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A MARKET FOR LEMONS IN SERIAL ENTREPRENEURSHIP? EXPLORING TYPE I AND TYPE II ERRORS IN THE RESTART DECISION

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Extant literatures on serial and habitual entrepreneurship contain inconclusive findings about the differential impact of learning from success and failure. Yet, there are no published studies combining both the restart decision and restart performance after previous failure or success with a first venture. Using a comprehensive longitudinal dataset of all one-time starts and restarts in Denmark from 1980 to 2007, we discovered the existence of a market for lemons in serial entrepreneurship. First introduced by Akerlof (1970), the market for lemons refers to a market in which low-quality products come to dominate. In serial entrepreneurship, this occurs due to Type II errors in the restart phenomenon. Type I error occurs when a potential entrepreneur endowed with the human and social capital necessary for restart success does not start a second venture. Type II error refers to the opposite and forms the basis for the market for lemons in serial entrepreneurship. Based on our empirical findings, we develop new theory relating these two types of errors to errors in learning attributions resulting in overconfidence bias and thereby impacting performance.

Editor's Comment

As more communities, states, and countries try to kick-start their economies by promoting entrepreneurship, recognized entrepreneurs and political leaders often preach the value of perseverance; taking the fall, dusting oneself off, and trying again. But is that really the best strategy? Might there not be an important message in failure? A must read

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for entrepreneurship scholars, this article—suggesting that adverse selection in markets characterized by asymmetric information is not only a problem when one is buying a car—offers a surprising look at serial entrepreneurs, their ability to learn from experience, and what that might mean for economic development and renewal.

Professor Peter Bamberger, Action Editor

INTRODUCTION

Restarts, namely new ventures started by entrepreneurs who have previously started one other venture, constitute an interesting, important, and understudied phenomenon in the literature on serial entrepreneurship and learning from experience. Consider just one aspect of venturing that has fascinated psychologists, economists, and entrepreneurship scholars alike, the risks involved in becoming an entrepreneur as opposed to wage employment. Stewart and Roth (2001) and Miner and Raju (2004) found over two dozen of studies of the risk propensity of entrepreneurs. Add to this the fact that restarters have an even bigger hurdle to cross, namely, deal with actual failure and risk it again or risk losing what they have gained in success of their first venture. This double jeopardy embodied in the restart phenomenon makes its very existence intriguing and its rather substantial prevalence in the landscape of entrepreneurship downright puzzling. Yet, approximately 18–25 percent of all new ventures are started by serial entrepreneurs (Hyytinen & Ilmakunnas, 2007). In some populations, the rates may be even higher than 45 percent (Eesley, 2009). Furthermore, restarters make above-average contributions to employment and economic development (Roberts & Eesley, 2011).

Add to this the role of experience and learning embedded in the careers of entrepreneurs starting more than one venture. The findings here are currently contradictory, but are filled with promise for future discoveries. For example, studies based on venture capital (VC)–funded firms have found evidentiary support for the importance of prior success on subsequent success (Gompers, Kovner, Lerner, & Scharfstein, 2010; Hsu, 2007). More recent literature utilizing more representative samples from the much larger population of serial entrepreneurs has found evidence for both success after failure (Eggers & Song, 2014) and failure after success and then success thereafter (Toft-Kehler, Wennberg, & Kim, 2014). Also, a recent report from Eurobarometer highlights an inherent conflict in people's attitudes toward this. While 50 percent of respondents felt that one should not start a venture if there is a risk of failure, 82 percent stated that entrepreneurs who failed in their first venture should be given a second chance and some help at the point of restart.

Rather than offering insights and contributions to existing scholarship in entrepreneurship, everything we have learnt so far about restart only deepens the puzzles at the heart of entrepreneurship. We already mentioned the risks associated with venture failure and the contrasting possibilities of learning from failure versus learning from success. Extant literature has only brought to light these issues without offering any answers that may feed into practice, pedagogy, or policy. Consider the plight of entrepreneurs who have closed down their first business because it is likely to run out of cash, but are able to imagine or perceive another opportunity that they believe may be worth pursuing. Should they do that or get back into the job market? On the one hand, they may have learned lessons from their first venture that would increase the likelihood of success in the next one. Yet, they may decide not to start it because potential stakeholders may not want to invest with them because of the stigma attached to failure in many societies. Moreover, they themselves might overestimate the risks of their next venture due to the hot stove effect (Denrell & March, 2001) or overweighting of recently sampled experience (Hertwig et al., 2004). In this case, the economies they live in loses potential opportunities for job creation (A recent study by Haltiwanger, Jarmin, and Miranda [2013] shows that most net new jobs in the United States are created by young companies, not large established ones and not small business—similar conclusions are found in Dahl, Jensen, and Nielsen [2009] in Denmark). This lost opportunity for job creation is even more poignant when we take into account the fact that governments everywhere are investing substantial resources in incentivizing start-ups. To mention just one example, The European Social Fund invests 10 billion Euros a year, a large portion of which goes to help train and finance start-up entrepreneurs. In addition to lost opportunities for direct job creation, there is also the issue of indirect job creation through angel investors who fund new start-ups. Wiltbank, Read, Dew, and Sarasvathy (2009) showed that experienced entrepreneurs who start multiple ventures and learn from them are likely to achieve better results as angel investors.

On the other hand, the most important lesson start-up entrepreneurs ought to have learned after their

Author's voice:
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first failure but may not realistically acknowledge to themselves may be that someone else with a different set of human, social, and psychological capital may be better suited to build the venture they seek to build. In other words, at least a portion of entrepreneurs who failed in their first venture ought not be starting a second one. How would they assess the lessons they have learned and overcome blind spots in their psyche that lead to overconfidence? (Camerer & Lovallo, 1999). Alternately, are there educators they can turn to who can help them prepare better for their next venture? If so, what do these educators need to know about helping the restarters prepare better? At least in part due to policy directives, educational institutions around the world are beginning to teach entrepreneurship not only in colleges and universities, but even in high school or elementary school in the form of creativity. But it is not clear that either policy makers or educators agree on what to teach. For example, in *Entrepreneurship Education: A Guide for Educators*, the European Commission references everything from business plans to art classes. And when it comes to the issue of failure, the guide keeps repeating that sometimes plans and ventures will fail and that failure is an integral part of entrepreneurship without devising any programs directly tackling failure management and assessment of potential reasons for failure. Without that, start-up entrepreneurs are faced with the need to persist as their only strategy. That leaves restarts either to sheer chance or to entrepreneurs' beliefs about and prior proclivity for heroic persistence.

In fact, although an increasing number of published studies have examined the performance of serial entrepreneurs (Eesley & Roberts, 2012; Eggers & Song, 2014; Nahata, 2013; Parker, 2009; Politis & Gabrielsson, 2009; Stokes & Blackburn, 2002; Toft-Kehler et al., 2014; Yamakawa, Peng, & Deeds, 2010; Zhang, 2011), very little empirical investigation has been done on the decision to restart (by looking at intended restart or actual restart), and the vast majority existing studies are only available as working papers or book chapters (Metzger, 2007; Stam, Audretsch, & Meijaard, 2008; Wagner, 2002). The overall assumption in studies of serial entrepreneurship, largely derived from the occupational choice (OC) literature (Åstebro, Chen, & Thompson, 2011; Evans & Jovanovic, 1989; Evans & Leighton, 1989), appears to be that the same human and social capital variables that influence the start of the first venture influence the start of the second (Unger, Rauch, Frese, & Rosenbusch, 2011). However, not only is this assumption yet to be empirically examined, but it also raises the question of whether the same variables *should* influence restart. In other words, we are interested in the following set of two complementary research questions: Who should start a second venture, but does not? And who should not restart, but does? However, the definition of "should" and "should not" are defined *empirically* in the analysis and discussed carefully to avoid making too simple prescriptions for action.

Studying entrepreneurial performance conditioned on restart, as all published research on serial entrepreneurship has done to date, is subject to an important blind spot, namely the consideration of those who should have restarted but did not. More specifically, the research needs to address the role of Type I and Type II errors in the phenomenon of restart. Type I error occurs when a potential entrepreneur endowed with the human and social capital necessary for restart success does not start a second venture. Type II error occurs when individuals without the requisite human and social capital, or with the wrong kinds of human and social capital, start a second venture.

In our study, we use a uniquely appropriate dataset to undertake the empirical exploration of this topic. The dataset consists of comprehensive longitudinal register data from Denmark, allowing us to examine both the decision to restart and performance after restart in terms of the variables used in the entrepreneurship literature. Furthermore, since the dataset covers all restarts during the period of 1980–2007, it has allowed us to examine how experience and learning acquired through both success and failure in the first venture influences performance after restart. Based on an in-depth empirical analysis of the restart phenomenon, we have uncovered strong evidence for the existence of both Type I and Type II errors, as defined above. For example, our data supports the prediction that entrepreneurs who have failed with their first business are more likely than successful entrepreneurs to re-enter entrepreneurship. This effect remains strongly significant even after excluding potential necessity entrepreneurs (those who are either unemployed over a long period or have low-opportunity costs in terms of wage earnings). When it comes to the performance of second ventures, the story becomes even more interesting. Ventures founded by restarters with high levels of specific kinds of human and social capital are less likely to close down the second time around, even if they failed with their first venture. Entrepreneurs with these types of human and social capital characteristics, however, are not more likely to choose reentry (i.e., Type I error). Re-entry after failure for individuals without these types of capital increases the likelihood of a repeat failure (i.e., Type II error). The dataset has also allowed us to explore several other variables of interest in the restart phenomenon, for example, person and firm characteristics.

Based on these findings and building upon more recent studies that support the findings, we have developed a theoretical framework to guide future quantitative and qualitative research into the phenomenon of restart. In particular, we suggest which learning mechanisms and attribution errors can lead to Type I or Type II errors in the restart phenomenon. Whether the first venture results in success or failure, and what entrepreneurs attribute their success/failure to, can lead to over- and underconfidence, which then influences the restart decision. In our theoretical framework, we also examine ways in which individuals and policymakers can come to grips with, and perhaps even avoid, the two kinds of error highlighted in our empirical analysis, with a view to preventing a "market for lemons" in entrepreneurship (Akerlof, 1970). A market for lemons is a market in which high-quality products leave the market so that only low-quality ones remain.

In sum, this study makes three important contributions. First, using a comprehensive and reliable dataset, we have studied in some depth a very important, yet novel, phenomenon, namely Type I and Type II errors in the restart decision. Not only do we show who is most likely to re-enter entrepreneurship after their first venture succeeds or fails, but we also describe the consequences of the re-entry choice on the performance of the second venture. Second, we have built a new theoretical framework to be explored in future research that spells out the relationships between experiences of success or failure in the first venture and the decision to restart. In particular, the framework explains why and how Type I and Type II errors occur to create a market for lemons in entrepreneurship (Akerlof, 1970). Third, we provide the pedagogical and policy implications of our results to help avoid this market for lemons, both from the micro and macroperspectives. In particular, the existence of Type I and Type II errors has practical implications for both entrepreneurs (lemons and peaches) making the re-entry choice and policymakers seeking to foster economic development through more successful entrepreneurship.

REVIEW OF THE LITERATURE RELEVANT TO RESTART

Although the phenomenon of restart has not yet been studied in any depth, certain key variables of interest to the phenomenon—mainly related to the human and social capital framework—have been identified and studied in the related literature. In our study of the restart phenomenon, we use these exact same variables, but integrate and build on this fragmented literature to show how these variables play into Type I and Type II errors. Note that most of this literature looks only into the start-up phenomenon. While some examine habitual entrepreneurship, none examine a comprehensive dataset such as ours that has information on all start-ups and restarts including after success and after failure in the first venture. All the same, the review below is relevant because the human and social capital variables studied tend to be the same both for first-time start-ups and restarts except for previous venture experience.

Both human capital (Diochon, Gasse, Menzies, & Garand, 2002; Kim, Aldrich, & Keister, 2006; Klepper, 2002; Lazear, 2004; Phillips, 2002; Reynolds, Carter, Gartner, & Greene, 2004; Wagner, 2005) and social capital (Bosma, Praag, Thurik, & Wit, 2004; Stam & Elfring, 2008) have been shown to be of considerable importance in entrepreneurship, whether in influencing the start-up decision or in the performance of a first venture. For ease of reading, we provide brief reviews of each type of capital separately below.

Author's voice:
What motivated you academically to undertake this research?

Human Capital

Education is the most common measure of human capital in entrepreneurship. However, the role of education in start-up success remains unclear. In a recent meta-analysis on the topic, Unger et al. (2011) found that the outcomes of education, such as actual skills and knowledge, were positively correlated with better performance, but education in itself was not. More highly educated people are informed about business opportunities and thus choose to enter occupations or industries to exploit such opportunities (Parker, 2004). Nevertheless, valuable entrepreneurial skills are unlikely to be the same as those acquired through formal education (Parker, 2004). When it comes to the likelihood of restart, both Wagner (2002) and Hessels et al. (2011) found education to have no effect, while Stam et al. (2008) found that education has a negative effect on abstinence from renascent entrepreneurship. In recent examinations of the likelihood for successful entrepreneurship, Metzger (2007) found that education lowers the likelihood of firm closure, while an earlier work by the same author (Metzger, 2006) suggests that education increases the likelihood of growth.

More generally, people with more work experience are expected to become entrepreneurs and also to perform better. More time on the job affords for more time to learn about the business environment and create networks, thus providing greater access to more opportunities within the work environment (Parker, 2004). Based on the literature, industry-specific experience

appears to be very important for entrepreneurial success. Many studies, including those by Phillips (2002) and Agarwal, Echambadi, Franco, and Sarkar (2004), have found that spin-off entrepreneurs are more likely to survive than others. Explanations for this finding include the transfer of knowledge, resources, and routines from the parent company to the new venture. Therefore, the performance of the new venture has also been shown to depend on the performance of the parent company (Agarwal et al., 2004; Phillips, 2002). In terms of abstinence from re-entry into entrepreneurship, however, Stam et al. (2008) found that prior industry experience has no effect.

In sum, there appear to be interesting relationships between human capital variables and start-up performance, but these relationships may be more nuanced than first suspected. Specifically, while education per se may not directly explain performance, the outcomes of education, namely task-related skills and knowledge, probably have a positive influence (Unger et al., 2011). This finding is reinforced by findings relating industry experience to start-up performance (Chatterji, 2009). Industry experience not only provides skills and knowledge but also relevant social networks and support mechanisms (Hsu, 2007), which are elaborated on in the following section.

Social Capital

The positive effects of social capital on new venture formation and subsequent performance are usually seen as working through two mechanisms: a motivation effect and access to important resources like information, capital, and labor (Aldrich & Zimmer, 1986; Brüderl & Preisendörfer, 1998; Parker, 2004). Several studies have emphasized the importance of having a moral support network (Brüderl & Preisendörfer, 1998; Hisrich, Peters, & Shepherd, 2005). Empirical support has been provided by Sanders and Nee (1996), who examined marital status; Hanlon and Saunders (2007), who studied key supporters for success; and Brüderl and Preisendörfer (1998), who examined survival and growth of newly founded businesses.

The importance of a social network in start-up success is greater still if the network contains entrepreneurs (Bosma, Hessels, Schutjens, Praag, & Verheul, 2012). It is thus possible to gain realistic insights into the values, abilities, and skills needed for starting and running a business, as well as important resources and contacts (Hisrich et al., 2005). This view is supported by Nanda and Sørensen (2010), who found that individuals with entrepreneurial parents or workplace peers more often become entrepreneurs, and by Davidsson and Honig (2003), who found that the likelihood of becoming an entrepreneur is greater for individuals with entrepreneurial parents, friends, or neighbors, or if family and friends encourage the individual to undertake an entrepreneurial venture.

One natural way of insuring committed moral and professional support is by having a founding team instead of being a solo entrepreneur. The dynamic model of effectuation, as introduced by Sarasvathy (2008), emphasizes the many benefits of getting new stakeholders on board, as they will bring in both new means (i.e., knowledge, contacts, etc.) and new goals (e.g., based on personal values) for the venture. Both factors are important for creating new entrepreneurial opportunities in an uncertain environment.

In the case of restart, in addition to these human and social capital variables, we must also consider the particular skills, knowledge, and networks acquired through the first start-up experience, specifically embodied in the experience of success in contrast to experience of failure. We turn to a review of the literature on this topic in the following section.

Previous Entrepreneurial Experience and Learning from Success/Failure

What do we know about the variables that influence performance after restart? More precisely, what do we know about the role of experience and learning on restart performance? And does it matter whether the first venture was a success or a failure?

Politis (2005) reviewed the literature on entrepreneurial learning to formulate a model of knowledge acquisition and transformation through three kinds of experience—start-up experience, management experience, and industry experience. Baron and Ensley (2006) provide evidence for the role of cognitive frameworks acquired by experienced entrepreneurs in contrast to first-time entrepreneurs. Additionally, a continuing series of empirical works on effectuation have provided details on what such expertise, acquired through experience, actually consists of and how it relates to entrepreneurial and venture performance (Brettel, Mauer, Engelen, & Küpper, 2012; Reuber, Dyke, & Fisher, 1990; Sarasvathy, 2001, 2008; Wiltbank et al., 2009).

Entrepreneurs learn in very different ways, from the tactical aspects of day-to-day activities in starting and running a firm to the overall strategic and leadership experience of steering a venture as a whole through uncertain and changing environments. The former provide opportunities for deliberate practice (Englebrecht, 1995; Gustafsson, 2006; Helfat et al., 2009;

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Krueger, 2007) through repeatable tasks such as closing sales deals; dealing with customers; executing operational logistics; hiring, firing, and managing employees; monitoring cash flows; and working with boards and professional advisors. The latter provides opportunities not only for experimental learning (Harper, 1996), but also for vicarious learning (Corbett, 2007), by observing others and viewing examples through interactions with peers, advisors, and mentors, either individually or via participation in networks and trade organizations. Entrepreneurs also frequently choose to learn more actively, enrolling in education programs and attending conferences and workshops that they find useful.

With respect to the role of learning and experience, most of the focus has been placed on the impact of the entrepreneur's experience on the performance of the venture started. A substantial amount of studies on restart performance or serial entrepreneurship performance use samples of VC-backed firms. While this stream is rigorous and useful for furthering research, its relevance is somewhat questionable, given that less than 1 percent of ventures obtain VC funding, even in the United States, which has the largest VC industry in the world. Even when we consider ventures that go public, which are widely acclaimed as the highest performing ventures, less than 30 percent of these receive any VC funding at all and VC funding as a share of total money raised by companies going public is under 20 percent (Gompers & Lerner, 2001). Keeping this cautionary note on relevance in mind, this stream of research nevertheless offers variables of interest for research into restarts. In particular, this stream of research has brought into question the role of the success or failure of the first startup in the performance of the second and subsequent ventures. Hsu (2007), for example, found that entrepreneurs who have succeeded in their first venture are more likely to obtain VC funding for their second. In contrast, Paik (2014) found that irrespective of whether their first venture was a success or a failure, serial entrepreneurs perform better than first-time entrepreneurs. Furthermore, serial entrepreneurs who were not backed by VCs in their first venture perform better than those with prior VC funding experience.

The literature on the influence of prior success on the success of subsequent ventures brings to light another contrast. Also using data from only VC-funded firms, Gompers et al. (2010) found evidence for "performance persistence," meaning that first-time entrepreneurs who experienced success in their first venture were more likely to succeed in a subsequent venture. This is in contrast to a more recent study by Eggers and Song (2014) which uses a more representative sample from the population of serial entrepreneurs—not only those backed by VC—to show that changing industry from one venture to another can reduce the probability of success in the restart.

There are at least two interesting variations on the above findings regarding the importance of prior success for subsequent success, both of which include literatures outside entrepreneurship, theoretical as well as empirical. The first variation is sourced from the literature on barriers to learning that shows how success can lead to subsequent failure (Denrell & March, 2001; Levinthal & March, 1993; Levitt & March, 1988; Rahmandad, 2008; Rerup, 2005; Toft-Kehler et al., 2014). The second consists of the literature on learning from failure, which maps the path from prior failure to future success (Ariño & Torre, 1998; Chuang & Baum, 2003; Cope, 2011; Harper, 1996; Kim & Miner, 2007; Sarasvathy, 2008; Toft-Kehler et al., 2014). Taken together, these two streams of literature, combined with the contradictory findings about the path from success to success elaborated upon earlier, raise the spectre of Type I and Type II errors in the restart phenomenon—a topic not present in existing theoretical frameworks. Such frameworks assume either fixed entrepreneurial abilities/traits (Cromie, 2000; Evans & Jovanovic, 1989) or automatic learning from success/failure experiences (Cope, 2011).

Moreover, extant work on serial entrepreneurship is almost entirely based on those who do end up restarting, completely ignoring those who choose not to. The aim of the current study is to remedy this shortcoming in the existing literature and to shine new light on the possibility of Type I and Type II errors in the restart phenomenon.

METHOD

Longitudinal register data from the Integrated Database for Labor Market Research (IDA) were used for the analysis. IDA is a matched employer-employee database that covers all the individuals and firms in Denmark. From IDA, we identified the founder(s) of every new business that engaged in real economic activity during the specified period.[1] The founders were sampled based on the following criteria, as

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[1] A new business is identified as a new workplace (or new workplaces) under a new legal unit (employer). Businesses in the primary and energy sectors are excluded because of government subsidies and control. Real activity requires that the business have fulltime-equivalent employees and turnover above a given limit, depending on the industry.

TABLE 1
Descriptive Statistics

Variable	Description	Observation	Mean	Standard Deviation
Failure (first)	Binary: closed within the first 3 years after start-up	41,259	0.551	0.497
Failure (last)	Binary: closed within the first 3 years after start-up	1,418	0.545	0.498
Failure wealth (first)	Binary: closed within the first 3 years after start-up and loss in founder personal wealth	41,259	0.299	0.458
Failure wealth (last)	Binary: closed within the first 3 years after start-up and loss in founder personal wealth	1,418	0.273	0.446
Female	Binary: female	41,259	0.345	0.475
Age	Numeric: age	41,259	35.563	11.044
Age^2	Numeric: age squared	41,259	1,386.683	835.229
Urban	Binary: Copenhagen and Aarhus region	41,259	0.431	0.495
Education	Numeric: the number of years of education beyond 9 years of elementary school	41,259	3.013	2.579
Years indu	Numeric: the number of years in the start-up industry 5 years prior to start-up (4 digit)	41,259	0.742	1.461
Number indu	Numeric: the number of different industries worked in 5 years prior to start-up	41,259	1.733	0.951
Parent eship	Binary: parent entrepreneur within the 5 years prior to start-up			
Peer eship	Binary: sibling or spouse entrepreneur within the 5 years prior to start-up	41,259	0.164	0.370
Team eship (first)	Binary: more than one founder identified	41,259	0.367	0.482
Team eship (last)	Binary: more than one founder indentified	1,418	0.402	0.490
Wealth (ln)	Numeric: ln wealth of founder and spouse the year before start-up	1,418	5.078	6.128
Persons (ln)	Numeric: ln number of persons in the firm in the start-up year	1,418	0.665	0.574
Same indu	Binary: first and second firm in the same industry	1,418	0.355	0.479
Years start-up	Numeric: the number of years between the first and second start-up	1,418	3.342	1.702
Industry	Categorical: service, hotel/restaurant, wholesale, retail, construction and manufacturing			

described by Sørensen (2007) and Nanda and Sørensen (2010): 1) founders of unincorporated businesses (businesses with personal liability) with an occupational code of employer or self-employed; 2) founders of incorporated businesses (businesses with limited liability) in firms with three or fewer workers; 3) founders of incorporated businesses with an occupational code of CEO or executive, in firms with more than three workers.[2]

From the total set of founders in IDA, we identified all those entrepreneurs who started up one or two businesses between 1980 and 2007, where the first business was started between 1988 and 1998. In the ensuing analysis, entrepreneurs who started a second business within 6 years of the first start-up constituted the sample of restarters (including both serial and portfolio entrepreneurs), while those who did not start-up again constituted the sample of one-time entrepreneurs. A second start-up must have occurred within 6 years of the first start-up due to our aim of studying what entrepreneurs learn from their first business experience, as opposed to other labor market experiences. Entrepreneurial experience prior to 1980 was not seen as problematic, given that the entrepreneurs were assumed to have no entrepreneurial experience from 1980 until the start-up date in 1988–1998. However, individuals with an occupational code of employer or self-employed in the year prior to the start-up were excluded. Finally, the limited number of serial entrepreneurs who were behind more than two start-ups that engaged in real economic activity during the period was also excluded. Descriptive statistics for the sample—1,418 restarters and the 39,841 one-time entrepreneurs—can be found in Table 1 in the Appendix.

The main purpose of this study is to investigate possible Type I and Type II errors regarding the restart decision of entrepreneurs. In other words, we

[2] A limited number of the identified entrepreneurial firms were excluded based on the following restriction: The firm could have no more than 5 founders or 20 persons present at the start-up year (founders and employees). In the regression analysis, the standard errors are clustered, since it is possible to have more than one entrepreneur behind each new firm.

are looking at past entrepreneurs who 1) do not restart although they have a high likelihood of success, or 2) restart although they have a low likelihood of success. The Heckman selection model was chosen to study these potential errors, as the selection equation reveals the likelihood of restart, while the main equation reveals the likelihood of restart failure.

The explanatory variables in both equations in the Heckman selection model can be insignificant (0), positive (+), or negative (−). This means that when combining the estimate of one specific variable (e.g., failure with the first venture) in the selection equation and the main equation, nine combinations are possible. This allows us to move from a theoretical definition of Type I and Type II errors, to one based on our empirical strategy, and as a result, the potential errors for individuals with specific human and social capital (as well as sociodemographic characteristics) can be assessed objectively. The combinations are shown in Table 2 below.

The nine combinations in Table 2 illustrate the change in the probability of restart and restart failure, respectively, dependent on previous failure, human and social capital, and sociodemographic characteristics (i.e., the independent variables). If for instance, previously failed entrepreneurs are more likely to start up again than previously successful entrepreneurs (combination 1), and these failed entrepreneurs are less likely than the successful ones to fail with their next venture, then these failed entrepreneurs have not made an error at all. At the extreme opposite end (combination 9) are failed entrepreneurs who are more likely than successful entrepreneurs both to restart and fail after restart. These are defined to have committed a strong Type II error. The 0s in the table refer to those failed entrepreneurs who are equally likely as successful entrepreneurs to restart and fail after restart (combination 3 is the case in point here).

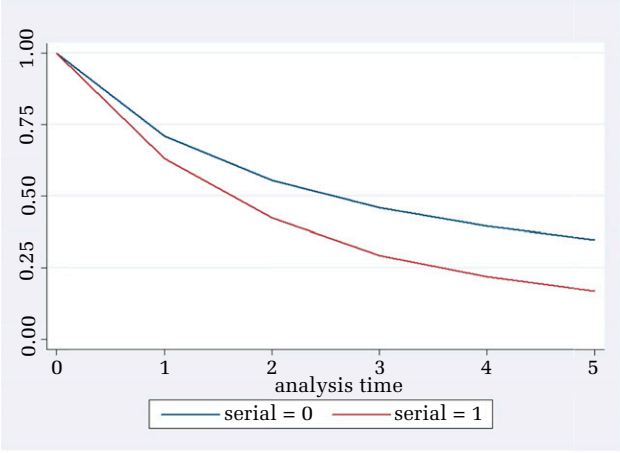
Aside from the possibility to assess Type I and Type II errors, the benefit of the Heckman approach is that the estimates of the likelihood of restart failure take into account the fact that some individuals are, *a priori*, more likely to start a second business (e.g., necessity entrepreneurs who have no other options on the labor market). In other words, the Heckman probit regression minimizes possible selection bias. However, the cost of this approach is that exactly the same variables must be included in the main and selection equations in addition to at least one extra instrument in the selection equation. Hence, variables not observed for one-time entrepreneurs (e.g., variables related to a second business) cannot be included.

The dependent variable in the main equation of the Heckman selection model is a dummy variable indicating whether the new firm closed down within the first 3 years, a period in which half of all new ventures disappear. New firm survival is a common measure of entrepreneurial success, as survival is a prerequisite for enjoying the pecuniary and nonpecuniary benefits of being an entrepreneur. However, firm survival is not always equal to success, and firm closure is not always equal to failure. An example could be one in which the entrepreneur survives with the new venture but fails to cover the opportunity cost—in earnings or work satisfaction—of the entrepreneurial career choice. In this case, survival is not equal to success. To accommodate for such a situation, we introduced an additional dependent dummy variable that takes the value of 1 if the new firm closed down within the first 3 years and the owner(s) lost personal wealth. The requirement of loss in personal wealth significantly reduced the number of entrepreneurs classified as having failed, compared to the previous measure. In this case, gaining knowledge of one's own personal

TABLE 2
The Definition of Type I and Type II Errors from the Two Equations in the Heckman Selection Model

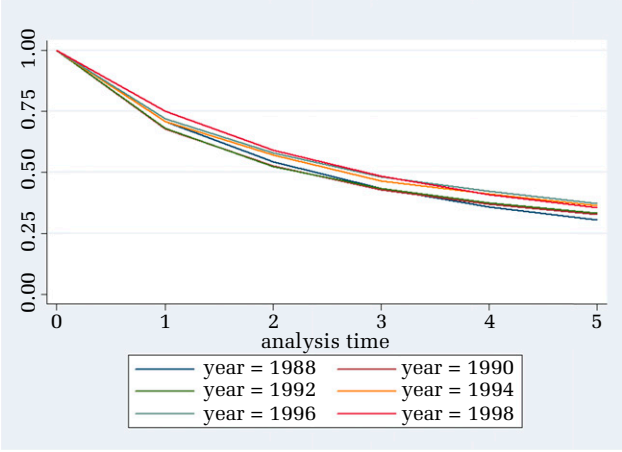
Independent Variables	**Dependent Variables**		
(Note that all 9 combinations are possible for each independent variable such as female, age, failed, etc.)	**Restart (Change in the probability of Restart)**	**Restart Failure (Change in the probability of Restart Failure)**	**Definition of Error**
Combination 1	+	−	No error, no bias
Combination 2	−	+	No error, no bias
Combination 3	0	0	No error, no bias
Combination 4	+	0	No error, bias
Combination 5	−	0	No error, bias
Combination 6	0	−	Type I, weak
Combination 7	−	−	Type I, strong
Combination 8	0	+	Type II, weak
Combination 9	+	+	Type II, strong

FIGURE 1
Kaplan–Meier survivor function (years after start-up) for the first firm divided into one-time entrepreneurs and restarters



entrepreneurial abilities through the venture experience and the entrepreneurial lifestyle were financially costly, and would therefore be considered a failure compared to the situation where the same insight was gained with little monetary investment; it is assumed that actual start-up is necessary to gain that insight. This alternative of considering loss in personal wealth, however, is not perfect. Even if the entrepreneur did not directly lose money on the experience, there was still an opportunity cost in terms of time (and, therefore, indirectly money) as well as potential negative emotions. Hence, both measures are included in the study, as there is no correct measure of "real failure." The survival rate of the first firm can be seen in Figures 1 and 2 in the Appendix.

FIGURE 2
Kaplan–Meier survivor function (years after start-up) for the first firm divided by start-up year 1988–1998



The independent variables included in both the selection and main equation of the Heckman model cover human capital, social capital, and personal demographics. Human capital includes years of education, years in the start-up industry, years in different industries, and a dummy variable for previous failure with the first venture, as defined above. Social capital covers dummies for whether parents or peers (siblings/spouses) are entrepreneurs and whether the founder was in a founding team in the first venture started. The latter variable is only included in the selection equation, as it is used as an instrument. We argue that membership in the first venture's starting team has a positive effect on the likelihood of restart but is unrelated to the likelihood of failure with the second venture, which is supported in Table 3. A more elaborate description of the construction of variables and descriptive statistics can be found in Table 1 in the Appendix.

In addition to the two different definitions of entrepreneurial failure, other sensitive analyses were conducted. First, the robustness of the results was assessed, excluding possible necessity entrepreneurs by removing those with 1) more than 25 weeks of unemployment during the 5-year period prior to the first start-up, or 2) an income of less than 200,000 DKR (approximately $35,250 USD) in the year preceding the first start-up. Second, we tested whether the importance of human and social capital in the restart decision and likelihood of restart failure are dependent on previous failure by interacting the failure dummy with these indicators. Only the effect of education was found to be dependent on previous failure and, hence, only this interaction was included in the analysis. Finally, to further control for variables related to the second business (e.g., same industry as the first, industry category, start-up size, and the years between the two start-ups), the likelihood of failure for a restart was estimated using a simple probit regression with these extra variables. This allowed for a correct graphical assessment of the size and significance of the previous failure and education interaction term, according to the approach used by Ai and Norton (2003) and Norton, Wang, and Ai (2004) as well as to test for additional interaction effects between previous failure and variables related to the second venture.

RESULTS

The significant results when restart failure is defined as firm closure, with and without wealth loss, are summarized in Table 4 and elaborated in the following sections (the results originate from Tables 5 and 6 in the Appendix, where the robustness tests of excluding potential necessity entrepreneurs are

TABLE 3
The Instrument Variable

	Restart				Restart Failure			
	No		Yes		No		Yes	
Team first	***N***	**%**	***N***	**%**	***N***	**%**	***N***	**%**
No	25,349	63.63	767	54.09	343	53.18	424	54.85
Yes	14,492	36.37	651	45.91	302	46.82	349	45.15
Total	39,841	100	1,418	100	645	100	773	100
Pearson χ^2	$p = .000$				$p = 0.529$			

also included). Table 4 utilizes the definitions of weak and strong Type I and Type II errors as presented in Table 2. Moreover, the baseline probability (all independent variables set to the mean) of restart and restart failure, respectively, from the Heckman selection models are included together with the marginal effects of the independent variables, which allows us to assess the magnitude of the errors.

Type I and Type II Errors: Failure Defined as Firm Closure

The left-hand side of Table 4 reveals that the baseline probability of restart is approximately 3 percent, while the baseline probability of restart failure is approximately 45 percent. Weak Type I errors seem to be prevalent for entrepreneurs with high education, industry experience in the start-up industry (i.e., spin-off entrepreneurs), and those with entrepreneurial parents. In other words, these entrepreneurs are not more likely to start up a second venture. But if they do, an additional year of education, experience in the start-up industry, and having an entrepreneurial parent decreases the likelihood of restart failure by 1.1 (per year), 2.0, and 11.1 percentage points, respectively. (Note: the latter two effects disappear when excluding necessity entrepreneurs.) To assess the prevalence of these weak Type I errors, 12 percent of the entrepreneurs that do not found a second venture had at least a bachelor's degree, while 26 percent and 17 percent had industry experience and entrepreneurial parents, respectively.

In comparison to successful entrepreneurs, entrepreneurs who have failed with their first venture are by 2.3 percentage points more likely to restart, regardless of their education level. Among the 1,418 restarters, 71 percent had failed with their first venture. The effect of previous failure on restart failure, however, is found to be dependent on the education level of the founder. Table 4 shows that failed entrepreneurs with no further education beyond elementary school fall into strong Type II errors since the likelihood of restart failure for

TABLE 4
The Main Results: Type I and Type II Errors

	Failure = Closure					
Dependent	**Restart**	**Restart Failure**		**Restart**	**Restart Failure**	
Independent	**mfx**	**mfx**	**Conclusion**	**mfx**	**mfx**	**Conclusion**
Female	−0.0181		No error, bias	−0.0185		No error, bias
Age	0.0036		No error, bias	0.0035		No error, bias
Age^2	−0.0001		No error, bias	−0.0000		No error, bias
Urban	0.0082		No error, bias	0.0086		No error, bias
Failure	0.0233	0.0983	Type II, strong	0.0141	0.0770	Type II, strong
Education		−0.0113	Type I, weak		−0.0111	Type I, weak
Failure (low education)	0.0223	0.2283	Type II, strong			
Failure (high education)	0.0223	−0.0386	No error, no bias			
Years indu		−0.0202	Type I, weak			No error, no bias
Number indu	0.0036		No error, bias	0.0037		No error, bias
Parent eship		−0.1109	Type I, weak		−0.0749	Type I, weak
Peer eship			No error, no bias	0.0048		No error, bias
Team eship	0.0167	−0.1140	No error, no bias	0.0152		No error, bias
Baseline (mean)	0.0296	0.4496		0.0310	0.3137	

Notes. Marginal effects from the Heckman selection models (Tables 5 and 6) can be seen for significant independent variables (5 percent level). The marginal effect of "Team eship" on "Failure" is based on a simple probit model (Tables 7 and 8) and not Heckman selection model. The regression results when excluding potential necessity entrepreneurs can be found in Tables 5 and 6.

TABLE 5
The Results (Coefficients and Standard Errors) of Heckman Probit Models, Using Firm Closure as the Dependent Binary Variable in the Main Equation (Top) and Restart as the Dependent Binary Variable in the Selection Equation (Bottom)

	Model 1		Model 2		Model 3		Model 4	
Main								
Female	0.027	0.120	0.027	0.120	0.157	0.120	0.135	0.150
Age	−0.001	0.028	−0.002	0.028	−0.031	0.030	0.018	0.044
Age²	−0.000	0.000	−0.000	0.000	0.000	0.000	−0.000	0.001
Urban	0.005	0.078	−0.000	0.078	−0.020	0.089	−0.178*	0.099
Failure	0.249**	0.114	0.595***	0.144	0.446**	0.204	0.663**	0.301
Education	−0.029**	0.014	0.043*	0.026	0.031	0.028	0.069*	0.037
Years Indu	−0.051**	0.024	−0.050**	0.024	−0.036	0.026	−0.043	0.031
Number Indu	−0.034	0.039	−0.032	0.039	−0.063	0.040	−0.035	0.055
Parent eship	−0.286***	0.097	−0.278***	0.096	−0.216*	0.111	−0.242*	0.131
Peer eship	0.067	0.093	0.063	0.093	0.016	0.106	0.016	0.139
F × Education			−0.099***	0.031	−0.095***	0.034	−0.141***	0.045
Constant	0.051	1.172	−0.256	1.154	1.310	1.176	0.155	1.544
Select								
Female	−0.291***	0.029	−0.291***	0.029	−0.282***	0.034	−0.233***	0.048
Age	0.053***	0.008	0.053***	0.008	0.065***	0.009	0.038***	0.015
Age²	−0.001***	0.000	−0.001***	0.000	−0.001***	0.000	−0.001***	0.000
Urban	0.119***	0.025	0.119***	0.025	0.138***	0.029	0.111***	0.036
Failure	0.354***	0.026	0.338***	0.043	0.323***	0.051	0.387***	0.067
Education	0.006	0.005	0.003	0.008	0.000	0.010	0.006	0.012
Years Indu	0.000	0.009	0.000	0.009	−0.002	0.009	0.005	0.011
Number Indu	0.053***	0.013	0.053***	0.013	0.044***	0.015	0.061***	0.020
Parent eship	−0.038	0.034	−0.038	0.034	−0.011	0.040	0.037	0.051
Peer eship	0.064*	0.033	0.064*	0.033	0.037	0.040	−0.037	0.053
Team eship	0.232***	0.025	0.232***	0.025	0.234***	0.030	0.236***	0.036
F × Education			0.005	0.010	0.010	0.012	0.007	0.015
Constant	−3.084***	0.145	−3.072***	0.147	−3.260***	0.167	−2.785***	0.295
Log-likelihood	−6,893		−6,887		−5,042		−3,306	
Observations	41,259		41,259		29,914		17,751	

Notes. Model 1 utilizes the full sample without interaction terms. Model 2 introduces the interaction term of previous failure and years of education. Models 3 and 4 mirror Model 2 but exclude possible necessity entrepreneurs by excluding long-term unemployed and low-income individuals, respectively.

* $p < 0.1$
** $p < 0.05$
*** $p < 0.01$

these entrepreneurs increases by 22.8 percentage points. In contrast to this, failed entrepreneurs with high education make the right decision to re-enter entrepreneurship. Each extra year of education decreases the likelihood of future failure by 3.9 percentage points meaning that previously failed entrepreneurs with a bachelor degree or higher are actually less likely to fail with the second venture. (Note: These results are robust, even when excluding necessity entrepreneurs.) Of the 1,005 previously failed restarters, 15 percent had a bachelor's degree or higher. Finally, entrepreneurs who founded their first venture within a team make the right decision to restart if they choose to start up within a team again.

Author's voice:
Was there anything that surprised you about the findings? If so, what?

Table 4 also depicts several factors that influence the decision to start a second venture, even though these factors have no influence on the likelihood of failure of that second venture. An exploration of these reveal that females are less likely to found a second venture, while middle-aged individuals, urban residents, and jacks-of-all-trades (individuals with experience from many different industries) are more likely to restart.

Addendum: A robustness test of the above results was conducted by estimating simple probit models, results from which can be found in Table 7 and Figures 3 and 4 in the Appendix. This robustness test had the benefit that we could add variables related to the second firm as well as graphically assess interaction effects of past failure and education, while it also had the cost that the estimated coefficients did not take selection into account. The findings did turn out to be robust, most importantly those concerning previous

TABLE 6
The Results (Coefficients and Standard Errors) of Heckman Probit Models, Using Firm Closure with Wealth Loss as the Dependent Binary Variable in the Main Equation (Top) and Restart as the Dependent Binary Variable in the Selection Equation (Bottom)

	Model 1		Model 2		Model 3		Model 4	
Main								
Female	0.084	0.131	0.082	0.131	0.196*	0.111	0.175	0.126
Age	−0.052*	0.030	−0.052*	0.030	−0.080***	0.025	−0.030	0.038
Age^2	0.001	0.000	0.001	0.000	0.001***	0.000	0.000	0.000
Urban	−0.061	0.085	−0.059	0.086	−0.082	0.084	−0.262***	0.089
Failure	0.213**	0.098	0.175	0.133	−0.030	0.143	0.044	0.190
Education	−0.031**	0.015	−0.036*	0.019	−0.044**	0.021	−0.016	0.023
Years Indu	−0.035	0.027	−0.036	0.027	−0.026	0.027	−0.019	0.030
Number Indu	−0.014	0.042	−0.015	0.042	−0.043	0.040	0.027	0.057
Parent eship	−0.220**	0.108	−0.219**	0.108	−0.122	0.111	−0.242*	0.136
Peer eship	0.049	0.100	0.048	0.100	0.038	0.105	0.122	0.129
F × Education			0.012	0.029	0.026	0.032	0.006	0.038
Constant	0.584	1.301	0.598	1.300	2.212**	0.961	1.367	1.164
Select								
Female	−0.285***	0.028	−0.285***	0.028	−0.276***	0.034	−0.226***	0.047
Age	0.050***	0.008	0.050***	0.008	0.060***	0.009	0.034**	0.015
Age^2	−0.001***	0.000	−0.001***	0.000	−0.001***	0.000	−0.001***	0.000
Urban	0.121***	0.024	0.121***	0.024	0.138***	0.029	0.109***	0.035
Failure	0.187***	0.025	0.188***	0.040	0.206***	0.049	0.245***	0.065
Education	0.005	0.005	0.005	0.006	0.006	0.007	0.014*	0.009
Years Indu	−0.007	0.009	−0.007	0.009	−0.008	0.009	−0.003	0.011
Number Indu	0.053***	0.012	0.053***	0.012	0.044***	0.015	0.062***	0.020
Parent eship	−0.037	0.034	−0.037	0.034	−0.007	0.039	0.037	0.051
Peer eship	0.065**	0.033	0.065**	0.033	0.039	0.039	−0.034	0.052
Team eship	0.206***	0.025	0.206***	0.025	0.208***	0.030	0.207***	0.036
F × Education			−0.000	0.010	−0.001	0.012	−0.011	0.015
Constant	−2.854***	0.142	−2.854***	0.143	−3.056***	0.162	−2.579***	0.292
Log-likelihood	−6,819		−6,818		−4,978		−3,268	
Observations	41,259		41,259		29,914		17,751	

Notes. Model 1 utilizes the full sample without interaction terms. Model 2 introduces the interaction term of previous failure and years of education. Models 3 and 4 mirror Model 2 but exclude possible necessity entrepreneurs by excluding long-term unemployed and low-income individuals, respectively.

* $p < 0.1$
** $p < 0.05$
*** $p < 0.01$

failure and education. With regard to other variables, we found as expected that initial founder wealth and restart within a team significantly reduced the likelihood of failure in the second venture. Note that industry category controls were added into the regressions but are not included Table 7.

Type I and Type II Errors: Failure Defined as Firm Closure and Wealth Loss

In previous studies, the definition of business failure has almost always involved firm closure, though in some cases it has been limited to personal bankruptcy or closure of a firm in financial distress. In other words, firm closure does not necessarily equal entrepreneurial failure if the financial loss and/or opportunity cost of the entrepreneurial experience is small and insignificant for the entrepreneur closing the firm. Hence, we re-analyzed our data with failure defined as a combination of firm closure and wealth loss. Results from this second set of analyses are provided on the right-hand side of Table 4, where we define failure of the first and last venture as failure to survive 3 years after start-up with a negative change in personal wealth.[3]

With this new definition of failure, the baseline probability of restart did not change from approximately 3 percent. But the baseline probability of restart failure decreased from approximately 45–31 percent. There are few major differences in results based on the new (stricter) definition of failure:

[3] For simplicity, the difference in personal wealth was calculated as the difference between wealth 2 years after start-up and wealth 1 year before start-up, regardless of how long the failed business survived. Furthermore, it was possible for the change in wealth associated with the first and second businesses to overlap in years, if the entrepreneur started the second business 1 or 2 years after the first.

TABLE 7
The Results (Coefficients and Standard Errors) of Probit Models with Firm Closure as Dependent Variable

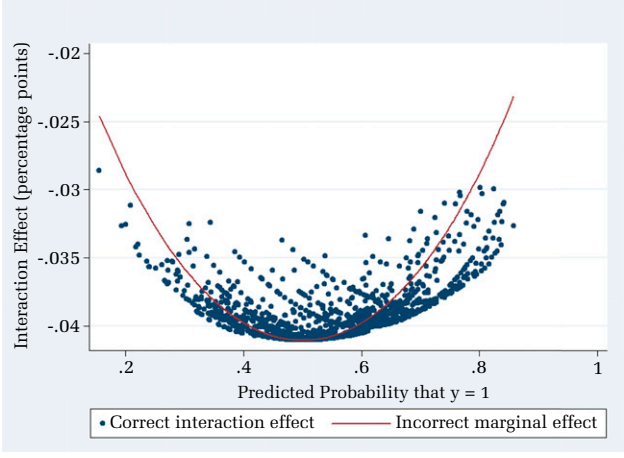
	Model 1		Model 2		Model 3		Model 4	
Female	0.014	0.086	0.022	0.086	0.055	0.104	0.039	0.145
Age	−0.016	0.025	−0.018	0.025	−0.026	0.028	0.018	0.043
Age^2	0.000	0.000	0.000	0.000	0.000	0.000	−0.000	0.001
Urban	−0.002	0.069	−0.010	0.069	0.029	0.081	−0.147	0.100
Wealth (ln)	−0.014**	0.006	−0.015**	0.006	−0.015**	0.007	−0.028***	0.008
Persons (ln)	−0.065	0.072	−0.056	0.071	0.025	0.083	0.038	0.101
Same indu	−0.139*	0.077	−0.127*	0.077	−0.191**	0.090	−0.196*	0.110
Years start-up	−0.032	0.021	−0.031	0.021	−0.020	0.025	−0.051*	0.031
Failure	0.198***	0.077	0.549***	0.130	0.551***	0.155	0.766***	0.209
Education	−0.013	0.015	0.061**	0.026	0.051*	0.030	0.112***	0.039
Years indu	−0.045*	0.026	−0.046*	0.026	−0.031	0.028	−0.034	0.033
Number indu	−0.019	0.036	−0.018	0.036	−0.043	0.042	−0.007	0.055
Parent eship	−0.261***	0.098	−0.251**	0.098	−0.216*	0.114	−0.239*	0.141
Peer eship	0.066	0.092	0.062	0.093	0.032	0.112	0.040	0.149
Team eship	−0.249***	0.080	−0.262***	0.080	−0.327***	0.094	−0.431***	0.115
F × Education			−0.103***	0.030	−0.099***	0.035	−0.149***	0.045
Constant	0.773*	0.467	0.548	0.476	0.622	0.526	−0.426	0.886
Industry dummy	Yes		Yes		Yes		Yes	
Pseudo R-squared	0.04		0.04		0.05		0.08	
Log-likelihood	−939		−933		−685		−450	
Observations	1,418		1,418		1,042		702	

Notes. Model 1 utilizes the full sample without interaction terms. Model 2 introduces the interaction term of previous failure and years of education. Models 3 and 4 mirror Model 2 but exclude possible necessity entrepreneurs by excluding long-term unemployed and low-income individuals, respectively.

* $p < 0.1$
** $p < 0.05$
*** $p < 0.01$

- Weak Type I error in the case of industry experience disappears since this variable now has no effect on restart failure.
- Even when excluding possible necessity entrepreneurs, previously failed entrepreneurs are still more likely to start up again but the size of this effect is somewhat smaller (1.4 percentage points compared to 2.3 with the previous definition). This result is as expected since failure now includes wealth loss influencing the desire and ability to restart.
- Decreased likelihood of restart failure (7.7 percentage points) is not dependent on the education level of the founder.
- The above two points show that previously failed entrepreneurs still exhibit a strong Type II error but with the new definition of failure, the result in Table 4 is less robust when excluding potential necessity entrepreneurs, even for founders with no further education.

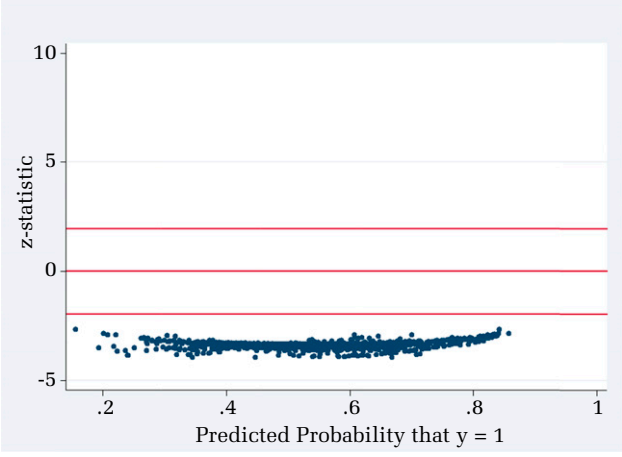
FIGURE 3
Interaction effect (failure × education) as a function of predicted probability of failure (second firm). Based on Model 2 Table 3



In sum, whereas the existence of Type II errors is robust to the two definitions of failure in the case of all start-up entrepreneurs taken together, it is less robust when we exclude necessity entrepreneurs.

Additionally, in both definitions of firm failure, team founders are more likely to make the right decision to restart if they again start the second venture with others, but this effect is less robust (i.e., only significant in one of the two models where potential necessity entrepreneurs are excluded). Moreover, the restart biases that were observed with the old definition of failure still exist with the new definition. Finally, simple probit models with additional controls and

FIGURE 4
Significance of interaction effect (failure × education) as a function of probability of failure (second firm). Based on Model 2 Table 3



graphical interpretation of interaction effects were conducted as a robustness test. Results from the robustness test continue to support the above findings and can be found in Table 8 in the Appendix. An additional finding not included in Table 8 is that the increased likelihood of restart failure for previously failed entrepreneurs is moderated by the time between the two start-ups. As expected, each additional year reduces the likelihood of restart failure. The result, however, was only robust when using the stricter definition of failure including wealth loss.

DISCUSSION

In this empirical exploration of the restart phenomenon, we sought to answer a complementary set of two questions related to Type I and Type II errors, defined in purely empirical and probabilistic terms: Who starts when they should not? And who does not start when they should? Overall, failed entrepreneurs are more likely to restart than successful entrepreneurs, even though these are also more likely to fail again and as a consequence commit strong Type II errors. In contrast, educated entrepreneurs or entrepreneurs with entrepreneurial parents, who are more likely to succeed in their restart, are not more likely to start a second venture and thus are prone to weak Type I errors. Although there are interesting nuances in addition to these central results in our study, the existence of this particular set of Type I and Type II errors is robust throughout the analyses. That raises the interesting issue of the mechanism that drives these errors in the restart phenomenon. We turn to a theoretical conceptualization of these next.

TABLE 8
The Results (Coefficients and Standard Errors) of Probit Models with Firm Closure as Dependent Variable

	Model 1		Model 2		Model 3		Model 4	
Female	0.020	0.089	0.017	0.089	0.039	0.108	0.059	0.150
Age	−0.047*	0.026	−0.047*	0.026	−0.060**	0.030	−0.011	0.049
Age^2	0.001	0.000	0.001	0.000	0.001*	0.000	0.000	0.001
Urban	−0.053	0.074	−0.049	0.074	−0.007	0.086	−0.238**	0.109
Wealth (ln)	0.019***	0.006	0.019***	0.006	0.015**	0.007	0.003	0.009
Persons (ln)	−0.014	0.076	−0.016	0.076	0.063	0.088	0.029	0.106
Same indu	−0.051	0.081	−0.052	0.081	−0.133	0.096	−0.206*	0.115
Years start-up	−0.022	0.022	−0.022	0.022	−0.017	0.026	−0.055*	0.033
Failure	0.240***	0.076	0.172	0.119	0.048	0.150	0.122	0.198
Education	−0.029*	0.015	−0.038**	0.019	−0.051**	0.023	−0.002	0.029
Years indu	−0.034	0.028	−0.036	0.028	−0.023	0.030	−0.013	0.037
Number indu	−0.002	0.039	−0.003	0.039	−0.028	0.045	0.083	0.058
Parent eship	−0.238**	0.107	−0.238**	0.108	−0.173	0.124	−0.310**	0.156
Peer eship	0.059	0.098	0.056	0.098	0.074	0.117	0.139	0.157
Team eship	−0.122	0.085	−0.124	0.085	−0.151	0.100	−0.289**	0.124
F × Education			0.022	0.029	0.040	0.036	0.012	0.046
Constant	0.409	0.493	0.432	0.494	0.675	0.549	−0.346	0.976
Industry dummy	Yes		Yes		Yes		Yes	
Pseudo *R*-squared	0.03		0.03		0.03		0.04	
Log-likelihood	−804		−804		−583		−375	
Observations	1,418		1,418		1,042		702	

Notes. Model 1 utilizes the full sample without interaction terms. Model 2 introduces the interaction term of previous failure and years of education. Models 3 and 4 mirror Model 2 but exclude possible necessity entrepreneurs by excluding long-term unemployed and low-income individuals, respectively.

* $p < 0.1$
** $p < 0.05$
*** $p < 0.01$

Theoretical Implications

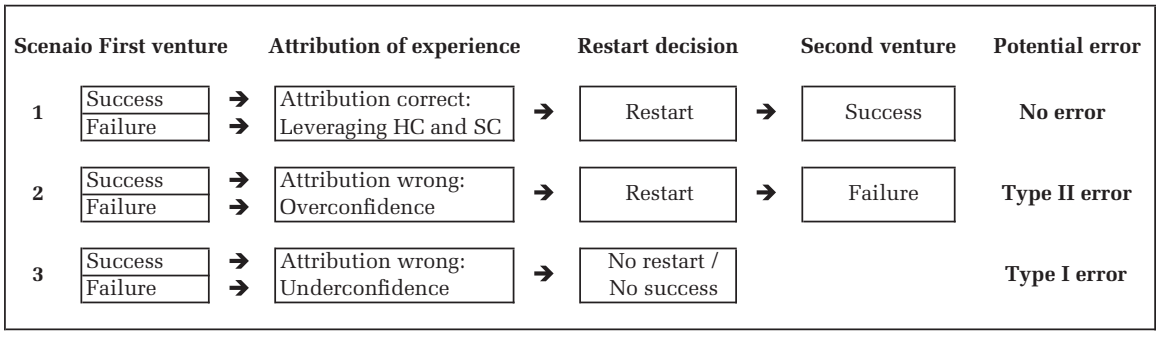
The existence of Type I and Type II errors in the restart phenomenon raises an immediate question as to the mechanisms that drive these errors. Could it be that people who should be restarting do not because they have readily available jobs in the labor market, while people who start when they should not may not have those job opportunities and therefore resort to a form of necessity entrepreneurship? The former, however, is likely true in our sample. Even so, this begs the question of why these entrepreneurs started their first venture in the first place? Therefore, their not restarting, conditioned on the fact that they did start one venture, cannot simply be explained away by the availability of job opportunities. When we add into this argument the fact that these are more likely to succeed the second time around, we are forced to seriously consider the possibility that they derived the wrong lessons from their failure about their potential for future success. In other words, in coming up with theoretical mechanisms relevant to the restart decision, we need to turn to the literature on attribution errors in learning.

The literature on attribution errors in learning has mostly been developed in organizational settings other than entrepreneurial. However, one subset of this literature has been well studied in entrepreneurship. We therefore see here a valuable opportunity to make a contribution that can help connect two well-developed yet currently disparate literature streams. In the theoretical model illustrated in Figure 5, we provide a framework for how attribution errors in learning from success and failure might result in over- and underconfidence. For example, when entrepreneurs believe that failure by itself leads to learning, without regard to their level of education, their attribution error leads them into overconfidence, resulting in the decision to restart even when they should not (Type II error). Similarly, not understanding the importance of coming from an entrepreneurial family in the likelihood for success can lead people to succumb to underconfidence after failure, preventing them from restarting when they should (Type I error).

On the one hand, because failure is associated with negative emotions such as grief, entrepreneurs may be less likely to re-enter after a business closure (Shepherd, 2003; Shepherd, Wiklund, & Haynie, 2009). On the other hand, certain traits, such as optimism or even overconfidence, are likely to be associated with positive emotions, which may make entrepreneurs more likely to re-enter (Hayward et al., 2009). There is a large body of literature describing cognitive biases exhibited by entrepreneurs (Busenitz & Barney, 1997). Prominent among these is overconfidence (Camerer & Lovallo, 1999; Forbes, 2005)—the tendency among entrepreneurs to overestimate their abilities and their probability of success. A related bias, called comparative optimism, is the belief that one is less likely than others to experience negative events and more likely than others to experience positive events (Helweg-Larsen & Shepperd, 2001).

Most studies of these biases have been done in laboratory settings and have focused almost exclusively on entry into a first venture rather than re-entry, or re-entry after failure. A notable exception is a study by Ucbasaran, Westhead, Wright, and Flores (2010), which, based on a survey of a representative sample of 576 British entrepreneurs, found that serial entrepreneurs are less likely to report reduced optimism after business failures. In addition to the lens of OC in economics and that of biases and emotions in psychology, scholars have also approached the question phenomenologically (Cope, 2011). However, learning, or improving entrepreneurial ability through entrepreneurial failure or success experience, as studied in recent research (Eggers & Song, 2014; Toft-Kehler et al., 2014), does not take into account what the entrepreneurs *think* they have learned from their first venture experience—a factor that is crucial for the re-entry decision.

FIGURE 5
Why do type I and type II errors exist?



Indeed, if the first entrepreneurial experience—successful or not—leads to correct attribution of the specific circumstances resulting in failure or success, the human and social capital of the founder will be leveraged, improving the chance of subsequent success. It is of course possible that both first-time entrepreneurs and restarters might be prone to innate over- or underconfidence bias unrelated to the success or failure of their first venture. But as recent research in psychology shows, even innate traits can be changed through actual experience (e.g., see Kaufman & Libby, 2012). Our theorizing here does not explicitly address the role of innate traits and biases. Instead, we seek to provide a framework for understanding the role of attribution errors, even after controlling for innate traits and biases. The crucial assumption in this argument, however, is that of "correct" attribution. The term correct/incorrect attribution points to the fact that even when people learn from experience, what they learn may or may not be what they ought to learn. The literature on learning provides examples in which people make incorrect attributions from experience. Denrell and March (2001), for example, use the famous quote from Mark Twain about the cat that jumps on the hot stove and never jumps again, even onto a cold stove, to show how one may overlearn or learn the wrong lessons from failure. More recently, Hertwig et al. (2004) show how people underweight the probability of rare events when they make decisions based on experience. In the case of potential restarters in entrepreneurship, not only is their first venture failure experience just a tiny sample of the phenomenon in question, but sheer recency of this experience may overwhelm more objective information they may have access to.

In contrast, failure can also lead to overconfidence if the founder believes that failure is a valuable learning experience but attributes the failure to the wrong factors (e.g., specific abilities, situations, and/or environmental factors) To put it another way, we do not know whether "Jake" and "Colin," as described by Cope (2011), learned *the right lesson* from the failure experience:

> *The fact is I lived through that (failure) and I saw a set of reasons why a company goes under and now I'm much more prepared to handle whatever the market sends to me.* "Jake" in Cope (2011)

> *You learn much more from failure. . . I mean just success coming along is just waiting for that big disaster to get you, because you're not thinking and whole bits of your brain shut down. You think you're invincible, you think you're Teflon coated and you're not.* "Colin" in Cope (2011)

In the same way, success in the first venture can result in either over- or underconfidence if attribution error is possible. In the first situation—which is intuitively more appealing and represented in the quote from "Colin"—the founder may incorrectly attribute success to high entrepreneurial ability and will therefore pursue another success by founding a second venture without further reflection. The second situation could arise if the founder incorrectly attributes the first success to the particular environment or situation, influence from significant others, or just plain luck or coincidence, and as a result, does not want to risk failure by founding another firm. The decision not to found another venture as a result of underconfidence from failure as well as success experiences eliminates the possibility of future success as an entrepreneur in a world where learning is possible.

The discussion above is summarized in Figure 5, which explains the antecedents to potential Type I and Type II errors.

Scenario 1 illustrates what happens when entrepreneurs make correct attributions to what they have learned from the experience of starting their first venture, whether that venture succeeded or failed. This means that correct attributions to learning from both success and failure can lead to productive leveraging of human and social capital by the restarter. Incorrect attribution, however, can result in over- or underconfidence, regardless of previous performance.

Scenario 2 illustrates that overconfidence as a result of previous success or failure increases the likelihood of restart and restart failure, resulting in a Type II error. Our empirical findings support this argument, showing that simply attributing learning to failure without regard to relevant human and social capital can lead failed entrepreneurs into making Type II errors. Even when excluding potential necessity entrepreneurs from the sample and defining previous failure as both firm closure and wealth loss, failed entrepreneurs were still more likely to re-enter entrepreneurship than successful entrepreneurs.

The possibility of Type I error is illustrated in Scenario 3, in which previous success or failure results in underconfidence, decreasing the likelihood of restart. This group of entrepreneurs will thus give up the opportunity to leverage the human and social capital that increases the likelihood of success in a second venture. Our findings indicate that founders with high levels of education, industry experience, and entrepreneurial parents are prone to this type of error, since these founders are less likely to fail in a second venture yet are less likely to re-enter entrepreneurship. It is easy to see why failed entrepreneurs with the requisite human and social capital for restart success might make the wrong attribution and fall into underconfidence bias. However, successful entrepreneurs

can also fall into this bias if they attribute their success to simple luck, as Kihlstrom and Laffont (1979) suggest, and choose to take their winnings and quit.

In addition to the relationships between attribution errors in learning, over- and underconfidence biases, and Type I and Type II errors in the restart phenomenon, as laid out in our theoretical framework, future research could also build on our model to more closely investigate how education enables learning from experience. Nielsen (2015), for example, found that highly educated entrepreneurs perform better in both stable and unstable industry environments. Recent work investigating learning from success and failure has focused on bounded samples such as VC-backed new ventures (Eesley, 2009; Gompers et al., 2010; Hsu, 2007), which are not representative of start-ups in general, based on the formal qualifications of the founder. In spite of the learning capabilities of highly educated entrepreneurs, these are not more likely to re-enter, which could be explained by their higher opportunity cost of foregone wages in the labor market. Still, not reentering may not be the best decision. While entrepreneurs, on average, are found to have lower earnings than employees (Hamilton, 2000), they also enjoy more autonomy and flexibility than employees (Parasuraman & Simmers, 2001), and experience greater satisfaction than employees (Hundley, 2001), even when controlling for selection of individuals into entrepreneurship. The crucial question is whether success in each occupation is defined as achieving the highest earnings or the highest satisfaction. Also, do entrepreneurs *know* their *changed payoffs* when they consider the choice between restart and wage employment after their first venture has succeeded or failed? More focus on these questions in empirical research could help former entrepreneurs make a more informed and rational decision of whether to re-enter.

Limitations and Future Research

Following Venkataraman (1997) and Shane and Venkataraman (2000), the individual-opportunity nexus has become a dominant theme in entrepreneurship research. Since our dataset does not contain explicit information on the nature of opportunities available to entrepreneurs, we could not directly address the role of opportunities in the current study. However, since our dataset contains all first-time entrepreneurs and restarters, we can assume that the aggregate set of all opportunities available to them is taken into account in the analyses. Although this aggregate set of all opportunities can be assumed to be available to all entrepreneurs, whether first-timers or restarters, in the case of the latter it matters whether they are restarting after success or after failure. Those who restart after failure are likely more restricted in the ways in which they take advantage of opportunities, simply because of more restricted access to resources from outside stakeholders. Those who restart after success, on the other hand, find more open doors, and hence have better access to resources. Once again, because our dataset contains all restarters, we can assume that at the aggregate level, the restrictions are normally distributed over all those who restart after failure, as is the expanded access over all those who restart after success. Furthermore, our analysis shows that failed entrepreneurs are more likely to restart, even after controlling for necessity entrepreneurs, suggesting that restriction in opportunities may not play an important role in the restart phenomenon at all. Regardless, it would be useful to find a way to explicitly model opportunities in the restart decision for future studies.

Another interesting avenue for future research could be to look at the factors that were found to be important in the restart decision, yet do not influence the likelihood of restart failure (the outcome labeled no error-bias in Tables 2 and 4). In line with Metzger (2008) and Stam et al. (2008), we found that females are less likely to restart, and the causes of this could be explored through qualitative research looking at how gender influences the attribution of success and failure experiences and how this affects learning and/or over- or underconfidence. Middle-aged founders, founders with experience from many different industries, and urban area residents were all found to be more likely to found a second venture, which is in line with these individuals being more likely to found a new venture in general (Parker, 2004). Finally, founders that were in an entrepreneurial team in their first venture were found to be more likely to start up again and succeed if a team also founds the second venture, suggesting that team-based habitual entrepreneurship is the correct decision. However, the main contribution of this study is its identification of the existence of Type I and Type II errors in the restart phenomenon and the development of theoretical framework describing the mechanisms that drive those errors. The implications for potential restarters, stakeholders (e.g., financiers, employees, etc.), and policymakers are outlined in the following section, where it is argued that (entrepreneurship) education and policy can

Author's voice:
If you were able to do this study again, what if anything would you do differently?

take valuable insights from the extant literature on "the market for lemons."

Additionally, it would be interesting in future research to develop a richer theory of possible learning errors in entrepreneurial experience. Extant research has shown that entrepreneurs can learn a variety of lessons from building ventures ranging from the importance of certain psychological variables—such as persistence and resilience—to a variety of ways to respond to external factors that influence performance. We believe an in-depth qualitative study that examines these can be useful to develop a fuller model of how attribution errors in learning can lead to over- or underconfidence in entrepreneurship. Finally, we could incorporate experimental designs in classrooms to identify effective ways to educate entrepreneurs that help rectify these attribution errors. Erev and Roth (2014) identify specific conditions under which decision makers can learn from experience to draw better conclusions that lead to more rational behavior over time. Designing experimental and experiential pedagogy that incorporates their insights can provide fertile avenues for future research in entrepreneurship in particular and in business education more broadly.

The Market for Habitual Entrepreneurs = A Market for Lemons?

Our findings reveal that previously failed entrepreneurs are more likely to found a second venture than previously successful entrepreneurs, which stands in contrast to the predictions based on the Occupational Choice Model. This suggests that the market for habitual entrepreneurs is a market for lemons if no learning takes place. To put it another way, the previous failure was a result of poor innate and fixed entrepreneurial abilities.

The *market for lemons* is a market failure presented by Akerlof (1970), which garnered him the Nobel Prize in 2001. In simple terms, the term "market for lemons" refers to a market in which low-quality products come to dominate higher quality products in terms of their price. The idea is that asymmetric information between buyers and sellers in the used car market results in adverse selection. Asymmetric information exists here because only the sellers know the quality of their cars and buyers do not. Buyers are thus forced to use an expected distribution of high-quality cars (i.e., peaches) and low-quality cars (i.e., lemons) in the market to calculate the statistical fair price offer of the car presented before them—that is, the weighted average of the reserve prices of a good car and a bad car. The result is adverse selection, as only sellers of low-quality cars would be willing to sell at this price and a market for lemons has thus been created. Since the buyers know this to be the outcome, they lower their price offer to the reserve price of a low-quality car. To create a market for high-quality cars under asymmetric information, the sellers must signal high quality to buyers in a credible way. This means that the signal has to be costly for sellers of low-quality cars but not for sellers of high-quality cars. In the given example, such a signal could be to issue a warranty with the transaction (e.g., the seller pays all repair bills within the first 2 years).

The problem of adverse selection under asymmetric information—and the solution of signaling—applies to a variety of situations. Returning to our findings, we know that previously failed entrepreneurs are more likely to restart. But it matters whether they are lemons or peaches, lemons being a metaphor for entrepreneurs who are making attribution errors and peaches signifying those who are not. Consider the implications for lemons in the market for entrepreneurs. Just as in the case of cars, lemons set in motion a vicious cycle of adverse selection that has deleterious consequences for the market as a whole. Here is how the vicious cycle might unfold:

- As our findings show, failed entrepreneurs, especially those most likely to fail again, are more likely to restart.
- When more lemons restart, stakeholders have to deal with noisier signals and likely become more risk averse in investing with restarters.
- Peaches also suffer from attribution errors and therefore at least some peaches will not restart. Furthermore, with stakeholders not investing, a classic market for lemons problem ensues. Lemons, therefore, increase the likelihood peaches will not restart even when they should. Overall distribution of restarters gets even more skewed against peaches and in favor of lemons.
- By providing seed funding and other incentives for starters *and not for restarters*, policymakers exacerbate the problem resulting in increased entry of potential lemons in the first place and their persistence through into the population of restarters.
- Scholars and institutions who educate—for success and persistence and against failure rather than calibration of learning from experience (such as the programs listed in the EU Guidebook cited at the introduction to this article)—also exacerbate the problem by both increasing re-entry of lemons and inhibiting re-entry of peaches. Note also that here overconfidence and persistence are confounded making the entire pool even murkier.

Nevertheless, we do find that highly educated entrepreneurs learn from experiences of failure. This

finding is in line with research showing that education increases the ability to adapt to changing and uncertain environments (Nielsen, 2015) and to attract high-quality employees (Dahl & Klepper, 2015). All these mechanisms imply that it might be worthwhile for the individual to invest in education as a signal to potential stakeholders of likelihood of correct attribution. Additionally, it might also be worthwhile to design educational programs at the point of failure and potential restart to both correct attribution errors and send more useful signals to potential stakeholders.

Education as a signal of correct attribution has previously been used to solve the problem of asymmetric information between employers and employees regarding the productivity of potential employees (Spence, 1974; Varian, 2014). Again, education could increase the productivity of employees or innately productive employees could choose more education to signal their ability under asymmetric information. The latter is labeled "the sheepskin effect" of education in the literature. Similar reasoning could be included when applying asymmetric information to the restart decision. That is, are highly educated founders less likely to fail with a second venture because their acquired skills help them make correct attribution from entrepreneurial experience? Or do individuals with an innate ability to make correct attribution (e.g., more intelligent, stronger work ethics, more sensitive to environmental stimuli) acquire more education to signal ability to stakeholder? Or both in combination? Future research could explore this further. Other signals could be having industry experience, entrepreneurial parents, or having been part of a start-up team in the first venture, although these factors are important for restart success regardless of success or failure with the first venture.

The above discussion emphasizes the importance of education for potential restarters and stakeholders. However, more education could make restart less likely, precisely because education is correlated with higher productivity and thus, higher earnings, increasing the opportunity cost of entrepreneurship. Indeed, education has been found to increase earnings for wage-earners only and not for entrepreneurs (Nielsen, 2015; Taylor, 1996). One exception was found by Van Praag (2005), who observed a greater effect on earnings for entrepreneurs.

Our current study offers an additional remedy for the market for lemons in entrepreneurship, namely education at the point of restart. Before we examine this, it might be relevant to raise the issue of what, if anything, can be learned through entrepreneurial experience, especially in addition to industry experience and business education more broadly. The primary answer to this question comes from a rising tide of recent research in entrepreneurship focused on dealing with Knightian uncertainty. Knight (1921) made a compelling argument as to the existence of three kinds of unknowns in the world: risk (having to do with unknown draws from known distributions), uncertainty (unknown draws from unknown distributions), and true (what we have since come to call Knightian) uncertainty that has to do with unknowable distributions. Knight argued that entrepreneurship has to do with the development of "judgment" that helps deal with the unknowable. Recent research in entrepreneurship has brought Knightian uncertainty front and center:

- Theoretically (Alvarez & Barney, 2007; Endres & Woods, 2010; Foss, Foss, & Klein, 2007; Foss & Klein, 2012; Sarasvathy, 2001),
- Empirically (Brettel et al., 2012; Chandler, DeTienne, McKelvie, & Mumford, 2011; Coviello & Joseph, 2012; Dew, Read, Sarasvathy, & Wiltbank, 2009; Fischer & Reuber, 2011; Read, Dew, Sarasvathy, Song, & Wiltbank, 2009; Sarasvathy, 2008; Schweizer et al., 2010; Wiltbank et al., 2009; also see Read, Sarasvathy, Dew, & Wiltbank, 2015 for a comprehensive review of over 200 articles), and
- Pedagogically (Blekman, 2011; Faschingbauer, 2013; Read, Sarasvathy, Dew, Wiltbank, & Ohlsson, 2010).

This stream of literature on entrepreneurial judgment embodied in an effectual as opposed to a causal (predictive) logic is derived from a cognitive science-based study of "expert" entrepreneurs who started multiple ventures including successes and failures and accumulated enough learning through their experiences to demonstrate continued positive performance (Sarasvathy, 2008). Findings from the study showed how "expertise" development as opposed to mere experience could help overcome the description-experience gap in risky choice identified by Hertwig and Erev (2009). Expertise development requires moving entrepreneurs beyond risky choice to the tackling of uncertainty and even true or Knightian uncertainty through effectual cocreation with others in addition to more accurate individual decision-making. If we are to bring lessons from expert entrepreneurs into programs of education at the point of restart, we need to emphasize the role of stakeholder interactions as well as individual entrepreneurial action.

In Denmark as well as in other innovation-driven economies, creativity, entrepreneurship, and innovation have recently been implemented to a much

Author's voice:
What implications does this research have for teaching entrepreneurship?

greater degree in the curricula of all parts of the educational system (Fonden for Entreprenørskab, 2013; Kuratko, 2005; Storey, 2003). The role of education at the point of restart is especially interesting given recent questions regarding the value of entrepreneurship education the way it is taught today (Lautenschläger & Haase, 2011). Opponents of the change in teaching methodologies argue that entrepreneurial abilities can only be augmented through learning by doing—that is, founding a real venture and dealing with the uncertainty and specific challenges that arise. Moreover, while failure experiences are especially important for learning, such experiences require ways to calibrate useful lessons and avoid attribution errors.

As restart education begins including relevant content from more rigorous research such as the description-experience gap (Erev & Roth, 2014; Hertwig et al., 2004; Hertwig & Erev, 2009) cited earlier, and effectual entrepreneurship (Blekman, 2011; Faschingbauer, 2013; Read et al., 2010), in addition to basic toolkits such as business planning, and popular start-up methodologies, such as lean (Ries, 2011) and business model canvas (Osterwalder, Pigneur, & Tucci, 2005), we may be able to develop truly impactful education for start-up entrepreneurs and restarters alike. We hope this study is a first step in both motivating such curriculum development through future research as well as pinpointing the point at which such curricula could be put to more effective use from a societal perspective of fostering job creation.

CONCLUSIONS

In this study, our goal was to highlight restart as an important yet understudied phenomenon in the economics of entrepreneurship. The comprehensive longitudinal dataset used, which included all entrepreneurs in Denmark who had started either one or two businesses over a given period of time, allowed us to empirically explore the antecedents and consequences of the choice to re-enter entrepreneurship, and more specifically, the presence of attribution error resulting in Type I and Type II errors.

The existence of these errors points to the possibility of a market for lemons in entrepreneurship (Akerlof, 1970). When we educate entrepreneurs or develop policy without paying attention to the restart phenomenon, we are encouraging lemons to enter and continue with entrepreneurship, while allowing peaches to abstain. This creates a vicious cycle by artificially increasing failure rates of new ventures and thereby selecting for even fewer peaches to take up entrepreneurship. The only way to prevent a market for lemons in entrepreneurship is through an awareness—both at the level of individual entrepreneurs and in society as a whole—of the existence of Type I and Type II errors, followed by designing the content and format of education to enable individuals to learn more calibrated lessons from experience.

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APPENDIX 1

LINKS TO THE WORLD OF PRACTICE

The European Commission recently has become very focused on habitual entrepreneurship: Should failed entrepreneurs be given a second chance? How do failed entrepreneurs get rid of the stigma? Should the bankruptcy laws be changed?

http://ec.europa.eu/growth/smes/promoting-entrepreneurship/advice-opportunities/bankruptcy-second-chance/index_en.htm

Many articles from the popular press help to motivate this study by arguing why entrepreneurs should persist after failure and what they learn from failure.

http://www.inc.com/elizabeth-macbride/why-repeat-entrepreneurs-succeed.html
http://www.bloomberg.com/news/articles/2014-07-28/study-failed-entrepreneurs-find-success-the-second-time-around
https://www.entrepreneur.com/article/227011
http://www.huffingtonpost.com/brian-honigman/35-tech-entrepreneurs-failure_b_5529254.html

These articles from the popular press also help motivate the study, this time by arguing that entrepreneurs should not persist after failure since learning is absent or not given for all individuals. This conflicting evidence on learning and whether persistence and failure should be supported calls for more research on the topic.

https://hbr.org/2011/04/why-serial-entrepreneurs-dont-learn-from-failure http://smallbiztrends.com/2011/02/don't-learn-from-failure.html https://www.entrepreneur.com/article/228723 http://theconversation.com/fail-early-fail-often-mantra-forgets-entrepreneurs-fail-to-learn-51998