

Perceptual Variables and Nascent Entrepreneurship

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ABSTRACT. Using a large sample of individuals in 28 countries, we investigate what variables are significantly correlated with an individual's decision to become an entrepreneur. Following existing literature in economics, we link such a decision to demographic and economic characteristics. In addition, we argue that perceptual variables such as alertness to opportunities, fear of failure, and confidence about one's own skills are also important. Our results suggest that perceptual variables are significantly correlated with new business creation across all countries in our sample and across gender. Although our data do not allow the identification of causal relationships, our findings suggest that, when making decisions, nascent entrepreneurs rely significantly on subjective and often biased perceptions rather than on objective expectations of success. Thus, perceptual variables should be included in economic models of entrepreneurial behavior.

KEYWORDS: Entrepreneurship, nascent entrepreneurship, perceptual variables.

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1. Introduction

In recent years, most of the economics literature related to entrepreneurship has focused on employment choices and on the alternative motivations that cause some individuals to become entrepreneurs. In this type of studies, an individual's decision to become an entrepreneur is the result of a maximization process in which the individual in question compares the returns from alternative income producing activities and selects the employment opportunity with the highest expected return (Kihlstrom and Laffont 1979; Leazar, 2002; Minniti, 2004).

Empirical studies in economics have also emphasized entrepreneurship as an employment choice. As a result, they have established demographic and economic factors such as education, age, wealth, and work situation to be important drivers of entrepreneurial behavior. We complement this approach by incorporating additional variables whose importance for entrepreneurial behavior has been established in the psychology and sociology literature. In other words, we argue that, in addition to the variables described above, when making decisions with respect to their employment, individuals also consider a set of subjective perceptions about entrepreneurship that they form based on the presence of role models, confidence in one's skills and ability, risk propensity, and alertness to unexploited opportunities. After all, entrepreneurship is about people. Thus, we add a set of variables describing personal perceptions and judgements about the environment that, although often biased, are nevertheless highly correlated with an individual's decision to start a new business. We call these factors *perceptual variables*.

The complementarities between many of the demo-economic variables and the perceptual variables draw attention to the fact that the decision

to start a new firm is a complex multi-layered process contingent, to a large extent, upon the context in which the actions are taken. Thus, in addition to personal characteristics, we include the individual's environment as a further component of entrepreneurial behavior and consider the possibility of country specific effects.

Our results suggest that *perceptual variables* have an impact on new business creation across all countries in our sample. In fact, our analysis suggests that subjective perceptions about one's own skills, likelihood of failure, existence of opportunities, and knowledge of other entrepreneurs, are all highly correlated to the decision to start a new business. Although our data do not allow us to clearly establish the causal direction of the relationship, they do suggest that entrepreneurs tend to rely relatively more on subjective perceptions than on objective expectations.

Our data are very well suited for the study of nascent entrepreneurs because they provide information about individuals who are in the process of starting a new business at that particular point in time and are not, like most other data sets, the results of the ex post evaluations of past decisions of successful entrepreneurs. Also, because of the standardization of the collection process, our data allow us to establish what factors are correlated with entrepreneurial behavior regardless of macroeconomic conditions and to what extent country effects are significant. To our knowledge, very few empirical studies have combined the insight that potential entrepreneurs react to economic

incentives with the insight that subjective perceptions also influence their behavior (Cooper et al., 1988; Busenitz and Barney, 1997; Koellinger et al., 2004). Our paper contributes to the elimination of this gap in the literature by providing a more accurate analysis of what variables are significant in the *make up* of nascent entrepreneurs, and by suggesting that perceptual variables matter and should be included in analytical models of entrepreneurial behavior.

2. Theoretical background

Table I provides a simple classification of several representative works on entrepreneurial motivation according to the variables included in the study.¹

Our study of nascent entrepreneurship includes demographic and economic characteristics of the individual, perceptual variables based on subjective judgements of the individuals, and aggregate variables summarizing the environment in which individuals make decisions. In the following section we review existing literature for each of these three groups of factors.

2.1. Demographic and economic characteristics

Entrepreneurship tends to be a young man's game. Levesque and Minniti (in press) have shown theoretically that the relationship between *age* and the likelihood of starting a new business picks at a relatively early age and decreases

TABLE I
Representative works grouped by variables included in the study

Demographic and economic variables	Aggregate variables	Perceptual variables	Demo-economic and aggregate variables	Demo-economic and perceptual variables	Demo-economic, aggregate and perceptual variables
Blanchflower (2004)	Acs et al. (1999)	Busenitz and Barney (1997)	Acs and Audretsch (1993)	Davidsson and Honig (2003)	Minniti and Arenius (2005)
Blanchflower and Oswald (1998)	Carree et al. (2000)	Cooper et al. (1988)	Thurik et al. (2002)	Delmar and Davidsson (2000)	
	Chell and Baines (2000)	Weber and Milliman (1997)			
Taylor (1996)	Wennekers and Thurik (1999)				

thereafter. Consistently, Reynolds et al. (2003) have found empirical evidence showing individuals between 25 and 34 years of age to be the most likely to be nascent entrepreneurs. Also, Blanchflower (2004) suggests that, although the probability of being an entrepreneur is highest among older individuals, the likelihood of being a nascent entrepreneur is maximized among young individuals.

In recent years, *gender* differences in entrepreneurial behavior have been also the subject of a significant amount of attention. Brush (1990, 1992) observed that men and women entrepreneurs differ very little with respect to demographic and psychological variables, while more pronounced differences seem to exist in business goals and management styles. Similarly, Lango-witz and Minniti (2005) found that the factors influencing female and male entrepreneurship tend to be the same. In spite of these similarities, women participation rates in entrepreneurship are systematically below those of men. Greene (2000) provides a possible answer to this puzzle by suggesting the existence of differences in average human and social capital.

In the theoretical literature in economics, *education* is often treated as a proxy for human capital and an engine of innovation. Entrepreneurs, however, are often modeled as possessing a broad range of talents but no advanced education in any specific area (Murphy et al., 1991; Leazar, 2002). Consistently with the theory, the relationship between education and new firm formation is uncertain, except for richer countries where post graduate training has been shown to have positive effects on high-tech start-up rates (Blanchflower, 2004). The uncertainty surrounding education is due in part to the fact that education levels have primarily a contextual significance and in part to the variety of meaning attributed to the word entrepreneurship.²

Since in economics, entrepreneurship is often treated as a *work status* choice, a sizable amount of research exists on the relationship between an individual's decisions to become an entrepreneur and the availability of employment options.³ In general, there is agreement that employed individuals are more likely to start new businesses. Less agreement, instead, exists about the relationship between aggregate unemployment and

entrepreneurial decisions. In fact, it is not clear whether high unemployment discourages entrepreneurship by reducing its potential markets or increases it by providing an income producing activity for otherwise displaced workers (Blanchflower, 2004).

Finally, economists have discussed the importance of financial resources and constraints on entrepreneurial decisions (Kihlstrom and Laffont, 1979; Evans and Jovanovic, 1989). In their work, entrepreneurial decisions are shown to be positively related to individuals' *household incomes*. Overall, the evidence suggests that entrepreneurs face liquidity constraints and that individuals with greater family wealth are more likely to switch from employment to entrepreneurship.

2.2. *Perceptual variables*

We complement the group of variables above, by adding four *perceptual variables*. That is, factors describing subjective perceptions and beliefs of the individual but not reflecting necessarily objective circumstances. Unlike demographic and economic characteristics, *perceptual variables* and their impact on entrepreneurship have received less attention from economists. This is in part due to the paucity of available data, and in part to the difficulty of embedding such variables into standard neoclassical models. Nevertheless, the emphasis on perceptions and beliefs is not new in economics and an increasing number of scholars agree that *opportunity perception* is the most distinctive and fundamental characteristic of entrepreneurial behavior (Kirzner, 1973, 1979).

The psychology literature has established the importance of *confidence in one's skills and ability* for entrepreneurial behavior. The decision to start a new business has been related to the presence of intentionality and locus of control (Baron, 2000). Starting a new firm is an intentional act that involves repeated attempts to exercise control over the process in order to achieve the desired outcome (Gartner, 1985). In economics, Harper (1998) argues that an internal locus of control increases the link between entrepreneurial alertness and self-efficacy and, therefore, leads to the creation of more new firms.

The relationship between entrepreneurship and *fear of failure* has received some attention from

economists who have considered the relationship between entrepreneurial decisions and risk aversion (Kihlstrom and Laffont, 1979). The intuition is that since most individuals are risk averse and since the perceived (rather than objective) fear of failure is an important component of the risk attached to starting a new business, a reduced perception of the likelihood of failure should increase the probability that an individual will start a new business (Weber and Milliman, 1997).

Finally, works in various social sciences have established the importance of *knowing other entrepreneurs* for entrepreneurial decisions. In psychology, for example, Baron (2000) and Begley and Boyd (1987) have discussed the importance of role models because of their ability to enhance self-efficacy. In economics, Minniti (2004) has discussed increases in individuals' confidence generated by the presence of role models and their ability to reduce ambiguity. Similarly, in sociology, Aldrich (1999), among others, has discussed the role of personal networks and their ability to enhance entrepreneurial confidence by providing advice, support and examples.⁴

2.3. Aggregate factors

It has been shown that entrepreneurial decisions differ also because of the environment in which they are taken (Chell and Baines, 2000). Jack and Anderson (2002), for example, argue that new firm creation is not merely an economic process but it is embedded in a specific environment. Thurik et al. (2002) provide a detailed analysis of aggregate conditions influencing nascent entrepreneurship and argue that technology, level of economic development, culture, and institutions all influence the demand for entrepreneurship by creating opportunities available for start-ups. In addition, they suggest that cultural and institutional conditions have an impact also on the supply of entrepreneurship because of their ability to influence the skills, resources and preferences of individuals within the population. Consistently with their analysis, empirical studies suggests that significant differences exist in the levels of new firm creation across countries and over time (Reynolds et al., 2003; Blanchflower, 2004) and that country effects may be quite important for entrepreneurial decisions (Acs and Audretsch,

1993). Thus, in addition to economic, demographic and perceptual factors, we consider the importance of the macroeconomic environment on entrepreneurial decisions by introducing the possibility of *country effects*.

3. Data and Method

Data used in the paper are from the Global Entrepreneurship Monitor (GEM) project. Using population samples, the GEM project estimates the prevalence rates of nascent and new businesses across several countries.⁵ The data used in this paper were collected during spring 2002.⁶ In each country, a standardized survey was administered to a representative sample of adults (18–64 years old) yielding a cross-country total of 80,117 individuals.⁷ The sample size varied from 972 individuals in Mexico to 12,837 in the UK. Because of individual-level missing data, 51,721 respondents were included in our final sample.⁸ In order to draw conclusions generalizable to the populations, raw data were given appropriate weights to match each country sample with the age and gender structure of the 2002 U.S. Census International Database.⁹

To identify individuals in the process of starting a business, respondents were asked: "You are, alone or with others, currently trying to start a new business, including any self-employment or selling any goods or services to others?" Respondents who answered "yes" were asked two additional questions. These questions were used to separate those who were truly committed to a new venture from those thinking about but not yet committed to it. These questions inquired (1) "Over the past twelve months have you done anything to help start a 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?" and (2) "Will you personally own all, part, or none of this business?" Only those respondents, who answered "yes" to the first question and "all" or "part" to the second question, were coded as *nascent entrepreneurs*. A total of 3,625 nascent entrepreneurs were identified in the sample. The nascent entrepreneur prevalence rate averaged 4.5 across the 28 countries in our sample, ranging

from a low of 1.0% in Japan to a high of 14.9% in Mexico.¹⁰

Our study consists in presenting a set of alternative models estimating the likelihood of an individual being a nascent entrepreneur given the following independent variables:

Age: The respondents were asked to provide their year of birth.

Gender: The respondents were asked to provide their gender.

Education: The respondents were asked to provide the highest degree they had earned. Their responses were harmonized across all 28 countries into a five-category variable. The five categories are “No education”, “Some secondary education”, “Secondary degree”, “Post secondary education”, and “Graduate degree”. In the logistic regression analysis, the “Secondary degree” category is used as the reference category. That is, we compared if those with levels of education others than secondary degrees were more or less likely to report trying to start a business than those holding a secondary degree.

Work status: The respondents were asked to provide their occupational status. The response categories were “Full or part time work”, “Not working”, and “Retired or student”. In the logistic regression analysis, “Full or part time work” is used as the reference category. That is, we compared if those working full or part time were more or less likely to report trying to start a business than those reporting other situations as their work status.

Household income: Respondents were asked to provide information about their household income. Data were classified into three groups, namely in the upper, middle or lower third of the income distribution of the country of origin. In the logistic regression analysis, the middle income group is used as the reference category.

Opportunity perception: 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.

Knowing other entrepreneurs: Respondents were asked whether they knew personally someone who had started a business in the two years preceding the survey.

Confidence in one's skills: Respondents were asked whether they believed to have the knowledge, skill and experience required to start a new business.

Fear of failure: The respondents were asked whether fear of failure would prevent them from starting a business.

For each of the four perceptual variables, responses were coded as binary variables with 2 indicating a yes response and 1 indicating a no response.

A correlation matrix for the variables was computed and is presented in Table II. Eight of the nine predictor variables have a strong correlation ($p < 0.001$) with our nascent entrepreneur measure. Table II shows that the likelihood of being a nascent entrepreneur decreases with age ($r = -0.051$). Also male respondents are shown to be more likely to be nascent entrepreneurs than female respondents ($r = -0.069$). In addition working respondents are more likely to qualify as nascent entrepreneurs than their non-working, student, or retired counterparts ($r = 0.045$). As expected, opportunity perception ($r = 0.165$), confidence in one's skills ($r = 0.204$), and knowing other entrepreneurs ($r = 0.157$) are positively related to being a nascent entrepreneur, whereas fear of failure ($r = -0.059$) is negatively correlated with our nascent entrepreneur measure. Table II also alerts us to the presence of collinearity among the independent variables.

Since our dependent variable is a binary variable, we analyze our data by employing binominal logistic regression models. The binominal logistic regression estimates the probability of an event happening. In our case, the event is being a nascent entrepreneur. Maximum likelihood estimations were used to calculate the logit coefficients which denote changes in the log odds of the dependent variable. We assessed the goodness of fit of the models using the Pearson Chi-square test, the rate of correct classifications and the pseudo R^2 . The significance of individual independent variables was tested using the Wald statistics.

We estimated five binominal logistic regression models. In each of them, the dependent variable is whether the respondent is a nascent entrepreneur, that is if he or she was actively trying to start a business (YES = 1 if the respondent

TABLE II
Correlation table

	Mean	N	1	2	3	4	5	6	7	8	9
1 Nascent	0.04	80116	0.04								
2 Age	39.49	79879	-0.051 ***	39.490							
3 Gender	1.50	80116	-0.069 ***	0.015 ***							
4 Work status	2.34	78892	0.045 ***	-0.027 ***	-0.200 ***						
5 Education	3.47	78400	0.004	-0.085 ***	0.009 *	0.073 ***					
6 Household income	2.06	65746	-0.031 ***	0.001	0.039 ***	-0.047 ***	0.023 ***				
7 Opportunity perception	0.26	67464	0.165 ***	-0.039 ***	-0.090 ***	0.083 ***	0.004	-0.061 ***			
8 Confidence in one's skills	0.40	77204	0.204 ***	0.031 ***	-0.184 ***	0.153 ***	0.024 ***	-0.089 ***	0.231 ***		
9 Fear of failure	0.33	76869	-0.059 ***	-0.014 ***	0.052 ***	0.000	-0.019 ***	0.059 ***	-0.039 ***	-0.110 ***	0.33
10 Knowing other entrepr.	0.34	78852	0.157 ***	-0.104 ***	-0.124 ***	0.098 ***	0.012 ***	-0.082 ***	0.222 ***	0.253 ***	-0.012 ***

qualified as being involved in a new venture, 0 otherwise). In Model 1, we test the connection between standard demographic and economic characteristics and the likelihood of a person being a nascent entrepreneur. In Model 2, we add perceptual characteristics to the variables used in Model 1. In Model 3, we test the connection between the likelihood of being a nascent entrepreneur and perceptual variables only. Model 3 was created primarily to address, though only indirectly, the collinearity issue. In Model 4, we explore more in details the influence of perceptual variables. In fact, Model 4 is a modified version of Model 2 in which we include interaction terms between *gender* and all other variables. By distinguishing between men and women, Model 4 provides some information on the generality of the impact of various demographic, economic and perceptual characteristics across our sample. Finally, in Model 5, we consider the possibility of specific *country effects* by adding dummy variables to the variables in Model 2. All models are built using pooled data (i.e. both men and women) across all 28 countries. Logistic regression results are presented in Table III for all five models.

4. Results and Discussion

In Model 1, shown in Table III, we entered variables measuring the five demographic and economic characteristics of the respondent. Consistently with existing literature, our results suggest that an individual's demo-economic make-up is quite important for understanding her likelihood of starting a new business. The chi-square shows that the overall model is significant at the 0.000 level and it predicts 95.4% of the responses correctly. All variables are significant.

Overall, we find that entrepreneurship is a young man's game. The coefficients of *age* and *gender* show a negative and significant relationship with the prevalence of nascent entrepreneurs. This is consistent with existing empirical and theoretical literature showing that the relationship between age and the likelihood of starting a new business picks at a relatively early age and decreases thereafter (Levesque and Minniti, forthcoming). The odds ratio for *gender* is 0.55 with a 95% confidence interval of [0.50, 0.59].

This suggests that women are only half as likely to start a new business as men and is consistent with previous empirical findings (Reynolds et al., 2003). Work status is related to the likelihood of being a nascent entrepreneur. In particular, working individuals are shown to be more likely to be nascent entrepreneurs than people in other occupational groups.¹¹ This is consistent with the observation that many people start new businesses while still holding on to a wage job.

Education is also positively related to the likelihood of starting a new business. In particular, our results suggest that the likelihood of being nascent entrepreneurs increases steadily as individuals have higher levels of education.¹² This result may be in part justified by the countries included in our sample. It is also consistent with Davidsson and Honig (2003), who link greater human capital with increased opportunity perception and an increased likelihood of entrepreneurial activity. Finally, *household income* is associated with the likelihood of starting a new business. As higher levels of income are considered, the relationship between nascent entrepreneurship and household income can be depicted as a U-shaped curve.¹³ At low income levels, starting a new business may provide access to high expected returns or simply the possibility of employment when standard labor markets fail. At high income levels, instead, household income reduces individuals' financial barriers and increases their likelihood of starting a new business.

In Model 2, four *perceptual variables* are added to the demo-economic ones included in Model 1. According to the block chi-square statistics ($p < 0.000$), Model 2 is better than Model 1 in explaining the probability of an individual being a nascent entrepreneur. In Model 2, the importance of *age*, *gender*, and *work status* is virtually unchanged.¹⁴ Both *education* and *household income*, on the other hand, appear to be less relevant. All four *perceptual variables* are highly significant.

In particular, *knowing other entrepreneurs* is positively and significantly related to being a nascent entrepreneur.¹⁵ The positive impact of knowing an entrepreneur might be explained by the fact that role models and being part of networks reduce ambiguity and provide

information for new entrepreneurs (Weber and Milliman, 1997). A different interpretation could take into account that the *knowing other entrepreneurs* variable does not differentiate between positive and negative examples. In either case, however, direct observations of other entrepreneurs reduce the ambiguity and uncertainty associated with entrepreneurial activity thereby encouraging it (Minniti, 2005). *Opportunity perception* is also positively and significantly related to being a nascent entrepreneur.¹⁶ The positive impact of this variable is easily reconciled with the economic theory of entrepreneurship according to which alertness to unexploited opportunities is a necessary condition for entrepreneurial action (Kirzner, 1973, 1979).

Confidence in one's skills is positively and significantly related to being a nascent entrepreneur. The coefficient on the variable has a Wald statistics equal to 914.04 which is significant at the 0.000 level. The "odds ratio" for the *confidence in one's skills* variable is 6.32 with a 95% confidence interval of [5.61, 7.12]. This suggests that those who perceive themselves as possessing the necessary skills are almost 6.4 times more likely to be nascent entrepreneurs than those who do not believe to have the necessary skills. Thus, *confidence in one's skills* emerges as the single most important component of the decision to start a new business (Koellinger et al., 2004). Our findings of the positive and very strong influence of this variable are consistent with the psychology literature on intentionality and self-efficacy (Baron, 2000). They are also consistent with expectancy theory, which suggests that an individual's belief about her ability to perform the task (being an entrepreneur) and the consequence of that task (to produce income and other non-monetary rewards) affect whether or not she will undertake the task at all.

Finally, *fear of failure* has a negative and significant impact on being a nascent entrepreneur.¹⁷ The negative connection between this variable and the likelihood of being a nascent entrepreneur is consistent with Weber and Milliman's (1997) suggestion that an increased perception of the probability of failure reduces entrepreneurial incentives by increasing the perceived riskness of starting a business.

TABLE III
Logistic regression results: Dependent variable = YES (nascent entrepreneurs)

	Model 1		Model 2		Model 3		Model 4		Model 5	
	Coefficient (std. error)	Wald	Coefficient (std. error)	Wald	Coefficient (std. error)	Wald	Coefficient (std. error)	Wald	Coefficient (std. error)	Wald
<i>Demographic and economic variables</i>										
Age	-0.022*** (0.002)	158.192	-0.023*** (0.002)	152.689			-0.028*** (0.006)	24.397	-0.019*** (0.002)	98.815
Gender	-0.611*** (0.043)	197.819	-0.212*** (0.046)	21.594			-0.348 (0.207)	2.824	-0.247*** (0.046)	28.455
Work status										
Working										
Not working	-0.157** (0.058)	92.245*** 7.451	0.074 (0.060)	46.111*** 1.486			0.321 (0.190)	2.970 2.865	-0.058 (0.062)	36.388*** 0.882
Retired or student	-0.971*** (0.103)	89.349	-0.685*** (0.105)	42.238			-0.047 (0.319)	0.023	-0.649*** (0.108)	36.282
Secondary degree		85.281***		3.897				8.356		13.215*
None	-0.875* (0.417)	4.403	-0.628 (0.424)	2.195			2.497 (2.391)	1.091	-1.123** (0.429)	6.838
Some secondary	-0.135* (0.054)	6.134	-0.044 (0.057)	0.600			-0.413* (0.171)	5.857	-0.165** (0.061)	7.237
Post secondary	0.300*** (0.049)	38.185	0.040 (0.051)	0.618			-0.026 (0.152)	0.029	-0.052 (0.054)	0.942
Graduate experience	0.432*** (0.104)	17.175	0.110 (0.108)	1.027			-0.292 (0.326)	0.806	-0.019 (0.114)	0.026
Household income		18.431***		7.314*				3.043		1.282
33% tile										
Upper	0.203*** (0.047)	18.374	-0.009 (0.049)	0.030			-0.045 (0.148)	0.091	0.025 (0.051)	0.247
33%tile										
Lowest	0.110* (0.055)	4.025	0.137* (0.057)	5.700			0.249 (0.173)	2.074	0.0367 (0.059)	1.280
33%tile										
<i>Perceptual variables</i>										
Knowing other entrepr.										
Opportunity perception			0.864*** (0.047)	344.770	0.939*** (0.046)	420.373	1.037*** (0.141)	54.322	0.872*** (0.048)	334.254
Confidence in one's skills			0.835*** (0.043)	369.443	0.855*** (0.043)	393.453	0.706*** (0.130)	29.268	0.883*** (0.045)	381.528
Fear of failure			1.844*** (0.061)	914.041	1.838*** (0.060)	931.652	1.862*** (0.188)	98.058	1.773*** (0.062)	809.679
Gender Interaction Terms			-0.422*** (0.052)	67.027	-0.388*** (0.051)	57.523	-0.417** (0.155)	7.224	-0.446*** (0.053)	71.619
Age * gender								0.796 (0.004)		

*** significant at $p \leq 0.001$; ** significant at $p \leq 0.01$; *significant at $p \leq 0.05$.

Overall we find that the *perceptual variables* are powerful predictors of the likelihood of being a nascent entrepreneur. In fact, Model 2 suggests that the impact of the perceptual variables may be stronger than that of standard demo-economic variables. As mentioned before, although in Model 2 all four *perceptual variables* are highly significant, the importance of *education* and *household income* is reduced with respect to Model 1.¹⁸ Although Dolinsky et al. (1993) have argued that perceptual factors may mediate the effects of *education* and *household income*, we can only suggest that *perceptual variables* are important but have no evidence to rank their effects.

To address, at least in part, the collinearity issue, and provide more evidence about the importance of perceptual variables, we tested Model 3 and Model 4. In Model 3, only the four perceptual variables are included in the regression. All four are highly significant. A comparison of the coefficient on these four variables in Model 2 and Model 3 suggests that they are very similar and that the addition of demo-economic variables in Model 2 has very little effect on them. In Model 4, instead, we consider whether gender changes the relationship between our dependent variable and the independent variables by adding gender interaction terms. Our results in Model 4 suggest that the relationships between the likelihood of becoming a nascent entrepreneur and *age*, *household income*, and all *perceptual variables* do not depend on gender. Thus, consistently with existing literature (Brush, 1990, 1992; Langowitz and Minniti, 2005), our results suggest that there are only minor individual level differences between men and women, and that environment and institutional factors should be examined to explain the lower entrepreneurship rate for women.¹⁹

More important, Model 4 suggests that the relationship between the likelihood of becoming an entrepreneur and all perceptual variables does not depend on gender. Both men and women who know other entrepreneurs, who perceive the existence of good opportunities, and who feel they have the ability, skills, and knowledge required for starting a new business are more likely to do so than their counterparts with different perceptions. Finally, both men and women

who are less afraid of failure are more likely of being nascent entrepreneurs. These results seem to confirm the importance of perceptual variables as drivers of entrepreneurial behavior for both genders. We also assessed the reliability of our results by internal replication, i.e., running separate regression analyses for each country. Across all 28 regressions, knowing other entrepreneurs, opportunity perception and confidence is one's skills were significant positive predictors of being a nascent entrepreneur. Age, having some secondary education and fear of failure were consistently significant negative predictors of the likelihood of being a nascent entrepreneur. Work status and household income were not significant.

Finally, in Model 5, we test for the possibility of *country effects* by using *deviation coding*. Deviation coding allows us to compare each individual country against the mean for all countries. We constructed a dummy for each individual country (e.g., U.S.A. = 1 if country is U.S.A.; otherwise U.S.A. = 0) and selected Singapore as the reference country and coded it as -1 on all other country dummies. Singapore was selected because its nascent prevalence rate is 4.5% which is also the average across all 28 countries in our sample. We then entered all the country dummies at the same time into the regression analysis.²⁰ In Model 5, the effects of *age* and *gender* remain significant and negative. However, working and non-working respondents are equally likely to engage in nascent entrepreneurship. Furthermore, the positive effects of *post secondary* and *graduate experience* disappear. All perceptual variables remain highly significant. The coefficients for *opportunity perception*, *confidence in one's skills* and *knowing other entrepreneurs* are all significant and positive, whereas, as expected, *fear of failure* is negatively related to being a nascent entrepreneur. Finally, for 21 of the 28 countries, the country effect dummies are significant.²¹ Overall, Model 5 suggests that the introduction of country specific effects, though significant, does not reduce the cross-country importance of perceptual variables.

The fact that in 21 cases, the country effect dummies are significant suggests that local influences are at work. Consistently with existing literature (Acs and Audretsch, 1993; Thurik et al., 2002; Reynolds, 2003), our results, although very

preliminary, suggest that, given their characteristics, the macroeconomic environments of some countries are more conducive to entrepreneurial behavior while others penalize it. Clearly, the relationship between cross-country and country specific drivers of entrepreneurial behavior is a complex and important one and much more work is needed in this area.

Finally, even after all the country dummies are included, about 75% of the variance remains unexplained. Although this is not an unusual result in empirical economic research, it is worth further discussion. First, it is most likely that our study does not include all relevant variables. In particular, given the data available, our consideration of country specific effects is limited to the inclusion of dummy variables. This is far from satisfactory since we are not able to specify the nature of important cross-country differences. Second, perhaps the linear additive model is not the most appropriate conceptual structure for the study of nascent entrepreneurship. The latter issue has been partly addressed, among others, by Minniti (2005) who has shown the existence of non-linearities in the decision to start a new business.²²

5. Conclusions and extensions

In this paper, we use original data to estimate binominal logistic regression models based on a standard economic approach of gender neutrality in which economic and demographic variables are considered. We then add a set of relevant perceptual variables and, finally, country dummies to account for macroeconomic differences. Our results suggest that the addition of perceptual variables improves the statistical fit of the model. Entrepreneurship is, after all, about people and, not surprisingly, subjective and often biased perceptions emerge as being highly correlated to nascent entrepreneurship. To our knowledge, no previous model had incorporated perceptual variables at the individual level. Our results suggest that it is appropriate to do so.

Our most significant result is the finding that, across all countries and across genders, perceptual variables and, in particular, the perception that individuals have of their own entrepreneurial abilities are very important. Unfortunately, per-

ceptual variables reflect subjective perceptions rather than objective conditions. As a result, they are likely to be biased. There exists some evidence that distortions in perceptions are common among individuals in general, and among entrepreneurs in particular (Cooper et al., 1988; Busenitz and Barney 1997). 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 expected and actual returns to entrepreneurship and entrepreneurial decisions found in the literature (Hamilton, 2000) as well as the fact that many new businesses fail shortly after inception (Dunne et al., 1988, Geroski, 1995).

The data, unfortunately, does not allow us to establish the causal direction of the relationship. In other words, we cannot establish whether confidence in one's own skills, knowledge and ability is a driver of entrepreneurial behavior or if, instead, the start up process increases an individual perception of her own ability. Noticeably, however, the percentage of individuals who responded yes to questions concerning perceptual variables varies significantly when alternative groups are considered. Table IV shows that nascent entrepreneurs in our sample, as well as new (*babybus*) and more established entrepreneurs (*experienced*), are much more likely to respond affirmatively to questions about perceptual variables than respondents who are not active in starting or managing a business (*not active*). Also, using 2001 GEM data for 18 countries, Koellinger et al. (2004) confirm our result and show that the confidence associated with one's own skills and ability declines as more experienced entrepreneurs are considered. It is our hope that other studies will follow our explorative investigation and lead to an unambiguous understanding of how perceptions influence entrepreneurial behavior.

Should they be confirmed by further research, findings that perceptual variables are highly correlated to the likelihood of being a nascent entrepreneur are also important because of their potential policy implications. Perceptual factors such as opportunity recognition, knowing other entrepreneurs, and fear of failure, are all characteristics of the individual. They cannot be easily changed by exogenous interventions such as, for

TABLE IV
Responses to questions about perceptual variables (percentage reporting YES)

	Not active	Nascent	Babybus ^a	Experienced ^b
Opportunity perception	24.0%	58.2%	50.5%	37.9%
Confidence in one's skills	38.3%	86.5%	84.6%	81.7%
Fear of failure	33.6%	20.3%	19.0%	20.8%
Knowing other entrepreneurs	32.4%	68.4%	66.7%	53.4%

^a Babybus includes start-ups that have been in existence for more than 3 but less than 42 months.

^b Experienced includes start-ups that have been in existence for more than 42 months.

example, government policies. While the latter can alter an individual's incentives, inherent factors depend on her specific history. They are path-dependent and, as a result, do not change or change very slowly. Although perceptual variables do change over time, to alter the way in which individuals think about themselves and their role in society takes a long time. In fact, should the causal direction of the relationship be unambiguously established, that is, should further studies show that optimistic perceptions increase the likelihood of starting a new business, our results would imply that the entrepreneurial history of a community is important in determining a policy's effectiveness or lack thereof. The adjustment mechanism produced by government interventions is, itself, a path-dependent process. Therefore, the same policy may have very different results in different communities.

Differences in aggregate conditions such as technology, level of economic development, institutions, and culture all cause differences in opportunities, resources, skills and preferences with regard to entrepreneurship. Policies providing incentives schemes for new and small firms by removing impediments for business start-ups may suffer from decreased probabilities of new firm survival without achieving much transformation towards an entrepreneurial economy. On the other hand, the many small start-ups created in this way may function as a seedbed for a small number of successful and innovative new firms. Within this context, Thurik et al. (2002) argue that there is room for at least two types of policy intervention. The first type is policy aimed at promoting the creation of new technology-based firms in new

industries. The second type is policy aimed at providing newly created firms, irrespective of their industrial classification, with the financial, organizational and technological resources needed to grow in both domestic and foreign markets. This type of generic policy in particular promotes variation among new businesses, creating the basis for a selection process that may result in new products and approaches.

Finally, several extensions of our project are possible. First, although our empirical models are rooted in extant theoretical and empirical evidence in economics and other social sciences, it would be desirable to develop an analytical and comprehensive model of how, and why, individuals choose to start a business. Such a model could be very useful in studying the architecture of entrepreneurial decisions. In other words, in understanding how perceptual variables interact with the demo-economic profile of an individual and contribute to her decisions. Efforts in this direction could address theoretically the issues of non-linearities and of causality in entrepreneurial decisions. As a result, they could lead to more accurate empirical estimates of nascent entrepreneurship and its drivers, and contribute to improving the predictive ability of our model.

Second, an important component of our study is the introduction of country effects. Entrepreneurs do not make decisions in a vacuum. A growing body of recent literature has addressed explicitly the relationship between the entrepreneurial sector and the macroeconomy (for example, Acs et al., 1999; Wennekers and Thurik, 1999; Carree et al., 2000). In our models, the current treatment of country effects is

limited to the introduction of dummy variables. It would be desirable to include data on the role played by macroeconomic factors such as level of development, technological sophistication, institutions and culture (Thurik et al., 2002). The institutional framework, for example, is crucial in determining the quantity and quality of entrepreneurial behavior as it defines individuals' incentives to transform perceived opportunities into actions. Baumol (1990) argued explicitly that institutional arrangements affect the quantity and type of entrepreneurial efforts. Technology and level of development are also important. New technologies lead to new markets, thereby creating opportunities for new start-ups. Very often, new technologies also lead to reductions in transaction costs whose resulting scale effects allow smaller and newer firms to compete more effectively with incumbent ones. Finally, the level of development influences environmental opportunities by creating the needs for deeper markets and the more resources for nascent entrepreneurs.

Overall, our study suggests that individual perceptions matter and that richer descriptions of local institutions and public practices should be introduced in microeconomic models of entrepreneurial behavior. It is our hope that our work will encourage more accurate descriptions of individuals' choices in which decisions with respect to entrepreneurship are based not only on objective demo-economic factors but, also, on subjective and possibly mistaken perceptions.

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Notes

¹ Works listed in Table I are only a small sample of the vast literature existing on the causes and motivations of entrepreneurial behavior. Also, the scope of some of the listed works spans across more than one group of variables. In such a case they have been listed as part of the group in which they provide the strongest contribution.

² If entrepreneurship refers to the introduction of technological innovations, we would expect a positive correlation between post-secondary education and start-up rates. On the other hand, if entrepreneurship refers more broadly to the exploitation of market opportunities, we may expect people with little or no education to be penalized by traditional labor markets and to be more likely to start their own business.

³ In this context, however, entrepreneurship is often identified with self-employment though the two are clearly not identical (Amit et al., 1993).

⁴ Clearly, *knowing other entrepreneurs* is not only a perceptual variable. In addition to its contribution to the subjective perception that an individual forms about entrepreneurship, it may be also considered as an indicator of social capital. In the context of this paper, however, the latter is captured in the third group of variables.

⁵ Additional details about the GEM project may be found at www.gemconsortium.org

⁶ For our purposes, complete sets of data were available for 28 countries. Countries included in our sample are Argentina, Australia, Belgium, Canada, Chile, Croatia, Denmark, Finland, France, Germany, Hong Kong, Hungary, Israel, Japan, Korea, Mexico, Netherlands, Norway, Poland, Russia, Singapore, Switzerland, Slovenia, South Africa, Sweden, Thailand, UK, U.S.A.

⁷ All surveys were administered by phone, except in Russia, South Africa, Hungary, Mexico, and Thailand where they were conducted face-to-face.

⁸ An analysis of the individuals excluded from our final sample showed no significant differences between the two groups of respondents.

⁹ Details about the procedures used to collect and harmonize GEM data can be found in Reynolds et al. (2005).

¹⁰ For the nascent entrepreneurship prevalence rates in each country see Reynolds et al. (2003).

¹¹ The odds ratio for the *not working* variable is 0.86 with a 95% confidence interval of [0.78, 0.96]. This suggests that those who are not working are only nine tenth as likely to be nascent entrepreneurs as those working full-time. The odds ratio for the *retired or student* variable is 0.39 with a 95% confidence interval of [0.32, 0.47]. This suggests that those who are retired or students are only two fifth as likely to be nascent entrepreneurs as those working full-time.

¹² The odds ratio for the *no education* variable is .41 with a 95% confidence interval of [0.19, 0.86]. This suggests that those who have no education are only two fifth as likely to be nascent entrepreneurs as those with a secondary level degree. The odds ratio for the *some*

secondary variable is 0.90 with a 95% confidence interval of [0.81, 0.99]. This suggests that those who have some secondary level education are only nine tenth as likely to start a new business as those with a secondary level degree. The odds ratio for the *post secondary* variable is 1.36 with a 95% confidence interval of [1.24, 1.49]. This suggests that those who have post secondary education are 1.4 times more likely to become nascent entrepreneurs than those with a secondary level degree. The odds ratio for the *post secondary* variable is 1.58 with a 95% confidence interval of [1.31, 1.90]. This suggests that those who have a graduate degree are 1.6 times more likely to become nascent entrepreneurs than those with a secondary degree.

¹³ Those belonging to the highest income group are 1.2 times more likely to start a new business than those belonging to the middle income group. The odds ratio for the *Upper 33%* variable is 1.23 with a 95% confidence interval of [1.13, 1.34]. Those belonging to the lowest income third are 1.1 times more likely to become nascent entrepreneurs than those belonging to the middle income third. The odds ratio for the *Lowest 33%* is 1.14 with a 95% confidence interval of [1.03, 1.26].

¹⁴ The only exception is *not working* whose moderate importance is further reduced and for which we observe a sign switch. This result may indicate that the effects of perceptual variables may counteract some insecurity caused by a not working status.

¹⁵ The odds ratio for *knowing other entrepreneurs* is 2.37 with a 95% confidence interval of [2.17, 2.60]. This suggests that those who know an entrepreneur are 2.4 times more likely to become entrepreneurs than those who do not know an entrepreneur.

¹⁶ The coefficient of the *opportunity perception* variable has a Wald statistics equal to 369.45 which is significant at the .000 level. The odds ratio for *opportunity perception* is 2.31 with a 95% confidence interval of [2.12, 2.51]. This suggests that those who report perceiving opportunities are 2.3 times more likely to become nascent entrepreneurs than those who do not perceive opportunities.

¹⁷ The odds ratio for the *fear of failure* variable is .66 with a 95% confidence interval of [0.59, 0.73]. This suggests that those who fear failure are only two thirds as likely to become entrepreneurs as those who do not fear it.

¹⁸ This confirms the presence of collinearity already indicated by the correlation coefficients in Table III.

¹⁹ Only two interactions variables are significant. We find that retired women and female students are two thirds as likely to start a new business as retired men and male students, and that women with some secondary level education are more likely to start a new business than men with a similar level education. This is consistent with Lefkowitz (1994) who shows that men and women react similarly to the work environment when one controls for spurious effects caused by systematic differences in types of job and job payments.

²⁰ To provide information about Singapore, since the country was used as the reference in the deviation coding, we recoded the data using U.S.A. as the new reference

country and repeated the analysis. In both regressions, the demo-economic and perceptual variables have the same betas and the model's diagnostics are unchanged. The beta coefficients of some individual country dummies change slightly, their significance, however, remains unchanged.

²¹ To save space, Table IV does not include the coefficients for the dummy variables representing each country. However, Argentina, Canada, Chile, Germany, Korea, Mexico, Singapore, South Africa, Thailand and U.S.A. are countries where the likelihood of becoming a nascent entrepreneur is, on average, higher than in other countries. Thailand and Singapore emerge as countries where the likelihood of entrepreneurial activity appears to be particularly high. Countries, where on average, the likelihood of becoming a nascent entrepreneur is lower than the averages are Australia, Belgium, Denmark, Finland, France, Hungary, Israel, The Netherlands, Slovenia, Sweden, and UK. Country effects are not significant for Croatia, Hong Kong, Japan, Norway, Poland, Russia, and Switzerland.

²² Clearly, other reasons can account for the value of our R^2 . The composition of our sample (which includes both men and women) may be one of them. In fact, the variables investigated may be poor predictors of nascent entrepreneurship for women. Delmar and Davidsson (2000), for example, considered age, education, gender, parents employment status, management experience and attitude toward self-employment and found that while researchers have a reasonably good understanding of the characteristics associated with men going into business, the same variables do not succeed in predicting nascent entrepreneur status for women.

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