

Country-Level Impact of Education on Entrepreneurship

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Introduction to Collaborative Social Science Data Analysis

(The impact of self confidence on entrepreneurship.)

Abstract

Why we chose to look into Education to explain Entrepreneurship - What has been done

Whilst it is tempting to look at education systems in a very pragmatic way with ratios of teachers per student, or number of students per class, we suggest to use another kind of indicators in order to trace the potential long-term investment made by governments. Indeed, we believe that education systems can favour entrepreneurship and, beyond, GDP growth at the country-level, depending on how supportive of students' self-confidence and how socially inclusive they are. We see this process as manifold but will only focus here on one of the potential causal relations. We want to understand specifically to what extent the support of individual self-confidence within education systems can affect the likelihood to become an entrepreneur, and thus impact the rate of entrepreneurship at the country level.

In trying to explore what supports entrepreneurship at the country-level, one should start by referring to what research asserted for that matter. For this purpose, we refer here to the OECD reports available online here <http://www.oecd.org/std/business-stats/48129925.pdf>. Two main sorts of determinants or favourable conditions have been looked into, that is environmental factors and individual factors. Although we intend to focus more on individual factors, we want to mention here the environmental factors as they should be controlled for. They actually divide into six broad categories:

The regulatory framework, which includes administrative burdens, regulations and frameworks, as well as fiscal policy parameters.

The market conditions, which include anti-trust laws, rules for competition, access to foreign markets, degree of public involvement and level of private demand.

The access to finance, which includes access to debt financing, access to venture capital, and stock markets.

The creation and diffusion of knowledge, which include research and development activity, transfer of non-commercial knowledge, co-operation among firms, technology availability and take-up.

The entrepreneurial capabilities, which includes business and entrepreneurship education as well as immigration.

The entrepreneurship culture of a population.

Grilo and Thurik [Grilo2005b] who looked into what determines entrepreneurship engagement levels throughout the European Union and the US pointed especially at the level of financial support available for entrepreneurs in the country and also at administrative complexities.

Of course, what determines entrepreneurship at a country-level has been long searched already but although structural and environmental factors have been looked at extensively, less has been done regarding cultural or educational factors. Yet, “the relative stability of differences in entrepreneurship across countries suggests that factors other than economic ones are at play” [Freytag2007] 2010 VERSION MAIN BIB. Even if “in recent years research has increasingly devoted itself to the subject” [OECD2009], a lot still needs to be done.

Over a hundred years have passed since Max Weber tried to explain how religious-ethical motivations affect entrepreneurship [Weber1905], and today religion may be less effective in justifying why some are more likely to start businesses than others. Still, that was a founding stone and it is now widely admitted that “cultural features influence attitudes towards start-ups and that these attitudes, in turn, have an impact on start-up activities” [OECD2009].

More recently, Davidsson, along with Delmar at first (1992), then alone (1995), then with Wiklund [Davidsson1995].

son1997values], at his turn, laid a stepping stone by investigating the relationship between structural factors, mainly economic, and cultural factors. As they compared two Swedish regions similar in terms of structure and observed different outcomes, they too concluded that there might be a small cultural effect in attitudes toward start-up activities. In 2010, Freytag and Thurik 2010 VERSION MAINBIB have also studied determinants of entrepreneurship in a cross-country setting and pointed at cultural features. Their results showed that “country specific (cultural) variables seem to explain the preference for entrepreneurship” and self-employment. Yet, not so many empirical studies have been carried out on this topic and most of them focused on which attitudes were favourable to starting a business, while almost none explored what determined these dispositions.

Rather than trying to trace cultural features at large, as we mentioned earlier, we intend to focus specifically on one key cultural institution, that is the education system. Indeed, like many in the education literature tend to assert, we believe that school personnel have an affect on students’ self-confidence [Scott1996] which is key as “individuals who decide to start a new business exhibit more confidence than those who do not” Robin M. Hogarth and Natalia Karelaia 2011 Entrepreneurial success and failure MAIN BIB. Now in entrepreneurship literature, “self-confidence was found to depend almost exclusively on the individual features of the respective person and his or her integration in social networks” [OECD2009].

Still, if we look at the following data from the [Global Entrepreneurship Monitor \(GEM\)](#) Adult Population Survey (APS) from 2012, there seem to be different amounts of self-confidence and entrepreneurial self-efficacy between countries. By a country’s entrepreneurial self-efficacy we mean the belief that the average individual of that country holds about his or her abilities to succeed as an entrepreneur. Here, the variable “perceived capabilities” has to be understood in a narrow sense, it refers only to the perceived capabilities to start a business. Seemingly the variable “fear of failure” only refers to the fear of failure as an obstacle in starting a business, despite the perceived good opportunities.

Variable	France	UK
Fear of Failure (GEM 2012)	43%	36%
Perceived Capabilities (GEM 2012)	36%	47%

So, although the research tends to hold self-confidence and also entrepreneurial self-efficacy as individual features, we intend to understand to what extent these individual characteristics are partly shaped at a collective or societal level by looking at the potential impact of education systems and their personnel.

Specifically, we expect to find out to what extent positive reinforcement in teaching can impact the rate of entrepreneurship at a country level, especially across OECD countries. Indeed, regarding France and the United Kingdom, many parameters differ between the two education systems but one stands out, that is the positive reinforcement. Indeed, while positive reinforcement is effectively in use throughout the compulsory education system in the UK, it is much more rarely activated in France, and only on an voluntary individual teacher's basis.

Our focus on the education systems stems partly from experience and from Inglehart research ?????????? MAIN BIB 2000 ?????????? . Indeed, we understand the period between 0 and 20 years of age to be a defining time in terms of personal values and personality construction, thus compulsory education, generally between 6 and 16 years of age, can prove of key importance in the building up of one's self-confidence. We would like to verify if this has to do with the amount of entrepreneurial self-efficacy mentioned above, in which case this could also affect entrepreneurial intentions, behaviours and actions. This assumption draws from Boyd and Vozikis's ?????????? MAIN BIB ?????????? stating how entrepreneurial intentions are at least partially the result of thought processes, which "underlie the creation of formal business plans, opportunity analysis, and goal-directed behaviour". Boyd and Vosikis also assert that individual self-efficacy "influences the development of both entrepreneurial intentions and actions or behaviours". To assert this, they rely on Fishbein and Ajzen 1975 ?????????? MAIN BIB ?????????? who illustrate the relation between beliefs and behaviour as follows:

- 1 Beliefs
- 2 Attitudes
- 3 Intentions
- 4 Behaviour

There could even be an incidence of the intention to perform a certain behaviour on the actual performance of that behaviour, which could lead to look into skills, abilities and willpower. It is almost like "individuals

would be predisposed to entrepreneurial intentions based upon a combination of both personal and contextual factors” ???? Boyd and Vosikis MAIN BIB ???? but Boyd and Vosikis building upon social psychology research introduce the concept of self-efficacy in Bird’s model of entrepreneurial intentionality for “self-efficacy will moderate the relationship between the development of entrepreneurial intentions and the likelihood that these intentions will result in entrepreneurial actions or behaviour”. Therefore, we will have to control for this entrepreneurial self-efficacy as we research potential effects of positive reinforcement.

Eventually, this goes without saying, we also looked into other studies connecting educational features and entrepreneurship. As a matter of fact, most of the research tends to focus specifically on entrepreneurial education, whatever its form, as it is expected partly to support the entrepreneurial self-efficacy ?????? Boyd and Vosikis MAIN BIB ?????????? . One slightly different and interesting perspective is that of King and Sobel [Kerry2008], who have already tried to show how school choice, and thus a different kind of interactions with students, can increase the rate of youth entrepreneurship but their perspective was still not directly in line with our research design, they asserted that a more business-like environment in K-12 education was the key, which was favoured by voucher programmes.

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The cross-cultural perspective on teaching and learning proposed by Watkins [Watkins2010] shall help us compare countries.

Cheng and Wong’s study about school effectiveness in East Asia [Cheng2006] will also help.

Eventually, to put all these into perspective, along with Gartner [Gartner1990] we will have a closer look at entrepreneurship’s underlying meanings in research and, with Acs, Desai and Klapper [Acs2008], we will ask ourselves what “entrepreneurship” data really shows.

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Quantitative Analysis of the Impact of Education on Entrepreneurship

Research Design

At this stage, having explained how determinants of entrepreneurship have been looked into, having mentioned

how education has been related to entrepreneurship so far, we need to assert here our very research question which is:

To what extent does the support of students' self-confidence within the education system impacts the rate of entrepreneurship across OECD countries?

Drawing from the literature, we expect to observe the following causal chain :

- > Education system reinforcing self-confidence
- > Higher degree of individual self-confidence
- > Higher probability an individual will become an entrepreneur
- > higher rate of entrepreneurship at a country-level.

Here, when we mention that an education system reinforces self-confidence, we mean that teachers use positive reinforcement when interacting with students. This entails providing feedback that will help the students maintain their level of motivation as well as their level of self-esteem. This also includes supporting students taking initiatives and encouraging their creativity.

The support of students' self-confidence within education systems as we just defined it can also affect the students' entrepreneurial self-efficacy, that should be controled for. To do so, we will look at the average perceived entrepreneurial capabilities and fear of failure in starting a business across the population at the country-level.

Ideally, since the literature suggests that self-confidence depends partly on one's integration within social networks [OECD2009], we should be looking into the collectivism or individualism at play across education systems, the more so as there is visibly something at stake on that side too :

Variable	France	UK
Sense of belonging (PISA 2012)	47%	79%

The lack of suitable data as well as the fact that OECD PISA (Programme for International Student

Assessment) tends to focus on different aspects of education systems for every triennial survey, lead us to give up on this for the time being. But we still think that should be included in a future research on that topic.

Regarding potential control variables, we should normally consider including at least the main environmental determinants of entrepreneurship but the lack of consistency in the data at hand for our explanatory variables made us use a summary of those as a proxy. We chose to use the level of good opportunities to start a business perceived on average across the population of the given country.

As we attempt to measure the impact of education systems' support of students' self-confidence on the rate of entrepreneurship at the country-level, we expect to observe different effects depending if we consider entrepreneurial intentions only or we also look into actual entrepreneurial activities. Even in measuring the impact on activities, we could potentially observe different effects between nascent and established entrepreneurship. Therefore, we will consider the three measures of entrepreneurship separately:

1 Entrepreneurial Intentions

2 Nascent Entrepreneurship

3 Established Entrepreneurship

Having explained what lead us into this specific research design, we will now present our data sources in greater detail.

Data Sources

To complete a quantitative analysis of the impact of educational factors – specifically the encouragement of creativity, self-sufficiency, and personal initiative – on the country-level rate of entrepreneurship, we have drawn on publicly available data from the Global Entrepreneurship Monitor (GEM) National Expert Survey (NES) and Adult Population Survey (APS).

The Global Entrepreneurship Monitor project is an annual assessment of the entrepreneurial activity, aspirations, and attitudes of individuals across a wide range of countries. The countries covered have grown from a low of ten to covering 75% of world population and 89% of world GDP by 2013. The 2001-2010 multi-year APS data base, for example, contains over 1.3 million observations of a total of 85 countries. This

data is often cited in academic research, including reports by the Organisation for Economic Co-operation and Development.

The NES is structured around nine entrepreneurial framework conditions evaluated by thirty-six experts in each surveyed country. These nine entrepreneurial framework conditions are included below (a minimum of four experts must be interviewed on each of the framework conditions).

1. Finance
2. Government policies
3. Government programs
4. Entrepreneurial Education and Training
5. Research and Development Transfer (R & D)
6. Commercial and professional infrastructure
7. Internal Market openness
8. Physical infrastructure and services
9. Cultural and social norms

The APS is a questionnaire distributed to a minimum of 2,000 adults in each participating country. The survey is created by a central GEM team, but the implementation is managed by national teams that compete for the role of implementing the survey. Experts are chosen based on experience and specialization and are expected to represent the entire country (including urban and rural areas).

Data Selection

After reviewing the available data, we decided to select the following variables for our analysis.

Source	Indicator
APS	Rate of Entrepreneurship (Intention, Nascent, Established)
NES	Way of Teaching
APS	Perceived Capabilities
APS	Fear of Failure / Perceived Opportunities
APS	Perceived Opportunities

The survey questions corresponding to these variables are as follows:

1. **Entrepreneurial Intention:** Percentage of 18-64 population (individuals involved in any stage of entrepreneurial activity excluded) who intend to start a business within three years.
2. **Nascent Entrepreneurship:** Percentage of 18-64 population who are currently a nascent entrepreneur, i.e., actively involved in setting up a business they will own or co-own; this business has not paid salaries, wages, or any other payments to the owners for more than three months.
3. **Established Entrepreneur:** Percentage of 18-64 population who are currently owner-manager of an established business, i.e., owning and managing a running business that has paid salaries, wages, or any other payments to the owners for more than 42 months.
4. **Way of Teaching:** In my country, teaching in primary and secondary education encourages creativity, self-sufficiency, and personal initiative.
5. **Perceived Capabilities:** Percentage of 18-64 population who believe to have the required skills and knowledge to start a business
6. **Fear of Failure:** Percentage of 18-64 population with positive perceived opportunities who indicate that fear of failure would prevent them from setting up a business.

7. **Perceived Opportunities:** Percentage of 18-64 population who see good opportunities to start a firm in the area where they live

The APS data represent the national-level average of values between 1 and 100 that were gathered as responses to surveys within each country. The NES data is calculated based on the average answer to a survey to the national experts. For each question, the experts surveyed had to state whether it is:

1. Completely false
2. Somewhat false
3. Neither true or false
4. Somewhat true
5. Completely true

(97. Do not know)

(98. Not applicable)

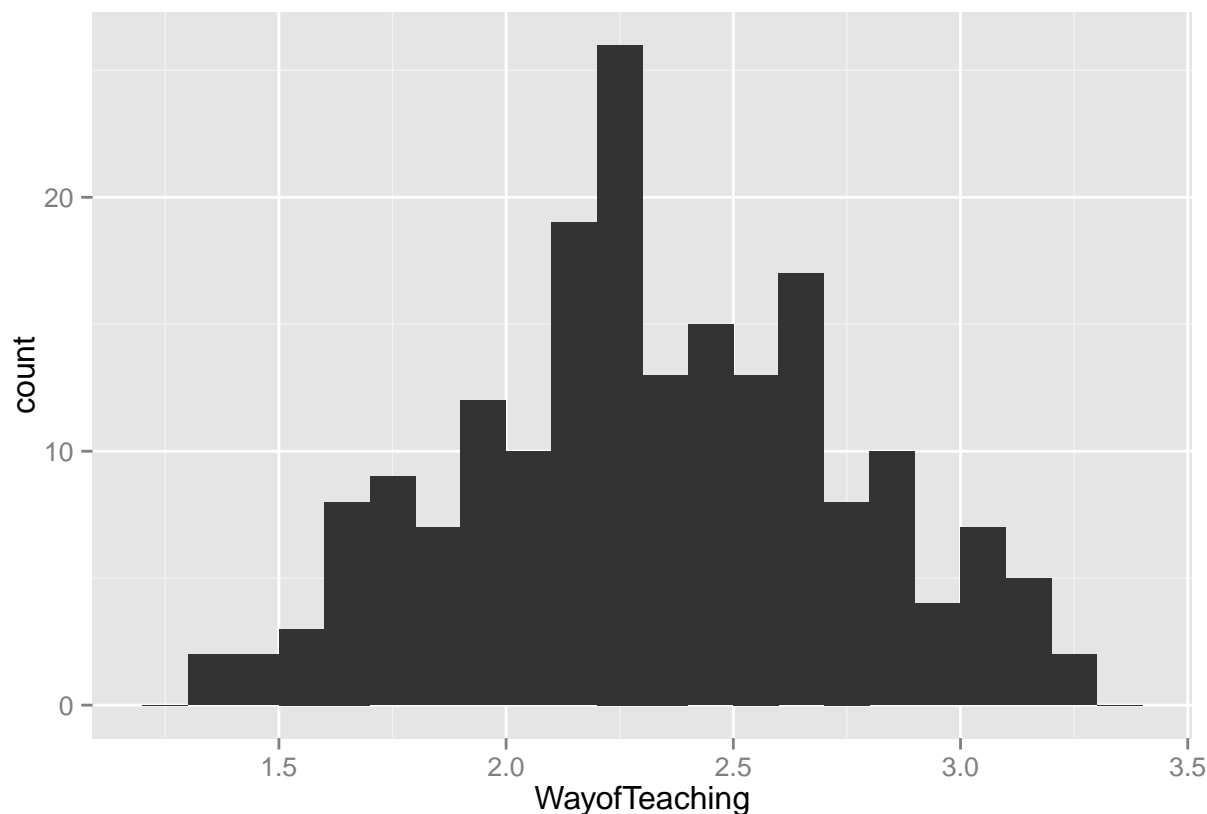
The process of importing, cleaning, and analyzing all of the data used in this project is fully documented and reproducible by referencing our GitHub repository.

Analytical Framework

To understand the impact of educational factors – specifically the encouragement of creativity, self-sufficiency, and personal initiative – on the country-level rate of entrepreneurship we built our model as outlined in the table below.

Variable	Indicator
Y Dependent Variable	Rate of Entrepreneurship (Intention, Nascent, Established)
X1 Explanatory Variable	Way of Teaching
X2 Control Variable	Perceived Capabilities
X3 Control Variable	Fear of Failure / Perceived Opportunities
X4 Control Variable	Perceived Opportunities

Data on our explanatory variable, Way of Teaching, is available on the GEM website for the years 2001-2010. To illustrate the distribution of this data, we have created the following histogram. As shown in the histogram, the largest density of scores is approximately 2.3, which lies between the “somewhat false” and “neither true or false” categories. This is not a whole number because the scores given by each of the 4 experts surveyed for each framework condition are averaged to create a national-level number. As discussed later in this paper, this presents some difficulties in drawing substantive conclusions from this data. Namely, a large number of indifferent responses complicate the process of determining the influence we would like to analyze.



Starting with this explanatory variable, as mentioned earlier, we expected to observe different effects depending on the kind of entrepreneurship we looked at:

- 1 Entrepreneurial Intentions
- 2 Nascent Entrepreneurship
- 3 Established Entrepreneurship

Therefore, we built three regression equations to examine the impact of our explanatory variable on the rate

of entrepreneurship (as measured by survey responses on the percentage of nascent entrepreneurs, established business owners, and respondents with the intention of becoming an entrepreneur). These three regression equations are as follows:

1. $PercentEntreIntention = \beta_1 WayofTeaching + \beta_2 PerceivedCabability + \beta_3 PerceivedOpportunities + \beta_4 FearFailure + \beta_5 FearFailure * PerceivedOpportunities$
2. $PercentNascent = \beta_1 WayofTeaching + \beta_2 PerceivedCabability + \beta_3 PerceivedOpportunities + \beta_4 FearFailure + \beta_5 FearFailure * PerceivedOpportunities$
3. $PercentOwner = \beta_1 WayofTeaching + \beta_2 PerceivedCabability + \beta_3 PerceivedOpportunities + \beta_4 FearFailure + \beta_5 FearFailure * PerceivedOpportunities$

The interaction term $\beta_5 FearFailure * PerceivedOpportunities$ was added to the regression because the survey question regarding “Fear of Failure” was only proposed to survey respondents who indicated they do perceive opportunities to start a business.

Based on a review of academic literature and expectations from other data analysis, we expected to see a statistically significant positive relationship between self-confidence reinforcement in teaching and the dependent variables we selected as indicators of the entrepreneurship rate. Instead, we found that when controlling for country-specific effects, the Way of Teaching is not statistically significant when using “Nascent Entrepreneur” or “Business Owner” as a dependent variable, has a negative coefficient in these regression equations. This relationship can be seen in the following regression output table. This regression output was generated using a simple least square regression model.

% Table created by stargazer v.5.1 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu

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To more clearly demonstrate the relationship between the “Way of Teaching” and our dependent variables, we have omitted the country-specific effects and generated simulations to show demonstrate the outcome of 1000 trials of our regression equation. Before doing so, however, we ran another set of regressions to determine

Table 5: Linear Regression Estimates with Country-specific Effects

	<i>Dependent variable:</i>		
	Entrepreneurial Intention	Nascent Entrepreneur	Entrepreneurship Owner
	(1)	(2)	(3)
Way of Teaching	0.57 (0.98)	−0.04 (0.41)	−0.44 (0.67)
Perceived Capabilities	0.09* (0.05)	0.03* (0.02)	0.13*** (0.03)
Fear of Failure	0.26** (0.11)	0.06 (0.04)	0.08 (0.07)
Perceived Good Opportunities	0.25*** (0.09)	0.06 (0.04)	0.01 (0.06)
Fear of Failure x Perceived Good Opportunities	−5.04* (2.55)	−5.13*** (1.10)	−7.14*** (1.80)
CountryBelgium	−2.95 (2.01)	−4.34*** (0.84)	−8.09*** (1.37)
CountryCanada	−3.30* (1.97)	−1.48* (0.85)	−6.02*** (1.38)
CountryChile	17.25*** (2.01)	0.65 (0.84)	−7.07*** (1.36)
CountryCzech Republic	0.28 (3.30)	−0.38 (1.45)	−5.57** (2.36)
CountryDenmark	−4.05** (1.93)	−4.49*** (0.80)	−4.53*** (1.31)
CountryFinland	−5.13*** (1.85)	−4.13*** (0.78)	−2.39* (1.26)
CountryFrance	0.96 (2.81)	−3.92*** (1.16)	−8.59*** (1.89)
CountryGermany	−3.78* (1.99)	−3.81*** (0.82)	−7.02*** (1.34)
CountryGreece	1.14 (2.18)	−3.36*** (0.86)	−1.12 (1.40)
CountryHungary	0.24 (2.16)	−2.60*** (0.90)	−6.32*** (1.47)
CountryIceland	4.31** (1.78)	0.05 (0.75)	−2.99** (1.23)
CountryIreland	−3.35** (1.69)	−2.41*** (0.70)	−4.26*** (1.13)
CountryIsrael	4.27*** (2.06)	−3.90*** (0.83)	−7.73*** (1.40)
CountryItaly	−2.33 (1.88)	−4.46*** (0.88)	−6.72*** (1.38)

which equation we would like to examine more closely. A regression output table with these results has been included below.

% Table created by stargazer v.5.1 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu

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Table 6: Linear Regression Estimates omitting Country-specific Effects

	<i>Dependent variable:</i>		
	Entrepreneurial Intention	Nascent Entrepreneur	Entrepreneurship Owner
	(1)	(2)	(3)
Way of Teaching	-5.66*** (1.04)	0.15 (0.37)	0.84 (0.56)
Perceived Capabilities	0.31*** (0.04)	0.13*** (0.01)	0.12*** (0.02)
Fear of Failure	0.13 (0.14)	0.02 (0.05)	0.22*** (0.07)
Perceived Good Opportunities	0.24* (0.13)	0.06 (0.04)	0.10 (0.06)
Fear of Failure x Perceived Good Opportunities	-0.005 (0.004)	-0.001 (0.001)	-0.004* (0.002)
Constant	1.94 (5.55)	-3.27* (1.83)	-7.01** (2.76)
Observations	172	192	191
R ²	0.40	0.42	0.20
Adjusted R ²	0.39	0.40	0.18
Residual Std. Error	5.16 (df = 166)	1.94 (df = 186)	2.92 (df = 185)
F Statistic	22.43*** (df = 5; 166)	26.63*** (df = 5; 186)	9.10*** (df = 5; 185)

Note:

*p<0.1; **p<0.05; ***p<0.01

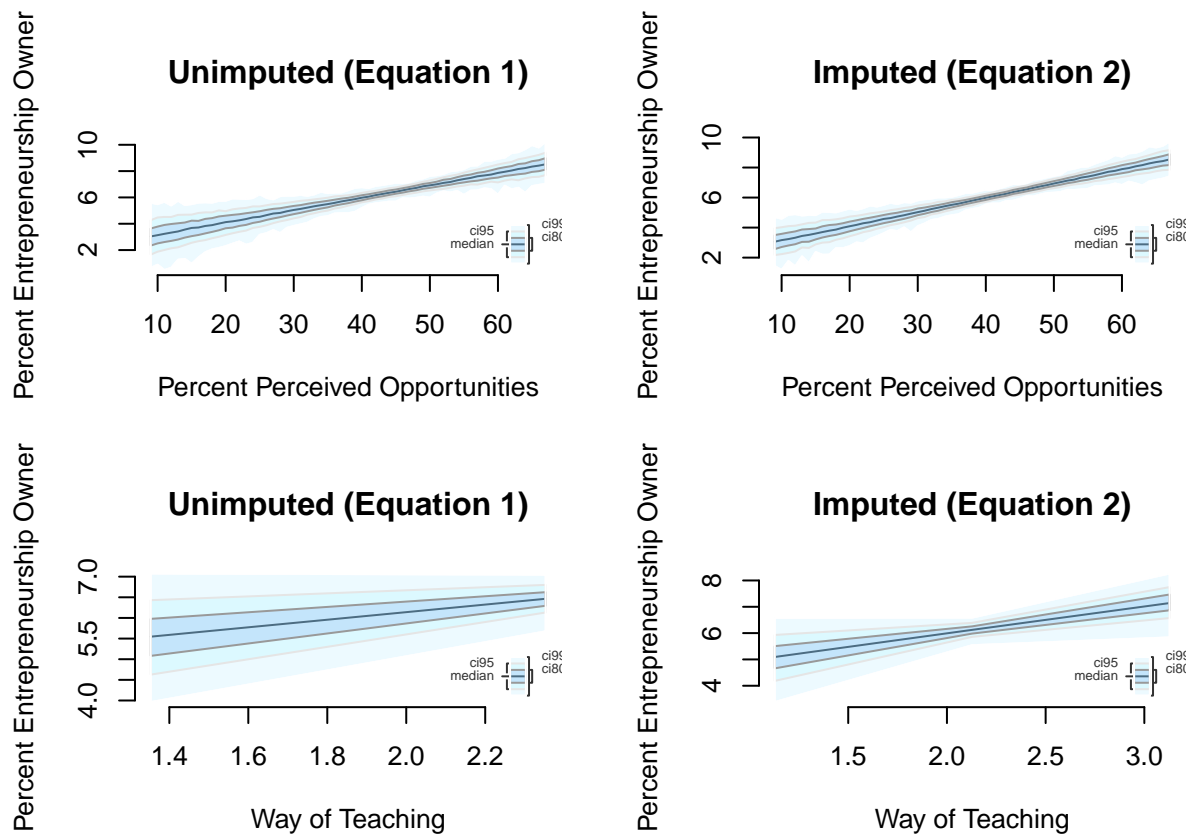
Given the positive relationship between the “Way of Teaching” and “Entrepreneurship Owner” we decided to use this equation for our simulations. Given the prevalence of omitted data in our data frame, we decided to attempt to increase the accuracy of this model by using the R program Amelia to generate an imputed data frame. This program uses statistical inference to generate imputed data (more information on the Amelia

package can be found on the program's [CRAN page](#)). Equation titled “Imputed” were calculated using this imputed data frame.

To generate the simulations, we decided to use the R package Zelig. This package allows us to set parameters for an explanatory variable and simulate trials of the above equation (more information on the Zelig package can be found on the program's [CRAN page](#)). We chose to simulate values in “Percent Perceived Capabilities” and “Way of Teaching” for this analysis. A regression output table and our simulation results are included below. Given our data characteristics and the available models in the Zelig package, we used a “Least Squares Regression for Continuous Dependent Variables.”

% Table created by stargazer v.5.1 by Marek Hlavac, Harvard University. E-mail: hlavac at fas.harvard.edu

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Results

Limitations of the data

From the results and from the description of the data made earlier, one can easily foresee quite a few

Table 7: Linear Regression Estimates omitting Country-specific Effects

	<i>Dependent variable:</i>	
	Entrepreneurship Owner	
	(1)	(2)
Way of Teaching	0.94* (0.52)	1.03*** (0.40)
Perceived Capabilities	0.09*** (0.02)	0.09*** (0.02)
Fear of Failure	0.25*** (0.07)	0.21*** (0.04)
Perceived Good Opportunities	0.14** (0.07)	0.12*** (0.05)
Fear of Failure x Perceived Good Opportunities	-0.005** (0.002)	-0.004*** (0.001)
Constant	-7.67*** (2.78)	-6.82*** (2.00)
Observations	172	318
R ²	0.19	0.17
Adjusted R ²	0.17	0.15
Residual Std. Error	2.58 (df = 166)	2.71 (df = 312)
F Statistic	8.03*** (df = 5; 166)	12.38*** (df = 5; 312)

Note:

*p<0.1; **p<0.05; ***p<0.01

Regression equation 1 is unimputed, regression equation 2 is imputed

limitations to the consistency and effectiveness of the data we used for this research. Although they are obvious, one should still name them here.

The GEM National Expert Survey however interesting and innovative for its extensive look into new sorts of data still allows for much improvement. It is essentially supposed to help control for the environmental determinants of entrepreneurship, which are here called the framework conditions. The major issue is not so much what it aims at revealing of the entrepreneurial context of each country but it has much more to do with methodology of data collection. Indeed, for each of these framework conditions, only four experts answered the survey, which makes the measure be very dependent on the individual respondent. This leads to highly variant data.

Regarding the D01 indicator we used as a proxy for a way of teaching supportive of students' self-confidence, it is quite variant from year to year, which is not quite what we would expect. Indeed, as we look at the way of teaching and education features, these are generally