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"I think I can, I think I can":
Overconfidence and Entrepreneurial
Behavior

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Abstract

Many firms fail shortly after inception. Yet individuals continue starting businesses. Prewar economists such as Keynes invoked animal spirits and stressed psychological factors in their explanations of economic behavior. Using a large sample obtained from surveys conducted in 18 countries, we study what variables have a significant impact on an individual's decision to start a business. We find strong evidence that subjective, and often biased, perceptions have a crucial impact on new business creation across all countries in our sample. Our findings are consistent with the idea that individuals rely significantly on their perceptions rather than on objective probabilities, evaluate their businesses prospects by taking an overconfident "inside view" of their situation, and, as a result, overestimate their likelihood of success.

Keywords: Entrepreneurship, Self-Employment, Perceptions, Perceptual Variables, Overconfidence.

JEL Code: D01, J29, M13

1

*"Young men of an adventurous disposition are
more attracted by the prospects of a great success
than they are deterred by the fear of failure."*
Alfred Marshall (1920, p.554)

1   Introduction

Many new businesses fail shortly after inception (Baldwin, 1995; Dunne et al., 1998), and entrepreneurship is a career choice that does not pay on average. Hamilton (2000) has shown that, except for the highest 25% of entrepreneurial incomes, staying in a wage job or moving back to it makes more economic sense than starting a new business. Along similar lines, Moskovitz and Vissing-Jorgensen (2002) have investigated the risk-return profile of investments in private enterprises and found them to be inferior to those in alternative investment opportunities, e.g. stocks. In spite of these rather depressing prospects, individuals continue to start businesses. Since business venturing has a significant impact on the individuals involved and whole countries, it is important to understand how these decisions are made, what factors influence individuals who make these decisions, and what kinds of errors these individuals are likely to make.

Economics is currently undergoing a fundamental shift away from the neoclassical paradigm and is beginning to be centered on dynamics, recursive methods and complexity theory (Colander et al., 2004). Recent studies in experimental economics and in psychology emphasize that people do not have the ability to form rational expectations by thinking and weighing all things and options, but instead try to learn from the behavior and attitudes of others and from salient events or phenomena that capture their attention. Prewar economists such as Irving Fisher and John Maynard Keynes had already stressed psychological factors in their explanations of economic behavior (Loewenstein, 1992). Keynes, in particular, viewed probability as a fundamentally subjective concept that depends on the logical relations between possible events (Rosser, 2001). In his famous "beauty contest," for example, Keynes argued implicitly that, in the face of un-measurable uncertainty, individuals base their expectations on what they think others expect on average. He also wrote: "Our decisions to do something positive … can only be taken as a result of animal spirits, and not as the outcome of a weighted aver-

age of quantitative benefits multiplied by quantitative probabilities [Keynes (1964, p.161)]".

More recently, Simon et al. (1999) argued that bounded rationality arises from human cognitive limitations. A boundedly rational decision maker with limited experience can be expected to make errors, e.g., perhaps to rely too much on emotional cues or to exhibit systematic biases in the processing of probabilities (Kunreuther et al., 2002). Thaler (2000) argued that the degree of rationality attributed to individuals should depend on the context being studied and that explanations of phenomena with few opportunities for learning (such as starting a business) should be very different from explanations of phenomena with many learning chances. Also, special attention has been paid to self-confidence and the literature on the topic is growing and becoming more influential (for example, see Benabou and Tirole 2002, 2003; Dosi and Lovallo 1997; Hoelzl and Rustichini 2005).

Using a large sample obtained from surveys conducted in 18 countries, we use probit analyses to study what variables have a significant impact on an individual's decision to start a business. Data used in our analysis were collected for the 2001 population survey of the Global Entrepreneurship Monitor (GEM) project. GEM is an ongoing large scale academic project designed to study the causes and implications of entrepreneurial behavior across countries. The main purpose of the survey was to identify individuals who, at the time of the survey, were owning and managing a business or were in the process of starting one. Our data are original and exceptionally well suited for our purpose since they record individuals who are in the process of starting a business and are not the results of ex post evaluations of past decisions. In other words, our data does not suffer from "hindsight bias" (Thaler, 2000).

Our paper investigates what factors are important in an individual's decision to start a business and contribute to the economic theory of entrepreneurial motivation and to our understanding of human behavior in general. Our results provide significant evidence that perceptual variables have a crucial impact on new business creation across all countries in our sample. Indeed, our probit analyses suggest that the subjective perception of having sufficient skills, knowledge and ability to start a business, the subjective perception of good business opportunities, and the subjective perception of risk reduction generated by knowing other entrepreneurs, are the main drivers of the decision to start a business. Our findings are consistent with the idea that individuals evaluate their business prospects by taking a subjective view of their situation, overestimate their likelihood of success, and, as a result, rely signifi-

3

cantly on their perceptions rather than on objective chances of success.   In particular, confi-
dence in one's own skills emerges as the major driver in the decision to start a business. Since
overconfidence is known to occur with entrepreneurs (Cooper et al., 1988; Busenitz and
Barney, 1997; Camerer and Lovallo, 1999), our results suggest that it may often be overcon-
fidence rather than an accurate assessment of one's own abilities that leads individuals to start
a business. The connection between entrepreneurial decisions and overconfidence may also
explain, in part, the high failure rate of new business owners.[1]

2   Theoretical Background

In microeconomic models of entrepreneurial behavior, objective variables as well as subjec-
tive preferences and perceptions have been considered as variables influencing the decision to
found a new business. Among the objective variables, evidence suggests that entrepreneurs
are significantly hindered by liquidity constraints and that individuals with greater family
wealth are more likely to switch from employment to self-employment (Evans and Jovano-
vich, 1989; Kihlstrom and Laffont, 1979). Conditions in the labor market have been also
identified as an important determinant of employment status choice though the nature of the
relationship is still under debate (Bogenhold and Staber, 1991; Acs et al., 1999; Blanchflower
and Oswald, 1998).[2] Age and gender play some role on entrepreneurial decisions. For exam-
ple, the probability of starting a business has been shown to increase with age up to a thresh-
old point and to decrease thereafter and men have been shown to be more likely to start a
business than women (Blanchflower, 2004). Surprisingly, education has been shown to be
negatively related to the probability of being self-employed, except in some rich countries
where post graduate training has been found to have some positive effects (Blanchflower,
2004; Reynolds et al., 2003).

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[1] Overconfidence is defined differently in different disciplines. In the psychology literature, overconfidence is often
defined as an overestimation of one's own ability to make accurate forecasts. In economics, the term often de-
scribes the overestimation of one's own abilities in general. We are using the term overconfidence in the latter
way.

[2]   In general, it is not clear whether high unemployment discourages self-employment by reducing its potential
markets or increases it by providing an income producing activity for otherwise displaced workers. Most likely,
both effects co-exist and their relative dominance is contingent upon other macroeconomic circumstances.

Since starting a business is a risky decision, in addition to socio-demographic variables, an individual's tolerance toward risk has been assumed important for entrepreneurial decisions (Iyigun and Owen, 1998; Kihlstrom and Laffont, 1979). Although data support the existence of some negative effects of risk aversion on entrepreneurial choices, the causality of the relationship is still unclear (Cramer et al., 2002). Weber and Milliman (1997), for example, have shown that although perceived risk attitudes, that is risk attitudes applied to subjectively perceived risks, may be stable, they are applied to something unstable: Thus, subjective risk perceptions may be systematically distorted, e.g., by prior gain and loss experiences made by the individual. In addition, since most individuals are not only risk averse but also ambiguity averse (Ellsberg, 1961; Tversky and Kahneman, 1992) knowing other entrepreneurs may increase the propensity of an individual to start a business. Minniti (2005) emphasizes the reduction of ambiguity regarding the outcomes of an entrepreneurial occupation resulting from knowing other entrepreneurs. Reducing ambiguity changes the weighting of probabilities so that reducing ambiguity may lead individuals to accept more risk (Einhorn and Hogarth, 1985).

Finally, subjective preferences and perceptions have also been identified as important determinants of entrepreneurial behavior (Arenius and Minniti, 2005). Evidence from empirical studies suggests that subjective perceptions about one's environment and about the individual's relative position in that environment are very important since entrepreneurship is an embedded phenomenon (Jack and Anderson, 2002). Of course, these differences may be the result of country specific factors that influence employment choices at the local level or, more likely, of the way in which a set of interdependent factors interact with each other to form a complex web of incentives and information upon which, ultimately, individuals make their choices. The emphasis on perceptions is not new in economic theories of entrepreneurship. Kirzner (1973, 1979) argues that entrepreneurship is alertness. That is, the ability to perceive unexploited opportunities. Higher entrepreneurial propensity has been also linked to self-confidence and an illusion of control. Building on Rotter (1966), Harper (1998) discusses the interdependence between entrepreneurship and locus of control and argues that an individual's "locus of control" influences his degree of alertness, and that an individual with an internal locus of control tends to believe that events are contingent upon his own behavior or his

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5

own relatively permanent characteristics. In Harper's theory, an internal locus of control increases entrepreneurial alertness. This increased alertness, in turn, leads to more opportunity perception and, therefore, to more entrepreneurship.

A concept related to self-confidence is that of overconfidence. Overconfidence is a perceptual distortion in the sense that one's own abilities – normally associated with one's own success potential – are systematically overestimated. Bernardo and Welch (2001) provide an explanation for the presence and persistence of overconfidence in entrepreneurs. Their argument is built on the concept of informational cascades: Individuals observe each other and typically repeat the actions of their peer by following "social signals" and ignoring their private information. Overconfident entrepreneurs, on the other hand, are less likely to imitate their peers and more likely to explore their environment. That is, they are more likely to act on their private signal and ignore the herd. Their behavior, in turn, provides new valuable information to their social group. In other words, they act altruistically without meaning to. Interestingly, Bernardo and Welch also show that groups with some overconfident individuals have an evolutionary advantage over groups without such individuals.

In general, in a decision under uncertainty, perceptions may be considered as a mediator between preferences and behavior, and as affecting both probabilities and outcomes (Kahneman and Tversky, 1979; Tversky and Kahneman, 1991, 1992). For an individual to start a new entrepreneurial venture, the sum of perceived potential outcomes weighted by their respective perceived probabilities has to be larger than the perceived potential outcomes of a wage job, weighted by its perceived probabilities in case risk is also involved (for similar arguments see Simon et al., 1999; and Forlani and Mullins, 2000). As a result, an individual's perceptions with respect to starting a business may be systematically distorted, e.g. by overconfidence, and the smaller perceived downside risks and greater perceived chances of success may increase the entrepreneurial propensity of an individual.

3   Data and Method

Data used in our analysis were collected for the 2001 population survey of the Global Entre-

preneurship Monitor (GEM) project. GEM is an ongoing large scale academic project designed to study the causes and implications of entrepreneurial behavior across countries.[3] Initiated in 1999 with 10 countries, the project collects data annually and has grown to include more than 40 countries in 2005. GEM data used in this paper were collected in 2001 in 29 countries. A harmonized, representative population survey with at least 2,000 observations was conducted in each of the participating countries, yielding over 74,000 completed interviews collected between June and July 2001. The main purpose of the survey was to identify individuals who, at the time of the survey, were owning and managing a business or were in the process of starting one. If either or both of these criteria applied, respondents were asked follow-up questions that allowed the construction of a profile of the respondents and of their businesses. Among other things, respondents currently owning and managing a business were asked the age of their venture and whether or not the business had already paid wages. These criteria were then used to identify the number of people involved in entrepreneurial activity in each country, and to distinguish between nascent, new, and established entrepreneurs.[4]

The GEM data set contains variables on nascent entrepreneurs and on new business owners. Individuals were coded as nascent entrepreneurs (*suboanw*) if they claimed of having been engaged in start-up activities during the 12 months preceding the survey, being full or part owners of the new business, and not having paid wages for longer than 3 months. Individuals were coded as new entrepreneurs (*babybuso*) if they claimed to be managing and owning a business at the time of the survey, and of having paid wages for no longer than 42 months. In addition, we computed a third variable, *experi*, identifying experienced entrepreneurs. *Experi* includes individuals who, at the time of the survey, owned all or part of a business they helped manage and that had paid wages or profits to the owners for longer than 42 months. Although individuals in all three groups are entrepreneurs, they are distinct from each other because of the length of time they have been involved in their businesses. A detailed description of the survey and all variables used in the study is presented in the Appendix.

All three variables *suboanw*, *babybuso*, and *experi* are binary variables computed at the individual level (individual fits definition "Yes"=1 or "No"=0). In our analysis, all three are used as dependent variables to test which covariables play a significant role in an individual's deci-

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[3] More information about the GEM project may be found at www.gemconsortium.org

[4] Details about the procedures used to collect and harmonize GEM data can be found in Reynolds et al. (2005).

7

sion to start a business and to analyze how entrepreneurs differ from non-entrepreneurs. All respondents fits into one of the three above groups, i.e. there are no missing values for the dependent variables. The dataset contains basic socio-demographics for each respondent, including age and gender. For the majority of countries, data are also available about working status, education level, and household income in 33% brackets with respect to the relevant national income distribution. Each survey participant was also asked six questions related to perceptual variables often associated with entrepreneurial behavior.

Specifically, respondents were asked whether they believed to have the knowledge, skill and experience required to start a new business (*suskill*). This variable describes the subjective assessment of one's own skills, knowledge and ability with respect to starting a new business. Respondents were asked whether they thought that good opportunities for starting a business would exist in the area where they lived in the six months following the survey (*opport*). This variable describes a personal assessment of the existence of opportunities. Respondents were also asked whether fear of failure would prevent them from starting a business. Fear of failure (*fearfail*) may be viewed as a proxy for risk tolerance and measures the degree to which individuals believe that fear of failing will affect their behavior with respect to starting a business. Finally, respondents were asked whether they expected the business conditions in their country to be better off, worse off, or about the same, one year after the survey (*ctrfutur*), and whether they thought that, one year after the survey, their family would be financially better off, worse off, or about the same (*famfutur*). These variables capture the interdependence between entrepreneurial decisions and the individual's environment. Unfortunately, the possible direction of their impact on the propensity to start a business is unclear and based on subjective perceptions. If, for example, the country future is expected to be unsatisfactory, the individual may not make a risky investment and hence restrain from founding a business. On the other hand, bad conditions in a country may imply a lack of employment opportunities and hence lead to a higher rate of business creation.

Finally, respondents were asked whether they knew personally someone who had started a business in the two years preceding the survey (*knowent*). This variable provides some sense of how direct exposure to entrepreneurs provides information about the entrepreneurial process. Unfortunately, we do not have sufficient information to identify what this variable captures exactly. Since the question referring to this variable only asks respondents whether they

knew other entrepreneurs in the 24 month preceding the survey, it is most likely that *knowent* reflects the fact that knowing other entrepreneurs might influence the perception of entrepreneurial opportunities by providing social clues in the uncertain environment characterizing the creation of a new firm. Connection to other entrepreneurs might also have an influence on an entrepreneur's self perception of having sufficient skills for entrepreneurial success.

The 11 countries that had data gaps in any of these variables were excluded from our analysis, reducing the working sample to 18 countries for a total of more than 40,000 observations. Countries included in our study are Argentina, Canada, Denmark, Finland, Germany, Hungary, India, Israel, Italy, Japan, New Zealand, Poland, Portugal, Russia, Singapore, South Korea, Sweden, and USA. Overall, GEM data are exceptionally well suited for our purpose. To our knowledge, the dataset is the only major cross-country study of entrepreneurial behavior that uses a consistent methodology in each country. As a result, it is more likely to produce consistent and comparable data. Moreover, since our main goal is to test for the role of perceptions, the use of survey data seem particularly appropriate. Finally, the data are unique because they include perceptions of individuals who were in the process of starting a new business at the time of the interview. This allows us to relate individual perceptual phenomena to the actual activity of starting a business. Earlier studies dealing with the influence of perceptions on entrepreneurial activity are based on experimental data (Busenitz and Barney, 1997; Cooper et al., 1988), or had to rely on noticeably smaller samples constructed from ex post evaluations by successful entrepreneurs and are, as a result, likely to suffer from both sample and hindsight biases. A detailed description of all independent variables is presented in the Appendix together with descriptive statistics for the 18 countries in our sample and the co-variables used for the regressions.

To identify the effects associated with entrepreneurial activity we run probit regressions and calculate a robust covariance matrix of the parameter estimates using the sandwich estimation procedure (White, 1982). The sandwich estimation procedure has the desirable properties of yielding asymptotically consistent covariance standard error estimates that are independent from distributional assumptions. The large sample size in our study makes robust covariance estimates particularly attractive (Kauermann and Carroll, 2001).[5] In addition, preparatory

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[5] Robust variance estimates and significance tests turned out to be nearly equivalent to the parametric estimates in test regressions.

tests revealed only weak correlation of the explanatory variables and no indication for a potential multicollinearity problem in the data.

All independent variables in the regression are dummies. The estimated model is a transformed probit model, where the reported coefficients are calculated with a discrete calculation associated with the dummy changing from 0 to 1. Each probit model is calculated as $E(y \mid \overline{X_j}) = P(y \neq 0 \mid \overline{X_j}) = \Phi(\overline{X_j b})$, where Φ is the cumulative standard normal distribution. The transformed probit models report coefficients $b_i^* = \Phi(\overline{X_1 b}) - \Phi(\overline{X_0 b})$ where $\overline{X_0} = \overline{X_1} = \overline{X}$ except that the ith element of $\overline{X_1}$ and $\overline{X_0}$ are set to 1 and 0, respectively. The coefficients have an intuitive interpretation. They indicate the percentage change in the observed outcome if the explanatory variable changes from 0 to 1. For example, a coefficient value of 0.05 means that – ceteris paribus – a population where all individuals report x=1 would have 5% more entrepreneurs than a population in which all individuals report x=0. In all regressions, we contrast the relevant dependent variable (*suboanw*, *babybuso* or *experi*) against the control group of non-entrepreneurs.

4   Results

We estimated two different models for each of the three dependent variables *suboanw*, *babybuso* and *experi*. For each individual, the first model includes as explanatory variables only country of residence, age, income percentile, education, and current work status. The second model adds all available variables that relate to an individual perception of chances and personal ability (perceptual variables). All regression results suggest that perceptual variables have a crucial impact on the creation of businesses and model diagnostics indicate that the fit of the regressions increase substantially when perceptual variables are added. Regression results are reported in Table 1.[6]

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[6] The difference in the number of cases between the descriptive statistics and the probit model originates from missing values in the database that occurred if respondents did not answer all survey questions. The probit model rejects all observations where at least one of the variables is missing. Note that the database contains only observations for which the dependent variables' index could be successfully computed. Thus, all missing observations result from missing information in the explanatory variables in the regressions.

The first two models (Models 1a and 1b) refer to nascent entrepreneurs as the dependent variable (*suboanw*). The strongest cross-national influence on the individual propensity to start a business is shown to be whether that person believes to have the sufficient skills, knowledge and ability to start a new business (*suskill*). According to the second probit model on *suboanw* (Model 1b), the individual probability to start a business increases by 5.62% on average, if the individual believes to have the sufficient skills. This is a very strong contribution for a single co-variable, considering that only 6.03% of the observations in Model 1b are actually nascent entrepreneurs (*suboanw* = 1).

In addition to the strong influence of the *suskill* variable, other perceptual variables also have a major impact on the decision to start a business. The perception of good business opportunities (*opport*) and optimism about the financial situation of the family in the near future (*famfutur*) all have a strong positive impact on *suboanw*. Fear of failure (*fearfail*) reduces the propensity to start a new business. Finally, knowing other entrepreneurs (*knowent*) is also important. Socio-demographic factors, such as household income and education, have a comparably small influence on entrepreneurial activity. Also, the relevance of these socio-demographic factors is clearly biased upward in the first model that does not explicitly control for perceptual variables. This suggests that instead of having a direct impact, socio-demographic variables like high educational attainment and high income are rather mediators of individual perceptions.

In Table 1, Models 2a and 2b report regression results for new business owners (*babybuso*) without and with perceptual variables respectively. Models 3a and 3b, instead, report regression results for more experienced entrepreneurs (*experi*) without and with perceptual variables respectively. Together, these models describe differences between new business owners, more experienced entrepreneurs and non-entrepreneurs. Again, we find that entrepreneurs and non-entrepreneurs differ significantly in their perceptions. Both new business owners and experienced entrepreneurs are more likely to perceive themselves as skilled (*suskill*), to know other individuals who have recently started a business (*knowent*), and to perceive good business opportunities (*opport*) than non-entrepreneurs. Also, entrepreneurs are less prone to state that fear of failure would stop them from starting a business (*fearfail*). In general, these results are consistent with the ones we obtained for nascent entrepreneurs (*suboanw*). In contrast to nascent entrepreneurs, however, both new business owners and experienced entrepreneurs are

11

more likely to have a high income. This suggests that high income is more likely to be a consequence than a prerequisite of successful entrepreneurial activity. As in the case of nascent entrepreneurs, *suskill* turns out to be the single most important factor that distinguishes entrepreneurs from non-entrepreneurs in all models.

In general, our results also support existing empirical evidence reporting strong country effects. This suggests that new business creation is significantly influenced by geographic and historical circumstances (Acs et al., 1999; Blanchflower, 2004). Interestingly, the coefficient signs change for some country dummies when perceptual variables are added to the regression model. This is consistent with the argument that individuals' perceptions are influenced by historical and cultural factors and, as a result, individuals differ significantly in their self-perceived skills and abilities in different countries as shown in Table 2. For each dependent variable, the country dummy variables in the second model (Models 1b, 2b, and 3b respectively) show country-specific effects after controlling for observable differences of individual perceptions. Thus, the country effects in the second model approximate the influence of institutional and economic framework conditions in entrepreneurial activity in the respective countries better than the first models because some cross-country variance due to different individual perceptions is explicitly considered. For example, Model 1a reports that Germany is significantly less entrepreneurial than the US. However, on average, Germans differ substantially in their individual perceptions from Americans, i.e. they are less confident in their skills and less optimistic about good business opportunities. After controlling for these perceptual factors explicitly, in fact, Model 1b indicates that the framework conditions for entrepreneurial activity in Germany are at least not worse than in the US.

Noticeably, the perception of having sufficient skills, knowledge and ability to start a business originates from the subjective perception of the individual and need not necessarily correspond to his actual skill level. In fact, Table 2 shows a surprisingly strong variance in the *suskill* variable among different countries. For example, about 55% of individuals in Hungary and Argentina believe to have the sufficient skills to start a new business, compared to only 11% in Japan or 24% in Sweden. It is hard to believe that these numbers reflect actual differences in objective entrepreneurial abilities among countries. Also, it is not convincing to argue that the required entrepreneurial skills are so dramatically different among countries. Thus, it is difficult to believe that the numbers in Table 2 reflect objective self-assessments.

12

Interestingly, countries that exhibit a high percentage of individuals with confidence in their own entrepreneurial skills also turn out to exhibit the highest percentage of entrepreneurs. Indeed, we find evidence in the data suggesting that individual perceptions might be systematically distorted and that some entrepreneurs might be driven by overconfidence.

Analyzing the relationship of sufficient skill perception and educational attainment levels yields additional evidence for our argument that relevant perceptions might be systematically distorted. Education is often used as a proxy measuring potential skills. To the extent that education is indeed a good proxy, individuals with high levels of educational attainment should be more confident in their entrepreneurial abilities. However, if the perception of the own skills to start a business is only loosely related to a potentially important aspect of these skills, namely education levels, something else must be driving this perception. Table 3 shows that, in general, skill perception and educational attainment are only weakly correlated (coefficients <0.1). In addition, Table 4 shows group-means of the *suskill* variable by educational attainment among countries. The results suggest that individuals with high education are not necessarily more confident in their entrepreneurial skills. For example, in Finland we find no effect of educational attainment on skill perception at all, i.e. there are no significant differences in skill perception between individuals with different educational backgrounds. Also, in Argentina, only 33% of individuals with graduate exposure believed to have the sufficient skills and knowledge to start a business, compared to 63.9% of individuals with only a secondary degree.

Furthermore, if individual perceptions were unbiased, confidence in ones own skills and abilities to start a business should increase as an individual gains relevant experience as an entrepreneur and successfully survives in the market for some time. Such learning-by-doing effects imply that experienced entrepreneurs should be more confident in their own skills than individuals who are just starting a business. To compare individual perceptions among nascent entrepreneurs (*suboanw*) and experienced entrepreneurs (*experi*), we use a Chi-Squared-Test to evaluate the null hypothesis that perceptions in both groups are equal. The results are reported in Table 5 and show that nascent entrepreneurs are significantly more confident in their skills, knowledge, and experience to start a business than experienced entrepreneurs. This finding, however, is not surprising if the perceptual bias experienced by nascent entrepreneurs reflects overconfidence. Also, nascent entrepreneurs are more optimistic about business op-

13

portunities and are more likely to know other entrepreneurs than their more experienced counterparts. This is a significant result since it is normally assumed that overconfidence is more likely to exist around activities with which individuals are already familiar (Griffin and Tversky, 1992).

Most important, we observe that the *suskill* variable has its strongest effect in the regression on nascent entrepreneurs (*suboanw*), which underlines our argument that overconfidence could be an important factor explaining entrepreneurial activity in general and the relatively low performance of entrepreneurs in particular (Baldwin, 1995; Dunne et al., 1998; Hamilton, 2000). For nascent entrepreneurs (*suboanw*), *suskill*="yes" increases the average individual probability to start a new business by 5.62%, according to Table 1. The average probability in the sample is 6.03%. Thus, individuals believing to have sufficient skills are (5.62/6.03) + 1 = 1.93 times more likely to be nascent entrepreneurs than non-entrepreneurs, everything else being the same. Similarly, *suskill*="yes" increases the chance to be in the group of new business owners (*babybuso*) by 1.82 times, compared to being in the group of non-entrepreneur. For experienced entrepreneurs, the ratio is 1.75. Thus, although sufficient skill perception is the single most important variable in all regression models, the "marginal" contribution of *suskill* is strongest for the group of nascent entrepreneurs, and declines as groups of more experienced entrepreneurs are considered.

Finally, Table 6 compares perceptual group means between all entrepreneurs and non-entrepreneurs. The difference in sufficient skill perception between entrepreneurs and non-entrepreneurs is striking: While 81% of all entrepreneurs believe to have the sufficient knowledge, skills and experience to start a business, only 32% of non-entrepreneurs do. Also, entrepreneurs are more likely to perceive good business opportunities (*opport*), to know another entrepreneur (*knowent*), and are less likely to exhibit fear of failure (*fearfail*). This is consistent with the regression results from Table 1, emphasizing that subjective perceptual variables have a crucial impact on market entry decisions, even though these perceptions might not be correct.

14

5   Discussion and implications

Overall, our findings suggest that the perception of having sufficient skills, knowledge, and experience has a major positive impact on the decision to start a business. Our results also show that perceiving the existence of business opportunities and knowing other entrepreneurs increase the likelihood of starting a new business, while fear of failure reduces the chance of doing so. We argue that this is the case because these variables influence the perceived chances of positive outcomes and risks associated with starting one's own business. Our results also suggest the existence of a perception bias. Indeed, there is some evidence that distortions in perceptions are common among individuals in general, and among entrepreneurs in particular (Busenitz and Barney, 1997; Cooper et al., 1988; Hoffrage, 2004). The importance of perceptual variables, and their associated bias, in the decision to start a new business may explain some of the observable inconsistencies between returns to entrepreneurship and entrepreneurial decisions found in the literature (Hamilton, 2000).

Our results are consistent with the hypothesis that smaller perceived downside risks and greater perceived chances increase the propensity of an individual to start a new business. In particular, our results show that individuals who perceive their skills as sufficient to starting a new business are more likely to do so in spite of the fact that such perceptions may be incorrect and systematically distorted, for example by overconfidence. In a controlled experiment with student subjects, Camerer and Lovallo (1999) have shown the presence of overconfidence and a resulting excess entry into markets. Specifically, using experimental market entry games in which payoffs depended on entrants' skills, they were able to show that when payoffs are based on own abilities, individuals tend to overestimate their chances of success more than when payoffs do not depend on skills.

The rationale behind such a behavior is that entrepreneurs have a strong tendency to consider their situation as unique. After all, by definition, entrepreneurs are individuals who deviate from the norm. Once they identify a profit opportunity, they isolate their present situation, namely starting a new business, and treat it as an original and unrepeatable event. As a result, they neglect the available statistics of past and future similar situations that could help them to form more accurate forecasts of their likelihood of success. Kahneman and Lovallo (1993)

15

define a situation in which forecasting individuals focus on the case at hand as the "inside view." In the inside view, the way to think about a problem is to consider all that one knows about it, with special attention to its unique features. In an alternative, Kahneman and Lovallo define the "outside view," as the one in which forecasting individuals focus on the statistics of a class of cases chosen to be similar, in relevant ways, to the current situation. Individuals in general, and entrepreneurs in particular, tend to base their choices on the predictions generated by the inside view. This suggests not only that entrepreneurs base their decisions largely on perceptions, but also that such perceptions may be overoptimistic and not related to actual measures of risk or abilities.

Interestingly, Camerer and Lovallo (1999) have also shown that overconfidence increases when individuals self-select into alternative experimental sessions and that participants neglect to adjust their expectations for the fact that the other group members have self-selected too. "Reference group neglect" is likely to be particularly high among potential entrepreneurs since, by definition, entrepreneurs are alert individuals who deviate from the norm in order to exploit opportunities. As a result, they do not think of themselves as part of a group and are likely to adopt an "inside view" when making entrepreneurial decisions (Kahneman and Lovallo, 1993). Along similar lines, Busenitz and Barney (1997) have shown overconfidence in entrepreneurs to be higher than overconfidence in managers. Finally, Cooper et al. (1988) have found also strong evidence of overconfidence. Their results suggest that 81% of entrepreneurs believe their chances of success to be at least 70%, and that a third of those believe they will be successful with certainty. Respondents also estimated their chances of survival to be higher than those of competing companies. Unfortunately, however, at the time of Cooper et al.'s study, 66% of all newly founded businesses were failing. The overconfidence hypothesis is also consistent with psychological studies showing that most individuals are overconfident about their own relative abilities, and that, when assessing their position in a distribution of peers, the vast majority of them rate themselves as being above average on almost any positive attribute (Weinstein, 1980).

The existence of overconfidence in entrepreneurial decisions leads to asking what function it may serve. Hvide (2002) shed light on why overconfidence emerges by proposing the existence of pragmatic beliefs. Hoffrage (2004) argues that there can be situations in which the benefits of being overconfident clearly outweigh the costs. For example, a physician may be

16

overconfident that a particular treatment will help her patient, but showing high confidence that it will help may be essential for a placebo effect to occur. This thought can also be related to entrepreneurial activity: Some people might start a business with the erroneous belief that they have the sufficient skills and experience. But just starting may help them to acquire the skills and the experience that they actually need.

Finally, the presence of some overconfident individuals can benefit society as a whole. These individuals explore business opportunities and provide valuable information to their social group that would not be otherwise available. Thus, societies with some overconfident individuals can have evolutionary advantages (Bernardo and Welch, 2001). Ultimately, evolutionary effects and the institutional framework determine the quantity and quality of entrepreneurial behavior as they define individuals' incentives to transform perceived opportunities into actions. Harper (1998) argues explicitly that the nature of political and economic institutions influences individuals' perceptions. Those institutions and policies that improve transparency and entitlement tend to increase the subjective perception of the link between actions and outcome. They increase, therefore, the number of individuals who perceive themselves as having an internal locus of control. Along similar lines, Baumol (1990) argues that institutional arrangements affect the quantity and type of entrepreneurial efforts. Optimistic biases have been often linked to an illusion of control (Taylor and Brown, 1988). Thus, an institutional setting leading to stronger perceptions of control over one's domain should yield more entrepreneurial activity.

Finally, our results have also implications at the aggregate level depending on the relative cost and benefit of excess entry. Specifically, if the benefits for economic growth of having many individuals trying new combinations (Schumpeter, 1934) outweigh the costs to society of a large number of failures, the objective of policy makers, for example, would be to encourage more and more entrepreneurship. However, if the costs outweigh the benefits, policy makers may rather be interested in how to discourage the "wrong" individuals. In this case, policy makers' incentives would be aligned with the individuals' incentives to maximize the expected outcome of entrepreneurial activity, given the potential cost of failure.

17

6 Conclusion

Starting a business is an intentional act that involves repeated attempts to exercise control over the process in order to achieve the desired outcome. If, indeed, entrepreneurial decisions are largely based on perceptions, and the cognitive mechanism we have discussed leads to overconfidence, it is likely that entrepreneurs overestimate their control over events. Individual perceptions may differ from actual abilities and risk level. In the long run, however, overconfidence may lead to better outcomes than more unbiased decision making. Although the entrepreneurial environment may be crowded with individuals acting on overconfident self-perceptions, this is not to say that potential entrepreneurs behave irrationally. They are simply overconfident, and the "inside view" which leads them, often, to overestimate their skills, makes them think "they can".

7   References

Acs, Z. J., Carlsson, B., Karlsson, C., 1999. The Linkages among Entrepreneurship, SMEs and the Macroeconomy. In: Z. J. Acs, B. Carlsson and C. Karlsson (Eds), Entrepreneurship, Small and Medium-Sized Enterprises and the Macroeconomy (Cambridge, UK: Cambridge University Press).

Arenius, P., Minniti, M., 2005. Perceptual variables and nascent entrepreneurship. Small Business Economics, in press.

Baldwin, J.R., 1995. The Dynamics of Industrial Competition (Cambridge: Cambridge University Press).

Benabou, R., Tirole, J., 2003. Intrinsic and extrinsic motivation. Review of Economic Studies 70, 489-520.

Benabou, R., Tirole, J., 2002. Self-confidence and personal motivation. Quarterly Journal of Economics 117, 871-915.

Bernardo, A.E., Welch, I., 2001. On the evolution of overconfidence and entrepreneurs. Journal of Economics and Management Strategy 10, 301–330.

Blanchflower, D.G., 2004. Self-employment: More may not be better. NBER Working Paper No. 10286.

Blanchflower, D.G., Oswald, A.J., 1998. What makes an entrepreneur? Journal of Labor Economics 16, 26-60.

Baumol, W. J., 1990. Entrepreneurship: Productive, unproductive, and destructive. Journal of Political Economy 98, 893–921.

Bogenhold, D., Staber, U., 1991. The decline and rise of self-employment. Employment and Society 5, 223-239.

Busenitz, L.W., Barney, J.B., 1997. Differences between entrepreneurs and managers in large organizations: Biases and heuristics in strategic decision-making. Journal of Business Venturing 12, 9-30.

Camerer, C.F., Lovallo, D., 1999. Overconfidence and excess entry: An experimental approach. American Economic Review 89, 306-318.

Colander, D., Holt, R.P., Rosser, J.B., 2004. The changing face of mainstream economics. Review of Political Economy 16, 485-499.

Cooper, A.C., Woo, C.Y., Dunkelberg, W.C., 1988. Entrepreneurs' perceived chances for success. Journal of Business Venturing 3, 97-108.

Cramer, J.S., Hartog, J., Jonker, N., Van Praag, C.M., 2002. Low risk aversion encourages the choice for entrepreneurship: An empirical test of a truism. Journal of Economic Behavior and Organization 48, 29-36.

Dosi, G., Lovallo, D., 1997. Rational entrepreneurs or optimistic martyrs? Some considerations on technological regimes, corporate entries and the evolutionary role of decision biases. In: Garud, R., Nayyar, P., Shapira, Z. (Eds.), Technological Innovation: Oversights and Foresights. Cambridge U. Press, Cambridge, pp. 41–68.

Dunne, T., Roberts, M.J., Samuelson, L., 1988. Patterns of firm entry and exit in U.S. manufacturing industries. Rand Journal of Economics 19, 495-515.

Einhorn, H.J., Hogarth, R.M., 1985. Ambiguity and uncertainty in probabilistic inference. Psychological Review 92, 433-461.

Ellsberg, D., 1961. Risk, ambiguity, and the Savage axioms. Quarterly Journal of Economics 75, 643-669.

Evans, D., Jovanovic, B., 1989. An estimated model of entrepreneurial choice under liquidity constraints. Journal of Political Economy 97, 808–827.

Forlani, D., Mullins, J.M., 2000. Perceived risks and choices in entrepreneurs' new venture decisions. Journal of Business Venturing 15, 305-322.

Griffin, D., Tverky, A., 1992. The weighing of evidence and the determinants of overconfidence. Cognitive Pasychology 24, 411-435.

Hamilton, B.H., 2000. Does entrepreneurship pay? An empirical analysis of the returns to self-employment. Journal of Political Economy 108, 604-631.

Harper, D., 1998. Institutional conditions for entrepreneurship. Advances in Austrian Economics 5, 241–275.

Hoelzl, E., Rustichini, A. 2005. Overconfident: Do You Put Your Money on It? The Economic Journal 115, 305-324.

Hoffrage, U., 2004. Overconfidence, In: R.F. Pohl (Ed.), Cognitive Illusions: Fallacies and Biases in Thinking, Judgement, and Memory. Hove, UK: Psychology Press, pp. 235-254.

Hvide, H.K., 2002. Pragmatic beliefs and overconfidence. Journal of Economic Behavior and Organization 48, 15-28.

Iyigun, M., Owen, A., 1998. Risk, entrepreneurship and human capital accumulation. American Economic Review 88, 454-457.

Jack, S. L., Anderson, A.R., 2002. The Effects of Embeddedness on the Entrepreneurial Process. Journal of Business Venturing 17, 467–487.

Kahneman, D., Lovallo, D., 1993. Timid choices and bold forecasts: A cognitive perspective on risk taking. Management Science 39, 17-31.

Kahneman, D., Tversky, A., 1979. Prospect theory: An analysis of decision under risk. Econometrica 47, 263-291.

Kauermann, G., Carroll, R.J., 2001. The sandwich variance estimator: Efficiency properties and coverage probabilities of confidence intervals. Journal of the American Statistical Association 97, 482-493.

Keynes, J.M., 1964. The General Theory of Employment, Interest, and Money. (New York and London: Harvest HBJ Books).

Kihlstrom, R., Laffont, J., 1979. A general equilibrium entrepreneurial theory of firm formation based on risk aversion. Journal of Political Economy 87, 719–740.

Kirzner, I. M., 1973. Competition and Entrepreneurship (Chicago, IL: University of Chicago Press).

Kirzner, I. M., 1979. Perception, Opportunity, and Profit (Chicago, IL: University of Chicago Press).

Kunreuther, H., Meyer, R., Zeckhauser, R. Slovic, P., Schwartz, B., Schade, C., Luce, M.F., Lippman, S., Krantz, D., Kahn, B., Hogarth, R., 2002. High stakes decision making: Normative, descriptive and prescriptive considerations. Marketing Letters 13, 259-268.

20

Loewenstein, G., 1992. The fall and rise of psychological explanations in the economics of intertemporal choice, In: Loewenstein, G., J. Elster (Eds), Choice Over Time, New York: Russell Sage Foundation, pp. 3-34.

Marshall, A., 1920. Principles of Economics - 8th Edition (London, UK: Macmillan & Co. Ldt.)

Minniti, M., 2005. Entrepreneurship and network externalities. Journal of Economic Behavior and Organization 57, 1-27.

Moskovitz, T. J., Vissing-Jørgensen, A., 2002. The returns to entrepreneurial investment: A private equity premium puzzle? American Economic Review 92, 745-778.

Reynolds, P., Autio, E., Hay, M., 2003. Global Entrepreneurship Monitor Report (Kansas City, MO: E. M. Kauffmann Foundation).

Reynolds, P.D., Bosma, N.S., Autio, E., 2005. Global Entrepreneurship Monitor: Data collection design and implementation 1998-2003. Small Business Economics, in press.

Rosser, B.J., 2001. Alternative Keynesian and post Keynesian perspectives on uncertainty and expectations. Journal of Post Keynesian Economics 23, 545-566.

Rotter, J.B., 1966. Generalized expectancies for internal versus external control of reinforcement. Psychological Monographs 80, No. 609.

Schumpeter, J.A., 1934. The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle (Cambridge, MA: Harvard University Press).

Simon, M., Houghton, S.M., Aquino, K., 1999. Cognitive biases, risk perception, and venture formation: How individuals decide to start companies. Journal of Business Venturing 15, 113-134.

Taylor, S.E, Brown, J.D., 1988. Illusion and well-being: A social psychological perspective on mental health. Psychological Bulletin 103, 193-205.

Thaler, R.H., 2000. From homo economicus to homo sapiens. The Journal of Economic Perspectives 14, 133-141.

Tversky, A., Kahneman, D., 1991. Loss aversion in riskless choice: A reference-dependent model. Quarterly Journal of Economics 106, 1039-1061.

Tversky, A., Kahneman, D., 1992. Advances in prospect theory: Cumulative representation of uncertainty. Journal of Risk and Uncertainty 5, 297-323.

Weber, E. U., Milliman, R.A., 1997. Perceived risk attitudes: Relating risk perception to risky choice. Management Science 43, 123-144.

Weinstein, N.D., 1980. Unrealistic optimism about future life events. Journal of Personality and Social Psychology 39, 806-820.

White, H., 1982. Maximum likelihood estimation of misspecified models. Econometrica 56, 997-1019.

21

8 Appendix - Data Description

8.1 Dependent Variables

Definition of entrepreneurial activity

The GEM 2001 adult population survey includes a representative sample of at least two thousand adults in each of 29 countries. Included in the survey were:

- Those older than the normal school leaving age (age varying from 14 to 18 years of age depending on the country)

- Those up to 64 years of age (a sample including those older than 64 was acceptable)

- Urban and rural areas

- All geographic regions of the country

All respondents were asked to three basic questions:

1a. Are you, alone or with others, currently trying to start a new business, including any type of self-employment? (yes, no, don't know, refuse)

1b. Are you, alone or with others, trying to start a new business or a new venture with your employer - an effort that is part of your normal work? (yes, no, don't know, refuse)

1c. Are you, alone or with others, the owner of a company you help manage? (yes, no, don't know, refuse)

Nascent entrepreneurs (*suboanw*)

Respondents who answered "yes" to items 1a or 1b, were then asked:

2a. You mentioned that you are trying to start a new business. Over the past twelve months have you done anything to help start this new business, such as looking for equipment or a location, organizing a start-up team, working on a business plan, beginning to save money, or any other activity that would help launch a business? (yes, no, don't know, refuse)

2b. Will you personally own all, part, or none of this business? (all, part, none, don't know,

refuse)

2c. Has the new business paid any salaries, wages, or payments in kind, including your own, for more than three months? (yes, no, don't know, refused)

Respondents were coded as "nascent entrepreneur" (*suboanw*=1) if, in addition to 1a and 1b, they answered "yes" to 2a and 2b, and "no" to 2c.

New business owners (*babybuso*)

In order to make the distinction between individuals involved in starting a new business (nascent entrepreneurs) and those involved in managing a very young business (baby business owners), respondents who answered "yes" to question 1c were asked:

3a. You said you were the owner or manager of a company. Do you personally own all, part, or none of this business? (all, part, none, don't know, refuse)

3c. What was the first year the owners received wages, profits, or payments in kind? (4 digit year, or no profits yet, don't know, refuse)

Respondents that classify as full or part owners of the business and had received wages or salaries paid up to 42 months were coded as "baby business owners" (*babybuso*=1).

Experienced entrepreneurs (*experi*)

This variable is not part of the original GEM survey and was computed by the authors using GEM data for the purposes of this paper. *Experi* includes all individuals who own all or part of a business they help to manage, and have paid wages or received profits for more than 42 months.

Table A1 shows the un-weighted ratios for all three definitions of entrepreneurship across the 18 countries in our sample.

8.2   Independent Variables

All independent variables used in the analysis are described in Table A2. All items were part of the GEM adult population survey questionnaire and were asked to all respondents, independently from whether they were involved in entrepreneurial activities. The socio-demographic variables *gemwork*, *gemhhinc*, and *gemeduc* were not explicitly part of the questionnaire, but were collected as background information for the surveys in 18 of the 29 countries included in GEM 2001. These items were then recoded following uniform scales by the GEM consortium. See Reynolds et al. (2005) for further details.

9   Tables

Table A1: Un-weighted ratios for the dependent variables in 18 countries

Country	SUBOANW	BABYBUSO	EXPERI	N
AR – Argentina	7.5%	2.5%	3.3%	1,992
CA – Canada	6.1%	3.2%	3.3%	1,939
D – Germany	4.2%	1.9%	3.5%	7,058
DK – Denmark	3.7%	2.3%	5.2%	2,022
FIN – Finland	3.2%	1.9%	6.2%	2,001
HU – Hungary	7.6%	3.7%	5.6%	2,000
IN – India	8.6%	3.4%	6.9%	2,011
IL – Israel	0.6%	3.4%	1.1%	2,055
IT – Italy	6.6%	1.7%	2.8%	1,973
JP – Japan	2.3%	0.7%	5.3%	2,000
KR – South Korea	7%	6.8%	9.6%	2,008
NZ – New Zealand	8.9%	6.2%	7.4%	1,960
P – Portugal	3.6%	3.2%	4.4%	2,000
PL – Poland	5%	2.2%	3.9%	2,000
RU – Russia	3%	3%	1.1%	2,012
S – Sweden	3.2%	1.9%	5.4%	2,056
SG – Singapore	4.0%	2.1%	3.0%	2,004
US – United States	6.5%	2.9%	5.5%	2,954
TOTAL	5%	2.8%	4.5%	42,045

Source: GEM 2001

Table A2: Variable definition and un-weighted descriptive statistics, GEM 2001 data

Variable (corresponding survey question)	Value	Relative Frequency
Gender	Male	48.1%
	Female	51.9%
Knowent (Do you know someone personally who started a business in the past 2 years?)	Yes	33.6%
	No	64.8%
	Refused	1.6%
Opport (In the next six months will there be good opportunities for starting a business in the area where you live?)	Yes	23%
	No	60.6%
	Refused	15.8%
Suskill (Do you have the knowledge, skill and experience required to start a new business?)	Yes	36.3%
	No	58.7%
	Refused	4.9%
Fearfail (Would fear of failure prevent you from starting a new business?)	Yes	33.2%
	No	60%
	Refused	6.7%
Famfutur (Looking ahead, do you think that a year from now you and your family will be better off financially, or worse off, or about the same as now?)	Worse	14.4%
	Same	49.1%
	Better	29.2%
	Missing	7.2%
Ctrfutur (In a year from now, do you expect that in the country as a whole business conditions will be better or worse than they are at the present, or just about the same?)	Worse	25%
	Same	38.2%
	Better	24.6%
	Missing	12.2%
Gemwork (Present working status of the individual)	Full / Full or part time	50.3%
	Part time only	6.9%
	Retired / disabled	10%
	Homemaker	10%
	Student	5.1%
	Not working: other	17%
	Missing	0.7%
Gemhhinc (Household income of the individual recoded into thirds relative to country income distribution.)	Lowest 33%	26.4%
	Middle 33%	30.9%
	Upper 33%	20.9%
	Missing	21.8%
Gemeduc (Educational attainment of the individual.)	Some secondary schooling	26.9%
	Secondary degree	34.9%
	Post secondary degree	33.3%
	Grad exp	1.4%
	Missing	3.5%
Age – in 8 categories (What year were you born?)	14-17 yrs old	2.1%
	18-24 yrs old	13%
	24-34 yrs old	19.2%
	35-44 yrs old	21.5%
	45-54 yrs old	18.1%
	55-64 yrs old	14.5%
	65-74 yrs old	8.1%
	75-84 yrs old	3%
	85-up yrs old	0.4%

Base: AR, CA, D, DK, FIN, HU, IN, IL, IT, JP, KR, NZ, P, PL, RU, S, SG, US.   N = 42,045

Table 1 - Probit regressions for nascent entrepreneurs, new entrepreneurs, and experienced entrepreneurs – 2001

Probit regressions	Y = suboanw				Y = babybuso				Y = experi			
	Model 1a		Model 1b		Model 2a		Model 2b		Model 3a		Model 3b	
	dF/dx**	P>|z|	dF/dx**	P>|z|	dF/dx**	P>|z|	dF/dx**	P>|z|	dF/dx**	P>|z|	dF/dx**	P>|z|
Russia	-0.0250*	0	-0.0094	0.089	0.0008	0.8	0.0054	0.171	-0.0182*	0	-0.0135*	0.001
Hungary	0.0078	0.197	0.0193*	0.002	-0.0002	0.955	-0.0003	0.936	0.0023	0.585	0.0033	0.429
Italy	0.0052	0.402	0.0088	0.227	-0.0039	0.359	0.0124*	0.04	-0.0049	0.258	0.0106	0.102
Denmark	-0.0179*	0	-0.0110*	0.036	-0.0029	0.375	-0.0013	0.68	-0.0042	0.215	0.0026	0.516
Sweden	-0.0228*	0	-0.0145*	0.001	-0.0066*	0.027	-0.0034	0.186	-0.0007	0.834	0.0027	0.436
Poland	-0.0011	0.842	0.0238*	0.002	-0.0002	0.964	0.0126*	0.005	-0.0038	0.318	0.0101*	0.045
Germany	-0.0159*	0	0.0091*	0.039	-0.0042	0.094	0.0031	0.216	-0.0096*	0	0.0000	0.992
Argentina	0.0213*	0.001	0.0334*	0	0.0001	0.986	0.0016	0.629	-0.0031	0.42	0.0021	0.606
New Zealand	0.0233*	0	0.0172*	0.005	0.0266*	0	0.0137*	0	0.0179*	0	0.0135*	0.002
Singapore	-0.0175*	0	0.0201*	0.003	-0.0043	0.157	0.0052	0.156	-0.0104*	0.001	0.0026	0.564
Japan	-0.0277*	0	0.0129	0.171	-0.0087*	0.014	0.0127*	0.045	0.0060	0.16	0.0439*	0
Korea	0.0041	0.484	0.0379*	0	0.0317*	0	0.0526*	0	0.0504*	0	0.0812*	0
India	0.0224*	0	0.0284*	0	0.0122*	0.002	0.0142*	0	0.0314*	0	0.0389*	0
Canada	0.0020	0.716	0.0143*	0.011	0.0039	0.265	0.0064*	0.043	-0.0095*	0.004	-0.0033	0.331
Portugal	-0.0194*	0.001	-0.0102	0.116	-0.0030	0.399	0.0012	0.746	-0.0057	0.161	-0.0021	0.648
Finland	-0.0165*	0.002	-0.0027	0.643	-0.0031	0.375	0.0032	0.371	0.0111*	0.01	0.0218*	0
Israel	-0.0382*	0	-0.0251*	0	0.0050	0.166	0.0110*	0.008	-0.0162*	0	-0.0076	0.061
age14-17	-0.0038	0.715	0.0043	0.659	0.0009	0.906	0.0125	0.167	-0.0050	0.743	0.0037	0.819
age18-24	-0.0029	0.422	0.0004	0.916	-0.0052*	0.01	-0.0026	0.152	-0.0136*	0	-0.0099*	0.001
age35-44	0.0003	0.93	0.0033	0.237	-0.0015	0.337	-0.0006	0.671	0.0161*	0	0.0142*	0
age44-54	0.0007	0.823	0.0058	0.064	-0.0041*	0.011	-0.0024	0.108	0.0269*	0	0.0246*	0
age55-64	-0.0106*	0.003	-0.0020	0.586	-0.0055*	0.006	-0.0018	0.336	0.0369*	0	0.0332*	0
age65-74	-0.0287*	0	-0.0193*	0	-0.0088*	0.009	-0.0039	0.22	0.0480*	0	0.0565*	0
age75-84	-0.0380*	0	-0.0259*	0.011	-0.0069	0.26	-0.0069	0.297	0.0002	0.987	0.0059	0.6
Female	-0.0236*	0	-0.0090*	0	-0.0092*	0	-0.0031*	0.008	-0.0123*	0	-0.0038*	0.009
gemhhinc(middle 33% income)	-0.0016	0.541	-0.0045	0.074	0.0052*	0.002	0.0017	0.269	0.0031	0.095	-0.0011	0.551
gemhhinc(upper 33% income)	0.0111*	0	-0.0021	0.454	0.0156*	0	0.0054*	0.002	0.0182*	0	0.0086*	0
gemwork(part-time job only)	0.0174*	0	0.0165*	0	0.0057*	0.015	0.0045*	0.034	-0.0005	0.853	0.0010	0.702
gemwork(retired/disabled)	-0.0302*	0	-0.0161*	0.001	-0.0148*	0	-0.0090*	0	-0.0231*	0	-0.0183*	0
gemwork(homemaker)	-0.0233*	0	-0.0125*	0.002	-0.0187*	0	-0.0115*	0	-0.0280*	0	-0.0203*	0
gemwork(student)	-0.0248*	0	-0.0178*	0	-0.0146*	0	-0.0102*	0	-0.0217*	0	-0.0174*	0

gemwork(not working:other)	-0.0110*	0.001	-0.0063*	0.04	-0.0171*	0	-0.0120*	0	-0.0276*	0	-0.0236*	0
gemeduc(secondary degree)	0.0138*	0	0.0086*	0.004	0.0030	0.092	-0.0003	0.83	0.0044*	0.028	0.0026	0.182
gemeduc(post-secondary degree)	0.0189*	0	0.0067*	0.031	0.0007	0.688	-0.0026	0.104	0.0011	0.61	-0.0016	0.44
gemeduc(grad exp)	0.0236*	0.013	0.0082	0.264	0.0014	0.761	-0.0015	0.657	0.0085	0.127	0.0029	0.545
knowent(yes)			0.0221*	0			0.0118*	0			0.0053*	0
fearfail(yes)			-0.0127*	0			-0.0046*	0			-0.0094*	0
suskill(yes)			0.0562*	0			0.0258*	0			0.0389*	0
opport(yes)			0.0278*	0			0.0058*	0			0.0042*	0.01
ctrfutur(same)			-0.0040	0.108			-0.0024	0.074			-0.0040*	0.016
ctrfutur(better)			-0.0068*	0.008			-0.0018	0.205			-0.0042*	0.017
famfutur(same)			0.0072*	0.047			0.0002	0.89			0.0002	0.934
famfutur(better)			0.0276*	0			0.0032	0.096			-0.0007	0.754
Number of obs	*29,334*		*20,389*		*28,575*		*19,782*		*29,137*		*20,209*	
Wald chi2(35)	*931.27*		*1,275*		*643*		*782*		*1,164*		*1,088*	
Prob > chi2	*0*		*0*		*0*		*0*		*0*		*0*	
Pseudo R2	*0.093*		*0.2098*		*0.1325*		*0.2207*		*0.1758*		*0.2384*	
Log likelihood	*-5,604*		*-3,669*		*-3,258*		*-2,154*		*-4,608*		*-3,141*	
Observed P	*0.0542*		*0.0603*		*0.029*		*0.0314*		*0.0478*		*0.0519*	
Predicted P at x-bar	*0.0366*		*0.026*		*0.0143*		*0.0069*		*0.0199*		*0.0154*	

Reference categories: USA, male, age25-34, country future(worse), family future(worse), household income (lowest 33%), working status(full or part-time job), education(some secondary schooling).

*: Coefficient significant at 95%.

**: dF/dx is for discrete change of dummy variable from 0 to 1.

***: predicts failure perfectly – variable and observations dropped

Note: All models contrast individuals of the dependent variable category against the group of non-entrepreneurs - observations that are coded as other types of entrepreneurs than the ones included in the dependent variable category are dropped.

age85-97 predicts failure perfectly – variable and observations dropped.

Table 2- Sufficient skill perceptions by country (% of yes)

Country	SUSKILL
AR - Argentina	55.0
CA – Canada	49.6
D – Germany	36.6
DK – Denmark	33.5
FIN – Finland	31.4
HU – Hungary	56.0
IN – India	43.7
IL – Israel	29.9
IT – Italy	30.9
JP – Japan	10.7
KR – South Korea	27.3
NZ – New Zealand	61.1
P – Portugal	34.3
PL – Poland	41.5
RU – Russia	30.4
S – Sweden	24.3
SG – Singapore	42.4
US – United States	55.4
TOTAL	38.2

Table 3 - Correlation of sufficient skill perception (*suskill*) and educational attainment (*gemeduc*)

	Suskill
Some secondary schooling	-0.086**
Secondary degree	-0.016**
Post-secondary degree	0.074**
Graduate exposure	0.070**
Kendall-Tau-b correlation coefficients for dummy variables, ** denotes significances at 99%	

Table 4 - Group-means of sufficient skill perception (*suskill*) by educational attainment (*gemeduc*) in all countries

	Overall	Russia	Hungary	Italy	Denmark	Sweden	Poland	Germany	Argentina
Some secondary	31.4%	20.6%	38.0%	12.5%	22.4%	33.1%	10.8%	25.0%	47.2%
Secondary degree	37.2%	22.2%	61.8%	25.4%	40.1%	41.4%	39.9%	30.1%	63.9%
Post secondary	43.3%	38.1%	74.2%	36.0%	44.3%	49.3%	62.7%	34.4%	61.3%
Grad exp	66.5%		83.7%						33.3%
Overall	38.1%	30.4%	56.0%	30.9%	37.8%	42.4%	34.3%	28.7%	55.0%
N	38,552	1,804	1,904	1,726	1,689	2,003	1,781	5,880	1,936
Chi-Square Test for equal group means (df)	0.000 (3)	0.000 (2)	0.000 (3)	0.000 (2)	0.000 (2)	0.000 (2)	0.000 (2)	0.000 (2)	0.000 (3)

	New Zealand	Singapore	Japan	Korea	India	Canada	Portugal	Finland	Israel	USA
Some secondary	58.8%	17.0%	4.6%		34.1%	32.2%	37.8%	31.0%	13.0%	41.8%
Secondary degree	61.5%	20.7%	9.9%	25.0%	51.2%	45.1%	44.3%	36.8%	28.0%	48.7%
Post secondary	64.6%	32.6%	12.8%	30.7%	58.7%	57.6%	51.8%	33.1%	35.0%	61.9%
Grad exp	59.6%		44.4%		53.5%	66.7%				65.8%
Overall	61.2%	24.3%	10.7%	27.3%	43.7%	49.7%	41.5%	33.5%	29.9%	55.5%
N	1,899	1,966	1,671	1,944	1,934	1,869	1,816	1,905	1,935	2,890
Chi-Square Test for equal group means	0.224 (3)	0.000 (2)	0.000 (3)	0.005 (1)	0.000 (3)	0.000 (3)	0.000 (2)	0.201 (2)	0.000 (2)	0.000 (3)

Table 5 - Test for different means of perceptual variables among nascent entrepreneurs and experienced entrepreneurs

Variable	Group	N	Mean (% of "yes")	Chi-Squared-Test that means are equal (Sign.)
Knowent	Experienced entrepreneurs (experi=yes)	1,864	0.52	0.000
	Nascent entrepreneurs (suboanw=yes)	2,086	0.62	
Opport	Experienced entrepreneurs (experi=yes)	1,654	0.37	0.000
	Nascent entrepreneurs (suboanw=yes)	1,867	0.52	
Suskill	Experienced entrepreneurs (experi=yes)	1,837	0.79	0.020
	Nascent entrepreneurs (suboanw=yes)	2,026	0.82	
Fearfail	Experienced entrepreneurs (experi=yes)	1,838	0.22	0.740
	Nascent entrepreneurs (suboanw=yes)	2,043	0.22	

Table 6 - Test for different means of perceptual variables among entrepreneurs* and non-entrepreneurs

Variable	Group	N	Mean (% of "yes")	Chi-squared-Test that means are equal (Sign.)
Knowent	No entrepreneur	36,399	0.31	0.000
	Entrepreneur*	5,017	0.59	
Opport	No entrepreneur	30,704	0.25	0.000
	Entrepreneur*	4,457	0.45	
Suskill	No entrepreneur	35,024	0.32	0.000
	Entrepreneur*	4,917	0.81	
Fearfail	No entrepreneur	34,268	0.37	0.000
	Entrepreneur*	4,920	0.23	
*: Entrepreneurs are all individuals currently starting a new business or managing and owning a business				