

Do skills variety influence entrepreneurial activity?

Evidence from PIAAC

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Abstract: In most European countries nearly two thirds of the adult population believe they do not have adequate skills to become an entrepreneur. The objective of this paper is to identify what skills characterize entrepreneurs using microdata from the Programme for the International Assessment of Adult Competencies (PIAAC). The predominant view in the literature argues that individuals with a diversified set of skills, gathered from various fields, are more likely to succeed as entrepreneurs than those who do not possess such a skill set. Our evidence supports this hypothesis of jack-of-all-trades not only for Employer Entrepreneurs but also for Solo Self-employed.

Keywords: Entrepreneurs, skills, jack-of-all-trades, PIAAC.

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1 Introduction

Entrepreneurship is capturing nowadays the attention of different governments for two reasons: first, due to the higher difficulties that young people face in their transition from education to the labour market during and after the great recession, and second, because there is a wide consensus that entrepreneurs positively contribute to innovate and to foster economic growth (Audretsch et al., 2006). However, a lack of entrepreneurship skills can be one of the most significant barriers to business creation. Figure 1 shows the proportion of the adult population who believe that they have the knowledge and skills to start a business and its relation with the proportion of the adult population who own an established business as provided by the Global Entrepreneurship Monitor 2015 data. From this figure we can see that there is a positive association between both measures: in those countries where there is a high proportion of the population who believe that they have the knowledge and skills to start a business, the proportion of entrepreneurs is also higher. In most European countries nearly two thirds of the adult population believe they do not have the right skills to become an entrepreneur. Taking this into account, educational policies are trying to promote those skills that will help young to be more able to adapt and to take advantage from the changing economic conditions through self-employment. However, from the literature (see, for instance, Simoes et al. 2016), it is not clear which skills should be promoted and whether they will have a positive effect or not on successful entrepreneurial activity.

The objective of our paper is to contribute to this literature trying to identify which skills characterize entrepreneurs, proxied by self-employed. With this aim, we analyse if the probability of becoming a self-employed is (partially) explained or not by the

endowments of skills of the population, an interesting issue as up-to-now traditional indicators of human capital have not shown the expected positive sign.

FIGURE 1

Our empirical analysis uses microdata from the Programme for the International Assessment of Adult Competencies (PIAAC), a survey that has been conducted by the OECD in 39 countries between 2011 and 2018. It assesses the proficiency of adults from age 16 onwards in literacy, numeracy and problem solving in technology-rich environments. The survey provides information on different skills use at work, as part of the job, in daily life and in relation to learning strategies. In addition, the survey collects a range of information on reading, writing and numeracy-related activities of respondents, as well as education, labour and family background variables.

The rest of the paper is structured as follows: first, the literature related to skills and entrepreneurship is summarised in section 2; next, we describe the data and present and discuss the obtained empirical evidence; last, the paper ends summarising the main findings.

2 Literature review

As highlighted by the OECD (2014, 2015), entrepreneurs face different barriers in order to start their activity. Two of the most relevant ones are the lack of financial capital and the lack of entrepreneurial skills (as already described in the previous section). Regarding the later, the literature has not found evidence of a strong link between traditional human capital measures and nascent entrepreneurs (Davidsson and Gordon, 2016). In fact, the meta-analysis by Unger et al (2011) reports low correlations between

traditional human capital measures and entrepreneurial success, but several studies have found evidence of the relevance of other type of skills. Table 1 shows the type of skills required by entrepreneurs according to the literature review carried out by the EC/OECD (2013).

TABLE 1

One of the most influential contribution in this context was done by Lazear (2002, 2003, 2004, 2005). Lazear argues that individuals with a diversified set of skills, gathered from various fields, are more likely to be self-employed than those who do not possess such a skill set. In contrast, paid employees benefit from being specialists in a certain area demanded by the labour market. In fact, the basic knowledge of entrepreneurs about everything is complementary to their employees' expert knowledge.

According to Stuetzer et al (2013), there are two theories explaining why entrepreneurs have more varied skills than employees: the investment hypothesis and the endowment hypothesis. The first one states that individuals purposely invest in a varied skill set by engaging a diverse education and working in different industries and jobs to acquire the skills required to start a business, a view clearly related to the human capital theory. Lazear (2005) identifies four possible ways to acquire more varied skills: past entrepreneurial experience, managerial experience, work experience in young and small firms that are characterized by the opportunity for employees to conduct a variety of tasks and, last, a varied curriculum in formal and informal education. On the opposite, the second argues that entrepreneurial talent or "taste for variety" drives the skill accumulation process, so it is an innate entrepreneurial endowment what leads individuals

to accumulate a more varied set of skills¹. Psychologists have already explored this second view. According to them, a person's personality structure could be indicative of success in entrepreneurial activities. In particular a lot of attention has been paid to the Big Five (extraversion, conscientiousness, openness to new experiences, agreeableness, and neuroticism), that according to the meta-analysis by Zhao and Seibert (2006) could be relevant factors.

The jack-of-all-trades view has been already tested by several researchers, including Lazear himself. Using longitudinal information from a sample of Stanford MBA alumni, he observed that individuals with more varied academic careers were more likely to become entrepreneurs. Analysing a large dataset for Germany, Wagner (2003, 2006) also found that performing different roles in the labour market was associated with larger probabilities of becoming self-employed, supporting Lazear's hypothesis. Astebro and Thompson (2011) for Canadian inventors, Backes-Gellner et al (2010) for employees in Switzerland, Bublitz and Noseleit (2014) for Germany are examples of other studies supporting Lazear's view.

However, in contrast to the majority of previous studies, using data for Germany, Lechman and Schnabel (2014) found only limited support to Lazear's theory. In particular, they find that an individual's probability of being an entrepreneur is only higher the larger the number of changes of profession if he/she is solo self-employed (but not if he employs other workers).

¹ In this context, the role of risk aversion and its relationship with the jack-of-all-trades theory has also been explored by Hsieh et al. (2017). They argue that if entrepreneurship is a more risky occupation than paid employment, and if individuals vary in their aversion to risk, then it follows that the least risk-averse people are most likely to become the entrepreneurs. However, as paid-employment requires a higher specialisation, the risk associated to this specific investment in human capital is also higher than acquiring balanced skills. Then risk-averse individuals who fear the loss of flexibility associated with highly specialized human capital may respond by diversifying their human capital investments. As a result, risk-averse people could ironically end up acquiring exactly the balanced skill sets which are especially conducive to entrepreneurship.

Last, Strohmeier et al (2017) have considered the gender dimension in the context of Lazear's jack-of-all-trades hypothesis. According to these authors, one of the key routes for acquiring a wide set of skills is by assuming a variety of multidimensional roles during the course of one's career. However, as women are more likely to experience career disruptions than men, they have lower exposure to a variety of different roles that will not allow them acquiring the same variety of skills than men.

Our analysis provides new evidence to this literature by considering a wide sample of countries (while most authors have focused on specific case studies) and different indicators on skills obtained through the PIAAC survey using a standardized questionnaire.

3 Empirical analysis

3.1 The data

The Programme for the International Assessment of Adult Competencies (PIAAC) is a survey which has been conducted by the OECD. Our study uses data from 34 countries taking part in Round 1², 2³ and 3⁴ of the programme carried out between 2008 and 2017.^{5,6} The initial dataset contains information about 221,901 individuals that is

² Round 1 (2008-2013): Belgium, Canada, Czech Republic, Denmark, Estonia, Finland, France, Germany, Ireland, Italy, Japan, Korea, Netherlands, Norway, Poland, Russian Federation, Slovak Republic, Spain, Sweden, United Kingdom, and United States.

³ Round 2 (2012-2016): Chile, Greece, Israel, Lithuania, New Zealand, Singapore, Slovenia, and Turkey.

⁴ Round 3 (2017): Ecuador, Hungary, Kazakhstan, Mexico and Peru.

⁵ Australia and Austria were also included in Round 1 but they are not considered in our study as detailed information on entrepreneurial activity is not provided for these two countries. Indonesia was also included in Round 2 but public data is not available. Data for the United States is also available for 2017, but only information from round 1 is considered in this study.

⁶ It is worth mentioning that an important limitation of PIAAC data in the context of our study is that it is only cross-sectional, so that unobserved heterogeneity and potential problems of endogeneity cannot be properly considered.

reduced to 61,391 observations once we focus on individuals working in the private sector with no missing information on the variables of interest.

The Survey of Adult Skills assesses the proficiency of adults from age 16 onwards in literacy, numeracy and problem solving in technology-rich environments. In addition, the survey collects a range of information on reading, writing and numeracy-related activities of respondents, as well as education, labour and family background variables. In our study, we consider the role of gender, age, foreign-born, marital status, having children or not, formal education, labour experience, work status, and country of residence, together with different indicators of skills. Details regarding variable definitions can be found in Annex 2 while summary descriptive statistics are shown in Annex 3.

We operationalize entrepreneurship as self-employment as many other studies (such as Wagner, 2003 or Hartog et al., 2010). Using self-employment as a measure of entrepreneurship is often criticized for including individuals who would not be considered entrepreneurs by other criteria. However, it is worth mentioning that in the specific context of our study, Astebro and Thompson (2011) found no significant difference in their results when entrepreneurship was measured via self-employment, business creation, or business ownership. In particular, we compare two different types of Self-employed with Employees: Solo Self-employed and Employer Entrepreneurs. According to this definition, in our dataset 81.6% of individuals are Employees, 11.1% are Solo Self-employed while 7.3% are Employer Entrepreneurs. Detailed figures at the country level are shown in Annex 4. We can see that cross-country differences are similar to the ones already discussed in the previous section when using GEM data. In particular, we can see that there is a sizeable variation across countries in the proportion of Solo Self-employed on private sector employment with values over 30% in countries like Peru, Ecuador and

Greece while in others like Japan, Estonia or Norway they are just above 5%. The variation is not so big in the proportion of Employer Entrepreneurs with a maximum of 17.3% in Greece and a minimum of 3.9% in Lithuania.

Regarding skills, it is not possible to find an exact equivalence between the skills listed in table 1 and the information collected by PIAAC. However, we have tried to follow a similar approach organising the information regarding skills that is provided by PIAAC into two groups: general skills and skills used at home⁷.

In respect to general skills, we analyse competences related to literacy and numeracy⁸. Specifically, these two domains are defined in the following way: Literacy is the ability to understand, evaluate, use and engage with written texts to participate in society, to achieve one's goals, and to develop one's knowledge and potential. Literacy encompasses a range of skills from the decoding of written words and sentences to the comprehension, interpretation, and evaluation of complex texts and Numeracy is the ability to access, use, interpret and communicate mathematical information and ideas in order to engage in and manage the mathematical demands of a range of situations in adult life. To this end, numeracy involves managing a situation or solving a problem in a real context, by responding to mathematical content/ information/ideas represented in multiple ways. As not all respondents are administered all the questions but a subset of the test items depending on their previous answers, Item Response Theory is used to assign final scores for each individual. In particular, ten plausible values of competence level in literacy and numeracy are provided for each respondent. In our analysis we use the first plausible value for each individual, although using the mean of the ten plausible

⁷ The PIAAC dataset also provides an assessment about skills used at a work, but this information is not used in order to avoid the potential problem of reverse causality (some skills are only used due to the fact that the considered individual is an entrepreneur).

⁸ PIAAC survey also considers competences in problem-solving, but as far as it was optional, some countries do not provide this information and, for this reason, we have not considered this dimension in our analysis.

values do not substantially change the results. Both indicators vary from 0 to 500 with higher levels indicating a higher competence in the considered dimension.

Regarding the skills used at home, we consider five different indicators that are derived from several items in the PIAAC questionnaire (see Annex 2): ICT at home; Numeracy at home; Reading at home; Writing at home and Readiness to learn. Perhaps the most interesting one in the context of our study is the last one. The indicator of readiness to learn summarises information on the following aspects: How often relate new ideas into real life; Like learning new things; Attribute something new; Get to the bottom of difficult things; Figure out how different ideas fit together; and, Looking for additional info. Each of these indicators are standardized in a way so that they have an average of 2 and a standard deviation of 1 with higher values indicating a more intensive use of the considered skills. These different aspects are clearly related to some of the personal entrepreneurial skills listed in table 1, while indicators on literacy and numeracy are more related to technical skills.

Last, we construct an indicator of diversity in skills' use for each individual by combining the information of general skills (literacy and numeracy) and the skills used at home (ICT at home; Numeracy at home; Reading at home; Writing at home and Readiness to learn) at the individual level. In order to avoid the problem of combining indicators with different metrics, first, we compute the quintiles for each of the seven indicators and assign a value 1 to 5 for each indicator based on these thresholds; second, we sum these values obtaining an overall measure of skills' use that varies from 5 to 35, with higher values indicating a more intensive use. By construction, the seven indicators are weighted equally. Next, we compute the share of each indicator i in the overall measure (s_{ij}) and obtain our diversity index for individual j by applying the following formula:

$$diversity_skills_j = \frac{1}{\sum_{i=1}^7 s_{ij}^2} \quad (1)$$

Consider one individual with equal values for each of the seven indicators. For instance, a value of 5 that means that he/she is in the highest quintile of use of every considered skill. In this case, the overall measure of skills use will be equal to 35 and the share of each indicator in this measure will be 0.1428. Applying equation (1), the value of the diversity index will be equal to 7. Note that the same value will be obtained for every individual with equal values for the seven indicators. Consider now an individual that is on the top quintile for one indicator, but in the bottom quintile for the rest. In this case, the value of the diversity index will be equal to 3.9, so a higher value of the indicator indicates a more balance and varied set of skills while lower values indicate a higher specialisation in the use of the considered skills.

3.2 *Empirical evidence*

In this section, we present the results of estimating multinomial logit models⁹ for the probability of being Solo Self-employed or being Employer Entrepreneur compared to an employee. Our specification includes several control variables such as gender, age, foreign origin, marital status or having children, traditional human capital indicators (schooling levels and experience), skills indicators, our measure of diversity in skills and country fixed-effects in order to capture institutional and cultural differences between the considered economies. The results of estimating these models by maximum likelihood

⁹ Probit models comparing Solo Self-Employers to Employees and Entrepreneur Employers to Employees have also been estimated. Results are very similar to those presented here and they are available from the author on request.

can be found in table 2¹⁰. Empirical evidence is obtained by considering the whole pool of countries with available information, although country individual results are available from the author on request. All the computations are carried taken into account the complex structure of the survey and corresponding weights.

TABLE 2

Before looking at the results for our variables of interest, it is worth mentioning that our findings regarding controls variables are in line with those summarized in the recent survey by Simoes et al. (2016). In particular, and looking at results from model 1 in table 2, being woman reduces the probability of being Entrepreneur employers, probably due to different preferences towards risk but also to occupational segregation (i.e., woman workers work in sectors that offer less possibilities to develop a career as entrepreneurs - Leoni and Falk, 2010) while no statistical difference is observed between employees and Solo self-employers. Regarding age, we find higher probabilities to become a Solo Self-employed or Employer Entrepreneur for older workers when compared to those between 16 and 24 years old, but we do not find robust evidence regarding the existence of a threshold above which the impact of the variable is reversed (although it is worth mentioning that we are controlling for age-groups and not for a continuous variable¹¹). The literature has concluded that this positive influence of age could be related to the accumulation of general and specific human capital, but also to the accumulation of financial resources or social capital. As in most studies on the topic,

¹⁰ Due to the potential presence of reverse causality (skills affect the probability of self-employment but at the same time, they can be related to the tasks developed at work), our estimates could be biased. As highlighted by Simoes et al. (2016), the correlation between skills indicators and errors in the model can be caused by omitted variables such as innate ability or other unobserved characteristics that we cannot control in a cross-sectional setting or measurement errors. The use of the instrumental variables can be a solution in the presence of this problem, but it is not easy to find proper instruments.

¹¹ As a robustness check, we replaced dummy variables related to age groups by age and age squared. We found a positive and statistically significant effect of age and a negative effect of age squared although not statistically significant at the usual levels,

foreign-born individuals have a higher probability to become self-employed than being an employee. However, this result is only found for Employer Entrepreneurs, but not for Solo Self-employed. The enclave hypothesis, together with the potential existence of discrimination, could explain this result: the high concentration of immigrant population in certain geographical areas can lead to the emergence of a local demand that can be served by co-ethnics, who at the same time could have preferences to hire other members of the group (or at least not to discriminate them)¹². The results regarding marital status and children are not as robust as the ones described until now, confirming, in fact, the results by the previous literature. There are arguments to believe that marital status can increase the probability of becoming an entrepreneur due, among other reasons; due to risk-sharing and wealth effects. This is what we find for Employer Entrepreneurs, but not for Solo Self-employed where no impact or a negative impact is found. The existence of children does not seem to affect the probability of self-employment.

Moving to variables related to human capital, we find a negative and significant effect of traditional indicators (education and experience) on the probability of becoming a Solo Self-entrepreneur while for Employer Entrepreneurs we find a positive effect. The results are in line with the usual arguments in the literature: individuals with higher levels of human capital (measured by schooling levels and previous experience) seem to be able better to identify self-employment opportunities. However, for those individuals who are self-employed by necessity and not by opportunity, the result does not necessarily hold as they prefer to take job opportunities as employees as far as they appear.

Model 2 in table 2 adds to the previous specification the indicators of skills described in section 3.1. The role of general skills seems to be limited in order to explain the probability to become a self-employed. Competence levels in literacy and in numeracy

¹² Information on the date of arrival to the host country is incomplete for several countries, so we have not been able to take this variable into account.

does not seem to be associated with the probability of being a Solo Self-employed. However, a higher competence in numeracy seems to be associated with a higher probability of being a Employer Entrepreneur. Moving to skills used at home, they seem to be relevant to be a Solo Self-employed, but not so much for Employer Entrepreneur. For Solo Self-employed, all considered indicators are significant and have a positive sign with the exception of ICT use at home that has a negative sign. The only variable that has a positive impact for both groups is the indicator of readiness to learn, which is closely related to some of the personality traits and attitudes that previous studies have found to be relevant to become an entrepreneur.

Model 3 in table 3 shows the results of replacing skills indicators by our indicator of diversity in skills. The estimated coefficient associated to this indicator is positive and significant both for Solo Self-Employed and Employer entrepreneurs. This result is in line with previous studies showing favourable evidence to the jack-of-all-trades view.

Next, we move to a more detailed analysis of gender differences. While the share of Solo Self-Employed is similar across genders (11%), the share of Employer Entrepreneurs is substantially lower among women: 5% compared to 9% for men. These figures are clearly in line with the results described above. It is also worth mentioning that in line to Strohmeier et al (2017), the value of our indicator for diversity in skills is lower for women than for men: 6.07 vs 6.11 being this difference statistically significant at the usual levels. Tables 3A and 3B show the results of estimating the multinomial logit models described above separately for men and women. There are no significant differences between men and women regarding the positive influence of age on being a Solo Self-Employed or and Employer Entrepreneur. Foreign origin has a differential effect for men and women: while it has a positive effect on the probability of Employer Entrepreneur but not for Solo Self-Employed for men, the opposite result is found for

women. This result is probably related to the decision of becoming self-employed by necessity and not by opportunity in the case of women. In a similar way, marital status has a negative effect for Solo Self-Employed in the case of men, while it is positive for the rest of individuals. Having children is positively associated for being a self-employed for women but it is negatively associated for men. Regarding education, results for men are similar to those described before in table 2 but no effect of traditional indicators of human capital is observed for women. It is worth mentioning the differential effect of experience for men as it is negative for Solo Self-Employed and positive for Employer Entrepreneurs. Last, in relation to the use of skills, there are no relevant differences between men and women, while the indicator of skills is positive and significant in all cases providing favourable evidence to the Jack-(and Jill)-of-all-trades hypothesis.

TABLES 3 & 4

4 Final remarks

The Lazear's jack-of-all-trades view predicts that individuals with a diversified set of skills are more likely to be self-employed than those who do not possess such a skill set. In contrast, paid employees benefit from being specialists in a certain area demanded by the labour market. In fact, the basic knowledge of entrepreneurs about everything is complementary to their employees' expert knowledge.

In line with several previous studies, our analysis of PIAAC data has confirmed this view (with all the caveats associated to the use of cross-sectional data that does not allow controlling for individual unobserved heterogeneity – Silva, 2007). In particular,

Both Solo Self-Employed and Employer Entrepreneurs have a higher diversity of skills than Employees after controlling for several individual characteristics.

However, the analysis has also shown that there are some skills that seem to be more important than others. In particular, the role of readiness to learn seems to be key in order to develop entrepreneurial jobs. The question, then, is can we develop these skills through educational policies? The answer to the question goes beyond the scope of our research, but evidence summarised by OECD/EC (2013) and by OECD/EU (2014, 2015) show two important aspects: first, that entrepreneurial skills should be tailored to participants taking into account the important role of non-cognitive skills and, second, that if these policies are targeted to some specific group of individuals (i.e, youth unemployed), measures should take into account the potential deadweight and displacement effects associated to the programmes. Impact evaluation and identification of best practices across countries are still on an early stage, being an important aspect of future research.

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Table 1. Types of skills required by entrepreneurs

Technical skills	Business management skills	Personal entrepreneurial skills
Written and oral communication	Planning and goal setting	Self-control/discipline
Environment monitoring	Decision making	Risk management
Problem solving	Human resource management	Innovation
Technology implementation and use	Marketing	Persistence
Interpersonal	Finance	Leadership
Ability to organise	Accounting	Change management
	Customer relations	Network building
	Quality control	Strategic thinking
	Negotiation	
	Business launch	
	Growth management	
	Compliance with regulations	

Source: OECD/EC (2013)

Table 2. Multinomial logit estimates

	Model 1		Model 2		Model 3	
	Solo Self	Employer Ent.	Solo Self	Employer Ent.	Solo Self	Employer Ent.
woman	-0.0233 (0.0746)	-0.614*** (0.0472)	0.0117 (0.0769)	-0.551*** (0.0497)	-0.0167 (0.0732)	-0.609*** (0.0465)
age_25_34	0.585*** (0.125)	0.700** (0.298)	0.628*** (0.146)	0.741** (0.295)	0.596*** (0.126)	0.709** (0.298)
age_35_44	1.081*** (0.101)	1.249*** (0.157)	1.124*** (0.122)	1.309*** (0.148)	1.096*** (0.102)	1.257*** (0.157)
age_45_54	1.595*** (0.204)	1.657*** (0.153)	1.628*** (0.231)	1.728*** (0.160)	1.618*** (0.207)	1.671*** (0.155)
age_55	1.979*** (0.219)	1.851*** (0.163)	2.002*** (0.243)	1.938*** (0.176)	2.014*** (0.224)	1.872*** (0.164)
immig	0.00411 (0.0609)	0.342* (0.192)	0.00806 (0.0599)	0.362* (0.208)	0.0344 (0.0667)	0.367* (0.202)
spouse	0.0617 (0.0524)	0.433*** (0.131)	0.0695 (0.0549)	0.427*** (0.127)	0.0528 (0.0503)	0.427*** (0.129)
children	-0.0741 (0.0749)	0.163 (0.131)	-0.0870 (0.0814)	0.166 (0.129)	-0.0565 (0.0717)	0.175 (0.127)
edcat_sec	-0.311* (0.189)	-0.0574 (0.101)	-0.338* (0.173)	-0.131 (0.0998)	-0.338* (0.195)	-0.0782 (0.100)
edcat_ter	-0.349 (0.290)	0.252** (0.117)	-0.421 (0.270)	0.0543 (0.122)	-0.423 (0.309)	0.195 (0.125)
exp	-0.0233*** (0.00762)	0.0110 (0.00863)	-0.0233*** (0.00761)	0.0100 (0.00913)	-0.0238*** (0.00792)	0.0108 (0.00884)
pvlit1			-0.00126 (0.00101)	-0.00255 (0.00205)		
pvnum1			0.000807 (0.000829)	0.00329** (0.00147)		
icthome			-0.125*** (0.0483)	0.0197 (0.0647)		
numhome			0.101* (0.0584)	0.0500 (0.0433)		
readhome			0.161*** (0.0337)	-0.0143 (0.0499)		
writhome			0.0960*** (0.0263)	0.0311 (0.0494)		
readytolearn			0.0896** (0.0372)	0.233*** (0.0375)		
diversity_skill					0.193*** (0.0470)	0.145** (0.0719)
Country fixed-effects	Yes		Yes		Yes	
Observations	61,391		61,391		61,391	

Multinomial logit estimates for employees (reference), solo self-employed and employer entrepreneurs.

Reference category is a male, with age under 24, no immigrant, single, with no children, primary education and no work experience. Robust cluster standard errors by country in parenthesis.

*** p<0.01, ** p<0.05, * p<0.1

Table 3. Multinomial logit estimates – Results for men

	Model 1		Model 2		Model 3	
	Solo Self	Employer Ent	Solo Self	Employer Ent	Solo Self	Employer Ent
age_25_34	0.700*** (0.227)	0.590 (0.467)	0.720*** (0.229)	0.625 (0.465)	0.706*** (0.223)	0.596 (0.469)
age_35_44	1.237*** (0.132)	1.130*** (0.381)	1.258*** (0.131)	1.184*** (0.377)	1.245*** (0.129)	1.134*** (0.383)
age_45_54	1.812*** (0.286)	1.480*** (0.315)	1.805*** (0.278)	1.533*** (0.283)	1.825*** (0.287)	1.488*** (0.313)
age_55	2.369*** (0.389)	1.785*** (0.337)	2.356*** (0.372)	1.859*** (0.295)	2.385*** (0.390)	1.795*** (0.334)
immig	-0.184 (0.112)	0.365* (0.202)	-0.158 (0.0989)	0.387* (0.210)	-0.151 (0.101)	0.386* (0.212)
spouse	-0.235*** (0.0658)	0.450** (0.179)	-0.242*** (0.0658)	0.432** (0.182)	-0.241*** (0.0655)	0.446** (0.178)
children	-0.148* (0.0768)	0.0668 (0.146)	-0.155* (0.0807)	0.0740 (0.145)	-0.130* (0.0740)	0.0770 (0.145)
edcat_sec	-0.244** (0.0963)	-0.0256 (0.123)	-0.292*** (0.0959)	-0.104 (0.120)	-0.273*** (0.0990)	-0.0433 (0.122)
edcat_ter	-0.388* (0.217)	0.185 (0.126)	-0.478** (0.211)	-0.0205 (0.129)	-0.464** (0.231)	0.136 (0.146)
exp	-0.0219** (0.0102)	0.0135*** (0.00452)	-0.0213** (0.00941)	0.0132*** (0.00446)	-0.0220** (0.0105)	0.0134*** (0.00452)
pvlit1			-0.00183 (0.00178)	-0.00218 (0.00251)		
pvnum1			0.00138 (0.00151)	0.00288* (0.00163)		
icthome			-0.0954** (0.0457)	0.0122 (0.0594)		
numhome			0.0462 (0.0647)	0.0583 (0.0635)		
readhome			0.194*** (0.0621)	0.00998 (0.0418)		
writhome			0.0533 (0.0360)	0.00404 (0.0616)		
readytolearn			0.0773** (0.0390)	0.244*** (0.0539)		
diversity_skill					0.187*** (0.0547)	0.120* (0.0727)
Country fixed-effects	Yes		Yes		Yes	
Observations	34,026		34,026		34,026	

Multinomial logit estimates for employees (reference), solo self-employed and employer entrepreneurs. Reference category is a man, with age under 24, no immigrant, single, with no children, primary education and no work experience. Robust cluster standard errors by country in parenthesis.

*** p<0.01, ** p<0.05, * p<0.1

Table 4. Multinomial logit estimates – Results for women

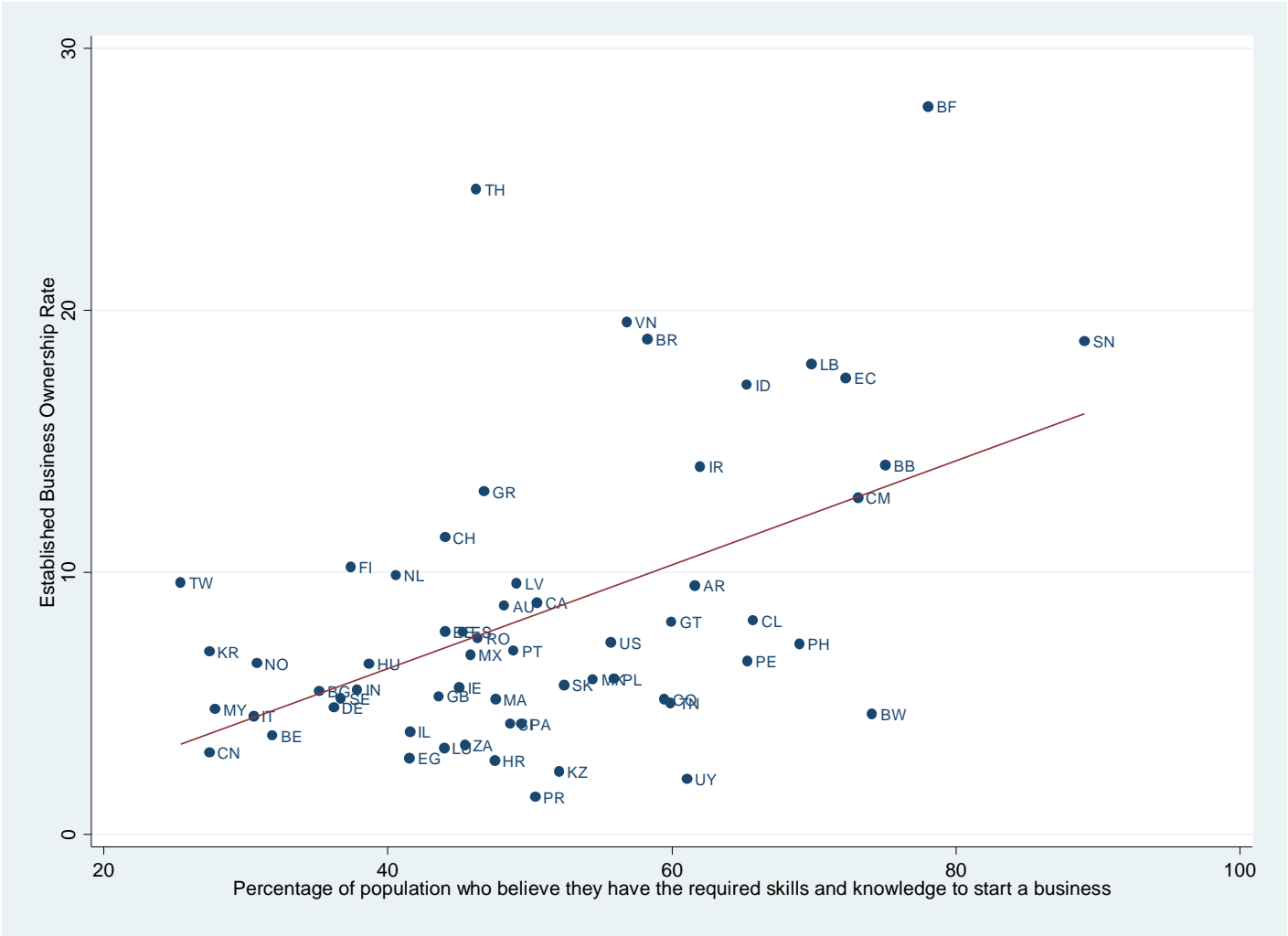
	Model 1		Model 2		Model 3	
	Solo Self	Employer ent	Solo Self	Employer Ent	Solo Self	Employer Ent
age_25_34	0.425*** (0.0632)	0.967*** (0.296)	0.509*** (0.0699)	1.035*** (0.309)	0.441*** (0.0627)	0.982*** (0.303)
age_35_44	0.874*** (0.109)	1.550*** (0.552)	0.954*** (0.116)	1.630*** (0.571)	0.894*** (0.108)	1.570*** (0.562)
age_45_54	1.309*** (0.163)	2.065** (0.817)	1.420*** (0.195)	2.185** (0.857)	1.339*** (0.166)	2.095** (0.832)
age_55	1.435*** (0.177)	1.984** (0.857)	1.537*** (0.171)	2.104** (0.905)	1.486*** (0.166)	2.036** (0.882)
immig	0.209* (0.114)	0.228 (0.236)	0.185* (0.0986)	0.246 (0.261)	0.236* (0.123)	0.261 (0.249)
spouse	0.353*** (0.0995)	0.427*** (0.121)	0.374*** (0.104)	0.422*** (0.124)	0.344*** (0.0950)	0.415*** (0.118)
children	0.128 (0.0857)	0.386** (0.193)	0.107 (0.0995)	0.385* (0.197)	0.143* (0.0863)	0.402** (0.186)
edcat_sec	-0.363 (0.339)	-0.0863 (0.230)	-0.345 (0.280)	-0.144 (0.229)	-0.388 (0.349)	-0.113 (0.235)
edcat_ter	-0.260 (0.428)	0.453* (0.244)	-0.294 (0.357)	0.275 (0.230)	-0.327 (0.451)	0.380 (0.241)
exp	-0.0228*** (0.00622)	0.00748 (0.0168)	-0.0245*** (0.00653)	0.00524 (0.0172)	-0.0237*** (0.00652)	0.00678 (0.0173)
pvlit1			-0.000903 (0.00196)	-0.00416* (0.00246)		
pvnum1			0.000498 (0.00154)	0.00512* (0.00289)		
icthome			-0.148** (0.0686)	0.0483 (0.0915)		
numhome			0.179 (0.117)	0.0166 (0.0600)		
readhome			0.113** (0.0534)	-0.0898 (0.134)		
writhome			0.154*** (0.0339)	0.124** (0.0534)		
readytolearn			0.117** (0.0545)	0.200*** (0.0671)		
diversity_skill					0.191*** (0.0623)	0.212** (0.0939)
Country fixed-effects	Yes		Yes		Yes	
Observations	27,365		27,365		27,365	

Multinomial logit estimates for employees (reference), solo self-employed and employer entrepreneurs.

Reference category is a woman, with age under 24, no immigrant, single, with no children, primary education and no work experience. Robust cluster standard errors by country in parenthesis.

*** p<0.01, ** p<0.05, * p<0.1

Figure 1. Perceived Capabilities vs Established Business Ownership Rate (GEM, 2015)



Note: See Annex 1 for the equivalence between country 2-digit ISP-code and names.

Annex 1. Country 2-digit ISP-code and country names

Country	Code	Country
AR	IT	Italy
AU	KR	South Korea
BB	KZ	Kazakhstan
BE	LB	Lebanon
BF	LU	Luxembourg
BR	MA	Morocco
BW	MK	Macedonia
CA	MX	Mexico
CH	MY	Malaysia
CL	NL	Netherlands
CM	NO	Norway
CN	PA	Panama
CO	PE	Peru
DE	PH	Philippines
EC	PL	Poland
EE	PR	Puerto Rico
EG	PT	Portugal
ES	RO	Romania
FI	SE	Sweden
GB	SI	Slovenia
GR	SK	Slovakia
GT	SN	Senegal
HR	TH	Thailand
HU	TN	Tunisia
ID	TW	Taiwan
IE	US	United States
IL	UY	Uruguay
IN	VN	Vietnam
IR	ZA	South Africa

Annex 2. Variables definition

Variables	Definition
woman	1 if woman; 0 if male.
age_24 (ref. group)	1 if age is 24 or less; 0 otherwise.
age_25_34	1 if age is between 25 and 34; 0 otherwise
age_35_44	1 if age is between 35 and 44; 0 otherwise
age_45_54	1 if age is between 45 and 54; 0 otherwise
age_55	1 if age is 55 or more; 0 otherwise
immig	1 if born in another country; 0 if born in country.
spouse	1 if living with spouse; 0 otherwise.
children	1 if having children; 0 otherwise.
edcat_pri (ref. group)	1 if highest level of formal education obtained is lower secondary or less; 0 otherwise.
edcat_sec	1 if highest level of formal education obtained is secondary; 0 otherwise.
edcat_ter	1 if highest level of formal education obtained is tertiary; 0 otherwise.
exp	Years of experience in paid work
pvlit1	Level of literacy skills (plausible value 1)
pvnum1	Level of numeracy skills (plausible value 1)
icthome	Indicator ICT at home. How often use internet for mail (H_Q05a); in order to better understand various issues (H_Q05c); conduct transactions (H_Q05d); How often use computer for spreadsheets (H_Q05e); word (H_Q05f); - programming language (H_Q05g); real-time discussions (H_Q05h).
numhome	Indicator numeracy at home. How often calculating costs or budgets (H_Q03b); use or calculate fractions or percentages (H_Q03c); use a calculator (H_Q03d); prepare charts graphs or tables (H_Q03f); use simple algebra or formulas (H_Q03g); use advanced math or statistics (H_Q03h).
readhome	Indicator of reading at home. How often read directions or instructions (H_Q01a); read letters memos or mails (H_Q01b); read newspapers or magazines (H_Q01c); read professional journals or publications (H_Q01d); read books (H_Q01e); read manuals or reference materials (H_Q01f); read financial statements (H_Q01g); read diagrams maps or schematics (H_Q01h).
writhome	Indicator of writing at home. How often write letters memos or mails (H_Q02a); write articles (H_Q02b); write reports (H_Q02c); fill in forms (H_Q02d).
readytolearn	Indicator of readiness to learn. How often relate new ideas into real life (I_Q04b); like learning new things (I_Q04d); attribute something new (I_Q04h); get to the bottom of difficult things (I_Q04j); figure out how different ideas fit together (I_Q04l); looking for additional info (I_Q04m).
diversity_skill	Indicator of diversity in the following skills: pvlit1, pvnum1, icthome, numhome, readhome, writhome, readytolearn. For the exact definition, see text.

Annex 3. Descriptive statistics

Variables	N	Mean	SD	Min	Max
employee	50095	0.816	0.388	0	1
self_solo	6814	0.111	0.314	0	1
self_super	4488	0.0731	0.260	0	1
male	34026	0.554	0.497	0	1
woman	27365	0.446	0.497	0	1
age_24	10682	0.174	0.379	0	1
age_25_34	15716	0.256	0.437	0	1
age_35_44	16207	0.264	0.441	0	1
age_45_54	12401	0.202	0.402	0	1
age_55	6385	0.104	0.305	0	1
immig	7183	0.117	0.321	0	1
spouse	42237	0.688	0.463	0	1
children	39106	0.637	0.481	0	1
edcat_prim	7377	0.120	0.325	0	1
edcat_sec	28510	0.464	0.499	0	1
edcat_ter	25471	0.415	0.493	0	1
exp	61391	16.17	11.79	0	47
pvlit1	61391	278.4	44.80	65.34	446.4
pvnum1	61391	278.1	48.95	38.60	467.0
icthome	61391	2.101	0.942	-1.209	7.710
numhome	61391	2.114	0.921	-0.508	6.174
readhome	61391	2.291	0.797	-1.299	7.427
writhome	61391	2.059	0.963	-0.296	6.115
readytolearn	61391	2.231	0.941	-1.075	4.644
diversity_skill	61391	6.094	0.564	3.903	7.000

Variables	N	Mean	SD	Min	Max
Belgium	1676	0.0273	0.163	0	1
Canada	8779	0.143	0.350	0	1
Chile	1265	0.0206	0.142	0	1
Czech Republic	1805	0.0294	0.169	0	1
Denmark	2542	0.0414	0.199	0	1
Ecuador	626	0.0102	0.100	0	1
Estonia	2591	0.0422	0.201	0	1
Finland	1879	0.0306	0.172	0	1
France	2050	0.0334	0.180	0	1
Germany	2106	0.0343	0.182	0	1
Greece	976	0.0159	0.125	0	1
Hungary	1731	0.0282	0.165	0	1
Ireland	1473	0.0240	0.153	0	1
Israel	1351	0.0220	0.147	0	1
Italy	927	0.0151	0.122	0	1
Japan	1823	0.0297	0.170	0	1
Kazakhstan	939	0.0153	0.123	0	1
Korea	1842	0.0300	0.171	0	1
Lithuania	982	0.0160	0.125	0	1
Mexico	774	0.0126	0.112	0	1
Netherlands	1952	0.0318	0.176	0	1
New Zealand	2431	0.0396	0.195	0	1
Norway	1903	0.0310	0.173	0	1
Peru	1216	0.0198	0.139	0	1
Poland	2744	0.0447	0.207	0	1
Russian Federation	601	0.00979	0.0985	0	1
Singapore	1940	0.0316	0.175	0	1
Slovak Republic	1565	0.0255	0.158	0	1
Slovenia	1480	0.0241	0.153	0	1
Spain	1344	0.0219	0.146	0	1
Sweden	1529	0.0249	0.156	0	1
Turkey	626	0.0102	0.100	0	1
United Kingdom	2419	0.0394	0.194	0	1
United States	1547	0.0252	0.157	0	1

Annex 4. Proportion of individuals according to work status

	Employees	Solo Self-employed	Employer entrepreneurs	Total
Belgium	82.10	9.04	8.86	100.00
Canada	82.64	10.18	7.18	100.00
Chile	71.32	21.38	7.30	100.00
Czech Republic	78.97	16.09	4.94	100.00
Denmark	84.97	7.43	7.60	100.00
Ecuador	51.87	36.20	11.93	100.00
Estonia	85.47	5.55	8.98	100.00
Finland	81.61	9.90	8.49	100.00
France	84.73	9.24	6.02	100.00
Germany	86.93	6.40	6.67	100.00
Greece	52.54	30.19	17.28	100.00
Hungary	85.32	9.16	5.52	100.00
Ireland	77.94	12.73	9.32	100.00
Israel	82.38	10.04	7.58	100.00
Italy	71.52	19.63	8.85	100.00
Japan	89.07	5.08	5.85	100.00
Kazakhstan	76.97	15.83	7.20	100.00
Korea	69.37	16.26	14.37	100.00
Lithuania	87.06	9.02	3.93	100.00
Mexico	65.74	25.20	9.06	100.00
Netherlands	83.19	9.75	7.06	100.00
New Zealand	79.78	11.05	9.17	100.00
Norway	89.50	6.42	4.09	100.00
Peru	46.09	40.10	13.80	100.00
Poland	84.32	10.41	5.27	100.00
Russian Federation	83.88	9.71	6.41	100.00
Singapore	84.33	8.89	6.78	100.00
Slovak Republic	79.71	15.24	5.05	100.00
Slovenia	84.11	10.51	5.38	100.00
Spain	79.05	13.52	7.43	100.00
Sweden	83.03	8.75	8.22	100.00
Turkey	73.86	16.22	9.92	100.00
United Kingdom	81.69	13.52	4.79	100.00
United States	82.66	10.77	6.57	100.00

