Living Forever:
Entrepreneurial Overconfidence at Older Ages

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Abstract: Overconfidence has been proposed as an explanation for excess market entry by entrepreneurs and low returns in entrepreneurial activities. However, establishing that entrepreneurs are more overconfident than non-entrepreneurs requires the use of representative population samples; in addition, econometric endogeneity issues in survey data must be addressed. To overcome these methodological challenges, we use a measure of overconfidence that employs self-reports of life expectancy. These self-reports are compared to actual life spans in a large sample of the US population. We show that entrepreneurs are indeed more overconfident than non-entrepreneurs. By using fixed-effects panel regression—and thus by exploiting the longitudinal nature of our data—we provide evidence that changes in entrepreneurial status are not associated with changes in subjective life expectancy. These two findings in combination offer evidence that overconfident individuals self-select into entrepreneurship.

Keywords: overconfidence; life expectancy; entrepreneurship; self-employment; selection

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1. Introduction

The high failure rates of business start-ups (Dunne et al., 1988; Geroski, 1995; Hessels et al., 2011) and the low average returns to self-employment (Hamilton, 2000) suggest that too many people become entrepreneurs (Camerer and Lovallo, 1999; Blanchflower, 2004). Part of this excess market entry is thought to result from the tendency of entrepreneurs to be more overconfident than non-entrepreneurs (Busenitz and Barney, 1997; Baron, 1998; Koellinger et al., 2007). Specifically, the average entrepreneur often seems to have unrealistically positive beliefs about future business success that are difficult to reconcile with actual data (Roll, 1986; Cooper, 1988; Wu and Knott, 2006). Experimental studies in which optimal criteria for market entry behavior are induced and both actual behavior and participant expectations are observed have provided evidence about entrepreneurial overconfidence (Camerer and Lovallo, 1999). Such experimental studies using students in a laboratory setting might have limited external validity. However, using field data to test for differences in overconfidence levels between entrepreneurs and non-entrepreneurs is also challenging because of two methodological concerns that such studies face.

First, statements about the relative level of overconfidence among entrepreneurs versus non-entrepreneurs should be based on representative population samples. Overconfidence has been shown to exist in a broad variety of circumstances and among different groups of people (Weinstein 1980; Svenson, 1981; Taylor and Brown, 1988; DeBondt and Thaler, 1995). Therefore, field studies that focus only on a relatively specific control group—such as managers (Busenitz and Barney, 1997; Forbes, 2005)—and studies without any control group (Wu and Knott, 2006) cannot test whether overconfidence is indeed a driver of (excess) business entry.

Second, the direction of causality between occupational choice and self-perception is difficult to determine. Existing field studies that link self-perceptions to entrepreneurial behavior typically use measures of overconfidence that are related to occupational choices. For example, the studies by Koellinger et al. (2007, 2011) use data from the Global Entrepreneurship Monitor and ask respondents whether they believe that they have sufficient skills to start and run a new company. In such a setting, individual beliefs may cause occupational choices, but occupational choices may also cause changes in individual beliefs as a result of self-justification, learning-by-doing, or new information that has become available over time. Moreover, people who have decided to act in a specific way *should*

evaluate this action more optimistically than they did before they made this decision. Furthermore, they *should* be expected to be more optimistic than people who had not (yet) decided to undertake such action (Heckhausen and Gollwitzer, 1987). One way to address the direction of causality in econometric studies of survey data is by using instrumental variables (Koellinger et al., 2011). However, it is well known that instrumental variable regression results are sensitive to the quality of the instruments, which is difficult to assess (Bound et al., 1995; Block et al., 2012).

In this paper, we present an alternative method for tackling these identification problems; we use a population-based panel dataset that allows us to construct an objective overconfidence measure that compares subjective expectations of life duration and observed life spans. Aging and expectations of death are fundamentally important matters for every individual. Beliefs about life expectancy are not likely to be a consequence of entrepreneurial behavior because learning-by-doing, self-justification of occupational choices and job-related information are domain-specific and unlikely to have a direct influence on subjective thoughts about life expectancy. However, subjective life expectancy is influenced by individual levels of confidence (Mirowsky and Ross, 2000). Furthermore, if entrepreneurs are indeed more overconfident that non-entrepreneurs, one would also expect to find evidence for this phenomenon in several domains (i.e., in addition to those domains directly related to entrepreneurial behavior) because overconfidence tends to have a general component that will be found in several domains (West and Stanovich, 1997; Klayman et al. 1999).

Specifically, using a representative sample of elderly US citizens, we test whether entrepreneurs (defined as those people who were self-employed at least once during their observed occupational histories) are more prone to exhibit overconfidence with respect to life expectancy than non-entrepreneurs (defined as those people in wage-work who were never self-employed in their observed occupational histories). Furthermore, we use the panel structure of our data to directly test for potential reverse causality; we exploit the fact that entrepreneurial status would be positively correlated with overconfidence in a fixed-effect panel regression if overconfidence were the result of occupational choice. Our contribution to the literature is twofold. First, our study design represents a novel approach to overcoming methodological shortcomings that are common in field studies on entrepreneurial overconfidence. Second, our results are consistent with the hypothesis that overconfident individuals are more likely to self-select into entrepreneurship. This second finding

contributes toward our understanding of occupational choice and the returns to entrepreneurship.

2. Related literature

Overconfidence is a cognitive bias related to the overestimation of one's own ability or chance of success either in absolute terms or relative to others and related to one's ability to make accurate forecasts or to know the truth (Moore and Kim, 2003; Hoffrage, 2004). As a result, overconfidence can lead to suboptimal decisions for individuals. For example, overconfidence in stock investment reduces returns on investment (Barber and Odean, 2001), managerial overconfidence can generate distortions in corporate investment (Malmendier and Tate, 2005), and the trading volume in financial markets is higher than the rational equilibrium expectation because of overconfident traders (García et al., 2007). However, overconfidence can also have positive effects. For example, overconfidence may serve to increase ambition, morale, resolve, and persistence (Johnson and Fowler, 2011). Furthermore, a certain portion of overconfident individuals in a population might have social advantages because their behavior can reveal valuable information to society that would not be available otherwise (Bernardo and Welch, 2001).

To compare judgmental accuracy between entrepreneurs and non-entrepreneurs, a feasible and practical measurement for entrepreneurship is required. For the purposes of our study, we define entrepreneurship as being self-employed, which is the most frequently used measure of entrepreneurship in the economics literature (Parker, 2009). From an economic perspective, this definition distinguishes individuals who operate a business independently—without the control of a supervisor—from those who have an employer and are not fully responsible for the survival of the business (Bruggren et al., 2012). Based on differences in the economic uncertainty and the types of authority faced by entrepreneurs (i.e., the self-employed) compared to non-entrepreneurs (employees), two different mechanisms might lead to a higher level of overconfidence among entrepreneurs (Forbes, 2005).

The *first* mechanism assumes that overconfident individuals self-select into entrepreneurship. Those who are more susceptible to the use of biases and heuristics to make decisions may be more inclined to become entrepreneurs because biases and heuristics can be effective and efficient guides to decision making in highly uncertain and complex environments (Busenitz and Barney, 1997). An assumption that is implicit in this view is that

overconfidence is a personality trait, to a certain extent, that is not limited to one specific situation or point in time.

The *second* mechanism assumes that the entrepreneurial environment itself triggers overconfidence. Entrepreneurs constantly face situations that tend to overload their information-processing capacities and that are characterized by high levels of uncertainty, novelty, emotion, and time pressure. Together, these factors may increase entrepreneurs' susceptibility to a number of cognitive biases (Baron, 1998). Thus, overconfidence could be a function of the contextual factors encountered by entrepreneurs, to some extent.

Our research idea relates to the studies of Puri and Robinson (2004, 2007), who use data on subjective life expectancy and actuarial tables to construct a measure of optimism that correlates with a broad range of economic outcomes and beliefs; these studies also show that entrepreneurs are more optimistic than non-entrepreneurs. Our study is distinguished from their studies because we benchmark subjective life expectancy with actual lifespan data to derive a measure of *over*confidence (i.e., a systematic judgment bias) instead of deriving a measure of optimism (i.e., generalized positive expectations about future events that may or may not be true). This additional step is important because people may have different beliefs about life expectancy that may be justified for several reasons, and certain of these may be unobservable to the investigator. Therefore, comparing average tendencies for optimism between entrepreneurs and non-entrepreneurs is not informative about the different cognitive styles of these groups. By introducing an objective benchmark (i.e., actual lifespan) that can be used to evaluate the accuracy of individual judgments, we are able to provide novel evidence for the hypothesis that entrepreneurs are more *over*confident than non-entrepreneurs.

3. Data and methodology

We use data from the Health and Retirement Study (HRS) (Juster and Suzman, 1995), a large-scale, longitudinal panel study that aims to record changes in labor force participation and the health situation of individuals at the end of their working lives and in the years that follow. Participants are United States civilians who are primarily 50 years of age or older Sometimes more than one member of a household is included in the survey. Data collection began in 1992 and continued biennially, which has resulted in ten waves of data collection (1992–2010). We use a version of the HRS data developed by RAND (RAND HRS Data File v.L) that contains harmonized data for the ten waves.

The dependent variable in our analysis is a measure of subjective life expectancy. Participants were asked in each wave of data collection to assign a probability (on a scale from 0 to 100) to the statement that he or she will live to the age of 75. From the second data wave onward, the question is only asked to those participants who are younger than the age of 65. For consistency, we remove an individual's assigned value from each data wave if the respondent is older than 65 at time of reporting. We refer to this variable as *Living to 75*. For the cross-sectional analysis, we average all reported *Living to 75* values per individual across the waves and divide the outcome by 100. We refer to this average value as *Living to 75*.

The main independent variables in the analysis are measures of actual life spans and entrepreneurial activities. The binary variable *Alive 75* indicates whether the difference between a study subject's death date minus his or her birth date is larger than 75×365.25 days (accounting for leap years). We exploit the panel structure of the HRS to construct the variable *Entrepreneur*. For each individual that reports being self-employed or running his own business at least once, this variable takes the value of 1; for those who report always working for someone else, it takes the value of 0. We also include other control variables in our analyses that are expected to have explanatory power for subjective life expectancy. In particular, we control for *Gender* (0: Female, 1: Male), *Birth year*, *Years of Education* (0-17+), *Income* (logarithm of the average reported individual earnings in nominal dollars), and *Diseases* (maximum reported amount of diseases from a set of eight common diseases[1] a respondent is told by a doctor that he/she has).

In each analysis, we include only participants of the HRS that were eligible to become 75 years of age during follow-up (those who were born in 1935 or earlier). This approach provides a sample of 3,250 individuals with complete information on all included variables, except for the *Alive 75* variable. The latter variable has missing values for those individuals remaining alive in the 2010 data collection or who dropped out from the sample during follow-up. *Alive 75* is available for 759 individuals with information on their date of death. After comparing *Living to 75* with *Alive 75* to see whether people are (on average) overconfident with respect to subjective life expectancy, we analyze two model specifications. First, we regress *Living to 75* on *Entrepreneur*, *Alive 75* and the other control variables. The regression results show whether there is a difference in subjective life

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[1] The eight diseases are: arthritis, cancer, diabetes, heart problems, high blood pressure, lung disease, psychiatric problems, and stroke.

expectancy between entrepreneurs and non-entrepreneurs after controlling for actual life span. A positive coefficient for *Entrepreneur* indicates that entrepreneurs have more positive beliefs than non-entrepreneurs regarding their life expectancy and provides evidence for overconfidence among entrepreneurs relative to non-entrepreneurs. The actual level of reported life expectancy is uninformative for measuring overconfidence, but a significant coefficient for *Entrepreneur* provides an insight into the relative strengths of the beliefs of entrepreneurs and non-entrepreneurs. The dependent variable *Living to 75* is bounded between 0 and 1; thus, it is not normally distributed. Therefore, we use a Generalized Linear Model (GLM) with a Binomial distribution, a logit link function (fractional logit model), and cluster the standard errors on the household level.

Second, we analyze the development of subjective life expectancy over time using a fixed-effect panel regression for continuous outcomes while simultaneously controlling for *Entrepreneur* and wave dummies. This analysis helps us to disentangle the two mechanisms that are proposed as explanations for the association between entrepreneurship and overconfidence: self-selection and contextual influence. The fixed-effect panel regression controls for time-invariant variables that influence the outcome variable and thus focuses the analysis on individuals who actually changed their employment status between wage employment and self-employment at least once during the observed time frame. Therefore, the fixed-effect panel regression analyzes whether changes in subjective life expectancy are related to changes in entrepreneurial status, and the coefficient for the variable *Entrepreneur* can be interpreted as the contextual effect of entrepreneurship on overconfidence. A positive coefficient would provide evidence for the mechanism proposed by Baron (1998): the entrepreneurial environment makes people prone to exhibit an overconfidence bias. A negative coefficient is expected if the entrepreneurial context makes the entrepreneur less overconfident, which might be the result of learning and calibration of beliefs. A non-significant coefficient that cannot be distinguished from zero would indicate that the entrepreneurial environment itself does not influence beliefs about life expectancy. Again, we cluster the standard errors in the analysis on the household level.

The structure of our research depends on whether the interpretation of subjective probabilities does not systematically differ between entrepreneurs and non-entrepreneurs. Suggestive evidence is presented by Pelissier and Van Buer (1992), who find that a person's score on an entrepreneurial orientation scale is not correlated with the probability that he or she assigns to phrases such as 'small chance', 'not likely', etc.

4. Results

Descriptive statistics for the sample used in the cross-sectional analysis are presented in Table 1. The *p*-values for differences between entrepreneurs and non-entrepreneurs are calculated using Pearson's χ^2 tests for categorical data and *t*-tests for continuous data. The total sample consists of 759 individuals; 26% of these individuals are entrepreneurs. More than half the total sample is male, and males are overrepresented in the group of entrepreneurs ($p < 0.01$). The mean birth year in the sample is 1932, which makes the entrepreneurs slightly older in our study than non-entrepreneurs. Participants have an average of 12 years of education, and entrepreneurs earn on average less than their counterparts ($p < 0.01$). The two groups do not differ in average number of diagnosed diseases. We use descriptive statistics to establish that overconfidence is present in subjective life expectancy. When the average reported value of *Living to 75* is 63%, only 27% of the sample actually reaches this age. This relatively large difference between subjective and actual life expectancy is present in the entrepreneur and non-entrepreneur group. These differences are consistent with findings that overconfidence is likely to occur in situations that are highly uncertain (Fischhoff et al., 1977; Yates, 1990), such as events that are far in the future (Weinstein, 1980).

< Table 1 about here >

We compare the relative level of overconfidence between entrepreneurs and non-entrepreneurs in a regression framework using GLM. The results, shown in Table 2, indicate that *Entrepreneur* is significantly positively associated with life expectancy. Entrepreneurs rate their life expectancies significantly higher than non-entrepreneurs, although their actual life spans (included as a control variable in the regression) do not provide solid evidence for this. Thus, the relative level of confidence differs between the two groups, which is consistent with the stronger overconfidence bias among entrepreneurs relative to non-entrepreneurs. The significant and positive coefficient for *Alive 75* shows that individuals who live longer than 75 years also have higher subjective life expectancies. *Gender, Birth year* and *Earnings* do not have explanatory powers for subjective life expectancy. *Years of Education* and *Diseases* have a positive and negative coefficient, respectively. This result is consistent with the stylized fact that higher-educated individuals live longer (Ross and Wu, 1995; Meara et al., 2008)) and the relation between diseases and death. These factors may thus be discounted in a subjective assessment of life expectancy.

The results for the fixed-effect panel regression can be found in Table 3. For this analysis, we employ a larger set of 3,250 individuals for whom we have complete information on all variables used in the cross-sectional analysis, except for *Alive 75*. Of these 3,250 individuals, 169 are not included in the regression because they did not provide their entrepreneurial status and subjective life expectancy in the same wave. Wave dummies are included in the regression to control for possible time trends in life expectancy. We find that *Entrepreneur* is negatively associated with subjective life expectancy, but this association is not significant. Thus, contrary to the suggestion of Baron (1998), the results do not provide evidence that overconfidence about life expectancy results from adaptations or learning processes during the time spent in self-employment.

< Table 3 about here >

Because of the difference in overconfidence that we found in the cross-sectional analysis (Table 2), the absence of a contextual influence on changes in occupational status with respect to life expectancy (Table 3) is consistent with the view that overconfident individuals self-select into entrepreneurship (Busenitz and Barney, 1997). This finding also relates to evidence that confidence in one's ability to perform tasks related to entrepreneurship is a robust predictor for starting a business (Townsend et al., 2008). Obviously, this finding does not preclude the possibility that contextual factors may influence judgment and decision-making styles in other ways that were not investigated in this study.

5. Conclusion

In describing five cognitive remedies for overconfidence, Russo and Schoemaker (1992) posit that awareness alone may be all that is required. If people are aware of their overconfidence biases, they can devise their own solutions to address them. Experiments and field data show that the relationship between competence and self-awareness might explain a significant amount of the overconfidence bias (Ferraro, 2005). Therefore, our study serves a practical purpose by showing that entrepreneurs, a relatively large group in society, have overconfident beliefs compared to non-entrepreneurs. This finding may be helpful for both entrepreneurs and non-entrepreneurs. If entrepreneurs could be aware of their cognitive biases, they may be able to exercise better judgment and make better decisions for themselves, their family members, and stakeholders in their companies. Non-entrepreneurs, such as the bankers who finance entrepreneurs, should also be aware of the overconfidence

bias that many entrepreneurs appear to have and look for independent sources of information when making risk assessments (De Meza and Southey, 1996).

In summary, we find novel evidence for overconfidence among entrepreneurs in a large sample of the US population. Our method overcomes the econometric endogeneity problems that are typical of field studies on overconfidence. Finally, our findings are consistent with the hypothesis that overconfident individuals are more likely to self-select into entrepreneurship in the population studied.

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7. References

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8. Tables

Table 1. Descriptive statistics for the sample used in the cross-sectional analysis. Standard errors are given between parentheses. The *p*-values for differences between the entrepreneurs and non-entrepreneurs are calculated using Pearson's χ^2 tests for categorical data and *t*-tests for continuous data

	Total	Non-Entrepreneurs	Entrepreneurs	*P*-value for difference
N	759	562	197	-
Living to 75 (0-1)	0.63 (0.25)	0.62 (0.26)	0.67 (0.23)	0.01
Alive 75 (0/1)	0.27 (0.44)	0.25 (0.43)	0.31 (0.47)	0.08
Gender (0 = Female, 1 = Male)	0.67 (0.47)	0.64 (0.48)	0.75 (0.43)	<0.01
Birth year	1932.17 (2.15)	1932.28 (2.10)	1931.86 (2.25)	0.02
Years of Education (0-17+)	11.88 (3.32)	11.81 (3.29)	12.10 (3.42)	0.28
Log Earnings	8.55 (2.26)	9.03 (1.49)	7.16 (3.30)	<0.01
Diseases (0-8)	2.85 (1.58)	2.90 (1.57)	2.71 (1.62)	0.14

Table 2. Result of the Generalized Linear Model explaining subjective life expectancy (_Living to 75_). Standard errors are given between parentheses and $^*p < 0.05,$ $^{**}p < 0.01,$ $^{***}p < 0.001.$

Variable	Coefficient
Entrepreneur	0.22* (0.10)
Alive 75	0.20* (0.10)
Gender	-0.01 (0.09)
Birth year	-0.03 (0.02)
Years of Education	0.02* (0.01)
Log Earnings	0.02 (0.02)
Diseases	-0.13*** (0.03)
Constant	51.61 (40.90)
_N_	759
Log Pseudo-Likelihood	-367.86

Table 3. Result of the Fixed Effect panel regression explaining subjective life expectancy (*Living to 75*). Standard errors are given between parentheses and $^*p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

Variable	Coefficient
Entrepreneur	-0.50 (1.62)
Wave 1	-3.69** (1.31)
Wave 2	-5.18*** (1.32)
Wave 3	-1.79 (1.34)
Wave 4	-3.03* (1.41)
Constant	71.64*** (1.26)
N observations	7,207
N groups	3,081
F(5, 4121)	5.60
P-value	<0.001

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