"I THINK I CAN, I THINK I CAN":
OVERCONFIDENCE AND ENTREPRENEURIAL BEHAVIOR

Philipp Koellinger (1)[*], **Maria Minniti** (2), **Christian Schade** (3)

(1) German Institute for Economic Research (DIW Berlin) and Erasmus University Rotterdam
(2) Babson College, Economics Division and Entrepreneurship Division
(3) Humboldt-Universität zu Berlin, Institute for Entrepreneurial Studies and Innovation
     Management

---

*Dr. Philipp Koellinger, Erasmus University Rotterdam, Department of Applied Economics, P.O. Box 1738, 3000 DR Rotterdam, The Netherlands. Email: koellinger@few.eur.nl.

"I THINK I CAN, I THINK I CAN":
OVERCONFIDENCE AND ENTREPRENEURIAL BEHAVIOR

Abstract

High failure rates and low average returns suggest that too many people may be entering markets. Thus, anticipating how one will perform in the market is a fundamental component of the decision to start a business. Using a large sample obtained from population surveys conducted in 18 countries, we study what variables are significantly associated with the 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. The strongest cross-national covariate of an individual's entrepreneurial propensity is shown to be whether the person believes to have the sufficient skills, knowledge and ability to start a business. In addition, we find a significant negative correlation between this reported level of entrepreneurial confidence and the approximated survival chances of nascent entrepreneurs across countries. Our results suggest that some countries exhibit relatively high rates of start-up activity because their inhabitants are more (over)confident than in other countries.

"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., 1988), 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 publicly traded assets such as stocks. High business failure rates and low average financial returns to entrepreneurship suggest that, at least with respect to pecuniary interests and individual welfare, too many people may be entering markets.

Given the social and economic relevance of creating new businesses, it is important to understand how entry decisions are made, what factors influence individuals who make these decisions, and what kinds of errors these individuals are likely to make. Excess entry into markets has also been demonstrated in experimental studies and causally linked to overconfidence. Camerer and Lovallo (1999) run a simultaneous market-entry experiment where the payoffs of participants decrease with the number of entrants, i.e. the intensity of competition. Their findings showed that entering subjects thought that the total profit earned by all entrants would be negative but estimated that their own profit would be positive. Camerer and Lovallo (1999) also suggest that the analysis

conducted with field data would be a very desirable way to study further the possibility of overconfidence as an explanation for excess entry and an especially compelling complement to experimental evidence. Finding empirical evidence of overconfidence requires measuring entrepreneurial confidence and linking such measure to actual start-up activities. Our paper contributes to this area of inquiry.

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 create a representative random sample of population in each country and to identify individuals in each sample 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 do not rely on the respondents ex post explanations for their own decisions. In other words, our data do not suffer from "hindsight bias" (Fischhoff 1975, Thaler 2000).

Our results provide significant evidence that subjective and possibly biased perceptions have a crucial impact on new business creation. In particular, confidence in one's own entrepreneurial skills emerges as a major driver in the decision to start a business across all countries in our sample. First, large variations in perceptions about one's own skills exist across countries. Yet, across countries, we found only weak or no positive correlation between education and confidence in one's own skill. Second, we find nascent entrepreneurs to be more confident in their own skills than individuals who have been successfully in business for some times. That is, confidence in one's

own skills appears to be stronger among individuals in early stages of the entrepreneurial process, when the outcome of the business is still based on expectations, than among individuals whose skills have been "tested" by the market. In fact, our regression models indicate that perceptions about one's own skills provide a higher relative contribution to the difference between nascent entrepreneurs and non-entrepreneurs than to the difference between established entrepreneurs and non-entrepreneurs. Finally, we find that countries exhibiting a high rate of entrepreneurial confidence exhibit significantly higher start-up activity but lower average chances that a business will survive in the market for more than 42 months.

Overall, our evidence suggests that potential entrepreneurs may be overconfident in their own skills and abilities. In addition to socio-economic and demographic factors, differences in subjective perceptions and the extent to which they are biased may help us to understand why some people start businesses while others do not. Our results complement and support the experimental findings of Camerer and Lovallo (1999) and suggest that, rather than an accurate assessment of one's own abilities, it may be overconfidence that often leads individuals to start a business. The connection between entrepreneurial decisions and overconfidence may explain, in part, the high failure rate of new business owners.

2. Theoretical Background

In microeconomic models of entrepreneurial behavior, objectively measurable variables as well as subjective preferences and perceptions have been considered as factors influencing the decision to start a business. Among objectively measurable variables, age and gender have been shown to play some role on entrepreneurial decisions. For example, the probability of starting a

business has been shown to increase with age up to a threshold point and to decrease thereafter (Levesque and Minniti, 2006), and men have been shown to be more likely to start a business than women (Blanchflower, 2004). Evidence also suggests that entrepreneurs are significantly hindered by liquidity constraints (Evans and Jovanovich, 1989) and that individuals with greater family wealth are more likely to switch from employment to self-employment (Kihlstrom and Laffont, 1979). 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), and conditions in the labor market have been identified as an important determinant of employment status choice, though the nature of the relationship is still under debate (Acs et al., 1999; Blanchflower and Oswald, 1998).[1] Finally, different economic characteristics as well as cultural variations have been linked to variations in rates of new firm formation across countries and regions (Acs et al., 2005; Davidsson and Wiklund, 1997).

Since starting a business is a risky decision, in addition to objectively measurable socio-demographic variables, subjective preferences and perceptions have also been suggested as important determinants of entrepreneurial behavior. Kirzner (1973, 1979) argues that entrepreneurship is alertness. That is, the ability to perceive unexploited opportunities. Similarly, Casson (1982) argues that the essence of entrepreneurship is being different because of different perceptions about the environment. Higher entrepreneurial propensity has been also linked to self-confidence and an illusion of control. Building on Rotter (1966), Harper (1998) discusses the

---

[1] 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.

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 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.

An individual's tolerance toward risk has been also assumed to be 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 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).

In general, in a decision under uncertainty such as starting a new business, 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 business, 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). Smaller perceived downside risks and greater perceived chances of success may increase the entrepreneurial propensity of that individual. In other words, an individual's perceptions with respect to starting a business may be systematically distorted by overconfidence.

Overconfidence has been 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 the study by Camerer and Lovallo (1999), instead, the term describes the overestimation of one's own abilities relative to others. We replicate with field data what Camerer and Lovallo test in an experimental setting. Thus, we test the better than average effect although, in our case, the average does not mean necessarily the mathematical average but, rather, what it takes to survive in the market. In other words, the mathematical average may not be meaningful since we do not know what it takes to survive and, in order to survive, an entrepreneur may have to do better than, say, 75% of the population. This type of overconfidence is distinct from an individual believing to be better than he actually is (Moore and Kim 2003), although the two forms of overconfidence are clearly related.

Recent studies have shown the better-than-average effect to be very common, and some of its characterizing factors have been identified. For example, individuals have been shown to exhibit the bias less when they believe to have no or limited control over events. Some works have shown that, when faced with difficult tasks, people often report to possess below average skills (Chambers et al 2003, Hoelzl and Rustichini 2005, Kruger and Burrus 2004). In fact, Krueger (1999) showed that people rate themselves above average in domains for which the average individual feels skilled and capable. The same people, however, rate themselves below average in more challenging or

unfamiliar domains. These results are consistent with Camerer and Lovallo's reference group neglect and with Harper's theory that the perception of possessing more internal control increases entrepreneurial alertness. It is also consistent with our argument that individuals exhibiting more self-confidence are more likely to become involved in starting a business.

The better-then-average effect provides compelling evidence that individuals maintain unrealistically positive images of themselves relative to others and, specifically, that the average individual tends to rate himself above the average in positive situations (Alicke et al.1995, Eiser et al. 2001). In our data, unlike other respondents, nascent and new entrepreneurs report very often to possess the necessary skills to successfully start a business. Also, Windschitl et al. (2003) suggest that when people judge their likelihood of success, their assessment of their own strength and weakness have greater impact than their assessments of their competitors' strengths and weaknesses. This is consistent with our argument that individuals who believe to have the skills and ability to start a new business are more likely to take an inside view of their prospects and overestimate their chances of success.

3. Data and Method

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.[2] Initiated in 1999 with 10 countries, the project collects data annually and has grown to include

---

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

more than 40 countries in 2006. 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.[3] The main purpose of the survey was to create a representative random sample of population in each country and to identify what percentage of these individuals, 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 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 entrepreneurs, new entrepreneurs, established entrepreneurs, and non entrepreneurs.[4]

Individuals were coded as nascent entrepreneurs (*nascent*) 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 to the owners or others for a period not exceeding 3 months. Individuals were coded as new entrepreneurs (*newentr*) if they claimed to be managing and owning a business at the time of the survey, and of having paid wages for at least 3 but no more than 42 months. Finally, respondents were classified as established entrepreneurs (*establ*) if, at the time of the survey, they owned all or part of a business they helped manage and that had paid

---

[3] Survey questions are standardized and conducted simultaneously in all countries. In each country, surveys are stratified geographically and conducted by phone, except in countries with low phone penetration rate in which surveys are conducted face to face. Population samples are random and based on direct dialing or use listed numbers with callbacks.

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

wages or profits for longer than 42 months. All three variables *nascent*, *newentr*, and *establ* are binary variables computed at the individual level (individual fits definition "Yes"=1 or "No"=0). All respondents in our sample fit into one of the three above groups or into none of the above. In the latter case, they are labeled as *non-entrepreneurs*. There are no missing values for these categories. Although individuals in the three entrepreneurial groups (*nascent*, *newentr*, or *establ*="Yes") are all entrepreneurs, they are distinct because of the length of time they have been involved in their ventures.

The dataset contains basic demographic information for each respondent, including age and gender. For most countries, data are also available about working status, education level, and relative income group.[5] 11 countries had data gaps in one or more of the demographic and socio-economic variables and, therefore, 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.

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 business (*suskill*). This variable describes the subjective assessment of one's own skills, knowledge and ability with respect to starting a business and is expected to have a positive influence on entrepreneurial propensity.

---

[5] Specifically, the income distribution of each country is divided into 3 groups, low, middle and high income (each including 33% of the population). Given his income, each individual is then classified as belonging to the low, middle, or high income group in his country. The specific income distribution of each country determines the monetary values included in each group. Thus, a US respondent with an income of, say, US$5,000 would be included in the low income group. A respondent with an identical income in another country, however, could be included in the middle or high income group.

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 and is also expected to have a positive impact. Respondents were also asked whether fear of failure would prevent them from starting a business. This variable is expected to have a negative effect on individuals' entrepreneurial propensity. In fact, fear of failure (*fearfail*) may be viewed as a proxy for downside risk tolerance.

Respondents were also asked two questions related to their expectations about the future which, in turn, can be influenced by objectively measurable conditions and subjective attitudes, i.e. optimism and pessimism. 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*). The possible impact of these perceptions on the propensity to start a business could be positive or negative. 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, as a result, lead to more attempts to start businesses.

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 indication of how direct exposure to other entrepreneurs provides information about the entrepreneurial process. We expect 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 business. In other words, knowing other entrepreneurs might reduce ambiguity and, as a result,

is likely to have a positive influence on start-up propensity (Minniti, 2005). A detailed description of all independent variables is presented in the Appendix together with descriptive statistics for the co-variables used in the estimated models.

The GEM project provides analogous data aggregate at the country level also from 2002 through 2005, including the same measures for entrepreneurial activity and most of the perceptual variables discussed above. These aggregate data, combined with those for 2001, allowed the construction of an unbalanced panel that we use to test the relationship between sufficient skill perceptions, entrepreneurial activity, and survival chances.

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 and a set of simple, comparable variables measuring relevant individual perceptions in each country. Earlier studies dealing with the influence of perceptions and overconfidence on entrepreneurial activity were based on experimental data with students (Camerer and Lovallo, 1999), or had to rely on noticeably smaller samples of established entrepreneurs from just one country (Busenitz and Barney, 1997; Cooper et al., 1988). Our data, instead, allow us to relate prevalence rates of perceptual variables, including a self-assessment of entrepreneurial skills, to cross-country differences in entrepreneurial activity and performance. Finally, our 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, thereby allowing us to relate individual perceptions to the actual activity of starting a business.

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).[6] In addition, preparatory 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 computed 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 5% 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. Thus, the coefficients can be thought of as reporting the difference in entrepreneurial activity due to x, holding everything else constant. In all models, we contrast the relevant dependent variable (*nascent*, *newentr* or *establ*) against the control group of non-entrepreneurs.[7] Finally, we run additional regressions and

---

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

[7] Without this filtering procedure, the control group would always contain entrepreneurs of the two other entrepreneurial categories. This would contaminate results and make their interpretation problematic. Hence, we excluded the two inappropriate entrepreneurial groups from the models whenever necessary. For example, in the probit model on nascent

correlations using the panel of aggregate country data from 2001-2005 to test whether sufficient skill perceptions are related to survival chances.

In the first step of our analysis, *nascent*, *newentr*, and *establ* are used as dependent variables in separate models to test which covariables are significantly associated with an individual's decision to start a business and to analyze how entrepreneurs differ from non-entrepreneurs.

4.   Results

We estimate two different models for each of the three dependent variables *nascent*, *newentr* and *establ*. For each individual, the first model includes as explanatory variables only country of residence, age, income group, education, and current work status. The second model includes all available variables. All model results suggest that perceptual variables have a significant 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.[8]

The first two models (1a and 1b) refer to nascent entrepreneurs as the dependent variable (*nascent*). 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 business (*suskill*). According to the second probit model on *nascent* (Model 1b), the individual probability to start a business increases by 5.6% on average, if the individual believes to have the

entrepreneurs, we excluded new entrepreneurs and established entrepreneurs from the sample in order to find out what differentiates nascent entrepreneurs from non-entrepreneurs.

[8] 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 all three dependent variables could be successfully computed. Thus, all missing observations result from missing information in the explanatory variables.

sufficient skills. This is a very strong contribution for a single co-variable, especially considering that only 6.03% of the individuals included in Model 1b are actually nascent entrepreneurs (*nascent* = 1).

In addition to the strong influence of the *suskill* variable, other perceptual variables are also strongly associated with 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 strong positive coefficients in the model on *nascent*. Knowing other entrepreneurs (*knowent*) is also positively associated with start-up propensity. Fear of failure (*fearfail*), on the other hand, seems to reduce the propensity to start a new business. Socio-economic factors, such as household income and education, have a comparably small influence on entrepreneurial activity. Also, the relevance of socio-economic factors is clearly biased upward in model 1, where perceptual variables are not explicitly controlled for. 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 entrepreneurs (*newentr*) without and with perceptual variables respectively. Models 3a and 3b, instead, report regression results for established entrepreneurs (*establ*) without and with perceptual variables respectively. Together, these models describe differences between new entrepreneurs, established entrepreneurs and non-entrepreneurs. Again, we find that entrepreneurs and non-entrepreneurs differ significantly in their perceptions. Both new entrepreneurs and established 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 than non-entrepreneurs to state that fear of failure would stop them

from starting a business (*fearfail*). In general, these results are consistent with the ones obtained for nascent entrepreneurs (*nascent*). In contrast to nascent entrepreneurs, however, both new entrepreneurs and established entrepreneurs are more likely to have a high income. This result may suggest that high income is a consequence rather than a prerequisite of successful entrepreneurial activity. Alternatively, it could also imply that individuals with a high income are more likely to survive the first months of new business ownership. 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.

Our results also support existing empirical evidence reporting strong country effects (Acs et al., 1999; Blanchflower, 2004). Interestingly, the coefficients' signs change for some country dummies when perceptual variables are added to the models. 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 in socio-economic factors and individual perceptions. Thus, the country effects in all "b" models approximate deviations of the expected level of entrepreneurial activity from the comparison country (US) that would occur if demographic, socio-economic, and perceptual variables were equally distributed across all countries in the sample. To illustrate, Table 2 shows the prevalence rates of nascent entrepreneurs (nascent), new entrepreneurs (newentr) and established entrepreneur (*establ*) across countries. Table 2 shows that fewer people are involved in start-up activities in Japan than in the US (-4.2%). Model 1a in Table 1 shows that Japan would be still significantly less entrepreneurial than the US (-2.8%), even if the socio-economic and demographic characteristics of the two populations were equally distributed. However, on average, Japanese differ substantially in their individual perceptions from Americans, i.e. they are less confident in their skills and less optimistic about

17

good business opportunities. After controlling for these perceptual factors explicitly, in fact, Model 1b in Table 1 indicates that Japanese would be *more* likely to start a business than Americans if demographic and socio-economic characteristics and perceptual variables were equally distributed in both countries (+1.3%). Obviously, these country-specific differences in perceptions could result from different economic conditions, and some perceptual biases could be more common in some countries than in others.

The evidence discussed above points out the importance of perceptual variables. It also contains significant evidence of the bias characterizing subjective perceptions. The belief 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 3 shows a surprisingly strong variance in the *suskill* variable across 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. Interestingly, countries that exhibit a high percentage of individuals with confidence in their own entrepreneurial skills also exhibit the highest percentage of entrepreneurs.

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 skills. However, if the perception of one's 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 4 shows that, in general, skill perception and educational attainment are only weakly correlated (coefficients <0.1). In addition,

results in Table 5, showing group-means for the *suskill* variable by educational attainment among countries, suggest that individuals with high education are not necessarily more confident in their entrepreneurial skills.[9]

In addition to providing information on the existence of perceptual biases, our results contain significant evidence on their direction. Confidence in ones own skills and abilities to start a business should increase as individuals gain relevant entrepreneurial experience and successfully survive in the market for some time. In other words, if individual perceptions were unbiased, established entrepreneurs should be more confident in their own skills than individuals who are just starting a business. We use a Chi-Squared-Test to evaluate the null hypothesis that perceptions among nascent entrepreneurs (*nascent*) and established business owners (*establ*) are equal. The results are reported in Table 6 and show that nascent entrepreneurs are significantly more confident in their skills, knowledge, and experience than established entrepreneurs. This finding suggests that nascent entrepreneurs may exhibit a perceptual bias reflecting overconfidence.

We observe that the *suskill* variable has its strongest effect in the regression on nascent entrepreneurs (*nascent*), together with Chi-Squared-Test, this suggests that strong confidence in entrepreneurial ability may be driving start-up decisions rather than being the consequence of a start-up decision made in the past. According to Table 1, for nascent entrepreneurs (*nascent*), *suskill*="yes" increases the average individual probability of starting a new business by 5.62%. The average probability in the sample is 6.03%. Thus, individuals who believe to have sufficient skills

---

[9] 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. 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. These results complement Burson et al (2006) who found that individuals at all skill levels are subject to similar degrees of error.

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 entrepreneurs (*newentr*) by 1.82 times, compared to being in the group of non-entrepreneur. For established entrepreneurs, the ratio is 1.75. Thus, although sufficient skill perception is the single most important variable in all regression models, its relative explanatory power is strongest for the group of nascent entrepreneurs, and declines as groups of more established entrepreneurs are considered.

Finally, we link entrepreneurial confidence to performance using country level prevalence rates and examine the relationship between sufficient skill perceptions, current and future levels of entrepreneurial activity, and survival chances. Table 2 displays the ratio of established to nascent entrepreneurs (*establ / nascent*) and the ratio of established entrepreneurs to new entrepreneurs (*establ / newentr*) in each country. Both ratios are positively correlated.[10] Table 2 shows strong variation of the ratios and of entrepreneurial activity in general across countries.[11] The two ratios can be interpreted as rough proxies for the average survival chances of nascent and new entrepreneurs in each country under the assumption that both the prevalence of entrepreneurial activity and the survival chances of new businesses are structural characteristics of a country and constant over time. The higher the ratio of established entrepreneurs to nascent or new

---

[10] The correlation coefficient is 0.54 for the countries covered by the 2001 GEM survey, and it is significant at above 99% confidence. Pooling all available country observations from 2001 to 2005 yields a correlation coefficient of 0.596, also significant at above 99%.

[11] For example, only 2.3% of Japanese were involved in start-up activities (*nascent*) at the time of the survey compared to 6.5% of Americans. Yet, the ratio of established entrepreneurs to nascent entrepreneurs (*establ / nascent*) is more favorable in Japan (2.3) than in the US (0.8). The same holds for the ratio of established entrepreneurs to new entrepreneurs (*establ / newentr*): Japan exhibits a ratio of 7.6 compared to 1.9 in the US. Assuming that these ratios do not change much over time, these results suggests that the average chances for new business survival are better in Japan than in the US.

entrepreneurs, the higher is the approximated chance of those early stage entrepreneurs to succeed with their businesses.

We test this assumption by constructing a cross-country panel including all participating countries in the GEM project from 2001 to 2005. The panel covers 40 countries and has an unbalanced structure since not all countries participated in the GEM project in all years. The stability of our proxies for survival rates over time is tested using correlations over various time lags. The results are reported in Table 7. Although there is some variation in the ratios, they are highly positively correlated over time. For example, the correlation coefficient for the ratio of established to nascent entrepreneurs in 2001 and 2005 is 0.755. Table 7 also shows that the prevalence rates of sufficient skill perceptions in each country are very robust over time.

Using this cross-country panel, we calculate the Pearson correlation coefficients between the past and current prevalence of *suskill*, ranging from *t-4* to *t*, and our two proxies for survival as well as for the prevalence of established entrepreneurs for all available countries. In addition, we estimate an unbalanced random effects linear model (Swamy and Arora 1972, Baltagi and Chang 1994) with *suskill* and a constant as explanatory variables.[12] The results are reported in Table 8. As expected, sufficient skill perceptions are positively associated with the prevalence of established entrepreneurs. Yet, the relationship with established entrepreneurial activity becomes insignificant for larger time gaps. At the same time, and consistently with our overconfidence argument, perceptions of having sufficient skills and ability are significantly and negatively associated with

---

[12] The appropriateness of the random effects assumption was tested in all 12 models using a Hausman (1978) test. In 9 models, random effects were supported by the test. In 3 cases, a fixed effects model was indicated but the estimated fixed effects model was not significantly different from an empty model because *suskill* does not explain variations in the data within countries (*R-squared within* <1% in all models, compared to *R-squared between* ranging from 6-21%). This suggests that variations in sufficient skill perceptions can help to explain cross-country differences in entrepreneurial activity, but not variations in entrepreneurial activity in a particular country over time.

future approximated survival rates. We find negative coefficients for all time gaps and for both ratios approximating survival chances.[13]

These findings imply that the approximated average survival chances of nascent entrepreneurs are actually *lower* in countries that exhibit high prevalence rates of entrepreneurial self-confidence. This result further supports our suggestion that overconfidence may, in fact, drive market entry decisions not only in the laboratory but also in the real world, and that some countries may exhibit comparably high rates of business start-ups because their inhabitants are more (over)confident than those of other countries.

5.   Discussion and implications

Overall, our results suggest that subjective and possibly biased perceptions have a major impact on the decision to start a business. 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. In particular, the subjective belief of having sufficient skills, knowledge, and ability to start a business (entrepreneurial confidence) appears as the most important factor in our regressions. In addition, we find a significant negative relation between entrepreneurial self-confidence and approximated survival rates of nascent entrepreneurs across countries. This result provides some evidence that the perception of entrepreneurial skills is likely to be biased by overconfidence.

---

[13] We chose to report the results for all 40 countries participating in the GEM study to highlight the robustness and generality of our results. However, when the analysis is replicated using only the 18 countries included in our probit models, the results are even stronger showing higher negative coefficient values for all time gaps between *suskill* and the two proxies for survival. For example, the correlation coefficient in this sample between *suskill* in *t-3* and *establ/nascent* is –0.65, significant at 95% confidence.

Our results are consistent with existing evidence that overconfidence is common among individuals in general (Weinstein, 1980; Hoffrage, 2004), and among entrepreneurs in particular. For example, Busenitz and Barney (1997) have shown overconfidence in entrepreneurs to be higher than overconfidence in managers. Also, Cooper et al. (1988) have found strong evidence of overconfidence among entrepreneurs. Their results suggest that 81% of entrepreneurs believe their chances of success to be at least 70%, and that a third of the entrepreneurs believe they will be successful with certainty. Participants in Cooper et al.'s study also estimated their own chances of survival to be higher than those of competing businesses. Unfortunately, however, at the time of the study, 66% of all newly founded businesses were failing. Camerer and Lovallo (1999) have shown that overconfidence in one's own skills leads to excess entry in experimental market conditions and that participants neglect to adjust their expectations for the fact that other group members also judge themselves as skilled. Thus, the importance of perceptual variables, and their associated bias, in the decision to start a business may explain some of the observable inconsistencies between returns to entrepreneurship and entrepreneurial decisions found in the literature (Hamilton, 2000; Camerer and Lovallo, 1999).

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) 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 that entrepreneurs may base their decisions largely on perceptions. Perceptions that, as our results show, may be biased because of overconfidence and not related to actual measures of risk or abilities.

Ultimately, numerous effects including evolution, history, culture and the institutional framework contribute to determine the quantity and quality of entrepreneurial behavior as they influence individuals' perceptions and incentives to transform perceived opportunities into actions. 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 may yield more entrepreneurial activity. Harper (1998) has argued 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 may 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.

Finally, its presence in entrepreneurial decisions, leads to asking what function overconfidence may serve for either the individual or for society as a whole. Hoffrage (2004) argues that, at the individual level, there can be situations in which the benefits of being overconfident clearly outweigh the costs. For example, a physician may be overconfident that a particular treatment will help her patient, and showing high confidence that the treatment will help may be essential for a placebo effect to occur. With respect to entrepreneurial activity, some people might start a business

with the erroneous belief that they have the sufficient skills and experience. However, the effort and steps necessary to starting may help them to acquire the skills and the experience that they actually need. Hvide (2002) shed light on why overconfidence emerges by proposing the existence of pragmatic beliefs. Busenitz and Barney (1997) argue that the use of biases and heuristics can be an effective and efficient guide for decisions with high environmental uncertainty and complexity, such as starting a business. Also, Busenitz and Barney mention that overconfidence may be beneficial in implementing a specific decision and persuading others to be enthusiastic about it as well.

Overconfidence may be beneficial, to some extent, even at the aggregate level. Without over-optimistic judgments, we would probably see fewer business start-ups but higher average success rates and returns among those who become entrepreneurs. It is not clear if excess entry is desirable in terms of social returns and, if so, in what quantity. In fact, unsuccessful businesses create negative externalities if the costs of their failure have to be absorbed – at least in parts – by others. On the other hand, overconfident and potentially unsuccessful entrepreneurs may also generate valuable information that would not be available otherwise (Bernardo and Welch, 2001; Minniti, 2005). In addition, new entry, albeit unsuccessful, might help spur competition and push incumbent businesses towards efficiency. Given the potential costs and benefits of excess entry, its optimal level may be dependent on the degree of its concentration across industries. Further explorations of this matter are clearly beyond the scope of this article, but may provide an interesting avenue for future research.

6.   Conclusion

Starting a business is an intentional act that involves repeated attempts to exercise control over a 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. As a result, the entrepreneurial environment may be populated by individuals who adopt an "inside view" and act on overconfident self-perceptions. Overconfident perceptions lead these individuals to overestimate their skills and make them think "they can". In general, individual perceptions are influenced by various factors, including economic framework conditions, history, culture and psychological phenomena such as heuristics and biases. Thus, perceptions of individual ability and risk may differ from actual abilities and probabilities. Yet, these possibly biased perceptions are strongly associated with actual start-up activities and have real economic consequences. This is not to say that perceptual biases are generally amiss. Ironically, individual overconfidence may even lead to better economic outcomes for society at large than more unbiased decision making.

References

Acs, Z. J., Carlsson, B., and 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.

Acs, Z.J., Arenius, P., Hay, Michael, and Minniti, M. (2005). Global Entrepreneurship Monitor Report. London, GB: London Business School, and Wellesley, MA: Babson College.

Alicke, M. D., Klotz, M. L., Breitenbecher, D. L., Yurak, T. J., and Vredenburg, D. S. (1995). Personal contact, individuation, and the better-than-average effect. *Journal of Personality and Social Psychology*, 68(5), 804-825.

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

Baltagi, B.H. and Chang, Y. (1994). Incomplete panels: A comparative study of alternative estimators for the unbalanced one-way error component regression model. *Journal of Econometrics*, 62, 67-89.

Bernardo, A.E., and 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., and 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.

Burson, K. A., J. Klayman, R.P. Larrick. 2006. Skilled or unskilled, but still unaware of it: How perceptions of difficulty drive miscalibration in relative comparisons. *Journal of Personality and Social Psychology* 90(1), 60-77.

Busenitz, L.W., and 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., and Lovallo, D. (1999). Overconfidence and excess entry: An establmental approach. *American Economic Review*, 89, 306-318.

Casson, M. (1982). *The Entrepreneur*. Totowa, NJ, US: Barnes and Nobles Books.

Chambers, J. R., Windschitl, P. D., & Suls, J. (2003). Egocentrism, event frequency, and comparative optimism: When what happens frequently is more likely to happen to me. *Personality and Social Psychology Bulletin*, 29(11), 1343-1356.

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

Cramer, J.S., Hartog, J., Jonker, N., and 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.

Davidsson, P., and Wiklund, J. (1997). Values, beliefs and regional variations in new firm formation rates. *Journal of Economic Psychology*, 18, 179-199.

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

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

Eiser, J. R., Pahl, S., & Prins, Y. R. A. (2001). Optimism, pessimism, and the direction of self-other comparisons. *Journal of Establmental Social Psychology*, 37(1), 77-84.

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

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

Fischhoff, B. (1975). Hindsight is not equal to foresight: The effect of outcome knowledge on judgment under uncertainty. *Journal of Establmental Psychology: Human Perception and Performance,* 1(3), 288-299.

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

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

Hausman, J.A. (1978). Specification tests in econometrics. *Econometrica*, 46, 1251-1271.

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

Hoelzl, E., and Rustichini, A. (2005). Overconfident: Do you put your money on it? *Economic Journal,* 115(503), 305-318.

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

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

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

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

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

Kauermann, G., and 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.

Kihlstrom, R., and 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.

Kruger, J. (1999). Lake Wobegon be gone! The below-average effect and the egocentric nature of comparative ability judgments. *Journal of Personality and Social Psychology*, 77(2), 221-232.

Kruger, J., and J Burrus. (2004). Egocentrism and focalism in unrealistic optimism (and pessimism). Journal of Establmental Social Psychology, 40(3), 332-340.

Levesque, M. and M. Minniti (2006). *Journal of Business Venturing*

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.

Moore, D. A., and T.G. Kim. (2003). Myopic social prediction and the solo comparison effect. *Journal of Personality and Social Psychology*, 85(6), 1121-1135.

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

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

Reynolds, P.D., Bosma, N.S., Autio, E., Hunt, S., De Bono, N., Servais, I., Lopez-Garcia, P., and Chin, N. (2005). Global Entrepreneurship Monitor: Data collection design and implementation 1998-2003. *Small Business Economics*, 24, 205-231.

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

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

Swamy, P. and Arora, S. (1972). The exact finite sample properties of the estimators of coefficients in the error components regression models. *Econometrica*, 40, 643-657.

Taylor, S.E, and 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., and 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., and 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.

Windschitl, P. D., J. Kruger, and E. Simms. (2003). The influence of egocentrism and focalism on people's optimism in competitions: When what affects us equally affects me more. *Journal of Personality and Social Psychology,* 85(3), 389-408.

Appendix - Data Description

Dependent Variables

Definition of entrepreneurial activity

The GEM 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 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 (nascent)

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" (*nascent*=1) if, in addition to 1a and 1b, they answered "yes" to 2a and 2b, and "no" to 2c. In the original GEM dataset, this variable is abbreviated as "*suboanw*".

New entrepreneurs (newentr)

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 (new entrepreneurs), 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 who classify as full or part owners of the business and had received wages or salaries paid up to 42 months were coded as "new entrepreneurs" (*newentr*=1).

Established entrepreneurs (establ)

This variable is not part of the original GEM survey data and was computed by the authors for the purposes of this paper. *Establ* 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.

Independent Variables

All independent variables used in the analysis are described in Table A1. All items were part of the GEM adult population survey questionnaire and were asked to all respondents, independently from their involvement in entrepreneurial activities. The socio-demographic variables *working status*, *household income*, and *education* 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.

Table A1: Variable definition and un-weighted descriptive statistics, GEM data

Variable (corresponding survey question)	Value	Relative Frequency
Gender	Male	48%
	Female	52%
Knowent (Do you know someone personally who started a business in the past 2 years?)	Yes	34%
	No	65%
	Refused	2%
Opport (In the next six months will there be good opportunities for starting a business in the area where you live?)	Yes	23%
	No	61%
	Refused	16%
Suskill (Do you have the knowledge, skill and establence required to start a new business?)	Yes	36%
	No	59%
	Refused	5%
Fearfail (Would fear of failure prevent you from starting a new business?)	Yes	33%
	No	60%
	Refused	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%
	Same	49%
	Better	29%
	Missing	7%
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%
	Better	25%
	Missing	12%
Working status (Present working status of the individual)	Full / Full or part time	50%
	Part time only	7%
	Retired / disabled	10%
	Homemaker	10%
	Student	5%
	Not working: other	17%
	Missing	1%
Household income (Household income of the individual recoded into thirds relative to income distribution in the relevant country.)	Lowest 33%	26%
	Middle 33%	31%
	Upper 33%	21%
	Missing	22%
Education (Educational attainment of the individual.)	Some secondary schooling	27%
	Secondary degree	35%
	Post secondary degree	33%
	Grad exp	1%
	Missing	4%
Age – in 8 categories (What year were you born?)	14-17 yrs old	2%
	18-24 yrs old	13%
	24-34 yrs old	19%
	35-44 yrs old	22%
	45-54 yrs old	18%
	55-64 yrs old	15%
	65-74 yrs old	8%
	75-84 yrs old	3%

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 established entrepreneurs, 2001

Probit regressions	Y = nascent entrepreneur		Y = new entrepreneur		Y = established entrepreneur	
	Model 1a	Model 1b	Model 2a	Model 2b	Model 3°	Model 3b
	dF/dx** in %	dF/dx** in %	dF/dx** in %	dF/dx** in %	dF/dx** in %	dF/dx** in %
Russia	-2.5*	-0.9	0.1	0.5	-1.8*	-1.3*
Hungary	0.8	1.9*	0.0	0.0	0.2	0.3
Italy	0.5	0.9	-0.4	1.2*	-0.5	1.1
Denmark	-1.8*	-1.1*	-0.3	-0.1	-0.4	0.3
Sweden	-2.3*	-1.5*	-0.7*	-0.3	-0.1	0.3
Poland	-0.1	2.4*	0.0	1.3*	-0.4	1.0*
Germany	-1.6*	0.9*	-0.4	0.3	-1.0*	0.0
Argentina	2.1*	3.3*	0.0	0.2	-0.3	0.2
New Zealand	2.3*	1.7*	2.7*	1.4*	1.8*	1.3*
Singapore	-1.8*	2.0*	-0.4	0.5	-1.0*	0.3
Japan	-2.8*	1.3	-0.9*	1.3*	0.6	4.4*
Korea	0.4	3.8*	3.2*	5.3*	5.0*	8.1*
India	2.2*	2.8*	1.2*	1.4*	3.1*	3.9*
Canada	0.2	1.4*	0.4	0.6*	-0.9*	-0.3
Portugal	-1.9*	-1.0	-0.3	0.1	-0.6	-0.2
Finland	-1.6*	-0.3	-0.3	0.3	1.1*	2.2*
Israel	-3.8*	-2.5*	0.5	1.1*	-1.6*	-0.8
age14-17	-0.4	0.4	0.1	1.2	-0.5	0.4
age18-24	-0.3	0.0	-0.5*	-0.3	-1.4*	-1.0*
age35-44	0.0	0.3	-0.2	-0.1	1.6*	1.4*
age44-54	0.1	0.6	-0.4*	-0.2	2.7*	2.5*
age55-64	-1.1*	-0.2	-0.5*	-0.2	3.7*	3.3*
age65-74	-2.9*	-1.9*	-0.9*	-0.4	4.8*	5.7*
age75-84	-3.8*	-2.6*	-0.7	-0.7	0.0	0.6
Female	-2.4*	-0.9*	-0.9*	-0.3*	-1.2*	-0.4*
gemhhinc(middle 33% income)	-0.2	-0.4	0.5*	0.2	0.3	-0.1
gemhhinc(upper 33% income)	1.1*	-0.2	1.6*	0.5*	1.8*	0.9*
gemwork(part-time job only)	1.7*	1.7*	0.6*	0.4*	0.0	0.1
gemwork(retired/disabled)	-3.0*	-1.6*	-1.5*	-0.9*	-2.3*	-1.8*
gemwork(homemaker)	-2.3*	-1.2*	-1.9*	-1.2*	-2.8*	-2.0*
gemwork(student)	-2.5*	-1.8*	-1.5*	-1.0*	-2.2*	-1.7*

gemwork(not working:other)	-1.1*	-0.6*	-1.7*	-1.2*	-2.8*	-2.4*
gemeduc(secondary degree)	1.4*	0.9*	0.3	0.0	0.4*	0.3
gemeduc(post-secondary degree)	1.9*	0.7*	0.1	-0.3	0.1	-0.2
gemeduc(grad exp)	2.4*	0.8	0.1	-0.2	0.9	0.3
knowent(yes)		2.2*		1.2*		0.5*
fearfail(yes)		-1.3*		-0.5*		-0.9*
suskill(yes)		5.6*		2.6*		3.9*
opport(yes)		2.8*		0.6*		0.4*
ctrfutur(same)		-0.4		-0.2		-0.4*
ctrfutur(better)		-0.7*		-0.2		-0.4*
famfutur(same)		0.7*		0.0		0.0
famfutur(better)		2.8*		0.3		-0.1
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 - Unweighted ratios for the dependent variables in 18 countries, 2001

Country	Nascent entrepreneurs in %	New entrepreneurs in %	Established entrepreneurs in %	Ratio established / nascent entrepreneurs	Ratio established / new entrepreneurs	N
NZ – New Zealand	8.9	6.2	7.4	0.8	1.2	1,960
IN – India	8.6	3.4	6.9	0.8	2.0	2,011
HU – Hungary	7.6	3.7	5.6	0.7	1.5	2,000
AR – Argentina	7.5	2.5	3.3	0.4	1.3	1,992
KR – South Korea	7.0	6.8	9.6	1.4	1.4	2,008
IT – Italy	6.6	1.7	2.8	0.4	1.6	1,973
US – United States	6.5	2.9	5.5	0.8	1.9	2,954
CA – Canada	6.1	3.2	3.3	0.5	1.0	1,939
PL – Poland	5.0	2.2	3.9	0.8	1.8	2,000
D – Germany	4.2	1.9	3.5	0.8	1.8	7,058
SG – Singapore	4.0	2.1	3.0	0.8	1.4	2,004
DK – Denmark	3.7	2.3	5.2	1.4	2.3	2,022
P – Portugal	3.6	3.2	4.4	1.2	1.4	2,000
FIN – Finland	3.2	1.9	6.2	1.9	3.3	2,001
S – Sweden	3.2	1.9	5.4	1.7	2.8	2,056
RU – Russia	3.0	3.0	1.1	0.4	0.4	2,012
JP – Japan	2.3	0.7	5.3	2.3	7.6	2,000
IL – Israel	0.6	3.4	1.1	1.7	0.3	2,055
Total	5.0	2.8	4.5	1.1	1.6	42,045

Table 3 - Sufficient skill perceptions by country, 2001

Country	suskill in % of respondents saying "yes"
NZ – New Zealand	61
HU – Hungary	56
AR - Argentina	55
US – United States	55
CA – Canada	50
IN – India	44
PL – Poland	42
SG – Singapore	42
D – Germany	37
DK – Denmark	34
P – Portugal	34
FIN – Finland	31
IT – Italy	31
IL – Israel	30
RU – Russia	30
KR – South Korea	27
S – Sweden	24
JP – Japan	11
Total	38

Table 4 - Correlation of sufficient skill perception (*suskill*) and educational attainment (*gemeduc*), 2001

Educational attainment level	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 5 - Group-means of sufficient skill perception (*suskill*) by educational attainment (*gemeduc*) in all countries, 2001

Sufficient skill perception in %								
	Overall	Russia	Hungary	Italy	Denmark	Sweden	Poland	Germany	Argentina
Some secondary schooling	31	21	38	13	22	33	11	25	47
Secondary degree	37	22	62	25	40	41	40	30	64
Post secondary schooling	43	38	74	36	44	49	63	34	61
Grad establence	67		84						33
Overall	38	30	56	31	38	42	34	29	55
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)

Sufficient skill perception in %								
	New Zealand	Singapore	Japan	Korea	India	Canada	Portugal	Finland	Israel	USA
Some secondary schooling	59	17	5		34	32	38	31	13	42
Secondary degree	62	21	10	25	51	45	44	37	28	49
Post secondary schooling	65	33	13	31	59	58	52	33	35	62
Grad establence	60		44		54	67				66
Overall	61	24	11	27	44	50	42	34	30	56
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 6 - Test for different means of perceptual variables among nascent entrepreneurs and established entrepreneurs, 2001

Variable	Group	N	Mean in % of group respondents saying "yes"	Chi-Squared-Test that means are equal (Sign.)
Knowent	Established entrepreneurs	1,864	52	0.000
	Nascent entrepreneurs	2,086	62	
Opport	Establisched entrepreneurs	1,654	37	0.000
	Nascent entrepreneurs	1,867	52	
Suskill	Established entrepreneurs	1,837	79	0.020
	Nascent entrepreneurs	2,026	82	
Fearfail	Established entrepreneurs	1,838	22	0.740
	Nascent entrepreneurs	2,043	22	

Table 7 – Stability of approximated survival rates and sufficient skill perceptions across countries, 2001 – 2005

Pearson correlation coefficients		Variable in t		
		Ratio established to nascent entrepreneurs (establ / nascent)	Ratio established entrepreneurs to new entrepreneurs (establ / newentr)	Sufficient skill perceptions (suskill)
Variable in	t + 1 (N = 107)	0.485***	0.607***	0.917***
	t + 2 (N = 76)	0.711***	0.667***	0.820***
	t + 3 (N = 55)	0.514***	0.677***	0.711***
	t + 4 (N = 23)	0.755***	0.692***	0.654***
* denotes 2-sided significance at 90% confidence ** denotes 2-sided significance at 95% confidence *** denotes 2-sided significance at 99% confidence				

Table 8 – Correlation of sufficient skill perceptions and approximated survival rates across countries, 2001-2005

	Ratio established entrepreneurs to nascent entrepreneurs (establ / nascent)		Ratio established entrepreneurs to new entrepreneurs (establ / newentr)		Established entrepreneurs, % of pop (establ)	
	Pearson correlation	Random effects coefficient	Pearson correlation	Random effects coefficient	Pearson correlation	Random effects coefficient
suskill (40 countries, 158 obs.)	-0.262***	-0.014	-0.331***	-0.021**	0.482***	0.111***
suskill (t-1) (37 countries, 107 obs)	-0.285***	-0.029***	-0.277***	-0.023**	0.548***	0.089***
suskill (t-2) (33 countries, 76 obs)	-0.290***	-0.040**	-0.252**	-0.021	0.559***	0.091***
suskill (t-3) (33 countries, 55 obs)	-0.390***	-0.045**	-0.398***	-0.025*	0.324**	0.047
suskill (t-4) (23 countries, 23 obs)	-0.340	n/a	-0.566***	n/a	0.319	n/a

Note: calculations based on the % of a population saying that they have the sufficient skills, knowledge and establence to start a business (suskill = "yes").
* denotes 2-sided significance at 90% confidence
** denotes 2-sided significance at 95% confidence
*** denotes 2-sided significance at 99% confidence