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IFN Working Paper No. 944, 2012

## **Do Women Have a Less Entrepreneurial Personality?**

Ola Bengtsson, Tino Sanandaji and Magnus Johannesson

# Do Women Have a Less Entrepreneurial Personality?

Ola Bengtsson\*, Tino Sanandaji† and Magnus Johannesson‡

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## Abstract

A striking fact about entrepreneurship is that the number of male entrepreneurs greatly exceed the number of female entrepreneurs. We use detailed survey data from Sweden to study to what extent this gender gap can be explained by gender differences in personality. We show that women have markedly different psyche than men (11 out of 14 traits differ), and that entrepreneurs have markedly different psyche than others (8 out of 14 traits differ). However gender differences in traits do not reduce women's likelihood of being an entrepreneur in a one-sided way. We find that, in aggregate, gender differences in personality traits can explain a modest part of the gender gap in entrepreneurship: our estimates suggest 21%-32%. We also document that personality traits that distinguish entrepreneurs from others are generally *not* more prevalent among the non-entrepreneurial self-employed. This finding highlights that entrepreneurship is distinct from other types of self-employment.

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# 1 Introduction and Literature Review

Gender differences in labor market outcomes are large and ubiquitous, especially for high-achieving jobs (Bertrand and Hallock, 2001). One controversial explanation for this disparity is that women may have "innate" personality traits that are not compatible with competitive, challenging and risky work environments (Gneezy, Niederle and Rustichini, 2003; Niederle and Vesterlund, 2007; Croson and Gneezy, 2009). While evidence from psychological tests and laboratory experiments confirm the existence of gender differences in traits, it remains an open question to what extent they explain actual employment choices.

In this paper, we study whether and how gender differences in personality traits explain gender differences in entrepreneurship. Around the world, the rate of male self-employment (the most common empirically proxy for entrepreneurship) exceeds that of females: in the US, 14% of the male labor force is self-employed versus 8% of women, and in the European Union, the corresponding figures are 19% and 10%.<sup>1</sup> From a policy perspective, it is important to understand the roots of this gender gap, because entrepreneurship carries considerable societal benefits—entrepreneurs innovate, launch products, create jobs and contribute to economic growth (Asc and Audretsch 1988, Kortum and Lerner, 2000, Carree and Thurik, 2003; Van Praag and Versloot, 2007). From an academic perspective, studying the reasons behind the gender gap can yield new insights on how to encourage, incentivize, and support entrepreneurs.

We build our analysis on the seminal argument by Frank Knight (1921) and Joseph Schumpeter (1934) that individuals who break new paths and undertake entrepreneurial ventures must have a special psyche. A large literature presents broad evidence in support of this argument, however, there exists little large-scale empirical research that directly links gender differences in personality traits to entrepreneurship<sup>2</sup>. It is challenging to establish such linkage because it requires data on a multitude of traits, for both entrepreneurs and other individuals. Overcoming this hurdle, we study gender differences in entrepreneurship using a recently-collected survey dataset from Sweden. Sweden presents a good testing ground for gender-based differences in labor market outcomes, because its high degree of emancipation diminishes the influence of institutional gender-based discrimination.

The scale and scope of our dataset gives us several research advantages. One, somewhat

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<sup>1</sup>The gender differences in self-employment exists in every EU country, and is greater for self-employed individuals who employ others (i.e., arguably a more relevant definition of entrepreneur).

<sup>2</sup>See Wagner (2007), Zhang et al. (2009), and Verheul et al (2011) for existing evidence.

unique, advantage is that we can distinguish between entrepreneurs and non-entrepreneurial self-employed by asking all self-employed individuals to self-report based on their business ambitions. Entrepreneurs strives to innovate and/or expand their business in a Schumpeterian sense, whereas the the non-entrepreneurial self-employed neither engage in innovation or plan to grow significantly. Motivations for non-entrepreneurial self-employed include non-pecuniary benefits from working for themselves (Hamilton, 2000; Hurst and Pugsley 2010), greater possibility to avoid taxes (Cullen and Gordon, 2007), regulatory barriers to employment, or the fact that self-employment reduces agency costs (Bitler et al. 2005). Although non-entrepreneurial self-employment plays an important role for the economy, it is a distinct phenomenon from the Schumpeterian entrepreneurship that policy makers and researchers often have in mind. One contribution of our paper is to highlight this distinction by documenting that (i) only a third of all self-employed self-identify as entrepreneurs, (ii) the gender difference is greater for entrepreneurship than for non-entrepreneurial self-employment, and (iii) the distinct psychological traits found among entrepreneurs in most cases cannot be found among the non-entrepreneurial self-employed.

Another advantage is that our sample is large, with 7,331 unique individuals, and representative of the cross-section of the working Swedish population. All individuals in our sample are twins. Prior research has shown that twins are broadly similar to other individuals with regards to personality traits and economic behavior (Kendler et al 1995, Johnson et al 2002). The twin status makes it possible to include twin-pair fixed effects in regressions on how personality traits relate to entrepreneurship. We can thereby test whether each trait affects entrepreneurship through genetics and childhood experiences (which twins partly share), or has other explanations.

A final, and important advantage of our dataset is its unusual level of detail. Based on a multitude of survey questions, we identify 14 distinct personality traits that collectively capture key dimensions of an individual’s psyche. These traits are risk aversion, loss aversion, ambiguity aversion, time discount rate (i.e., payoff patience), numeracy (i.e., ability to calculate odds), illusion of control, belief that money is fungible, awareness about the opportunity costs concept, tolerance of greed (i.e., acceptance of market economy outcomes that may be ”unfair”), trust in others, locus of control, positive attitude towards civic engagement, behavioral inhibition, and happiness. Our survey data includes more questions per trait than as typical in similar studies that often rely on on indirect measures. For example, we measure of risk aversion on a series

of question that are experimentally validated and shown to be predictive of real life risk taking behavior (Dohmen et al. 2011). Lastly, the richness of data allows us to compare the marginal influence on the likelihood of being an entrepreneur across traits that are empirically related, yet conceptually distinct. For example, we can analyze separately the roles of behavioral inhibition and happiness, traits that are positively correlated with each other.

Our dataset also has two limitations. First, our sample includes only Swedes between the ages of 51 and 66. Due to the enormous data collection costs associated with the surveys, it is unfortunately not possible to broaden the sample to other countries or age segments. Second, we observe personality traits and employment choices contemporaneously. It may be that some traits are the result, rather than the determinant, of entrepreneurship. For example, it may be that an entrepreneurial career makes individuals more risk taking. In an untabulated test we use the traits of twins who are not entrepreneurs themselves as instruments, finding that the personality traits of siblings can explain entrepreneurial behavior. This suggests that "treatment" is unlikely to fully account for differences in personality differences between entrepreneurs and others.<sup>3</sup>

Our empirical testing analysis proceeds in three steps. In the first step, we investigate how women compare to men along the 14 personality traits (with controls for age). We find strong evidence that women, on average, have different psyche than men. Women have weaker numeracy skills and more control illusion, believe less in the fungibility of money, are less tolerant of greed and more trusting in others, have weaker internal locus of control, are less favorable towards civic engagements and less behaviorally inhibited. Interestingly, we find that women are *more* risk-avert but *less* ambiguity-avert. An ambiguity avert individual, who we identify by asking a question based on the classical Ellsberg paradox, is unwilling to make choices associated with unknown probabilities. Ambiguity aversion is distinct from risk aversion, both conceptually (Fox and Tversky, 1995; Maccheroni, Marinacci and Rustichini, 2005) and empirically—the correlation between the two is virtually zero in our data.

In our second step, we relate the likelihood of being an entrepreneur to the 14 personality traits (with controls for gender and age). We find that, as compared with others, entrepreneurs have less risk-aversion and less ambiguity-aversion. The finding pertaining risk-aversion is well-documented in prior studies, however, we are the first to use a large-scale dataset to document that entrepreneurs are also less ambiguity avert, just as Frank Knight (1921) hypothesized.

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<sup>3</sup>As further evidence against the "treatment" explanation, Cesarini et al (2011) show that there is a strong genetic component in several of the personality traits that we study.

We further show that entrepreneurs are more aware about the opportunity cost concept, more tolerant of greed, have stronger internal locus of control, are more civic minded, and are less behaviorally inhibited and happier. Our findings broadly support the popular view that entrepreneurs are outgoing individuals willing to cope with risk and uncertainty.

In the third step of our analysis of gender differences in entrepreneurship, we unify the above discussed analyses. We find that, on aggregate, personality traits can explain a relatively modest fraction of the gender difference in entrepreneurship. The estimates from our probit regressions indicate between 21% and 32%.<sup>4</sup> Obviously, our estimates of the fraction explained by personality traits cannot be interpreted as precise figures, because they are sensitive to exactly how each trait is measured and how the statistical model is specified.

One reason why the aggregate effect of psyche is relatively modest is that is that some personality traits have gender differences but do not determine entrepreneurship, and, conversely, some traits determine entrepreneurship but have no gender difference. Another reason is that gender differences in traits do not in a clear cut way reduce women's likelihood of being an entrepreneur. On the one hand, we find that women are less likely to be entrepreneurs because they have higher risk aversion, stronger sense of fairness, weaker internal locus of control and less favorable attitude towards civic engagements. On the other hand, we find that women are more likely to be entrepreneurs because they are less ambiguity avert and less behavioral inhibition. The existence of such opposite effects means that researchers studying only a small subset of personality traits could come to the wrong conclusion about gender differences in entrepreneurship.

A natural question to ask is what explains the gender difference in entrepreneurship that is unexplained by the 14 personality traits we study. One explanation is that there could be measurement error in the way we measure the traits (Beauchamp et al, 2011). Measurement errors in traits where men are more entrepreneurial biases the estimate of the share of the gap explained by personality downward, while measurement error in traits where women are more entrepreneurial biases it upward. A related explanation is that the set of personality traits we study is incomplete. One trait excluded from our analysis is over-optimism (Puri and Robinson, 2006), although we likely capture it in part with our happiness and locus of control traits, traits which are associated with over-optimism. Another excluded trait is the willingness to compete, but it is difficult to measure this trait outside laboratory experiments (see Gneezy, Niederle and

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<sup>4</sup>The lower figure is derived in a specification where each personality trait is captured by a dummy, and the higher figure is derived in a specification where each trait is captured by multiple dummies.

Rustichini, 2003).

Likely, the most important explanation is that non-psychological factors play a dominant role for the gender difference in entrepreneurship. It is beyond the scope of our paper (and the limits of our dataset) to explore the importance of such factors, but we note that previous research suggests various possibilities. One strand of the literature emphasizes gender discrimination in product and credit markets (e.g. Borjas and Bronars 1989, Muravyev et al. 2009). Female business owners tend to work fewer hours, likely because of greater family responsibilities (Sanandaji and Wallen 2009). They also have less capital and are less likely to have prior experience in industry or in managerial roles compared to men (Carter et al. 1997; Boden and Nucci 2000; Fairlie and Robb 2009). Prior research also document that women are less likely to have degrees in business or technical fields, fields of study associated with entrepreneurship (Menzies et al. 2004). Another possibility is that parents make gender-based choices on how to transmit human capital to their children. Robinson (2011) shows that such transmission could be an important factor driving self-employment choices. Choice of industry also seems to be important. Du Rietz and Henrekson (2000) show that women entrepreneurs tend to be active in industries where expansion is generally more difficult, in part accounting for lower growth rate for firms headed by women. Finally, it is possible that social norms, lack of role models and cultural factors—as emphasized by the sociological and feminist literatures—may contribute to the gender difference in entrepreneurship.

In the concluding part of our empirical analysis, we compare the personality traits between non-entrepreneurial self-employed and others (i.e. employees and those who are inactive in the labor market). Concretely, we exclude entrepreneurs from our sample, and show that only one entrepreneurial trait—lower risk aversion—differs significantly between the non-entrepreneurial self-employed and the general population. We also show that personality traits can explain much less of the gender gap in self-employment than the gender gap in entrepreneurship. Collectively, these findings indicate that entrepreneurship requires a special psyche, and that this psyche is different from that required for other types of self employment.

This paper contributes to the literature in psychology and, more recently, experimental economics that study gender differences in personality and psyche. Croson and Gneezy (2009) review this literature, and conclude that there are "robust [gender] differences in risk preferences, social (other-regarding) preferences, and competitive preferences". Our findings support this conclusion, showing that women differ for 11 out of the 14 personality traits that we study.



This paper also contributes to the literature that study how personality and psyche relates to entrepreneurship (see Shane, 2003, for a review). Numerous studies have linked higher tolerance for risk with a higher propensity to engage in self-employment (Kihlstrom and Laffont 1979; Rees and Shah 1986; Begley and Boyd, 1987; Stewart et al. 1999; Van and Cramer 2001, Cramer et al. 2002, Caliendo et al 2009; Roach and Sauermann, 2011), though not all studies have been conclusive, such as Cramer et al. (2002). We confirm that entrepreneurs are less risk avert, and also show that they are less ambiguity avert than other individuals. We also confirm the finding of Brockhaus (1980) and Mueller and Thomas (2001) that entrepreneurs have stronger internal locus of control. Finally, although one could argue that the personality traits we measure are not behavioral biases, our findings relate to papers linking behavioral biases to entrepreneurship (Olson, 1986; Cooper et al., 1988, Forbes, 2005; Koellinger et al., 2007; Burmeister and Schade 2007).

This paper is also related to Nicolaou et al. (2008) who, using data on British twins, find that a large fraction of the variability in the self-employment likelihood is genetic. The role of genes for self-employment strongly suggests that preferences and personality traits—in turn proven to be genetic, see for example Cesarini et al (2011)—are key determining factors of who becomes an entrepreneur.

The remainder of this paper is organized as follows. Section 2 presents evidence on the prevalence of gender differences in entrepreneurship. We introduce the sample and explain our focal variables in Section 3. Section 4 presents results on gender differences and entrepreneurship, and Section 5 presents results on entrepreneurship and self-employment. The paper ends with a brief conclusion in Section 6.

## 2 Evidence on the Entrepreneurship Gender Gap

Female self-employment rates have climbed somewhat in the United States and most other developed countries during the last decades. Nevertheless the gender gap in this labor market outcome remains large and ubiquitous. Table 1 illustrates this fact, by presenting self-employment statistics from United States and 33 European countries. The figures are collected from Eurostat, the U.S. Bureau of Labor Statistics, and the U.S. Census Survey of Business Owners.

Panel A reports the fraction of the working population that is self-employed. Across the countries, the arithmetic average self-employment rate is 19% for men versus 10% for women. Hence, men are twice as likely to be self-employed than women. This pattern holds for every

country that we report. Panel B reports the fraction of the working population that is self-employed and employ at least one person other than the owner. Self-employed with employees is a measure likely to correspond more closely (though of course still not perfectly) with entrepreneurship. The gender gap in employer firms is even wider: across the countries, men are about three times as likely as women to be self-employed with employees.

In the United States while men are overrepresented by 70% among all self-employed, they are overrepresented by 200% among those self-employed who employ at least one external worker. In a recent Kauffman Foundation study focusing on the gender gap in U.S. entrepreneurship, Mitchell (2011) confirms that women self-employed are underrepresented as employer firms, and far less likely to have sales above one million dollar per year. Other research has shown that female-owned firms are on average smaller than male-owned ones (Coleman 2002; Robb and Wolken 2002; Fairlie and Robb 2009), and that female business owners tend to less growth oriented than their male counterparts (Orser and Hogarth-Scott 2002, Morris et al. 2006). All of this indicates that the gender gap in entrepreneurship is wider than the already large gender gap in self-employment.

## 3 Data

### 3.1 Sample

We obtain our data from The Swedish Twin Registry, which is the largest twin registry in the world. Beginning in early 2009, the registry sent out a detailed survey—Screening Across the Life-span Twin (SALTY)—to 24,914 Swedish twins born between 1943 and 1958. A total of 11,743 individuals answered the survey, reflecting a response rate of 47%. Each respondent answered a battery of detailed questions on his or her economic preferences, risk and ambiguity attitudes, and behavior. The questions were designed by a team of researchers based on existing theoretical and empirical work in economics, psychology, and behavioral science. To construct our final sample, we exclude 4,403 individuals who did not answer all the survey questions that we use to create the 14 personality traits we study. Panel A of Table 2 summarizes our sample. We study 7,331 individuals, of whom 49% are women and 51% men.

Cesarini et al. (2011) merge the SALTY survey data with information from Swedish administrative records, and make an in-depth investigation of the population representativeness of this sample using that data. Comparing income, education and other similar variables with the Swedish average, they find that the twin sample is observationally representative of the

Swedish population as a whole.<sup>5</sup> This evidence corroborates previous research, which shows that twins are similar to the full population in most important dimensions, including personality and psyche (Kendler et al 1995, Johnson et al 2002). This fact enables population validity of our findings, a key assumption of the growing economic literature that uses twins (surveyed in Cesarini et al 2009) to study economic behavior.

### 3.2 Self-Employment and Entrepreneurship

Each respondent was asked a series of questions about self-employment and business ownership. The fraction of the sample who was self-employed, including both entrepreneurs and other types of self-employed individuals, is 16%. The figure is twice as high for men (22%) as for women (11%), confirming a gender gap in self-employment.

While self-employment is an interesting phenomenon in and out of itself, the attention afforded to it by researchers and policy makers largely reflects the belief that it is a proxy for innovative entrepreneurship. When academics and business leaders were asked to define entrepreneurship, the most common choices were the creation and development of new ventures followed by innovation. In contrast "the creation of a mom-and-pop business" was not viewed as entrepreneurship (Gartner 1990). As an empirical matter, the overwhelming majority of self-employed individuals are not entrepreneurs in the Schumpeterian sense, as they do not bring a new innovation to the market or plan to grow their business. Rather, many of them are construction workers, shop owners, taxi and truck drivers, gardeners, plumbers, fast food vendors, hair-dressers, and on the more high skilled end lawyers, physicians, consultants and accountants who have chosen a particular legal employment form in which to perform their work.<sup>6</sup>

The Census Bureau's Survey of Business Owners provides several pieces of evidence that self-employment is not equal to entrepreneurship: Firstly, the median business owner who works full time has zero employees. Secondly, of small firms started in 2002, later 90% were four years later either out of business or had fewer than five employees. Hurst and Pugley (2010) provide a wide range of survey evidence suggesting that the vast majority of American self-employed neither innovate nor intend to innovate, nor grow or intend to grow. Though some small-scale

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<sup>5</sup>The twins have marginally higher average income and marriage rates, slightly lower birth weight, but no differences in educational attainment.

<sup>6</sup>In the U.S., the industries with the largest concentrations of self-employed men are construction, landscaping services, auto repair, restaurants, truck transportation, and crop production (farmers). For women, the industries are private households (cooks, maids, caretakers), child day care services, services to buildings (janitors and cleaners), restaurants and beauty salons.

ventures are indeed nascent entrepreneur who had not yet had time to grow, this tiny segment is in practice dominated in the data by the large numbers of non-entrepreneurial self-employed.

The distinction between entrepreneurship and other types of self-employment has implications for the psychological literature on entrepreneurship. Theories are designed for the psychology of Schumpeterian entrepreneurs, but commonly tested using self-employment as a proxy for entrepreneurship. The traits required to be an entrepreneur may be different than the traits required to be a self-employed plumber or dentist. For instance, as Knight (1921) argued innovative businesses need to deal with uncertainty associated with bringing truly novel products and technologies to the market. However, a self-employed plumber or dentist who sells a familiar product does not typically need to wrestle with uncertainty about the distribution of outcomes, for example regarding consumer demand or the technological feasibility of some projects. Using the self-employed to test Knight's theory about entrepreneurs might lead to misleading results. Our evidence in Section V is consistent with this expectation.

Though we cannot hope to perfectly separate the self-employed from entrepreneurs, we make an attempt to remove at least those who are obviously not entrepreneurs. For this purpose, we included in the SALT survey a question that explicitly distinguishes entrepreneurship from other types of self-employment:

*"Sometimes it is desirable to differentiate between being an entrepreneur and being self-employed. An entrepreneur commercializes a new innovation or idea. An entrepreneur has, or plans to have, a number of employees and strives to expand the business. A self-employed person owns and runs his/her own company, for instance a restaurant or a law firm, where he/she works. A self-employed person normally does not strive to expand over a certain limit and has 0 or a few employees. Would you say that you are primarily an entrepreneur or a self-employed person?"*

Using this question to identify entrepreneurs, we find that the gender difference for entrepreneurship is much stronger than for self-employment. As reported in Panel A of Table 2, there are close to five times as many male entrepreneurs (9%) than female ones (2%), which means that 40% of self-employed males self-identify as entrepreneurs compared to only 18% of self-employed women.

One objection to our measure of entrepreneurship is that it is self-reported. It may be that some individuals state in the survey that they want to expand their company, not because they are true entrepreneurs but rather because they are over-optimistic or like to boast. If men were

more prone than women to such misreporting, then this could be one explanation to the observed gender difference in entrepreneurship. In an unreported test, we find evidence that contradicts this explanation: the compensation premium to entrepreneurship (which is positive), is significantly higher for men than for women.<sup>7</sup> If men were more biased towards over-claiming an entrepreneurial status, one would expect them to have a lower compensation premium than women.

### 3.3 Personality Traits

We now describe how we measure the 14 personality traits that are the focal variables of our empirical analysis. For each trait, we code the relevant survey questions based on the individual's responses, and add up codings for the trait.<sup>8</sup> We then create a dummy variable that is 1 if the coding shows that the individual is above the sample median for the particular trait, and is 0 otherwise. Several traits, for example "Illusion-of-Control" and "Ambiguity-Aversion", are identified with only one survey question each—in such cases, we create a dummy variable that is 1 if the question shows that the individual has the trait, and is 0 otherwise. The aggregation of survey responses into dummy variables has the advantage of making it easier to interpret estimated coefficients. One disadvantage, however, is that the aggregation may remove relevant information from the data. This could amplify the measurement error when we study the importance of personality traits for explaining the gender differences in entrepreneurship. To mitigate this error, we also do a test using the disaggregate measure of each trait.

Panel B of Table 2 reports the mean of each trait and its cross-correlation with all other traits. We note that the cross-correlations are overall relatively small: only 8 out of 91 correlations are above an absolute value of 0.1. This indicates that the traits capture unique dimensions of the individual's psyche. The low cross-correlations also mean that we can include all of them as independent variables without running into multi-collinearity problems.

We capture four traits that measure the individual's attitude towards various types of risk and the timing of payoffs, respectively. We infer the trait "Risk-Aversion" from hypothetical choice questions about the individual's willingness to substitute safer future income against riskier, higher future income. Another trait is "Loss-Aversion", referring to the documented

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<sup>7</sup>Compensation data come from Swedish administrative records from 1996-2000 (i.e., a decade before the survey date), and includes wage labor, income from own business, pension income and unemployment compensation. The compensation premium to entrepreneurship - measured using twin-fixed effects - is SEK 54K for men and SEK 20K for women. The average earning in our sample is SEK 290K.

<sup>8</sup>The survey questions are not reported due to space considerations, but can be obtained from the authors upon request.

tendency to prefer avoiding losses to acquiring gains (Kahneman and Tversky 1992). We also infer "Ambiguity-Aversion" from a hypothetical choice question that builds on the classic Ellsberg (1961) paradox. Whereas "Risk-Aversion" refers to the preference for certain outcome over uncertain outcomes "Ambiguity-Aversion" refers to the preference for known risks over unknown risks. Studying the cross-correlation matrix, we find that "Risk-Aversion" and "Loss-Aversion" have a positive correlation of 0.14, but "Ambiguity-Aversion" is uncorrelated with these traits. Finally, we use another set of hypothetical choice questions to infer "Time-Preference", a trait capturing how strong the individual's preference is for receiving payoffs later versus earlier.

We identify five traits that capture, each in its own unique way, how much the individual resembles the profit-making decision-maker envisioned by economics. We measure the individual's cognitive ability with respect to numerical calculations, which we label "Numeracy".<sup>9</sup> <sup>10</sup> We also capture whether the individual suffers from "Illusion-of-Control", i.e. have the irrational belief that he/she can influence a lottery outcome that—by design—is outside his/her control. We measure "Fungibility-of-Money" by hypothetical choice questions based on Tversky and Kahneman (1981). The basic idea of these questions is to identify individuals who view money as having intrinsic value beyond their actual consumption value. As a related trait, we measure whether the individual values a thing based on its purchase price or on its current market value. We call this trait "Opportunity-cost-Awareness". Finally, we measure to what extent the individual is willing to accept outcomes that follow from market economic forces, but may be viewed as socially unjust. We call this trait "Greed-Tolerance".<sup>11</sup>

We identify three traits that, in a broad sense, capture the individual's view of himself and others. We ask the individual if he/she feels that one could trust others, a trait we label "Trust-in-Others". The trait "Locus-of-Control" measures to how strongly the individual believes that that one's own efforts matter for life outcomes rather than fate and luck. A survey with 14 questions is used to measure this trait. With the exception of risk preferences, "Locus-of-Control" is the personality trait that has most strongly been linked with entrepreneurship in the literature. We also identify the individual's attitude towards civic engagements, and label this trait "Civic-Mindedness". A high "Civic-Mindedness" means that the individual is willing to donate blood, organs (in the case of death), and contribute with time and money to non-profit civic activities.

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<sup>9</sup>In an unreported analysis, we find that for men, this trait has a significantly positive correlation with the score on the Swedish Military's standardized intelligence test.

<sup>10</sup>Cesarini et al, 2011, denotes this trait "the representativeness heuristic".

<sup>11</sup>The questions measuring this trait are based on Kahneman et al (1986).

It is important to note that "Civic-Mindedness" is measured based on the individual's actual actions, rather than his/her beliefs or stated preferences. For this reason, this trait may be more influenced by a treatment effect from being an entrepreneur.

Finally, we identify two traits that capture the individual's behavioral inhibition and happiness, respectively. We measure "Lack-of-Behavioral Inhibition", which shares some similarity with extroversion, through a series of question about how actively the individual interacts with other people. We measure "Happiness" by a straightforward question about how happy the individual would describe him/herself to be. As expected "Lack-of-Behavioral Inhibition" and "Happiness" are positively correlated (0.13), and they are both positively correlated with "Trust-in-Others" (0.15 and 0.14, respectively).

## 4 Results on Gender, Entrepreneurship and Psyche

We next study whether and how gender differences in psyche explain gender differences in entrepreneurship. We conduct this investigation in three steps. First, we analyze which personality traits differ between women and men. Second, we analyze which traits differ between entrepreneurs and other individuals. Third, we combine these two analyses, and make inferences about (i) what is the aggregate effect of all traits on the gender difference in entrepreneurship, and (ii) which traits contribute to this effect.

### 4.1 Gender and Psyche

To relate personality traits to gender, we run a probit regression where the dependent variable is "Female-Gender", i.e. is 1 if the individual is a woman, and is 0 if the individual is a man. We include fixed effects for the individual's age, and cluster residuals by twin pair (regressions without such clustering yield qualitatively similar results). We also include the 14 personality traits. Table 3 presents the results. A positive (negative) coefficient means that an entrepreneur is more (less) likely to possess a certain trait.

Consistent with the prior literature, we document that women are less risk avert and loss avert. However, we also find that the opposite is true for ambiguity aversion: *women are less ambiguity avert*. Even though all our aversion traits stem from the individual's attitude towards uncertainty, ambiguity aversion is conceptually and empirically distinct from risk aversion and loss aversion (with close to zero cross-correlation correlations). One interpretation of our findings is that women are worse at handling uncertainty related to work outcomes, but better at

handling uncertainty related to the work processes.

We also show that women are worse at numeracy, have more control illusion, but believe more in the fungibility of money. They also have less tolerance for greed, more trust in others, have weaker internal locus of control and a less favorable attitude towards civic engagements. Finally, women are more behaviorally inhibited than men. Overall, we find statistically significant differences for 11 of the 14 personality traits we study. Hence, there are extensive gender differences in psyche.

We confirm this conclusion in a series of unreported robustness tests. In a first set of tests, we run separate regressions for each personality trait. We find that all traits, except behavioral inhibition, that are significant in Specification 1 of Table 3 remain significant. In a second set of tests, we replicate in Specification 1 but add additional control variables. The control variables are "Years-Education" (Specification 1), "Annual Income" (Specification 2), "Married-Dummy" (Specification 3), and "Number of Children" (Specification 4). The addition of these control variables does not appear to substantially influence the magnitude of the coefficients for the personality traits. This indicates that the results are not explained by differences in education, income, or family characteristics.

One limitation of our tests is that they do not identify whether the gender difference in psyche is due to the individuals' genetics and pre-employment experiences, or the result of treatment effects from the individual's employment choice. One possibility is that women differ along the personality traits we study, simply because there are fewer female entrepreneurs. In an untabulated test, we find evidence contradicting this explanation. Concretely, we show that the gender differences in traits remains qualitatively similar even if we exclude either entrepreneurs or all self-employed individuals from the sample.

## 4.2 Entrepreneurship and Psyche

We next relate personality traits to the likelihood of being an entrepreneur. We run probit regressions where the dependent variable is 1 if the individual is an entrepreneur, and is 0 otherwise. We include fixed effects for the individual's age, and cluster residuals by twin pair (regressions without such clustering yield qualitatively similar results).

Results are presented in Table 4. Specification 1 includes as independent variable only the "Female-Gender" dummy, and Specifications 2-3 add the 14 personality traits. We first turn our attention to the coefficients on the traits reported in Specification 2. A positive (negative) co-



efficient means that an entrepreneur is more (less) likely to possess a certain trait. We find that entrepreneurs are less risk avert and less ambiguity avert. These traits are both related to uncertainty, however, ambiguity aversion is conceptually and empirically distinct from risk aversion. Our finding that these traits are different for entrepreneurs is consistent with entrepreneurial work tasks being uncertain in both their execution and outcome. Although the linkage between entrepreneurship and risk aversion is well-documented (Kihlstrom and Laffont 1979; Rees and Shah 1986; Stewart et al. 1999; Van Praag and Cramer 2001, Caliendo et al 2009), we are the first to use a large-scale dataset to show the linkage between entrepreneurship and ambiguity aversion.

We further show that entrepreneurs are more aware about opportunity cost and more tolerant of greed. These are intuitive results, because a person launching an innovative firm requires the ability to make cogent business decisions. Finally, we show that entrepreneurs have stronger internal locus of control and a more favorable attitude toward civic engagements, are less behaviorally inhibited and happier. Our results on locus of control corroborate the findings of existing studies (Brockhaus, 1980; Mueller and Thomas, 2001). Overall, these traits are consistent with the view that entrepreneurship requires an outgoing, "salesman" personality type.

We conduct a series of unreported robustness tests to validate our results. In a first set of tests, we run separate regressions for each personality trait. We find that all coefficients that are significant in Specification 2 of Table 4 remain significant. In a second set of robustness tests, we replicate Specification 2 of Table 4 but also include an additional control variable. The control variables are "Years-Education" (Specification 1), "Annual-Income" (Specification 2), "Married-Dummy" (Specification 3), and "Number-of-Children" (Specification 4). We find that neither control has any substantive effect on the magnitude of "Female-Dummy", or on the personality trait variables. From this we infer that the above discussed results are robust in the sense that they are not explained by differences in education, income, or family.

### 4.3 The Effect of Gender Differences in Psyche on Entrepreneurship

We next compute the aggregate effect of the gender differences in personality traits on the likelihood of being an entrepreneur. We compare the coefficient on the *FEMALE-GENDER* dummy in Specification 1, which excludes all traits, to the same coefficient in Specification 2 of Table 4, which includes all traits. We find that the inclusion of traits reduces the coefficient estimate from 6.9 percentage points to 5.5 percentage points, which reflects a 21% decline. To investigate how this result is affected by our aggregation of the personality traits, we re-run Specification 2 but

replace the trait dummies with fixed effects capturing each unique coding based on the survey questions. For example, we include 3 dummies for the "Happiness" trait, because the survey question had four possible answers, ranging from least to most happy). Similarly, we include 20 dummies for the "Trust-in-Others" trait, because there were two trust-related questions, and each had a possible answer from 1 (least trusting) to 10 (most trusting). Some traits, for example "Ambiguity-Aversion", are measured only with one question and two possible answers. In such cases the fixed effect for traits is the same as the dummy used in our other Specifications. Specification 3 shows result with only the coefficient on "Female-Gender" reported for brevity. We find that the coefficient on "Female-Gender" is 4.7 percentage points, which reflects a 32% decline from Specification 1 without any personality trait variables.<sup>12</sup> We conclude from all these tests that gender differences in psyche can explain a relatively modest fraction of the gender differences in entrepreneurship.

We conduct an unreported robustness test of the importance of gender differences in traits in explaining the gender gap in entrepreneurship. We here follow the technique of decomposing inter-group differences in mean levels of an outcome into those due to different observable characteristics across groups and those due to different effects of the impact of these characteristics between groups. The technique is commonly attributed to Oaxaca (1973) and Blinder (1973), and we use the particular refinement developed by Fairlie (2005) that allows for a binary dependent variable. We confirm with this technique that about a third of the gender gap in entrepreneurship can be explained by gender differences in traits.<sup>13</sup>

We next analyze which particular traits contribute to this effect of gender differences in psyche on entrepreneurship. We compare the results from Table 3 with Specification 2 of Table 4. We find that six personality traits—risk aversion, ambiguity aversion, greed tolerance, locus of control, civic mindedness, and behavioral inhibition—are significantly different for both women and for entrepreneurs. Hence, there are five gender differences in psyche that do not have any significant effect on gender differences in entrepreneurship, because these traits are not more (or less) prevalent for entrepreneurs. Also, there are two gender differences for entrepreneurs that do not have any significant effect on gender differences in entrepreneurship, because these traits are not more (or less) prevalent for women. This finding is one reason why we find a relatively modest

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<sup>12</sup>In an untabulated set of tests, we redo the above specifications but use OLS as the estimation technique instead of probit. We find qualitatively similar coefficients on the personality traits, and that the gender difference in traits explains between 16%-22% of the gender gap in entrepreneurship.

<sup>13</sup>The Fairlie (2005) technique allows for a decomposition analysis, demonstrating that risk aversion is the most important contributor, followed by greed tolerance, behavioral inhibition and trust in others.

aggregate effect of the gender differences in psyche on the likelihood of being an entrepreneur.

Another reason is that there are opposite effects for the personality traits that are significantly different for both women and entrepreneurs. On the one hand, women are less likely to be entrepreneurs because they are more risk avert, have weaker internal locus of control, have stronger sense of fairness, and are less positive towards civic engagements. On the other hand, women are more likely to be an entrepreneur because they are less ambiguity avert and less behaviorally inhibited.

The final reason is that each trait has a small marginal effect. Multiplying the coefficients from Table 3 with those in Specification 2 of Table 4, we find that the traits with the largest marginal effect—risk aversion, greed tolerance and civic mindedness—each contribute to less than 0.25 percentage points of the gender difference in entrepreneurship, which is small compared with the 6.9 percentage point gender difference found without controlling for personality traits. Importantly, the effect of entrepreneurial traits more common for women (i.e., ambiguity aversion and low behavioral inhibition) are much smaller than the effects of entrepreneurial traits more common for men.

#### **4.4 Gender Differences in Importance of Psyche for Entrepreneurship**

One possibility is that part of the gender gap in entrepreneurship could be due to gender differences in how much different traits matter for the likelihood of being an entrepreneur. For example, it may be that women are not only generally less risk avert than their male counterparts (as our findings show), but this difference could be particularly large for those women who are entrepreneurs. To test this possibility, we create 14 new variables that interact "Female-Gender" with each personality trait. We then replicate Specification 2 of Table 4 but also include these interactions as independent variables. If the hurdle was different for women, we would expect to find several significant coefficients on the interaction variables.

Table 5 present results on the interaction variables, with other independent variables unreported for brevity. We find a weakly-significant negative coefficient on the interaction with "Fungibility-of-Money". Combined with our finding in Table 3 that women believe in general more in the fungibility of money, this interaction result suggests that female entrepreneurs are less different than male entrepreneurs along this personality trait. We find a significantly positive coefficient on "Opportunity-cost-Awareness". Combined with our finding in Table 4 that entrepreneurs are more aware about the opportunity cost concept, this interaction result suggests

that this difference in psyche applies less to women than to men. Aside from these two results, we infer that the impact of a trait on entrepreneurship is about the same for men and women.

## 5 Results on Self-Employment and Psyche

### 5.1 Non-Entrepreneurial Self-Employment and Psyche

We conclude our empirical analysis by investigating whether non-entrepreneurial self-employed differ from other individuals in the same way entrepreneurs do. We replicate the analyses of Table 4, but exclude entrepreneurs from the sample and use a dependent variable that is 1 if the individual is a non-entrepreneurial self-employed, and is 0 otherwise. Results are presented in Table 6. In Specification 2, which includes the personality traits, we find that with one exception—risk aversion—the traits common among entrepreneurs are *not* common for non-entrepreneurial self-employed.

Moreover, we find that non-entrepreneurial self-employed differ from others along several traits for which there is no difference between entrepreneurs and others. Concretely, non-entrepreneurial self-employed have lower time discount rate, lower control illusion, higher fungibility of money, and less trust in others. These patterns suggest that the psychological determinants of entrepreneurship and other types of self-employment are markedly different from each other. In an untabulated test, we compare the personality traits between entrepreneurs and non-entrepreneurial self-employed, and show that 6 traits are qualitatively the same (and statistically significant) as in Specification of Table 4. These findings highlight that researchers who want to study entrepreneurship must distinguish this phenomenon from other types of self-employment. This separation is very important in practice, because a sample of self-employed individuals typically include more non-entrepreneurial self-employed (there are twice as many in our dataset). Most established datasets do not separately identify entrepreneurs, making it difficult to draw reliable conclusions on entrepreneurship.

### 5.2 The Effects of Gender Differences in Psyche on Non-Entrepreneurial Self-Employment

Table 6 also provide evidence on the extent by which personality traits can explain gender differences in non-entrepreneurial self-employment. Comparing the coefficient on the "Female-Gender" dummy across Specifications 1-3, we find that the inclusion of the 14 personality traits make the gender difference decline from 5.5 percentage points to 5.0 percentage points. Inter-

estingly, this decline of about 9% is considerably lower than the corresponding 32% decline we found for entrepreneurs. This difference suggests that gender difference in psyche are a much more important factor for entrepreneurship than for other types of self-employment, another manifestation that the two phenomena are distinct.

## 6 Conclusion

We study whether and how gender difference in entrepreneurship can be explained by gender differences in psyche. The scale and scope of our survey dataset, which includes Swedish middle-aged twins, information about 14 distinct personality traits. Some of these traits have been studied previously in the entrepreneurship literature, but we include several new ones (e.g., ambiguity aversion), and measure others (such as risk) more thoroughly using a set of experimentally validated questions.

In our empirical testing, we show that women have markedly different psyche than men (11 out of 14 traits are significant). Moreover, we show that entrepreneurs have different psyche than others (8 out of 14 traits are significant). Entrepreneurs are less risk avert, less ambiguity avert, more aware about the opportunity cost concept, more tolerant of greed, have stronger internal locus of control, and are more favorable towards civic engagements, and are less behaviorally inhibited and happier. We find that gender differences in psyche can, in aggregate, explain a modest fraction, about 21%-32%, of the gender gap in entrepreneurship. The effect is relatively modest because (i) some personality traits with gender differences do not determine entrepreneurship, (ii) some traits that determine entrepreneurship have no gender difference, and (iii) for the traits that determine entrepreneurship and have gender difference, there are opposite effects. We also show that personality traits can explain much less of the gender difference in non-entrepreneurial self-employment than it can for the gender difference in entrepreneurship.

Our conclusion is that while personality traits are highly correlated with entrepreneurship, gender differences along these cannot fully explain why there is a large gender gap in entrepreneurship. External factors, be it the education system, the labor market, traditional household division of labor, the role of the public sector, discrimination or social norms must be taken into account to explain why women are underrepresented as entrepreneurs.

Although our main aim is to shed new light on the gender differences in entrepreneurship, we also make contribution to the literature by documenting which personality traits are more prevalent for entrepreneurs, and by showing that most of these entrepreneurial traits are not

more common for non-entrepreneurial self-employed.

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**Table 1: Statistics on Self-Employment Rate In United States and European Countries**

*This table lists the fraction of employed individuals who are self-employed. Panel A includes all self-employed individuals, and Panel B includes only self-employed individuals who employ others (i.e., a better definition of entrepreneur). Men/Women is the ratio of the fraction of self-employed men over the fraction of self-employed women. The figures for the Switzerland and the United States refers to 2009. European data comes from own calculations based on the Eurostat database, including those above the age of 15 who are employed. Since Eurostat does not include data for the United States, we rely on the Bureau of Labor Statistics for a measure of American self-employment (Hipple 2010). The Bureau of Labor Statistics record if the firm employs others than the owner for the two thirds of American self-employed who are unincorporated, but not for incorporated firms. We therefore estimate the employer share of this group using data from the Census Survey of Business Owners from 2007.*

	<b>Panel A: Self-Employed</b>			
	<u>All</u>	<u>Women</u>	<u>Men</u>	<u>Men/Women</u>
Austria	11.6%	8.9%	14.0%	1.6
Belgium	13.4%	9.0%	17.0%	1.9
Bulgaria	11.7%	8.9%	14.3%	1.6
Croatia	19.8%	17.2%	22.1%	1.3
Cyprus	16.7%	10.2%	22.2%	2.2
Czech Republic	17.1%	11.1%	21.6%	1.9
Denmark	8.5%	4.8%	11.9%	2.5
Estonia	8.0%	5.1%	11.2%	2.2
Finland	12.8%	8.5%	16.9%	2.0
France	10.9%	6.7%	14.7%	2.2
Germany	11.0%	7.5%	14.0%	1.9
Greece	30.3%	22.1%	35.8%	1.6
Hungary	11.9%	8.4%	15.0%	1.8
Iceland	12.5%	8.3%	16.3%	2.0
Ireland	16.4%	6.9%	24.6%	3.6
Italy	23.6%	16.2%	28.6%	1.8
Latvia	10.1%	8.0%	12.3%	1.5
Lithuania	9.3%	7.2%	11.5%	1.6
Luxembourg	7.7%	6.1%	9.0%	1.5
Macedonia	18.5%	8.4%	24.8%	3.0
Malta	14.2%	6.1%	18.4%	3.0
Netherlands	14.4%	10.4%	17.8%	1.7
Norway	7.5%	4.1%	10.5%	2.5
Poland	18.9%	14.4%	22.7%	1.6
Portugal	21.8%	18.9%	24.3%	1.3
Romania	21.7%	13.6%	28.1%	2.1
Slovakia	15.8%	9.2%	21.2%	2.3
Slovenia	12.4%	7.8%	16.2%	2.1
Spain	16.0%	11.4%	19.6%	1.7
<b>Sweden</b>	<b>10.7%</b>	<b>6.2%</b>	<b>14.7%</b>	<b>2.4</b>
Switzerland	13.1%	10.2%	15.5%	1.5
Turkey	25.5%	14.1%	30.0%	2.1
United Kingdom	13.7%	8.7%	18.0%	2.1
United States	10.9%	7.9%	13.7%	1.7
AVERAGE	14.7%	9.8%	18.5%	2.0

Table 1 continued

Panel B: Self-Employed with Employees				
	<u>All</u>	<u>Women</u>	<u>Men</u>	<u>Men/Women</u>
Austria	4.8%	2.7%	6.6%	2.5
Belgium	4.5%	2.4%	6.2%	2.6
Bulgaria	3.8%	2.4%	5.0%	2.1
Croatia	4.7%	2.8%	6.4%	2.3
Cyprus	4.9%	1.4%	7.8%	5.7
Czech Republic	3.6%	1.8%	5.0%	2.8
Denmark	3.6%	1.6%	5.4%	3.5
Estonia	3.3%	1.3%	5.5%	4.2
Finland	4.2%	2.1%	6.1%	2.9
France	4.4%	2.1%	6.6%	3.1
Germany	4.8%	2.6%	6.8%	2.6
Greece	8.0%	4.1%	10.6%	2.6
Hungary	5.5%	3.5%	7.2%	2.1
Iceland	4.1%	2.3%	5.8%	2.5
Ireland	5.2%	2.4%	7.7%	3.2
Italy	6.7%	3.6%	8.7%	2.4
Latvia	3.9%	2.7%	5.3%	2.0
Lithuania	2.2%	1.1%	3.4%	3.0
Luxembourg	3.2%	1.8%	4.3%	2.4
Macedonia	5.4%	3.5%	6.6%	1.9
Malta	4.4%	1.3%	6.0%	4.8
Netherlands	3.9%	1.9%	5.5%	2.9
Norway	2.2%	1.1%	3.1%	2.8
Poland	4.2%	2.7%	5.4%	2.0
Portugal	5.2%	2.9%	7.1%	2.4
Romania	1.3%	0.7%	1.8%	2.5
Slovakia	3.6%	2.0%	4.8%	2.3
Slovenia	3.8%	2.1%	5.2%	2.5
Spain	5.6%	3.5%	7.2%	2.0
<b>Sweden</b>	<b>4.0%</b>	<b>1.8%</b>	<b>5.9%</b>	<b>3.3</b>
Switzerland	5.8%	3.2%	8.0%	2.5
Turkey	5.3%	1.3%	6.9%	5.4
United Kingdom	2.6%	1.5%	3.7%	2.5
United States	2.5%	1.2%	3.6%	3.0
AVERAGE	4.3%	2.2%	5.9%	2.9

**Table 2: Sample Overview**

Sample is 7,331 Swedish twins who responded to the SALT survey (we include only respondents who answered all of the relevant questions). Panel A describes the sample. Panel B reports the mean of the dummy variables that we create, based on the survey questions (see Appendix A), to capture different psychological traits. For each trait, we report the mean and its cross-correlation with other traits.

**Panel A: Description of Sample**

	<u>All Individuals</u>	<u>Women</u>	<u>Men</u>	<u>Men/Women</u>
Full sample	7,331	3,621	3,710	
<i>Fraction of All Individuals</i>		49%	51%	
Self-employed sample	1,198	382	816	
<i>Fraction of Full Sample</i>	16%	11%	22%	2.1
Entrepreneur sample	393	67	326	
<i>Fraction of Full Sample</i>	5%	2%	9%	4.7
<i>Fraction of Self-Employed Sample</i>	33%	18%	40%	

**Panel B: Summary Statistics of Innate Traits (all variables are dummies)**

	<u>Mean</u>	<u>Cross-Correlation Matrix</u>												
		<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>	<u>13</u>
1 RISK-AVERSION	0.62													
2 LOSS-AVERSION	0.82	0.14												
3 AMBIGUITY-AVERSION	0.63	-0.01	0.02											
4 TIME-PREFERENCE	0.93	-0.07	-0.01	0.00										
5 NUMERACY	0.45	-0.08	0.00	0.03	0.01									
6 ILLUSION-OF-CONTROL	0.78	-0.08	-0.02	0.08	0.05	0.03								
7 FUNGIBILITY-OF-MONEY	0.95	-0.04	-0.02	0.02	0.03	-0.01	0.02							
8 OPPORTUNITY-COST-AWARENESS	0.13	-0.06	-0.06	-0.01	0.03	0.01	0.00	-0.02						
9 GREED-TOLERANCE	0.36	-0.11	-0.09	0.03	0.00	0.03	0.04	0.05	0.01					
10 TRUST-IN-OTHERS	0.25	-0.03	0.00	0.04	0.05	0.01	0.02	0.04	-0.01	0.01				
11 LOCUS-OF-CONTROL	0.51	-0.08	0.00	0.07	0.05	0.02	0.04	0.05	0.01	0.08	0.11			
12 CIVIC-MINDEDNESS	0.48	-0.09	-0.03	0.05	0.05	0.07	0.05	0.04	0.00	0.07	0.04	0.08		
13 NON-BEHAVIORAL-INHIBITION	0.45	-0.13	-0.04	0.03	0.02	0.03	-0.01	0.06	0.01	0.07	0.15	0.15	0.12	
14 HAPPINESS	0.29	-0.01	0.00	-0.02	-0.01	0.00	-0.01	0.03	-0.01	0.04	0.14	0.08	0.03	0.13

**Table 3: Gender and Psychological Traits**

Data from SALTY Twin Surveys. Specification 1 is a probit regressions, where the dependent variable is 1 if the individual is a woman, and is 0 if the individual is a man. The pecification includes entrepreneur age fixed effects. Coefficients reflect marginal effects. Residuals are clustered by twin pair. Significance at 1% level marked with \*\*\*, at 5% with \*\*, and at 10% with \*.

	<u>1</u>
RISK-AVERSION	0.111*** [0.013]
LOSS-AVERSION	0.057*** [0.016]
AMBIGUITY-AVERSION	-0.085*** [0.013]
TIME-PREFERENCE	-0.027 [0.025]
NUMERACY	-0.061*** [0.012]
ILLUSION-OF-CONTROL	-0.058*** [0.015]
FUNGIBILITY-OF-MONEY	-0.123*** [0.029]
OPPORTUNITY-COST-AWARENESS	0.012 [0.018]
GREED-TOLERANCE	-0.119*** [0.013]
TRUST-IN-OTHERS	0.130*** [0.014]
LOCUS-OF-CONTROL	-0.069*** [0.012]
CIVIC-MINDEDNESS	-0.146*** [0.012]
NON-BEHAVIORAL-INHIBITION	0.059*** [0.013]
HAPPINESS	-0.008 [0.014]
Nr of Observations	7,331
R-squared	0.07
Sample	Full
Fixed Effects	Age
Clustering of Residuals	Twin

**Table 4: Entrepreneurship and Psychological Traits**

Data from SALT Twin Surveys. All specifications are probit regressions. The dependent variable is 1 if the individual is an entrepreneur, and is 0 otherwise. Specification 3 includes unreported fixed effect dummies formed based on the coding of each psychological trait. All specifications include entrepreneur age fixed effects. Coefficients reflect marginal effects. Residuals are clustered by twin pair. Significance at 1% level marked with \*\*\*, at 5% with \*\*, and at 10% with \*.

	<u>1</u>	<u>2</u>	<u>3</u>
FEMALE-GENDER	-0.069*** [0.005]	-0.055*** [0.005]	-0.047*** [0.005]
RISK-AVERSION		-0.023*** [0.005]	Included as fixed effect dummies formed based on the coding of each trait.
LOSS-AVERSION		-0.005 [0.005]	
AMBIGUITY-AVERSION		-0.012** [0.005]	
TIME-PREFERENCE		0.002 [0.008]	
NUMERACY		0.000 [0.004]	
ILLUSION-OF-CONTROL		0.003 [0.005]	
FUNGIBILITY-OF-MONEY		0.008 [0.010]	
OPPORTUNITY-COST-AWARENESS		0.016** [0.007]	
GREED-TOLERANCE		0.019*** [0.005]	
TRUST-IN-OTHERS		-0.007 [0.005]	
LOCUS-OF-CONTROL		0.011*** [0.004]	
CIVIC-MINDEDNESS		0.012*** [0.004]	
NON-BEHAVIORAL-INHIBITION		0.017*** [0.005]	
HAPPINESS		0.013** [0.005]	
Nr of Observations	7,331	7,331	7,331
R-squared	0.06	0.11	0.15
Sample	Full	Full	Full
Fixed Effects	Age	Age	Age
Clustering of Residuals	Twin	Twin	Twin



**Table 5: Entrepreneurship and Psychological Traits, Gender Differences**

Data from SALTY Twin Surveys. Specification 1 is a probit regression, and the dependent variable is 1 if the individual is an entrepreneur, and is 0 otherwise. The specification includes "FEMALE-GENDER" (unreported), all variables capturing traits (unreported), and interactions between FEMALE-GENDER and traits (reported). The specification also includes entrepreneur age fixed effects. Coefficients reflect marginal effects. Residuals are clustered by twin pair. Significance at 1% level marked with \*\*\*, at 5% with \*\*, and at 10% with \*.

	<u>1</u>
<u>Interactions with FEMALE-GENDER:</u>	
RISK-AVERSION	0.012 [0.010]
LOSS-AVERSION	0.002 [0.011]
AMBIGUITY-AVERSION	-0.006 [0.009]
TIME-PREFERENCE	0.034 [0.025]
NUMERACY	0.014 [0.011]
ILLUSION-OF-CONTROL	0.005 [0.012]
FUNGIBILITY-OF-MONEY	-0.043* [0.022]
OPPORTUNITY-COST-AWARENESS	-0.019** [0.008]
GREED-TOLERANCE	0.016 [0.011]
TRUST-IN-OTHERS	0.019 [0.013]
LOCUS-OF-CONTROL	-0.001 [0.009]
CIVIC-MINDEDNESS	0.017 [0.011]
NON-BEHAVIORAL-INHIBITION	-0.002 [0.009]
HAPPINESS	0.001 [0.010]
Nr of Observations	7,331
R-squared	0.12
Sample	Full
Fixed Effects	Age
Clustering of Residuals	Twin

**Table 6: Self-employment and Psychological Traits**

Data from SALTY Twin Surveys. All specifications are probit regressions. The sample excludes entrepreneurs, and the dependent variable is 1 if the individual is non-entrepreneur self-employed, and is 0 otherwise (i.e., employed). Specification 3 includes unreported fixed effect dummies created based on the coding of each psychological trait. All specifications include entrepreneur age fixed effects. Coefficients reflect marginal effects. Residuals are clustered by twin pair. Significance at 1% level marked with \*\*\*, at 5% with \*\*, and at 10% with \*.

	<u>1</u>	<u>2</u>	<u>3</u>	<u>Sp. 2, Tab. 4</u>
FEMALE-GENDER	-0.055*** [0.008]	-0.052*** [0.008]	-0.050*** [0.008]	-
RISK-AVERSION		-0.023*** [0.008]	Included as fixed effect dummies formed based on the coding of each trait.	-
LOSS-AVERSION		0.003 [0.010]		
AMBIGUITY-AVERSION		-0.007 [0.008]		-
TIME-PREFERENCE		-0.039** [0.017]		
NUMERACY		0.000 [0.008]		
ILLUSION-OF-CONTROL		-0.032*** [0.010]		
FUNGIBILITY-OF-MONEY		0.038** [0.015]		
OPPORTUNITY-COST-AWARENESS		0.015 [0.012]		+
GREED-TOLERANCE		0.005 [0.008]		+
TRUST-IN-OTHERS		-0.021** [0.009]		
LOCUS-OF-CONTROL		-0.003 [0.008]		+
CIVIC-MINDEDNESS		0.004 [0.008]		+
NON-BEHAVIORAL-INHIBITION		0.001 [0.008]		+
HAPPINESS		0.005 [0.009]		+
Nr of Observations	7,331	7,331	7,331	
R-squared	0.02	0.02	0.04	
Sample	Full	Full	Full	
Fixed Effects	Age	Age	Age	
Clustering of Residuals	Twin	Twin	Twin	