

# Ability or Finances as Constraints on Entrepreneurship? Evidence from Survival Rates in a Natural Experiment\*

**Steffen Andersen**

Department of Economics, Copenhagen Business School

**Kasper Meisner Nielsen**

Department of Finance, Hong Kong University of Science and Technology

*Abstract:* We use a natural experiment in Denmark to test the hypothesis that aspiring entrepreneurs face financial constraints because of low entrepreneurial quality. We identify 304 *constrained entrepreneurs* who start a business after receiving windfall wealth and examine the performance of these marginal entrepreneurs. We find that constrained entrepreneurs have significantly lower survival rates and lower profits when compared with a matched sample of unconstrained entrepreneurs. These results are consistent with the hypothesis that the marginal entrepreneur is of low quality. (JEL J23, L26, M13)

\*We thank Thea Yde Jensen and Julie Marx for excellent research assistance. We are grateful to an anonymous referee and to Henk Berkman, Christophe Bonnet, Martin Browning, Sudipto Dasgupta, Mette Ejnæs, Eithan Goldman, Glenn Harrison, Hans Hvide, Alexander Ljungqvist (the editor), and Chandler Lutz, as well as seminar participants and colleagues at the Academy of Entrepreneurial Finance 2011 Meeting, Deakin Finance Colloquium 2011, the European Finance Association 2011 Meeting, Hong Kong University of Science and Technology, Singapore Management University, University of Bergen, University of Copenhagen, and University of East Anglia for helpful comments and suggestions. Send correspondence to Steffen Andersen, Department of Economics, Copenhagen Business School, telephone: +45 3815 2591. Email: [sa.eco@cbs.dk](mailto:sa.eco@cbs.dk). Kasper Meisner Nielsen, Department of Finance, Hong Kong University of Science and Technology, telephone: +852 2358 7683. Email: [nielsen@ust.hk](mailto:nielsen@ust.hk). This work was supported by the Danish Social Science Research Council [grant number 09-065449].

Entrepreneurship plays an important role in job creation and economic growth. Due to these positive externalities, many countries have established policy programs and agencies aimed directly at encouraging entrepreneurship. Financial constraints are among the most cited impediments to entrepreneurship.<sup>1</sup> If financial constraints are binding, low-wealth households will be constrained from starting businesses. Such constraints result in less entrepreneurial activity and, in turn, lower economic growth. Consequently, policy initiatives have often attempted to ease access to financing.

The question of why aspiring entrepreneurs face financial constraints is natural. If financial constraints are imposed by well-functioning capital markets, we expect the marginal entrant to be of lower quality than is the average entrepreneur. In this study we use a natural experiment to test the hypothesis that the marginal entrant is of low quality. We test this hypothesis under the assumption that differences in quality will show up as differences in outcomes measured by performance. We use exogenous variation in wealth resulting from unanticipated inheritance due to sudden death to identify *constrained* entrepreneurs (i.e., individuals who become self-employed after receiving windfall wealth); we then assess their performance in relation to a matched sample of *unconstrained* entrepreneurs (i.e., individuals with similar characteristics who became self-employed in the same period but who did not receive windfall wealth). To measure performance, we examine survival rates, entrepreneurial profits, and total income.

Our results reveal that constrained entrepreneurs perform significantly worse than do unconstrained entrepreneurs. After one (five) year(s), only 64.1% (41.9%) of the constrained entrepreneurs stay in business. In comparison, 75.0% (50.0%) of the unconstrained entrepreneurs in the control group stay in business. We also find lower performance when we examine entrepreneurial profits and total income using detailed data from the Danish Tax Authorities. On average, entrepreneurial profit is 22% to 39% lower for the constrained entrepreneurs over the first five years after establishment, while total income in the same period is 5% to 20% lower for constrained entrepreneurs. The combination of lower survival rates, lower entrepreneurial profit, and lower total income

supports the hypothesis that the marginal quality of constrained entrepreneurs is lower than that of unconstrained entrepreneurs.

Although our results are consistent with the hypothesis that the marginal entrepreneur is of low quality, the main weakness of our approach is that we cannot rule out confounding effects related to inheritances. While our experiment imposes no selection of beneficiaries except in the event of sudden death, entry into entrepreneurship is positively affected by inherited wealth. The treatment effect might therefore be confounded by a wealth effect that potentially can explain our results. To separate the treatment effect from a wealth effect, we use entrepreneurs whose parents suddenly die shortly after business formation as counterfactual in our experiment. In this setting, constrained entrepreneurs receive windfall wealth before they become self-employed, while unconstrained entrepreneurs receive the windfall shortly after business formation. We find that constrained entrepreneurs underperform both before and after unconstrained entrepreneurs receive windfalls. This finding effectively rules out the likelihood that our treatment effect is confounded by a wealth effect.

Overall, we find that constrained entrepreneurs have significantly lower survival rates, lower entrepreneurial profits, and lower total income when compared with a matched sample of unconstrained entrepreneurs. We use a competing risk model to show that the lower survival rates are driven by higher failure rates among constrained entrepreneurs. We also show that differences in entrepreneurial profits and total income are not driven by efficient stopping rules or a direct effect of wealth on performance. Collectively these results are consistent with the hypothesis that the marginal entrepreneur is of low quality.

Our results offer an alternative interpretation of why aspiring entrepreneurs, when questioned in surveys, say that raising financing is their principal problem (Blanchflower and Oswald 1998). Consistent with the existence of financial constraints, prior literature

documents a positive correlation between the propensity to become an entrepreneur and individual wealth (Evans and Jovanovic 1989; Evans and Leighton 1989; Fairlie 1999; Quandrini 1999; Gentry and Hubbard 2001), or exogenous variation in wealth due to inheritance or lottery winnings (Holtz-Eakin, Joulfaian, and Rosen 1994b; Lindh and Ohlsson 1996; Blanchflower and Oswald 1998). While these studies demonstrate that low-wealth households are excluded from capital markets, this observation does not imply that policy makers should make loans easier to come by. De Meza (2002) shows that encouraging entry into entrepreneurship shifts individuals with negative net present value undertakings into business. Subsidizing credit may decrease efficiency because it offsets the disciplining role of capital markets. The barrier to firm formation might therefore be low entrepreneurial quality rather than access to financing. Direct empirical evidence on the disciplinary role of external financing is scant. A recent exception is Nanda (2008), who shows that entry subsequently dropped after a tax reform in Denmark that made external financing more expensive. Similarly, Hvide and Møen (2010) and Nanda (2011) show that the quality of *wealthy* entrants is lower because they do not face the discipline of the external market. In comparison, we assess the quality of the *marginal* entrant, by studying individuals who start a business after receiving windfall wealth.

Our study contributes to the literature by using a natural experiment to test the hypothesis that the quality of the marginal entrant is low. We thereby challenge the premise behind policies that facilitate broad access to financing: frictions in the capital markets preclude entrepreneurs with good ideas from starting a new business. Our results question the welfare gains from promoting entrepreneurship among constrained individuals. Positive externalities from entrepreneurship on job creation and growth (King and Levine 1993a, 1993b) are less likely to materialize if the marginal entrepreneur is of low quality.

Our results, however, do not imply that all individuals with worthy projects will obtain financing. Frictions in the capital markets might prevent some entrepreneurs with good projects from starting a new business, and lenders might find it optimal to ration their access to capital. For instance, Stiglitz and Weiss (1981) present a model in which banks use the interest rate as a screening device. As a result, aspiring entrepreneurs with safer projects are discouraged from starting their businesses. Alternatively, local banking monopolies might limit access to financing for start-ups and subsequently distort entrepreneurship (Kerr and Nanda 2009, 2010). Our results also do not preclude the prevalence of lender discrimination against certain individuals. Nevertheless, our results suggest that the rationale for initiatives to promote wider entrepreneurship should focus on eliminating the cause of frictions or discrimination rather than on providing broad access to financing.

Section 1 presents our data and provides summary statistics. Section 2 presents the results, and Section 3 separates the treatment effect from possible wealth effects. Section 4 concludes.

## **1. Windfall Wealth from Unexpected Inheritance due to Sudden Death**

We exploit exogenous variation in individual wealth to test the hypothesis that entrepreneurs face financial constraints because of low entrepreneurial quality. Exogenous variation in wealth is derived from a natural experiment in which individuals receive windfall wealth due to the sudden death of their legal parents. For the identification strategy to work, the death event has to be unexpected and sudden.<sup>2</sup> Sudden deaths are medically defined as an unexpected death that occurs instantaneously or within a few hours of an abrupt change in the person's previous clinical state.<sup>3</sup> To this end, we have

assembled a unique dataset from Denmark that allows us to identify windfall wealth from unexpected inheritance and relate it to entrepreneurial activity.

In addition to supplying micro data from administrative registers, the Danish case also provides us with a legal environment that eases the identification of estates and their heirs. We focus exclusively on inheritance cases where all beneficiaries are offspring (i.e., where the suddenly deceased was a widow or widower, or in rare cases, a couple). We refer to these cases as terminations of households. This designation simplifies the analysis, as children, according to the Danish Inheritance Law of 1964, will inherit by default the estate in proportional shares. Although opting out through wills is possible in Denmark, the inheritance law ensures that children will inherit at least 50% of the estate in the cases we consider. Only 2% of the empirically relevant individuals in Denmark have drafted a will (Ret og Råd, 2008). Consequently, the net wealth of the estates in our sample is divided equally among the offspring.

Identification of estates is facilitated by the institutional environment. Danish law requires that a death certificate be issued by a doctor when a citizen dies. Danish law further obliges the relatives to report the death to their local funeral authority within two days. The funeral authority formally notifies relevant government agencies, including the Central Office for Personal Registration (*CPR Registeret*) and the probate court (*Skifteretten*). *Skifteretten* supervises the process that transfers legal title of property from the decedent's estate to her beneficiaries. *Skifteretten* immediately seizes the decedent's assets, with the purpose of meeting liabilities, and transfers the net worth to the beneficiaries according to the sharing rule established by the inheritance law. By law, the transfer of the decedent's estate has to be finalized within 12 months of the death. The net worth of the estate is subject to a 15% estate tax for offspring if the estate's net wealth exceeds DKK 191,000 (EUR 25,638) in 1998. This threshold is inflated by a price index in subsequent years.

### *A. Data sources*

Our data cover the population of adult Danes in the period between 1995 and 2007. Our analysis will, however, focus on individuals who inherit in the period from 1995 to 2001 and, subsequently, start a business in the following year. This leaves a five-year evaluation period after firm formation to assess the outcome of the businesses. We construct a dataset with 19,329 individuals who unexpectedly inherited wealth due to the sudden deaths of their legal parents in the period from 1995 to 2001.

Our dataset contains economic, financial, and personal information about all individuals in Denmark. We derive data from the following five sources made available through Statistics Denmark:

1. Individual and family data from the official Danish Civil Registration System (*CPR Registeret*). We use these data to identify all individuals' legal parents. The sample contains the entire Danish population and provides a unique identifying number across individuals, households, and time.

2. Causes of deaths from the Danish Cause-of-Death Register at the Danish National Board of Health (*Sundhedsstyrelsen*). This dataset classifies the cause of death accordingly to international guidelines specified by the World Health Organization's International Classification of Diseases (ICD-10) system.<sup>4</sup> The source of these data is the official death certificates conveying a medically qualified opinion on the cause of death. We have obtained the cause of death for all Danish citizens who passed away between 1995 and 2007.

3. Employment data from Statistics Denmark's IDA database. Employment data are based on filings from firms and public agencies in the last week of November each year. From these filings we obtain the employment status of all individuals by their CPR number. We use this dataset to identify whether individuals become, and survive as,

entrepreneurs. We follow prior literature and define entrepreneurs as self-employed (Evans and Jovanovic 1989; Evans and Leighton 1989; Holtz-Eakin, Joulfaian, and Rosen 1994a; Holtz-Eakin, Joulfaian, and Rosen 1994b; Blanchflower and Oswald 1998; Fairlie 1999; Quandrini 1999; Gentry and Hubbard 2001; and Hurst and Lusardi 2004). Statistics Denmark classifies individuals as self-employed whenever 50% of their total income originates from entrepreneurial profit. This ensures that we study individuals who are full-time self-employed. In fact, individuals classified as self-employed in our sample on average obtain more than 90% of their total income from entrepreneurship; most of the remaining residual income is financial income. In addition, the data allow us to check whether individuals' parents are entrepreneurs and, thereby, to control for differences in entrepreneurial propensities and possible inheritance of businesses.

4. Income and wealth information from the official records at the Danish Tax and Customs Administration (*SKAT*). *SKAT* receives this information directly from the relevant sources: employers supply statements of wages paid to their employees. Financial institutions supply information on their customers' deposits, loans, mortgages, interests (paid or received), security investments, and dividends. *SKAT*'s measure of net wealth includes the most important components of individual wealth (bank deposits, bank loans, property values, mortgages, stocks, mutual funds and bonds.)<sup>5</sup> *SKAT*'s definition of total income equals the sum of labor income, financial income, and entrepreneurial profit. Labor income is wages from paid employment; financial income includes realized capital gains, interests (received or paid), and dividends. Entrepreneurial profit is the pre-tax profit from self-employment and includes potential gains if the business is sold. The Danish Tax code requires that entrepreneurs submit an income statement to the tax authorities. The income statement follows the tax code for corporations, starting with revenues, business expenses, depreciations, and profits. Profits are taxed as personal income, and the tax code allows entrepreneurs to smooth profits, and hence taxes,



through savings inside the firm. Through Statistics Denmark, we have access to entrepreneurial profit as well as the savings inside the firm.

5. Education records from the Danish Ministry of Education. All completed (formal and informal) courses of education are registered on a yearly basis and made available through Statistics Denmark.

### *B. Data construction*

The starting point of our analysis is deceased parents who cause a termination of the household. Terminations of households occur whenever i) the last living parent dies, or ii) both parents die within the same calendar year. In total, we identify 83,602 terminations of households between 1995 and 2001. Panel A in Table 1 shows the distribution across time. From this sample, we identify the cause of death with the purpose of selecting a sample of household terminations resulting from sudden and unexpected death. Panel B details the cause of death based on WHO's ICD-10 codes.

The identification of relevant ICD-10 codes relies on related medical literature as well as a thorough inspection of WHO's detailed classification system.<sup>6</sup> Thus, among natural deaths, we consider acute myocardial infarction (ICD-10: I22-I23), cardiac arrest (I46), congestive heart failure (I50), stroke (I60-I69), and sudden deaths by unknown causes (R95-R97) as sudden deaths. Among unnatural deaths, traffic accidents (V00-V89) and other accidents and violence (V90-V99, X00-X59, and X86-X90) are unanticipated by the relatives. The latter category excludes suicide or violence by subjects related to the deceased. Panel B tabulates the number of deaths for each type of sudden death, whereas Panel C shows the total number per year. In total, we identify 12,068 terminations of households due to sudden deaths from 1995 to 2001.<sup>7</sup>

The final step in our sample selection entails linking the deceased to their beneficiaries. On average, each terminated household had 1.60 beneficiaries (i.e.,

children). This step expands our sample size to 19,329 individuals who experience a wealth windfall.

Table 2 presents summary statistics of our final sample of beneficiaries. As the main focus of the study is identifying individuals who become entrepreneurs after receiving windfall wealth, we split our sample into pre-shock entrepreneurs and non-entrepreneurs. For all individuals, we report income, wealth, age, gender, education, and marital status for the year prior to their parents' sudden death. Income and wealth are indexed to constant 2000 Danish kroner (DKK). In our sample, 5.8% of the beneficiaries (1,123 individuals) were already entrepreneurs.<sup>8</sup> In keeping with prior literature, Table 2 shows that entrepreneurs have significantly higher income and wealth, are older, and tend to be male. Table 2 also reports the size and distribution of windfall wealth. On average, beneficiaries receive a windfall of DKK 228,800 (EUR 30,700). Inherited wealth is also quite liquid. The deceased parents hold, on average, around half of their wealth in financial assets (bank account, bonds, and stocks). The windfall is economically important, as it is almost twice as large as the average pre-inheritance net wealth of DKK 133,900 (EUR 17,900). The distribution of inherited wealth has substantial variation. One quarter of the beneficiaries inherit nothing, while individuals in the fourth quartile of the distribution of inherited wealth on average receive a windfall of DKK 859,600 (EUR 115,500). Pre-shock non-entrepreneurs inherit, on average, DKK 220,400 (EUR 29,600), which is equivalent to 1.04 years of total income, or 1.87 times the pre-shock net wealth. Thus, the size of windfall appears large enough to provide sufficient financial cushion for aspiring entrepreneurs to start their own businesses.

## 2. Empirical Results

### *A. Windfall wealth and the propensity to become entrepreneur*

To test the effect of windfall wealth on entrepreneurial activity, we estimate the difference in entrepreneurial activity around the parent's sudden death. This approach is attractive because it effectively controls for time-invariant individual characteristics that are likely to impact the decision to become and be an entrepreneur. Because our main interest is to understand the startup decision and performance of new entrepreneurs, we focus solely on individuals who were not self-employed before the event.

The starting point of the analysis is the 18,206 beneficiaries who were non-entrepreneurs prior to receiving windfall wealth (see Table 2). If financial constraints limit firm formation, we expect beneficiaries to exhibit a greater propensity to become entrepreneurs after receiving windfall wealth. To control for expected level of entry absent windfall wealth, we compare the treatment group to a control group of individuals with the same characteristics who do not receive windfall wealth. Our control group is a matched sample of individuals of exactly the same age, gender, and education level, and from the same pre-inheritance income and wealth quintiles (i.e., twenty groups of equal frequency) in the same year as the treated individual. Thus, we apply a one-to-many exact matching procedure, which provides us with a difference-in-differences estimate of the average treatment effect of windfall wealth on becoming an entrepreneur.<sup>9</sup>

For some beneficiaries, we cannot identify a match, and as a result, the sample is reduced to 18,009 beneficiaries. Among these, 2.1% (377 individuals) become self-employed after receiving windfall wealth. In comparison, 0.83% of the control group becomes an entrepreneur. The difference-in-differences estimate of 1.27 percentage points is significant at the 1% level.

In Table 3 we run cross-sectional regressions of the propensity to become an entrepreneur among the treated individuals. The dependent variable is the difference between an indicator variable for entry of the treated and the average entry rate for the matched sample (i.e., the difference in differences of the propensity to become an

entrepreneur for the treated relative to that of the control group). The variable of interest is inherited wealth measured in million DKK. Our specifications also include variables to capture changes in individual characteristics and year fixed-effects.<sup>10</sup>

Column 1 of Table 3 shows a positive and significant effect of inherited wealth on the propensity to become an entrepreneur. The effect is significant both economically and statistically. Windfall wealth of 1 million DKK (EUR 134,200) increases the probability of an individual starting her own business by 0.95 percentage points.<sup>11</sup> This figure is relative to a baseline probability of entering into entrepreneurship of 2.1% for the sample of treated individuals, and 0.83% for the matched sample.

In columns 2 and 3 we address the critique by Hurst and Lusardi (2004) that relates to inheritance of businesses. In principle, the relationship between windfall wealth and entrepreneurship could be driven by inheritance of entrepreneurial estates. In our sample, 2.6% of the estates are entrepreneurial. If beneficiaries tend to continue these businesses, the issue appears large enough to explain most of the variation in data. In Column 2 we therefore include an indicator for whether the deceased was an entrepreneur (*entrepreneurial estate*), and note that the effect of windfall wealth on the propensity to become an entrepreneur remains largely unchanged. In Column 3 we entirely exclude entrepreneurial estates from the sample with little effect on the results.

In Column 4 we include parental wealth among our match characteristics to control for the potential higher propensities to become an entrepreneur in wealthy families. For instance, Hurst and Lusardi (2004) argue that because of strong intergenerational correlation in educational, occupational, savings, and wealth preferences, inherited wealth might capture different entrepreneurial propensities of wealthy families.<sup>12</sup> We note that the marginal effect of inherited wealth increases when the control group has identical parental wealth. Thus, the positive effect of windfall wealth on the propensity to become an entrepreneur is not driven by differences in family wealth.

At first glance, the marginal effects of windfalls might appear economically small. Yet the propensity to become an entrepreneur among treated individuals is more than twice as high as the control group. Thus windfall wealth allows *constrained* individuals to become entrepreneurs. This finding is consistent with prior literature (Holtz-Eakin, Joulfaian, and Rosen 1994b; Lindh and Ohlsson 1996; Blanchflower and Oswald 1998). Our final sample includes 355 potentially *constrained* entrepreneurs who formed a business after receiving windfall wealth, and excludes 22 beneficiaries who inherit from an entrepreneurial estate and subsequently become entrepreneurs.

*B. The performance of the marginal entrepreneur*

Our experiment identifies 355 potentially *constrained* entrepreneurs. To assess the performance of the constrained entrepreneurs, we analyze their survival rate, entrepreneurial profit, and total income in relation to a matched sample of unconstrained entrepreneurs. The matched sample consists of individuals of the same age, gender, education level, and pre-entrepreneurship income and wealth vigintiles (excluding inheritance) who start a business at the *same* time as the treated individuals. In case of several matches, we use the matched individual with the closest pre-entrepreneurship income to the treated individual. Thus, we apply a one-to-one exact matching procedure.<sup>13</sup> Matching on age, gender, length of education, income, wealth, and entry year is possible because each year, on average, around 25,000 individuals become entrepreneurs. Despite the large control group, we fail to match 51 constrained entrepreneurs, and as a result, the sample is reduced to 304.<sup>14</sup>

Table 4 reports the characteristics of constrained and unconstrained entrepreneurs. The average entrepreneur is 39.5 years old, and 72% are male. Average annual income in the year before becoming an entrepreneur is DKK 200,700 for constrained, and DKK 207,200 for unconstrained, entrepreneurs. Due to inheritance, net wealth is significantly

larger for constrained entrepreneurs. The average constrained entrepreneur possesses wealth of DKK 1,052,500 (EUR 141,300), while unconstrained entrepreneurs possess DKK 98,800 (EUR 13,300). This difference is caused by the windfall as we match on pre-inheritance wealth. Panels B, C, and D of Table 4 show no statistically significant difference between the distribution of individual, geographic, and industry characteristics of constrained and unconstrained entrepreneurs. Thus, without inheritance, constrained and unconstrained entrepreneurs appear identical based on observable characteristics.

Panel A in Table 5 shows average survival rates for constrained entrepreneurs and the matched sample after 1, 2, 3, 4, and 5 years. Entrepreneurship is risky: on average, 64.1% of the constrained entrepreneurs survive the first year, and only 41.9% survive the first five years. In comparison, the survival rates for the unconstrained entrepreneurs are significantly higher. After the first year, 75.0% of the unconstrained entrepreneurs survive, and after the first five years, 50.0% survive. The difference in survival rates between constrained and unconstrained entrepreneurs is significant—both economically and statistically.

The difference in survival rates documented in Panel A in Table 5 might reflect that *constrained* entrepreneurs are faster at exiting, due to efficient stopping rules; have more successful exits; or are taking more risk than the average entrepreneur. In Panel B, we therefore examine entrepreneurial profit, which includes both savings inside the firm and potential gains from successful exits. Panel B of Table 5 documents that unconstrained entrepreneurs have higher entrepreneurial profits than do constrained entrepreneurs. The average difference in entrepreneurial profit varies between DKK 29,600 and 75,100 per year. Moreover, all differences are both economically and statistically significant.

Figure 1 shows the distribution of entrepreneurial profits to examine whether the lower averages are driven by the tails of the distribution. We assign constrained entrepreneurs into bins using the quintile cut-off points from the distribution of

entrepreneurial profits for unconstrained entrepreneurs in year 1. If the distributions are identical, we expect 20% of the constrained entrepreneurs to be assigned to each bin. Figure 1 shows a different pattern. Constrained entrepreneurs are overrepresented in bin 1 (low income), as 26% are assigned here, and underrepresented in bin 5 (high income), as only 14% are assigned here. Among the top 10% we also find large differences: Only 8% of the constrained entrepreneurs are assigned here, and their average entrepreneurial profit equals DKK 662,000, while that of unconstrained entrepreneurs equals DKK 834,000. The difference in the distribution of entrepreneurial profit shows that the lower performance is not driven by outliers.

Panel C of Table 5 shows that differences in entrepreneurial profit persist when the sample is reduced to surviving entrepreneurs (both treatment and control have to survive). Again we find that unconstrained entrepreneurs have higher income from entrepreneurship. The differences are large and significant in the initial phase. By the end of the fifth year, when only 41.9% of the constrained entrepreneurs have survived; the difference in profit is smaller.

While entrepreneurial profit includes retained earnings, the tax code makes it advantageous to retain earnings inside the firm. Retained earnings are only partly taxed in the income year and partly taxed in the year of extraction. Postponing income taxes by retaining earnings is particularly valuable in years with high income because of progressive taxation. As the ability to benefit from this tax rule is likely to be increasing with wealth, we examine in Panel D whether constrained entrepreneurs retain more entrepreneurial profit than do unconstrained entrepreneurs. Panel D shows that, on the contrary, unconstrained entrepreneurs retain more earnings than do constrained entrepreneurs.

In Panel E of Table 5, we report the total income for constrained and unconstrained entrepreneurs. The assessment of total income helps to ascertain whether lower survival rates of constrained entrepreneurs are driven by constrained entrepreneurs being more

effective at imposing efficient stopping rules. If constrained entrepreneurs are more effective at imposing efficient stopping rules, we expect them to have higher total income either because they return to paid employment or because they stop loss-making businesses earlier. If this is the case differences in total income will be smaller. We further expect the differences in total income to be smaller because total income includes cost of external financing (interest payments) and excludes opportunity cost of capital for self-financed entrepreneurs. Constrained entrepreneurs possess more wealth than unconstrained entrepreneurs, and are therefore more likely to self-finance their business. Thus the inclusion of financial income will bias against finding differences in total income.

Panel E of Table 5 reports the difference in total income between constrained and unconstrained entrepreneurs. After their first year as entrepreneurs, constrained entrepreneurs have DKK 23,600 lower total income than unconstrained entrepreneurs. The difference is equivalent to 11.8% of the pre-entrepreneurship level. In years 2 and 3, the difference increases to DKK 34,800 and 38,800, respectively. Both differences are statistically significant at the 1% level. In years 4 and 5, the difference in total income declines to DKK 29,700 and 10,400, respectively.

Panel A in Figure 2 provides a comparison of total income among constrained and unconstrained entrepreneurs, while Panel B compares the total income for individuals who receive windfalls but stay in employment to a matched sample of similar individuals. On average, constrained entrepreneurs earn less from self-employment. The area between the two lines provides a graphical illustration of the relative underperformance of constrained entrepreneurs. Interestingly, Panel B shows no effect on total income for individuals who received windfall wealth but stayed in paid employment.

The lower income from entrepreneurship is hardly surprising, as prior literature documents lower earnings from self-employment. Using survey data on U.S. individuals, Hamilton (2000) compares the wage differential between self-employed and paid



employees. He finds that the self-employed earn a significantly smaller stream of future earnings. This finding suggests that entrepreneurs are willing to sacrifice substantial earnings in exchange for non-pecuniary benefits, such as the value of “being your own boss.” The lower income might also be attributed to the ability to underreport income among the self-employed. Estimates of underreporting in United States range from 18 to 57% (Slemrod 2007, Sarada 2010), while the average underreporting in Denmark is 14.8% among self-employed who are randomly selected for a tax audit (Kleven et al. 2011). We note that while the magnitude of underreported income can explain part of the drop in income for individuals who become self-employed, it cannot explain differences in earnings between constrained and unconstrained entrepreneurs unless constrained entrepreneurs are more prone to evade taxes. We consider this possibility in Section 3.

*C. Determinants of the performance of the marginal entrepreneur*

Although the comparison between constrained and unconstrained entrepreneurs successfully controls for time-invariant individual heterogeneity captured by our match characteristics, it is still interesting to examine the marginal effect of individual characteristics. In Table 6, therefore, we run regressions of entrepreneurial outcomes, while controlling for individual characteristics, and report the marginal effects.

In Column 1 of Table 6, the dependent variable is business closure taking the value one if the business is closed, either as a failure or a success. Our variable of interest is an indicator taking the value one if the entrepreneur is constrained. By construction there is no time variation in constrained. We therefore use the pooled data over the five-year window to evaluate performance, and estimate the relationship in a logit model with clustered standard errors at the individual level. We include age, gender, education, pre-entrepreneurship income, pre-inheritance and pre-entrepreneurship wealth, indicator variables equal to one if the entrepreneur is married or has children, and year effects. The

results reveal that constrained entrepreneurs, on average, are 8.85 percentage points more likely to close their businesses. This difference is significant at the 1% level.

Exits capture both failure through closure of the business or success through selling the business. To examine that the lower survival rates of constrained entrepreneurs are driven by failure rather than success, we follow Fine and Gray (1999) and estimate a competing risk model. Success through business sales is not directly observed in our data, but profits from sales are included in the entrepreneurial profit recorded by the tax authorities. We therefore characterize an exit as success if a large positive entrepreneurial profit is reported in the year of exit, and an exit as failure if the entrepreneurial profit is low. We use a conservative characterization of success and set the cutoff level to DKK 100,000. According to this conservative classification, 16.5% of all exits are classified as successful outcomes (14.8% for constrained entrepreneurs and 18.4% for unconstrained entrepreneurs). Column 4 of Table 6 reports the results from the competing risk model. We estimate a sub-hazard rate of failures of 1.34 for constrained entrepreneurs, which is significant at the 1% level.<sup>15</sup> Thus, constrained entrepreneurs fail much faster than do unconstrained entrepreneurs.

In columns 2 and 3 we analyze the income from entrepreneurship. Again we use the pooled data from the five-year window, while controlling for individuals characteristics and year-fixed effects. We estimate the relationship using a linear regression model where standard errors are clustered at the individual level. Column 2 shows that constrained entrepreneurs, on average, earn DKK 69,000 less per year in entrepreneurial profits over the five years. These differences are relative to a pre-entrepreneurship total income of DKK 200,700 and are, thus, economically significant. Column 2 shows that constrained entrepreneurs, on average, also have DKK 25,810 lower total income per year than do unconstrained entrepreneurs in the five years after business formation. We also note that the coefficients on the control variables are consistent with prior literature:

entrepreneurial profit is increasing in education and pre-entrepreneurship total income and is decreasing in age.

To nuance the story, in alternative specifications we also examine the difference in entrepreneurial profits and total income between constrained and unconstrained entrepreneurs. We find that the underperformance of constrained entrepreneurs is higher for individuals with higher pre-entry income and longer education. In general, performance is increasing in both income and education for both constrained and unconstrained entrepreneurs. Yet, because the increase is larger for the latter group, the underperformance of constrained entrepreneurs is increasing in income and education. We also find the underperformance to be stronger for individuals who do not stay with their industry (measured at the 4-digit industry level). This evidence suggests that underperformance is concentrated among individuals who, despite having longer education and higher income, could not obtain financing to undertake projects outside the industry in which they were employed.

One concern with the results in columns 2 and 3 is that the underperformance could be driven by exiting entrepreneurs. The samples in columns 5 and 6 therefore only contain entrepreneurs who are active at the beginning of each year, and exclude failed entrepreneurs in the following years. Again, we find significantly lower entrepreneurial profits and total income among the constrained entrepreneurs. On average, constrained entrepreneurs have DKK 75,200 lower entrepreneurial profits when the sample is restricted to active businesses. If we focus on total income, the average difference is DKK 35,700 per year.

In summary, constrained entrepreneurs appear to have significantly poorer outcomes than have the average unconstrained entrepreneur. They have lower survival rates and earn significantly lower profits from their businesses. The poor performance is consistent

with our hypothesis that these individuals face constraints to entrepreneurship because of their low quality rather than their access to financing.

### **3. Treatment versus Wealth Effects**

Although the evidence in Tables 5 and 6 supports the hypothesis that entrepreneurs face financial constraints because of low entrepreneurial quality, our experiment shows that entry into entrepreneurship is positively affected by inherited wealth. The treatment effect might therefore be confounded by a wealth effect that potentially can explain the results. For instance, wealth might positively affect risk taking, investments, consumption through the firm, savings inside the firm, and tax avoidance and, thereby, possibly explain the observed performance measured through profits and income. Alternatively, entrepreneurship can be interpreted as a luxury good that only wealthy individuals can afford.

The idea that wealth can affect entrepreneurial outcomes is not new. For instance, Hvide and Møen (2010) show that entrepreneurs' start-up performances are a function of their wealth. They find that the relationship between start-up performance, as measured by profitability on assets, and wealth increases in the first three wealth quartiles but drops in the top wealth quartile. Nanda (2008) also provides evidence of higher failure rates among the most-wealthy entrepreneurs, which suggests that the spike in entry at the top end of the wealth distribution is driven by low-ability entrepreneurs who can afford to start weaker firms because they do not face the discipline of external finance.

To assess whether our interpretation of the evidence is consistent with a treatment effect and not driven by a confounding wealth effect, we perform several additional tests.

#### *A. Controlling for inherited wealth*

We start the analysis and discussion of treatment versus wealth effects by examining whether inherited wealth directly affects outcomes. According to the alternative interpretation of the uncovered evidence as being driven by a confounding wealth effect, we expect inherited wealth to correlate negatively with outcomes. We therefore include inherited wealth as a control variable in our empirical specifications.

Column 1 of Table 7 shows a positive effect of inherited wealth on failure rates and negative effects on entrepreneurial profits and total income, but all effects are statistically insignificant. More importantly, the estimated coefficients on the indicator for constrained entrepreneurs are of similar magnitude when compared to the estimates in columns 1, 2, and 3 in Table 6. There appears to be no systematic relationship between inherited wealth and outcomes, and the inclusion of windfall wealth does not impact the estimated underperformance of constrained entrepreneurs.

Another way to address whether the treatment effect is confounded by a wealth effect is to revise our match characteristics. Rather than matching on pre-inheritance wealth, we match on the post-inheritance level. If our results are driven by the confounding wealth effect, we should expect to see no difference in performance between constrained and unconstrained entrepreneurs when we match on post-inheritance wealth. Column 2 in Table 7 reports the results. The findings in Column 2 show that large differences in performance between the constrained and unconstrained entrepreneurs are not driven by a general effect of wealth on firm performance.

#### *B. Controlling for parental wealth*

Differences in parental wealth might also influence aspiring entrepreneurs' ability to form a successful business. In particular, we find that beneficiaries' propensity to become self-employed is increasing in inherited wealth and, thus, parental wealth. Differences in parental wealth might explain the documented underperformance if individuals from

wealthy families are less motivated to exert effort. Although including inherited wealth and matching on the post-inheritance wealth level partly addresses this issue, one might still be concerned with the possibility of family wealth influencing the results. In Column 3 of Table 7, we therefore report the performance of constrained entrepreneurs in relation to a matched sample of unconstrained entrepreneurs from equally wealthy families. Thus, rather than matching on pre-inheritance wealth, we match on parental wealth.

From Column 3 of Table 7, we observe economic underperformance of constrained entrepreneurs, consistent with the main results. We also note that the differences in performance are slightly smaller than the main results when we match on parental wealth. We conjecture that this result is driven by parental financing of offspring entrepreneurs among the control sample. If parents desire to provide financial support to offspring, they are likely to finance projects that could not obtain financing from financial intermediaries.

*C. Using unconstrained entrepreneurs who receive windfall wealth as control group*

Our final tests focus on using existing entrepreneurs whose parents die suddenly in years 1 to 3 after business formation as counterfactual in our experiment. Existing entrepreneurs are unconstrained in the sense that they started their businesses before receiving windfall wealth. As sudden deaths are unanticipated, we can use the exogenous timing of the windfall to unconstrained entrepreneurs to directly test whether our results are confounded by a wealth effect. If windfall wealth affects entrepreneurial outcomes, the performance of unconstrained entrepreneurs will be negatively affected after they inherit wealth. Hence, under the alternative hypothesis, we expect the differences in performance to be larger before unconstrained entrepreneurs inherit.

We form a control sample of unconstrained entrepreneurs who start a business at the same time but inherit in years 1 to 3 after business formation. We match on education level, gender, pre-entrepreneurship income, and wealth (excluding inheritance). We relax

the exact matching on age because the sample of treated unconstrained entrepreneurs is relatively small.<sup>16</sup> With these matching criteria we can successfully match 140 constrained entrepreneurs to unconstrained entrepreneurs, and except for age, no statistical difference exists between the characteristics of the two groups. On average, constrained entrepreneurs are 39.9, and unconstrained entrepreneurs, 41.8, years old. While this difference is statistically significant at the 10% level, we note that this difference will bias against finding differences in performance, as age in general correlates negatively with entrepreneurial performance (see Table 6).

Results in Column 4 of Table 7 provide evidence in favor of our hypothesis. Unconstrained entrepreneurs are 11.5% more likely to survive than constrained entrepreneurs. After unconstrained entrepreneurs receive windfall wealth, the difference in survival rates increases by 1.9 percentage points, as indicated by the interaction term (*Constrained \* Treatment of unconstrained entrepreneurs*). We find similar results for entrepreneurial profit. Before unconstrained entrepreneurs inherit wealth, their entrepreneurial profit is DKK 90,900 higher than that of constrained entrepreneurs, and after inheritance, the difference increases to DKK 99,700.

Finally, we perform a placebo test to examine whether inherited wealth has an adverse effect on performance among our sample of unconstrained entrepreneurs who inherit in years 1 to 3 after business formation. If wealth affects outcomes through the channels previously discussed, we expect performance to decline once unconstrained entrepreneurs receive windfall wealth.

Column 5 in Table 7 reports the results from the placebo test (*treatment of unconstrained entrepreneurs*) of the effect of inherited wealth on outcomes for unconstrained entrepreneurs as compared to a matched sample of unconstrained entrepreneurs who do not receive windfall wealth. We note that unconstrained entrepreneurs who receive windfalls survive slightly longer than does the matched sample. This result is consistent

with the findings of Holtz-Eakin, Joulfaian, and Rosen (1994b), who analyze the effect of inherited wealth on performance of existing entrepreneurs two to three years after receiving an inheritance. When we inspect the underlying survival rates, we note that the difference tends to decline over time. Thus, windfalls to existing entrepreneurs postpone exit but have little long-term effect. We conclude that the placebo test bolsters our hypothesis that the lower survival rates, profits, and income of constrained entrepreneurs are driven by lower entrepreneurial quality.

#### *D. Alternative specifications*

The online Appendix to this paper shows results for a number of alternative specifications of the main analysis. The alternative specifications include using different matching procedures, matching criteria, and control variables. Overall the results from the alternative specifications are consistent with the main results.

## **4. Conclusion**

Financial constraints are frequently cited as a main barrier to entrepreneurship. Evidence of such financial constraints has previously been identified either in cross-sectional tests of the propensity to become an entrepreneur or in surveys of aspiring entrepreneurs. While the evidence is consistent with the existence of financial constraints, prior literature has not presented a formal test of the underlying causes of the apparent financial constraint. We propose and examine a simple explanation for the apparent financial constraints to entrepreneurship. We conjecture that a well-functioning capital market would fund able entrepreneurs and constrain individuals with lower entrepreneurial quality. Using a natural experiment to generate exogenous variation in wealth, we test this hypothesis by identifying a group of previously constrained individuals, who become entrepreneurs after receiving the windfall. We compare the



performance of these businesses to the performance of businesses established by unconstrained entrepreneurs. We find large differences in performance, consistent with our hypothesis that individuals face financial constraint as a result of low entrepreneurial quality.

## REFERENCES

- Abadie, A., and G. W. Imbens. 2006. Large Sample Properties of Matching Estimators for Average Treatment Effects. *Econometrica* 74(1): 235–267.
- Altonji, J. G., and T. A. Dunn. 2000. An Intergenerational Model of Wages, Hours, and Earnings. *Journal of Human Resources* 35: 221–258.
- Andersen, S., and K. M. Nielsen. 2011. Participation Constraints in the Stock Market Marked: Evidence from Unexpected Inheritances due to Sudden Death, *Review of Financial Studies* 24, 1667-1697.
- Blanchflower, D. G., and A. J. Oswald. 1998. What Makes an Entrepreneur? *Journal of Labor Economics* 16: 26–60.
- Charles, K. K., and E. Hurst. 2003. The Correlation of Wealth across Generations. *Journal of Political Economy* 111: 1155–1182.
- De Meza, D. 2002. Overlending? *Economic Journal* 112: F17–F31.
- Evans, D. S., and B. Jovanovic. 1989. An Estimated Model of Entrepreneurial Choice under Liquidity Constraints. *Journal of Political Economy* 97:808–827.
- Evans, D. S., and L. S. Leighton. 1989. Some Empirical Aspects of Entrepreneurship. *American Economic Review* 79: 519–535.
- Fairlie, R. W. 1999. The Absence of the African-American Owner Business: An Analysis of the Dynamics of Self-employment. *American Economic Review* 79:519–535.
- Fine, J. P., and Gray, R. J. 1999. A Proportional Hazards Model for the Subdistribution of a Competing Risk. *Journal of the American Statistical Association* 94:496-509.
- Gentry, W. M., and R. G. Hubbard. 2001. Entrepreneurship and Household Saving. Working paper, Columbia University.

- Hamilton, B. H. 2000. Does Entrepreneurship Pay? An Empirical Analysis of the Returns to Self-employment. *Journal of Political Economy* 108: 603–631.
- Heckman, J. J., Ichimura, H., and P. Todd. 1998. Matching as an Econometric Evaluation Estimator. *Review of Economic Studies* 65: 261-294.
- Hirano, K., and G. W. Imbens. 2004. The Propensity Score with Continuous Treatments. In *Applied Bayesian Modelling and Causal Inference from Incomplete-Data Perspectives*, ed. A. Gelman and X.-L. Meng, 73–84. West Sussex, England: Wiley InterScience.
- Holtz-Eakin, D., D. Joulfaian, and H. S. Rosen. 1994a. Entrepreneurial Decisions and Liquidity Constraints. *RAND Journal of Economics* 25: 334–47.
- Holtz-Eakin, D., D. Joulfaian, and H. S. Rosen. 1994b. Sticking It Out: Entrepreneurial Survival and Liquidity Constraints. *Journal of Political Economy* 102: 53–75.
- Hurst, E., and A. Lusardi. 2004. Liquidity Constraints, Household Wealth, and Entrepreneurship. *Journal of Political Economy* 102: 319–47.
- Hvide, H. K., and J. Møen. 2010. Lean and Hungry or Fat and Content? Entrepreneurs' Wealth and Start-up Performance. *Management Science*, forthcoming.
- Kerr, W., and R. Nanda. 2009. Democratizing Entry: Banking Deregulation, Financing Constraints and Entrepreneurship. *Journal of Financial Economics* 94: 124–209.
- Kerr, W., and R. Nanda. 2010. Banking Deregulations, Financing Constraints and Firm Entry Size. *Journal of the European Economic Association* 8: 582–593.
- King, R. G., and R. Levine. 1993a. Finance and Growth – Schumpeter Might Be Right. *The Quarterly Journal of Economics* 108: 717–737.
- King, R. G., and R. Levine. 1993b. Finance, Entrepreneurship, and Growth. *Journal of Monetary Economics* 32:513–542.

- Kleven, H. J., M. B. Knudsen, C. T. Kreiner, S. Pedersen, and E. Saez. 2011. Unwilling or Unable to Cheat? Evidence from a Randomized Tax Audit Experiment in Denmark, *Econometrica* 79: 651–692.
- Lindh, T., and H. Ohlsson. 1996. Self-employment and Welfare Gains: Evidence from the Swedish Lottery. *Economic Journal* 106: 1515–1526.
- Nanda, R. 2008. Cost of External Finance and the Selection into Entrepreneurship. Working paper, Harvard Business School.
- Nanda, R. 2011. Entrepreneurship and the Discipline of External Finance. Working paper, Harvard Business School.
- OECD. 2010. *SMEs, Entrepreneurship, and Innovation*. OECD Policy Report, Paris.
- Quandrini, V. 1999. The Importance of Entrepreneurship for Wealth Concentration and Mobility. *Review of Income and Wealth* 45: 1–19.
- Ret og Råd. 2008. *Analyse af den nye arvelov*. Copenhagen, Denmark.
- Sarada. 2010. The Unobserved Returns to Entrepreneurship. Working paper, University of California, San Diego.
- Slemrod, J. 2007. Cheating Ourselves: The Economics of Tax Evasion. *Journal of Economic Perspectives* 21: 25–48.
- Stiglitz, J. E., and A. Weiss. 1981. Credit Rationing in Markets with Imperfect Information. *American Economic Review* 71, 393-410.

**Table 1 Causes of household terminations, 1995–2001**

IDC10	Year						Total	
	1995	1996	1997	1998	1999	2000		2001
A. Household terminations	10,550	10,939	11,539	11,628	12,513	12,867	13,566	83,602
B. Decedent's cause of death								
Natural								
A00-R99	9,861	10,224	10,722	10,886	11,721	12,082	12,813	78,309
Acute myocardial infarction (a)	154	85	96	90	101	85	91	702
Cardiac arrest (b)	98	95	80	63	81	85	81	583
Congestive heart failure (c)	223	240	227	245	287	232	292	1,746
Stroke (d)	765	799	848	794	868	975	1,006	6,055
Sudden death by unknown cause (e)	221	87	108	87	71	106	72	752
Unnatural deaths	689	715	817	742	792	785	753	5,293
Traffic accidents (f)	66	49	48	43	54	63	51	374
Other accidents and violence (g)								
V00-V89								
V90-V99								
X00-X59	201	227	302	254	305	301	266	1,856
X86-X90								
C. Sudden household terminations (a+b+c+d+e+f+g)	1,728	1,582	1,709	1,576	1,767	1,847	1,859	12,068
Average number of beneficiaries	1.49	1.63	1.57	1.57	1.59	1.64	1.70	1.60
Number of beneficiaries	2,560	2,587	2,697	2,479	2,844	3,029	3,133	19,329

This table tabulates the cause of death using ICD-10 classification of diseases for terminated households from 1995 to 2001. A household is terminated if the deceased was a widow or widower, or, in the rare cases in which a couple dies within the same year. *ICD-10* is the World Health Organization's International Classification of Diseases. Codes are: Natural (A00-R99) and unnatural (V00-Y98) deaths. Within both natural and unnatural deaths, Panel B shows the number of sudden deaths caused by: Acute myocardial infarction (I22-I23); Cardiac arrest (I46); Congestive heart failure (I50); Stroke (I60-69); Sudden deaths by unknown cause (R95-R97); Traffic accidents (V00-V89); and other accidents and violence (V90-V99, X00-X59 & X86-X90). Other accident and violence do not include suicides or violence caused by relatives of the decedent.

**Table 2 Characteristics of pre-inheritance entrepreneurs vs. non-entrepreneurs**

	All	Pre-inheritance Entrepreneur		Difference (1)-(2)
		Yes (1)	No (2)	
<i>Panel A: Income, financial wealth, and net wealth</i>				
Total income (DKK 1,000)	209.9 (145.4)	192.0 (197.6)	211.0 (141.5)	-19.1*** [-4.26]
Financial wealth (DKK 1,000)	97.7 (788.2)	270.4 (919.3)	87.1 (778.1)	183.4*** [7.58]
Net wealth (DKK 1,000)	133.9 (1115.0)	394.2 (1995.1)	117.8 (1034.5)	276.4*** [8.08]
<i>Panel B: Individual characteristics</i>				
Age (years)	41.4 (10.2)	45.3 (9.0)	41.1 (10.3)	4.1*** [13.20]
Gender (% male)	54.0 (49.9)	79.0 (40.8)	52.5 (50.0)	26.5*** [17.44]
Education (years)	11.8 (2.9)	11.9 (3.0)	11.8 (2.9)	0.1 [0.75]
Married (%)	51.9 (50.0)	64.6 (47.8)	51.1 (50.0)	13.5*** [8.81]
Children in household (%)	46.1 (49.9)	49.0 (50.0)	46.0 (49.8)	3.0** [1.97]
<i>Panel C: Inherited wealth</i>				
Average	228.8 (883.1)	364.2 (869.5)	220.4 (883.2)	143.7*** [5.30]
1 <sup>st</sup> quartile	0.6 (1.1)	0.7 (1.2)	0.6 (1.0)	0.2** [2.15]
2 <sup>nd</sup> quartile	17.8 (11.9)	19.7 (12.0)	17.7 (11.9)	1.9** [2.56]
3 <sup>rd</sup> quartile	145.2 (68.4)	153.6 (68.2)	144.7 (68.4)	9.0** [2.15]
4 <sup>th</sup> quartile	859.6 (1753.1)	965.6 (1315.5)	849.3 (1789.9)	116.3 [1.22]
N	19,329	1,123	18,206	

We report descriptive statistics (mean and standard deviation) for all beneficiaries, beneficiaries who are pre-inheritance entrepreneurs, and non-entrepreneurs, respectively. For each beneficiary, we report total income, financial wealth (bank account, bonds, and stocks), net wealth before inheritance, age, gender, education (years of schooling), marital status, and whether there are children in the household. For each set of descriptive statistics, we also compute the difference in the average characteristics of pre-inheritance entrepreneurs and non-entrepreneurs and test whether these differences are significantly different from zero. All amounts are in thousand year-2000 DKK. One Euro is equivalent to DKK 7.45. Standard errors are in parentheses, and *t*-statistics are in square brackets. \*\*\*, \*\*, and \* denote significance at the 1, 5, and 10 percent levels, respectively.

**Table 3 Exogenous changes in wealth and firm formation**

Independent variable	Difference-in-differences of the propensity to become entrepreneur			
	OLS	OLS	OLS	OLS
Model	All	All	Non-entrepreneurial estates	Non-entrepreneurial estates matched on parental wealth
Sample	All	All	Non-entrepreneurial estates	Non-entrepreneurial estates matched on parental wealth
	(1)	(2)	(3)	(4)
Inherited wealth	0.0097*** (0.0032)	0.0086*** (0.0032)	0.0102*** (0.0038)	0.0137*** (0.0051)
Inherited wealth squared	-0.0002*** (0.0001)	-0.0002*** (0.0001)	-0.0005*** (0.0002)	-0.0011** (0.0005)
Entrepreneurial estate		0.0232** (0.0099)		
Control variables	Yes	Yes	Yes	Yes
Year effects	Yes, fixed	Yes, fixed	Yes, fixed	Yes, fixed
N	18,009	18,009	17,539	10,675

The dependent variable is the difference between an indicator variable for entry of the treated and the average entry rate for the matched sample (i.e., the difference in differences of the propensity to become an entrepreneur for the treated relative to that of the control group). The control group consists of individuals of the same age, gender, length of education, vigintile of the income distribution, and vigintile of the wealth distribution. In addition to matching on general characteristics, the control group is matched on parental wealth in Column 4. *Inherited wealth* is measured in million year-2000 DKK. *Inherited wealth squared* is the square of inherited wealth. *Entrepreneurial estate* is an indicator for whether the deceased was an entrepreneur. Control variables include (indicator variables) for changes in marital status and family size. The reported coefficients are marginal effects at the sample means. Standard errors are clustered at the individual level and reported in parentheses. \*\*\*, \*\*, and \* denote significance at the 1, 5, and 10 percent levels, respectively.

**Table 4 Characteristics of constrained and unconstrained entrepreneurs**

Pre-entrepreneurship characteristics	Constrained (1)	Unconstrained (2)	Difference (1)-(2)
<i>Panel A: Income, financial wealth, and net wealth</i>			
Total income (DKK 1,000)	200.7 (7.7)	207.2 (6.3)	-6.3 [-1.26]
Average income change (DKK 1,000)	-8.5 (3.3)	-6.4 (3.0)	-2.2 [-0.54]
Financial wealth (DKK 1,000)	1089.6 (936.9)	141.8 (22.2)	947.8 [1.01]
Net wealth (DKK 1,000)	1052.5 (945.9)	98.8 (51.3)	953.7 [1.02]
<i>Panel B: Individual characteristics</i>			
Age (years)	39.5 (0.5)	39.5 (0.5)	-
Gender (% male)	71.7 (2.6)	71.7 (2.6)	-
Education (years)	12.0 (0.2)	12.0 (0.2)	-
Married (%)	54.3 (2.9)	51.3 (2.9)	3.0 [0.76]
Children in household (%)	49.7 (2.9)	46.7 (2.9)	3.0 [0.83]
<i>Panel C: Region of residence</i>			
Capital region (%)	31.6 (2.7)	31.9 (2.7)	
Zealand (%)	15.5 (2.1)	17.8 (2.2)	
Southern Jutland and Funen (%)	20.1 (2.3)	19.7 (2.3)	
Central Jutland (%)	24.7 (2.5)	23.0 (2.4)	
Northern Jutland (%)	8.2 (1.6)	7.6 (1.5)	
$\chi^2$ -test			0.75
<i>Panel D: Industry</i>			
Manufacturing (%)	7.6 (1.5)	7.9 (1.5)	
Construction (%)	8.6 (1.6)	10.2 (1.7)	
Retail (%)	10.5 (1.8)	8.6 (1.6)	
Services (%)	50.0 (2.9)	48.7 (2.9)	
Transportation (%)	4.9 (1.2)	4.9 (1.2)	
Unknown (%)	18.4 (2.2)	19.7 (2.3)	
$\chi^2$ -test			1.27
N	304	304	



We report descriptive statistics (mean and standard error) for constrained and unconstrained entrepreneurs. Constrained entrepreneurs are individuals who become entrepreneurs after receiving windfall wealth due to the sudden death of their parents. The matched sample of unconstrained entrepreneurs consists of individuals who were able to start their businesses without receiving windfall wealth. Unconstrained entrepreneurs have the same age, gender, and length of education; are from the same vigintiles of the income and wealth distributions; and started their businesses at the same time as the constrained entrepreneurs. In Panel A we report total income, average income change in the 3 prior years, financial wealth (bank account, bonds, and stocks), and net wealth after inheritance. Panel B reports individual characteristics: age, gender, education (years of schooling), marital status, and whether there are children in the household. Panel C reports the region of residence, whereas Panel D reports the main industry. For each set of descriptive statistics, we also compute the difference in the average characteristics of constrained and unconstrained entrepreneurs and test whether these differences are significantly different from zero. All amounts are in thousand year-2000 DKK. Standard errors are in parentheses, and  $t$ -statistics are in square brackets. \*\*\*, \*\*, and \* denote significance at the 1, 5, and 10 percent levels, respectively.

**Table 5 Differences in firm survival rates, entrepreneurial profits, and total income**

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
<i>Panel A: Survival rates</i>						
Constrained entrepreneurs	1.000	0.641	0.580	0.535	0.457	0.419
Unconstrained entrepreneurs	1.000	0.750	0.637	0.588	0.530	0.500
Difference	-	-0.109*** [-2.90]	-0.057 [-1.49]	-0.053 [-1.34]	-0.073* [-1.92]	-0.081** [-1.98]
N	304	304	304	304	304	304
<i>Panel B: Entrepreneurial profits</i>						
Constrained entrepreneurs	101.3	141.7	121.2	110.6	104.0	106.3
Unconstrained entrepreneurs	128.8	182.7	184.6	183.0	179.1	155.2
Difference	-27.5* [-1.84]	-41.0** [-1.98]	-63.4*** [-3.03]	-72.4*** [-3.11]	-75.1*** [-3.21]	-48.9** [-2.16]
N	304	304	304	304	304	304
<i>Panel C: Entrepreneurial profits among surviving firms</i>						
Constrained entrepreneurs	101.3	170.7	165.7	174.0	198.4	244.3
Unconstrained entrepreneurs	128.8	196.9	235.8	243.3	251.1	263.8
Difference	-27.5* [-1.84]	-26.2 [-1.31]	-70.1*** [-3.03]	-69.3** [-2.24]	-52.7* [-1.70]	-19.5 [-0.54]
N	304	227	202	169	132	104
<i>Panel D: Retained earnings</i>						
Constrained entrepreneurs	9.6	11.8	10.3	9.9	14.3	12.2
Unconstrained entrepreneurs	22.8	25.3	11.6	7.6	23.0	16.5
Difference	-13.1** [-2.06]	-13.5 [-1.16]	-1.3 [-0.12]	2.3 [0.18]	-8.8 [-0.73]	4.4 [-0.44]
N	304	304	304	304	304	304
<i>Panel E: Total income</i>						
Constrained entrepreneurs	158.9	156.9	167.7	177.7	177.2	194.1
Unconstrained entrepreneurs	172.4	180.5	202.5	216.5	206.9	204.5
Difference	-13.5 [-1.39]	-23.6 [-1.63]	-34.8*** [-2.69]	-38.8*** [-3.03]	-29.7** [-2.40]	-10.4 [-0.85]
N	304	304	304	304	304	304

This table reports survival rates, entrepreneurial profits, and total income for *constrained* individuals who become self-employed after receiving windfall wealth. The matched sample of *unconstrained* entrepreneurs consists of individuals who were able to start their businesses without receiving windfall wealth. Unconstrained entrepreneurs have the same age, gender, and length of education; are from the same quintiles of the income and wealth distributions; and started their businesses at the same time as the constrained entrepreneurs. Panel A reports survival rates. Panel B reports entrepreneurial profits; Panel C reports entrepreneurial profits for surviving firms; Panel D reports retained earnings; while Panel E reports total income. Difference is the difference in income between constrained and unconstrained entrepreneurs. Profits and

income are measured in 1,000 DKK.  $t$ -statistics are in square brackets. \*\*\*, \*\*, and \* denote significance at the 1, 5, and 10 percent levels, respectively.

Table 6 Determinants of business failure rates, entrepreneurial profits, and total income.

Sample	All			Active entrepreneurs		
	Business closure	Entrepreneurial profit	Total income	Business failure	Entrepreneurial profit	Total income
Independent variable	Logit	OLS	OLS	Competing Risk	OLS	OLS
Model	(1)	(2)	(3)	(4)	(5)	(6)
Constrained	0.0885*** (0.0311)	-69.00*** (19.04)	-25.81*** (9.86)	1.339*** (0.163)	-75.16*** (25.51)	-35.72*** (12.92)
Age	0.0036* (0.0019)	-3.05*** (0.88)	-0.65 (0.55)	1.018* (0.011)	-4.30*** (1.21)	-0.84 (0.78)
Male	-0.0179 (0.0357)	25.22 (15.81)	6.16 (9.94)	0.951 (0.132)	29.20 (21.27)	2.51 (13.29)
Education	-0.0070 (0.0057)	8.07** (3.63)	3.69** (1.86)	0.990 (0.045)	12.11** (5.64)	2.42 (2.53)
Pre-entrepreneurship income (DKK 1000)	-0.0003** (0.0001)	0.49*** (0.11)	0.49*** (0.06)	0.999 (0.001)	0.60*** (0.15)	0.55*** (0.07)
Pre-entrepreneurship wealth (DKK 1000)	-0.0000* (0.0000)	0.00 (0.00)	-0.00* (0.00)	0.999 (0.001)	0.001 (0.001)	-0.001 (0.001)
Married	-0.0632* (0.0358)	63.10*** (18.28)	6.10 (10.97)	0.818* (0.114)	84.92*** (25.13)	7.56 (16.17)
Children	0.0200 (0.0351)	10.64 (17.29)	-7.88 (10.87)	1.073 (0.144)	13.25 (16.20)	-1.72 (15.76)
Year effects	Yes	Yes, fixed	Yes, fixed	Yes	Yes, fixed	Yes, fixed
N	3023	3013	3013	1898	1892	1892

Column 1 reports the marginal effect of characteristics on entrepreneurial closure, using a logit model. Columns 2 and 3 report the marginal effect on entrepreneurial profits and total income. Column 4 reports the sub-hazard ratio on entrepreneurial failure using a competing risk model (see Section 2.C for details). Columns 5 and 6 report the marginal income effect for entrepreneurs who are active at the beginning of the year. Those in the matched sample of unconstrained entrepreneurs have the same age, gender, and length of education; are from the same vignettes of the income and wealth distributions; and started their businesses at the same time as the constrained entrepreneurs. *Constrained* is an indicator for being classified as a constrained entrepreneur. Control variables are described in the footnote to Table 2. Standard errors are clustered at the individual level and reported in parentheses. \*\*\*, \*\*, and \* denote significance at the 1, 5, and 10 percent levels, respectively.

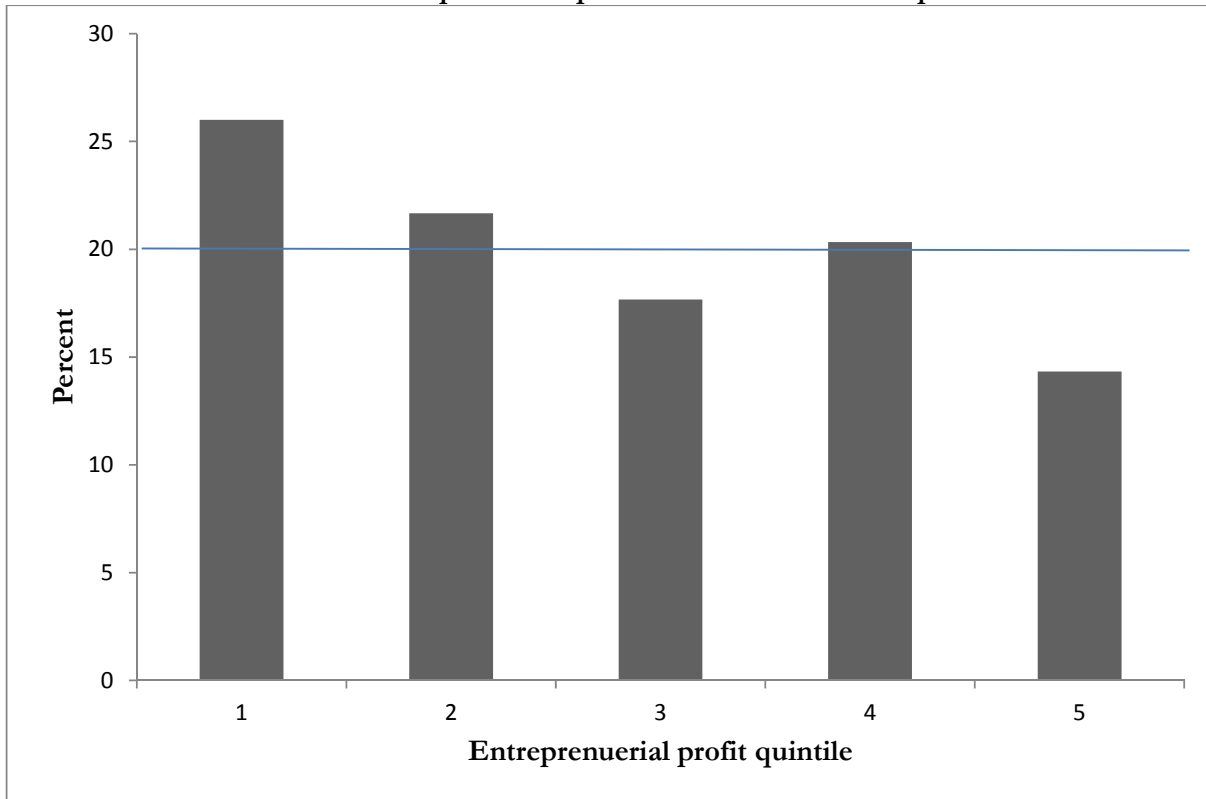
**Table 7 Treatment versus wealth effect**

Matching criteria on wealth	Treatment test				Placebo test
	Pre-inheritance wealth	Post-inheritance wealth	Parental wealth	Pre-inheritance wealth	Pre-inheritance wealth
	(1)	(2)	(3)	(4)	(5)
<i>Panel A: Business closure</i>					
Constrained	0.0841** (0.0335)	0.0748*** (0.0314)	0.0604 (0.0463)	0.1146* (0.0661)	
Inherited wealth	0.0185 (0.0552)				
Constrained * Treatment of unconstrained				0.0189 (0.0571)	
Treatment of unconstrained					-0.0604** (0.0304)
Control variables	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	No	Yes
N	3023	3017	1508	1373	3128
<i>Panel B: Entrepreneurial profit</i>					
Constrained	-61.72*** (19.17)	-65.67*** (19.17)	-55.64** (26.97)	-81.23*** (28.08)	
Inherited wealth	-30.67 (19.98)				
Constrained * Treatment of unconstrained				-11.16 (24.48)	
Treatment of unconstrained					10.31 (20.05)
Control variables	Yes	Yes	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes	No	Yes
N	3013	3006	1501	1364	3128
<i>Panel C: Total income</i>					
Constrained	-22.49*** (10.24)	-28.89*** (10.89)	-47.13*** (15.74)	-19.77 (20.20)	
Inherited wealth	-13.67 (11.83)				
Constrained * Treatment of unconstrained				3.22 (18.97)	
Treatment of unconstrained					-5.21 (13.09)
Control variables	Yes	Yes	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes	No	Yes
N	3013	3006	1501	1364	3128

Columns 1 to 4 report the differences in business closure, entrepreneurial profit, and total income between constrained and unconstrained entrepreneurs. Constrained entrepreneurs are individuals who become self-employed after receiving windfall wealth. Unconstrained entrepreneurs are a matched sample of individuals who were able to start their businesses without receiving windfall wealth. Unconstrained entrepreneurs have the same age, gender, and length of education; are from the

same vigintiles of the income and wealth distributions; and started their businesses at the same time as the constrained entrepreneurs. The main exception is Column 4, in which the matched sample consists of unconstrained entrepreneurs who receive windfall wealth in year 1 to 3 after business formation. Unconstrained entrepreneurs in Column 4 have the same gender and length of education; are from the same vigintiles of the income and wealth distributions; and started their businesses at the same time as the constrained entrepreneurs. Column 5 reports differences in business closure, entrepreneurial profits, and total income from a placebo test of inherited wealth among unconstrained entrepreneurs who suddenly inherit in years 1 to 3 after business formation. Columns 1, 4, and 5 use pre-inheritance wealth to form the matched sample. Column 2 uses post-inheritance instead of pre-inheritance wealth to form the matched sample of unconstrained entrepreneurs. Column 3 uses parental wealth instead of individual wealth to form the matched sample of unconstrained entrepreneurs. Regressions in panels A, B, and C are specified as columns 1, 2, and 3 in Table 6, respectively. *Constrained* is an indicator for being classified as a constrained entrepreneur. *Treatment of unconstrained* is an indicator equal to one after the treatment of unconstrained entrepreneurs with windfall wealth. *Inherited wealth* is in million DKK. Standard errors are clustered at the individual level and reported in parentheses. \*\*\*, \*\*, and \* denote significance at the 1, 5, and 10 percent levels, respectively.

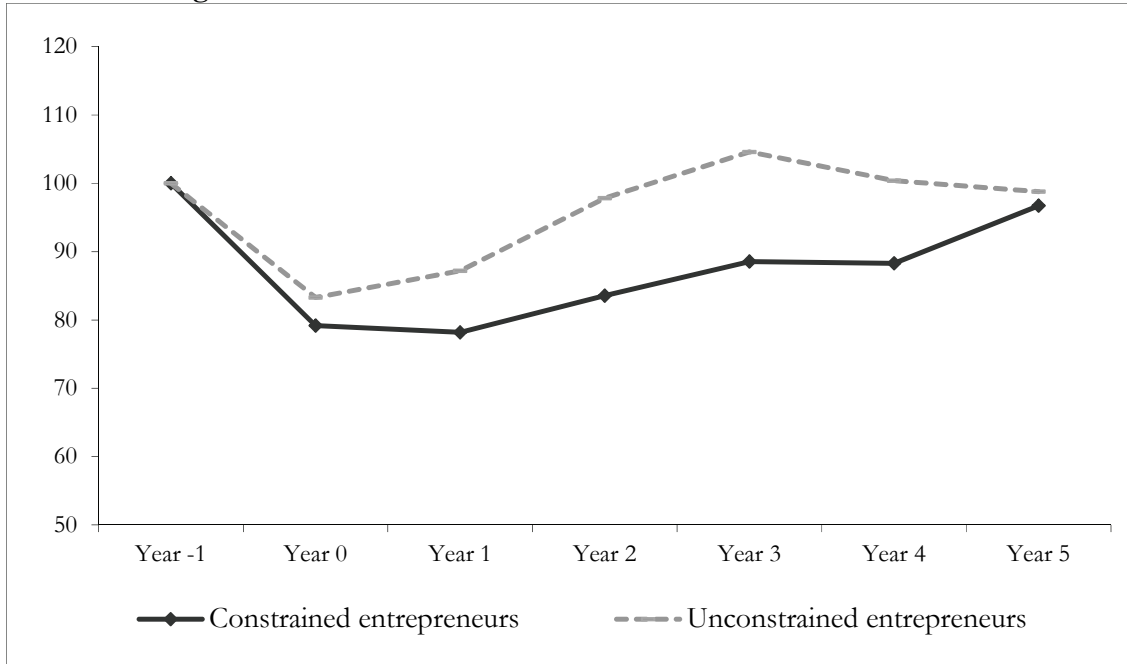
**Figure 1**  
**Relative distribution of entrepreneurial profit for constrained entrepreneurs in Year 1**



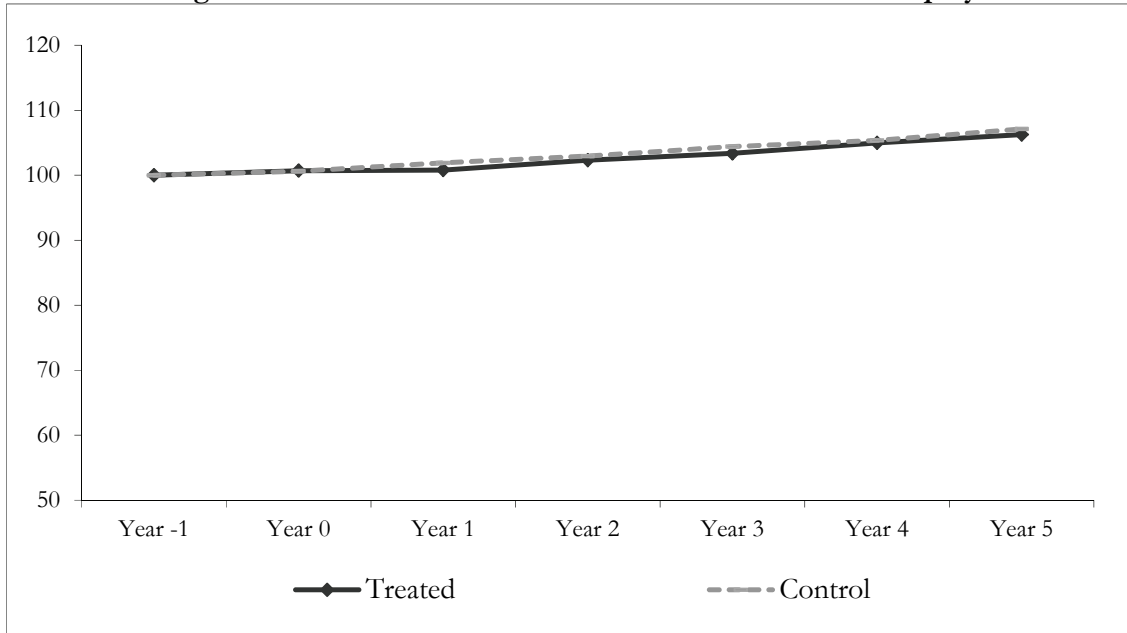
This figure reports the distribution of entrepreneurial profit for constrained entrepreneurs relative to the distribution for unconstrained entrepreneurs in year 1. Constrained entrepreneurs are assigned into bins using the quintile cut-off points from the distribution of entrepreneurial profits for unconstrained entrepreneurs in year 1. Quintile 1 (5) represents the lowest (highest) entrepreneurial profits. If the distributions are identical, we expect 20% of the constrained entrepreneurs to be assigned to each bin.

Figure 2

Panel A: Average total income around windfall wealth and business formation



Panel B: Average total income around windfall wealth for continued employment



Panel A plots total income for constrained and unconstrained entrepreneurs. Constrained entrepreneurs are individuals who become self-employed after receiving a windfall wealth. Unconstrained entrepreneurs are a matched sample of individuals who were able to start their businesses without receiving windfall wealth. Unconstrained entrepreneurs have the same age, gender, and length of education; are from the same quintiles of the income and (pre-inheritance) wealth distributions; and started their businesses at the same time as the constrained entrepreneurs. Panel B plots total income for continued employment among individuals who receive windfall wealth but continue with their existing jobs (*Treated*). The *control* group consist of a matched sample of similar individuals. Total income is indexed to the pre-entrepreneurship and pre-inheritance level (Year -1 = 100).



## FOOTNOTES:

---

<sup>1</sup> Surveys of current and aspiring entrepreneurs suggest that obtaining financing is one of the principal hurdles to forming and growing new businesses (Blanchflower and Oswald 1998). Not surprisingly, access to financing is high on the policy agenda around the world. In the United States, for example, the Small Business Administration has, since 1954, delivered millions of loans and guarantees for bank loans to facilitate the financing of small businesses. Many OECD countries are also encouraging entrepreneurship by easing access to financing (see OECD [2010] for an overview of policies across countries).

<sup>2</sup> We also need the death event to be uncorrelated with omitted variables that affect the outcome variable; e.g., the decision to become an entrepreneur.

<sup>3</sup> For instance, the American Academy of Paediatrics defines sudden cardiac death as a non-traumatic, nonviolent, unexpected event resulting from sudden cardiac arrest within 6 hours of a previously witnessed state of normal health.

<sup>4</sup> WHO's International Classification of Diseases, ICD-10, is the latest in a series that has its origin in the 1850s. WHO took over the responsibility of ICD at its creation in 1948, and the system is currently used for mortality and morbidity statistics by all Member States.

<sup>5</sup> SKAT does not have information about individuals' holdings of cash outside bank accounts, the value of their cars, their private debt (e.g., debt to private individuals), or other informal wealth holdings (e.g., antiques or stamp collections).

<sup>6</sup> See WHO's webpage at [www.who.int/classifications/icd/en](http://www.who.int/classifications/icd/en), and Andersen and Nielsen (2011) for references to the medical literature.

<sup>7</sup> As sudden death, by definition, excludes deaths that are caused by chronic diseases or involve treatment of the deceased prior to death, the classification effectively rules out many of the most common causes of death: For instance, 29% and 33% of all deaths are due to neoplasia (mainly cancer) and diseases in the circulatory system, respectively. Among these common causes, only acute myocardial infarction, sudden cardiac arrest, congestive heart failure, and strokes are considered sudden deaths. Thus, only 12.5% of natural deaths are classified as sudden and unexpected.

---

<sup>8</sup> On average, 8% of the workforce in Denmark is self-employed. Our beneficiaries are significantly younger than the average individual in the workforce. Becoming self-employed is positively correlated with age, experience, and wealth. We therefore have a lower fraction of self-employed (5.8%) among beneficiaries when they inherit.

<sup>9</sup> The methodology of difference-in-differences matching follows from Heckman et al. (1998). We report consistent results using different matching procedures as presented in Abadie and Imbens (2006) and Hirano and Imbens (2004) in the internet appendix. We employ our exact 1-to-many matching procedure for simplicity.

<sup>10</sup> Our control variables include indicator variables taking the value one if the individual gets married, gets divorced, or has children. We obtain marginal effects of similar magnitude if we alternatively omit control variables, include fixed region-year effects, or include fixed industry-year effects. These results are available in the internet appendix.

<sup>11</sup> One standard deviation increase in inherited wealth yields a marginal effect of 0.86 percentage points, which is close to the reported effect of one million DKK of inherited wealth.

<sup>12</sup> For instance, Altonji and Dunn (2000) and Charles and Hurst (2003) document strong intergenerational correlations in occupation, education, wealth, and saving preferences.

<sup>13</sup> We use the one-to-one exact matching procedure to minimize differences in pre-entrepreneurship income between constrained and unconstrained entrepreneurs. In the internet appendix we report consistent results when use 1-to-many matching.

<sup>14</sup> The match frequency can be increased by decreasing the list of pre-entrepreneurship characteristics that we match on, because we use exact matching. We obtain quantitatively similar results when we match on fewer characteristics or use propensity score matching, but also note that the unmatched characteristics of constrained and unconstrained entrepreneurs become less similar. Thus, the presented matching is preferred because it provides a more precise mapping of the characteristics of constrained and unconstrained entrepreneurs. In the Internet Appendix, we conduct a sensitivity analysis, varying matching criteria.

<sup>15</sup> Our definition classifies 54 out of 328 exits as successes. Using different cutoff levels to define “success” changes the estimated sub-hazard rate for constrained entrepreneurs very little. We obtain sub-hazard rates of

---

1.338, 1.288, and 1.284 when we alternatively define success as exits with entrepreneurial profit above DKK 50,000, DKK 250,000 and DKK 500,000, respectively.

<sup>16</sup> Table 2 shows that our sample of beneficiaries includes 1,123 individuals who are entrepreneurs before they receive windfall wealth. As we require that the windfall occurs shortly after business formation, the number of unconstrained entrepreneurs who receive windfall wealth is even lower, which forces us to exclude age as a matching characteristic.