearly percentage of mortality rate closely resemble those of prior studies.

In order to investigate the role of alternative sources of income, we perform panel data logistic regression models with random effects on exit. Results are displayed in Table 2.

As expected, the variable for entrepreneurial earnings is strongly significant and negatively related to the likelihood of exit. In support of our theoretical argument, the percentage of self-employment income on alternative income is strongly significant and it negatively influences exit. This finding supports the view of wage income as signal of potential for a career within the established firm. The higher the weight of wage on self-employment earnings the higher the likelihood that individual finds it more fruitful to pursue a wage-work career as opposed to entrepreneurship, hence the higher the likelihood that an individual abandons his entrepreneurial activity. Interestingly, the impact of relative income is even more important than absolute entrepreneurial income.

As robustness check, we perform survival analysis by employing a Cox Proportional Hazards Model. This model has the advantage to take into account the issue of right censoring. Table 3 reports this analysis and confirms the results obtained with our prior model.

DISCUSSION AND CONCLUSIONS

Prior work has cast entrepreneurial exit as a dichotomous decision (e.g., exit or not; wage work or entrepreneurship). Using matched employee–employer data over eight years on a population of new Swedish entrepreneurs, we reveal that such dichotomies are false. Many individuals not only enter self-employment while simultaneously engage in wage work (Folta et al., 2010) but persist in this status till the decision to exit.

Our theoretical model and empirical results point to the importance of considering the entrepreneur’s wage work income on the decision to exit self-employment. As

such, exit is endogenous to the entry-exit dynamics regarding simultaneous wage work. Our paper has three broad implications for research on entrepreneurial exit. First, in contrast to previous work, the exit decision is endogenous: individuals switch to paid-employment before leaving self-employment and not vice versa (Evans and Leighton, 1989). This might have profound implications for how we should interpret prior research. Second, our results ultimately suggest to re-examine the role of opportunity costs. This argument has been often downplayed (Elfeinbein et al., 2010), in favor of human capital explanations. Yet, his role become fundamental if considered as concurrent and not ex-ante. Third, this work contributes to integrate entrepreneurship in the individuals mobility literature which casts the individual attainment process (career) as the ultimate scope and not new venture success. Entrepreneurship represents one of the ways to get ahead in career.

TABLES

Table 1. The Liability of Newness

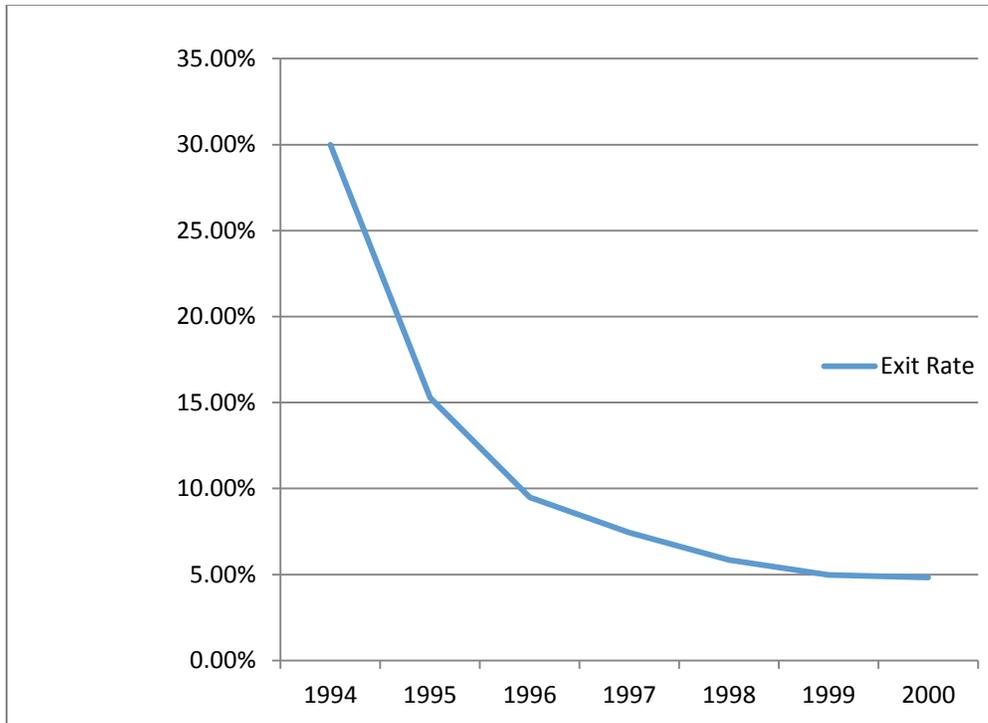


Table 2. Panel Data Logistic Regression With Random Effects On Entrepreneurial Exit

VARIABLES	EXIT
Self-Employment Income	-0.000*** (0.000)
Percentage of Income	-0.943*** (0.093)
Rank in Source of Income	0.101*** (0.023)
Total # of Income Sources	-0.063*** (0.012)
Sex	-0.020 (0.032)
Age	-0.027 (0.025)
age2	0.000 (0.000)
Time Unemployed	0.091*** (0.009)
Wage experience	-0.099 (0.078)
Entrepreneurial experience	0.120 (0.067)
Household Wealth	-0.005 (0.005)
Constant	0.222 (0.477)
Observations	20,676

Standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05

Table 3. Cox Proportional Hazard Model on Entrepreneurial Exit

VARIABLES	EXIT
Self-Employment Income	-0.000*** (0.000)
Percentage of Income	-0.641*** (0.029)
Rank in Source of Income	0.016 (0.012)
Total # of Income Sources	-0.032*** (0.007)
Sex	-0.066*** (0.016)
Age	-0.050*** (0.010)
age2	0.001*** (0.000)
Time Unemployed	0.128*** (0.006)
Household Wealth	0.003 (0.002)
Observations	70,152
Risk	70152.000

Standard errors in parentheses. *** p<0.001, ** p<0.01, * p<0.05

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CONCLUDING SECTION

CONCLUSIONS AND FUTURE RESEARCH

My dissertation offers three research papers on an underrepresented phenomenon in the entrepreneurship literature: selection effects. A central tenet of my research is the intuition that processes of self-selection by individuals – in entrepreneurship or in organizations before entrepreneurship – impact the analysis of fundamental issues in entrepreneurial research, such as the determinants of initial size, performance, and exit. Therefore, I revisit prior research findings on founders' background characteristics and entrepreneurship; I show that ignoring selection effects compromises our understanding of the entrepreneurial process; and I propose selection-based arguments. My dissertation is well positioned to investigate selection effects thanks to the access to one of the fewest databases in the world that contains information on those individuals who are at risk of transitioning from wage work to entrepreneurship and vice versa, but eventually don't.

The first two essays offer theoretical models and empirical evidence around selection effects in initial size and entrepreneurial performance. The most important contribution is the discovery of a fundamental source of selection effects: the different ways entrepreneurs enter the market, i.e. types of entrants, such as spinouts or de novo. These peculiar selection processes operate through the influence of types of entrants on an individual's thresholds of entry and initial size (i.e. the desired size at which founders intend to start their ventures). The second essay, in particular, by examining the performance implication of endogeneity in initial size, raises the paradox that the liability of smallness might turn out to be a liability of types of entrants. In the end, this might eventually question the long-standing view of initial size as signal of venture quality.

Finally, the third essay is the first to consider the theoretical and empirical implications of endogeneity in exit decision. Empirical evidence suggests that prior work casting entrepreneurial exit as a dichotomous decision (e.g., exit or not; wage work or entrepreneurship) is false. Counterintuitive to the popular view of entrepreneurs as risk-takers, the data reveals that many individuals persist in wage work much afterwards the launch of their venture. As a result, understanding the determinants of entrepreneurial exit is incomplete and biased if scholars overlook the role of other sources of income, namely salary, relative to entrepreneurial earnings.

In conclusion, my dissertation starts from coping with the empirical challenge of disentangling selection effects from treatment effects and ends up reexamining prominent theoretical explanations to fundamental issues in entrepreneurship, such as the notion of initial size, the liability of smallness, and the interplay between entrepreneurial performance and exit decision. The empirical implications of selection effects and the theoretical mechanisms proposed open important avenues for future research. In the following paragraphs I present two directions that probably represent my future steps.

A first line of future inquiry is motivated by the pursue of a better understanding of the dynamic interplay between initial size and performance. It builds upon the contribution of the second research paper in providing micro-level explanations to the liability of smallness. Drawing on the notion of prior career as key mechanism linking the macro-level explanations to individual-level theories (Shane & Khurana, 2003), this fourth

project examines the role of prior entrepreneurial experience. The project is titled “*Entrepreneurial Experience, Start-Up Size*²⁸”, and the abstract follows next.

We examine how entrepreneurial experience conditions two key findings of research in entrepreneurship: (1) founders’ wealth and start-up size; (2) start-up size and entrepreneurial performance. Departing from the common practice of using start-up size either as control in performance analysis, or as outcome of the entrepreneurial process, we model start-up size as founders’ strategic decision. As such, starting small might not be a suboptimal choice but a rational decision, if supported by entrepreneurial experience. Drawing on real option theory, we claim that founders with entrepreneurial experience are less likely to incur in the economic and social costs of overinvesting or underinvesting. Using a novel matched employer-employee dataset on US ventures, i.e. the Kauffman Firm Survey, we find that founders with entrepreneurial experience might reduce the amount of capital committed to the new activity without compromising their ventures performance.

A second broader and highly potential line of inquiry stems from my third research paper. This latter, in contrast to previous effort, departs from a view of exit as outcome of the entrepreneurial process (i.e. survival), and conceptualize it as a strategic choice. This view has important implications for future research. First, it opens up the way to explore the post exit process. Considering exit as the dead end and final outcome of the entrepreneurial process has hindered the study of the post-exit process. Conversely, my view encourages in depth investigation of Evans & Leighton (1989)’s empirical finding that about 50% of entrepreneurs come back to wage work within seven years. Second, it turns out the attention to the fact that, controlling for economic performance, staying in the business (surviving) is just one of the multiple strategic options available to entrepreneurs. Since entry, an entrepreneur is at risk of staying in the business, exit out to

²⁸ The paper in its current version is co-authored with Professor Raffaele Oriani and Professor Francesco Rullani – LUISS Guido Carli University, Rome (IT).

paid employment, exit out to self-employment (serial entrepreneurship), or exit out to unemployment. Examining these competing options in terms of prior experience as job hoppers might be an intriguing question. The phenomenon of job hopping can be viewed as the other side of Jack-of-all trade coin. Since evidence on the survival implications of Lazear (2004)'s model are mixed, as illustrated in the introductory section (Astbro & Bernhardt, 2005; Frederiksen & Wennberg, 2011; Gimeno, Folta, Cooper, & Woo, 1997), future investigation adopting a job-hopping perspective might help reconcile these contrasting results.

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