Country-Level Impact of Education on Entrepreneurship

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Abstract

Why we Chose to Look into Education to Explain Entrepreneurship - What Has Been Done

While 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 indicator 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 many-fold but will only focus here on one of the potential causal relations. We want to understand specifically to want 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 Organisation for Economic Co-Operation and Development (OECD) list of indicator for entrepreneurial determinants available here. Two main sorts of determinants or favourable conditions, environmental factors and individual factors, have been identified and researched. Although we intend to focus more on individual factors, we want to mention here the environmental factors as they should be controlled for in our analysis. They have been divided into six broad categories by the OECD:

- **The regulatory framework**: Including administrative burdens, regulations and frameworks, as well as fiscal policy parameters.

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

- **The access to finance**: Including access to debt financing, access to venture capital, and stock markets.

- **The creation and diffusion of knowledge**: Including research and development activity, the transfer of non-commercial knowledge, co-operation among firms, technology availability, and take-up.

- **The entrepreneurial capabilities**: Including business and entrepreneurship education as well as immigration.

- **The entrepreneurship culture** of a population.

This framework and studies such as that by Grilo and Thurik (I. and A.R. 2005), who looked into what determines entrepreneurship engagement levels throughout the European Union and the U.S., provides a helpful starting point for our analysis. However, rather than focusing on the structural and environmental factors driving the rate of entrepreneurship at a country-level – which as been researched extensively already – we have chosen to examine cultural and educational factors. We reached this decision following research indicating that "the relative stability of differences in entrepreneurship across countries suggests that factors other than economic ones are at play" (Freytag and Thurik 2010). Even if "in recent years research has increasingly devoted itself to the subject" (OECD 2009), a lot still needs to be done.

Research on these factors began as early as a hundred years ago, when Max Weber attempted to explain how religious-ethical motivations affect entrepreneurship (Weber et al.). Today, religion may be less effective in justifying why some are more likely to start businesses than others, but this effort served as a founding stone and it is now widely recognized that "cultural features influence attitudes towards start-ups and that these attitudes, in turn, have an impact on start-up activities" (OECD 2009).

More recently, Davidsson, along with Delmar at first (1992), then alone (1995), then with Wiklund (Davidsson and Wiklund 1997), at his turn, laid subsequent stepping stones 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 (Freytag and Thurik 2010) 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, 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 (Scott et al. 1996), which is key as "individuals who decide to start a new business exhibit more confidence than those who do not" (Hogarth and Karelaia 2012). 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" (OECD 2009).

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 degrees 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" should 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 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 (Inglehart and Baker 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 (Boyd and Vozikis 1994) 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 (Fishbein and Ajzen 1975) 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 make research into skills, abilities and willpower an important step in understanding entrepreneurship rates. This sentiment was echoed by Boyd, who stated "individuals would be predisposed to entrepreneurial intentions based upon a combination of both personal and contextual

factors" (Boyd and Vozikis 1994). This has been further stregthened in research by Boyd and Vosikis, building upon social psychology research, as they introduced the concept of self-efficacy in Bird's model of entrepreneurial intentionality, saying "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 need to control for this entrepreneurial self-efficacy as we research the potential effects of positive reinforcement.

We also looked into other studies connecting educational features and entrepreneurship. In 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 Vozikis 1994). One slightly different and interesting perspective is that of King and Sobel (A. and S. 2008), 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. However, their perspective was still not directly in line with our research design, as they asserted that a more business-like environment – favoured by voucher programs – in K-12 education was the key answer to their research question.

Quantitative Analysis of the Impact of Education on Entrepreneurship

Research Design

At this stage, having explained how the determinants of entrepreneurship have been researched and having mentioned how education has been related to entrepreneurship so far, we need to assert here our research question:

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 :

1. An education system reinforcing self-confidence

2. Higher degree of individual self-confidence

3. Higher probability an individual will become an entrepreneur

4. 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 controlled 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 (OECD 2009), 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)

Additional information on the GEM data used for this research can be seen in the descriptive statistics table included below.

Table 4:

| Statistic	N	Mean	St. Dev.	Min	Max
WayofTeaching	192	2.324	0.419	1.353	3.278
PercentFear	318	33.928	7.982	10	61
PercentNascent	318	4.329	2.505	0.400	15.400
PerceivedCapability	318	43.186	11.065	9	67
PercentOwner	317	6.414	2.931	0.400	28.000
PercentIntention	295	10.299	6.951	0.700	46.500
PercentOpportunities	318	33.931	15.168	3	71

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

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:

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.
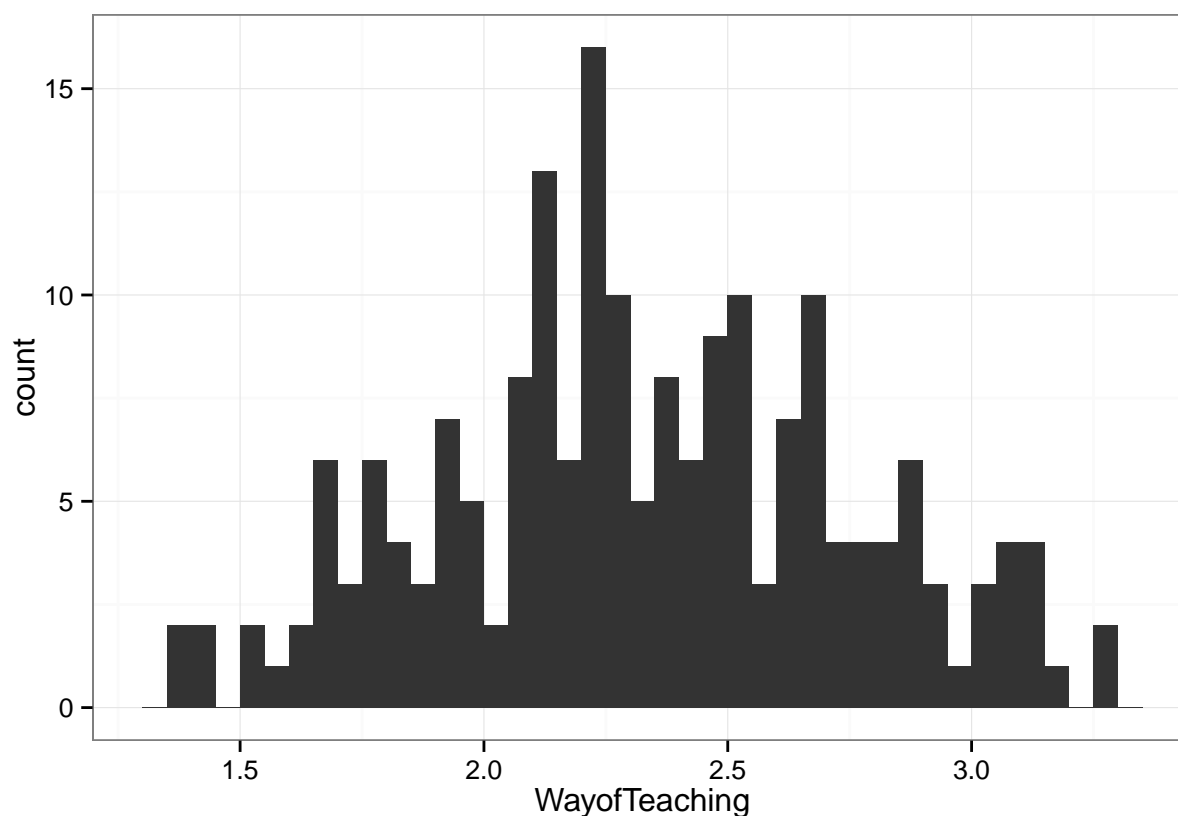
In addition to understanding the density of each recorded "Way of Teaching" indicator, it is also helpful to examine the differences in this indicator among OECD countries. To see this, we have created a figure showing the distribution of the average "Way of Teaching" value over the 2001-2010 period for the OECD countries included in the surveys. This figure is included below.
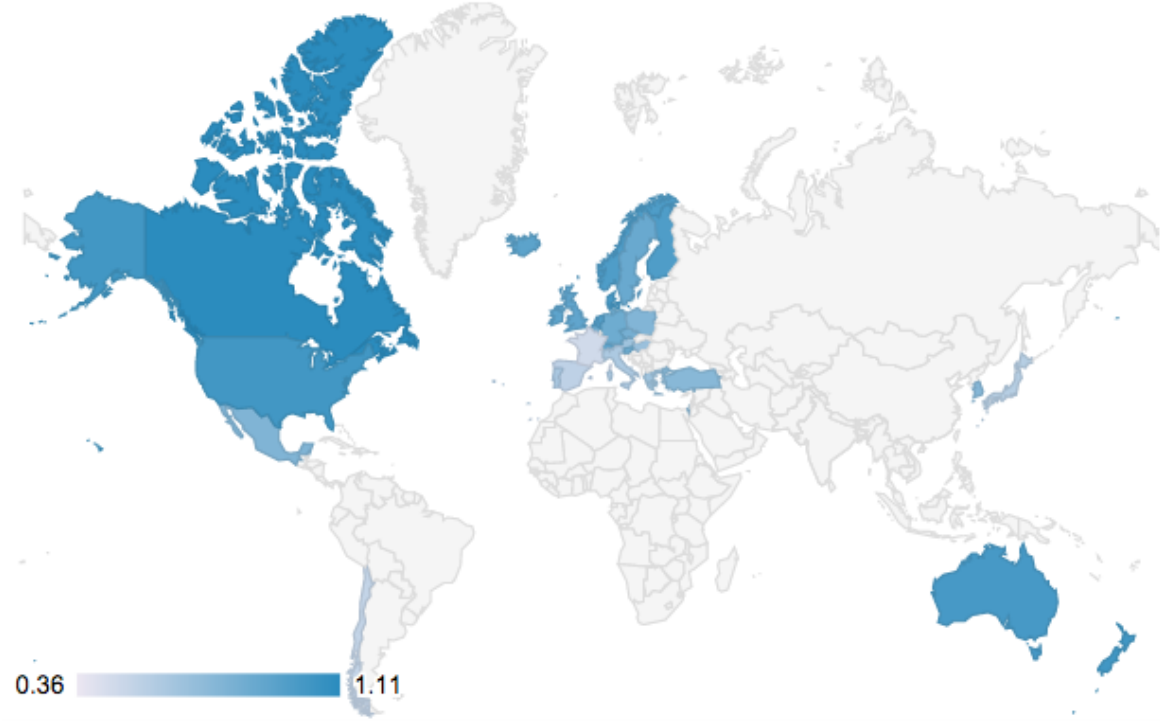
0.36 — 1.11

image:

Starting with this explanatory variable, 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 table 4 below. This regression output was generated using a simple least square regression model.

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 which equation we would like to examine more closely. The results can be seen in table 5 below.

Given the positive relationship between the "Way of Teaching" and "Entrepreneurship Owner" we decided to use this equation for our simulations. In an effort to address data availability issues, we also decided to run a second model including imputed data generated by 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 our explanatory variable "Way of Teaching" and "Perceived Capabilities" for this analysis. One important aspect of the Zelig package is that observations with omitted variables will be omitted from the calculation. For this reason, there is some variation between the coefficients for the Zelig model and the model in the preceding regression output chart.

Given our data characteristics and the available models in the Zelig package, we used a "Least Squares

Table 6: Linear Regression Estimates with Country-specific Effects

	Dependent variable:		
	Entrepreneurial Intention	Nascent Entrepreneur	Entrepreneurship Owner
	(1)	(2)	(3)
Way of Teaching	0.57	−0.04	−0.44
	(0.98)	(0.41)	(0.67)
Perceived Capabilities	0.09[*]	0.03[*]	0.13[***]
	(0.05)	(0.02)	(0.03)
Fear of Failure	0.26[**]	0.06	0.08
	(0.11)	(0.04)	(0.07)
Perceived Good Opportunities	0.25[***]	0.06	0.01
	(0.09)	(0.04)	(0.06)
Fear of Failure x Perceived Good Opportunities	−5.04[*]	−5.13[***]	−7.14[***]
	(2.55)	(1.10)	(1.80)
CountryBelgium	−2.95	−4.34[***]	−8.09[***]
	(2.01)	(0.84)	(1.37)
CountryCanada	−3.30[*]	−1.48[*]	−6.02[***]
	(1.97)	(0.85)	(1.38)
CountryChile	17.25[***]	0.65	−7.07[***]
	(2.01)	(0.84)	(1.36)
CountryCzech Republic	0.28	−0.38	−5.57[**]
	(3.30)	(1.45)	(2.36)
CountryDenmark	−4.05[**]	−4.49[***]	−4.53[***]
	(1.93)	(0.80)	(1.31)
CountryFinland	−5.13[***]	−4.13[***]	−2.39[*]
	(1.85)	(0.78)	(1.26)
CountryFrance	0.96	−3.92[***]	−8.59[***]
	(2.81)	(1.16)	(1.89)
CountryGermany	−3.78[*]	−3.81[***]	−7.02[***]
	(1.99)	(0.82)	(1.34)
CountryGreece	1.14	−3.36[***]	−1.12
	(2.18)	(0.86)	(1.40)
CountryHungary	0.24	−2.60[***]	−6.32[***]
	(2.16)	(0.90)	(1.47)
CountryIceland	4.31[**]	0.05	−2.99[**]
	(1.78)	(0.75)	(1.23)
CountryIreland	−3.35[**]	−2.41[***]	−4.26[***]
	(1.69)	(0.70)	(1.13)
CountryIsrael	4.27[**]	−3.90[***]	−7.73[***]
	(2.06)	(0.83)	(1.40)
CountryItaly	−2.33	−4.46[***]	−6.72[***]
	(1.96)	(0.80)	(1.30)
CountryJapan	−3.50	−4.49[***]	−2.58
	(3.17)	(1.33)	(2.17)
CountryKorea, Republic Of	6.46[***]	−2.71[***]	−0.09
	(2.31)	(0.95)	(1.55)
CountryMexico	10.17[***]	1.32	−9.54[***]
	(2.05)	(0.84)	(1.36)
CountryNetherlands	−5.28[***]	−4.34[***]	−4.75[***]
	(1.93)	(0.81)	(1.32)
CountryNew Zealand	−0.44	1.18	−1.97
	(2.06)	(0.83)	(1.36)
CountryNorway	−3.19[*]	−2.77[***]	−3.59[***]
	(1.86)	(0.79)	(1.28)
CountryPoland	7.33[**]	−3.50[**]	−4.15[*]
	(3.22)	(1.41)	(2.29)
CountryPortugal	−3.51	−4.95[***]	−6.72[***]
	(2.70)	(1.05)	(1.71)
CountrySlovenia	−1.18	−4.29[***]	−6.56[***]
	(1.80)	(0.76)	(1.24)
CountrySpain	−5.28[***]	−4.38[***]	−5.36[***]
	(1.90)	(0.75)	(1.23)
CountrySweden	2.63	−5.31[***]	−5.01[***]
	(2.51)	(0.96)	(1.56)
CountrySwitzerland	−2.24	−3.66[***]	−3.94[***]
	(1.91)	(0.81)	(1.32)
CountryTurkey	9.54[***]	−4.66[***]	−4.26[***]
	(2.08)	(0.89)	(1.45)
CountryUnited Kingdom	−4.94[***]	−4.32[***]	−6.60[***]
	(1.89)	(0.80)	(1.30)
CountryUnited States	−2.29	−0.20	−6.68[***]
	(1.76)	(0.73)	(1.18)
PercentFear:PercentOpportunities	−0.01[**]	−0.001	−0.002
	(0.003)	(0.001)	(0.002)
Constant	−5.49	3.33	5.77
	(5.89)	(2.44)	(3.99)
Observations	172	192	191
R^2	0.85	0.79	0.66
Adjusted R^2	0.81	0.74	0.58
Residual Std. Error	2.86 (df = 136)	1.28 (df = 156)	2.08 (df = 155)
F Statistic	22.04[***] (df = 35; 136)	16.58[***] (df = 35; 156)	8.59[***] (df = 35; 155)

Note: <div align="right">[*]p<0.1; [**]p<0.05; [***]p<0.01</div>

Table 7: Linear Regression Estimates omitting Country-specific Effects

	Dependent variable:		
	Entrepreneurial Intention	Nascent Entrepreneur	Entrepreneurship Owner
	(1)	(2)	(3)
Way of Teaching	-5.66^{***}	0.15	0.84
	(1.04)	(0.37)	(0.56)
Perceived Capabilities	0.31^{***}	0.13^{***}	0.12^{***}
	(0.04)	(0.01)	(0.02)
Fear of Failure	0.13	0.02	0.22^{***}
	(0.14)	(0.05)	(0.07)
Perceived Good Opportunities	0.24^{*}	0.06	0.10
	(0.13)	(0.04)	(0.06)
Fear of Failure x Perceived Good Opportunities	-0.005	-0.001	-0.004^{*}
	(0.004)	(0.001)	(0.002)
Constant	1.94	-3.27^{*}	-7.01^{**}
	(5.55)	(1.83)	(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

Regression for Continuous Dependent Variables." A regression output table and our simulation results are included below.
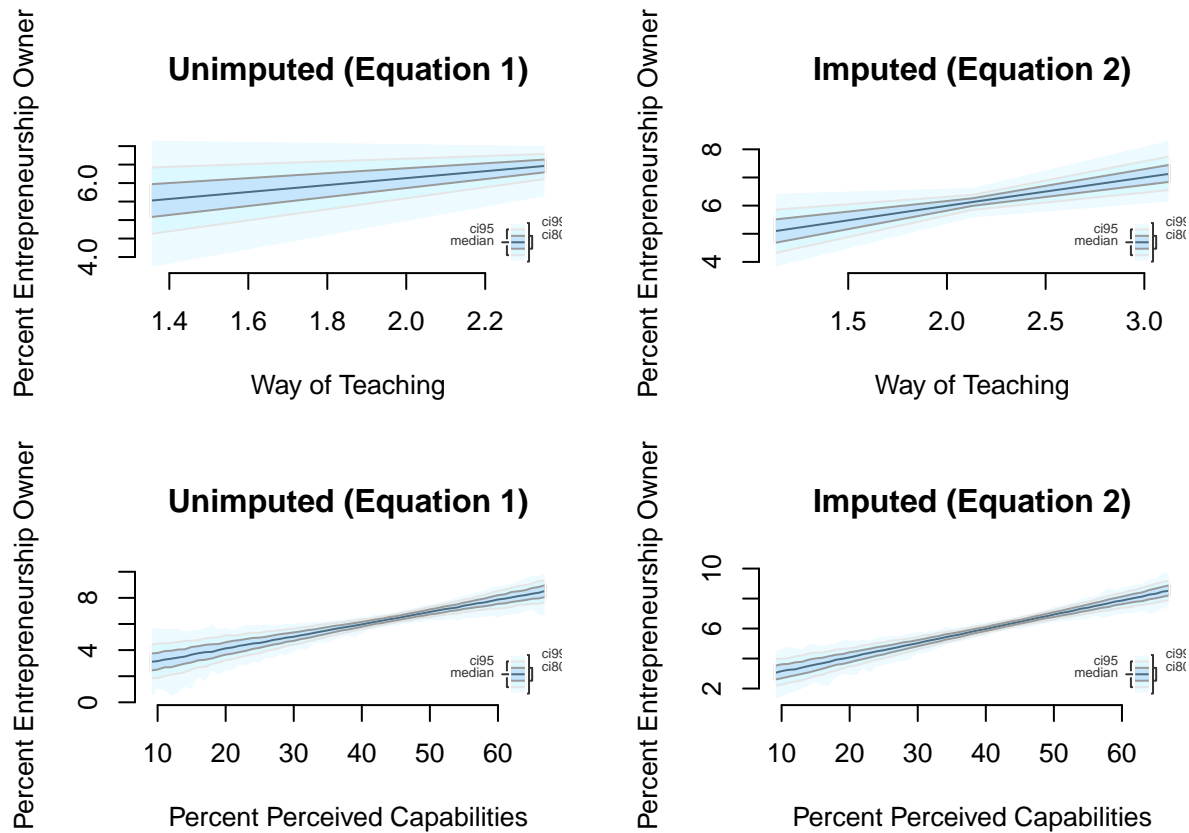
Table 8: Least Squares Regression for Continuous Dependent Variables

	Dependent variable:	
	Entrepreneurship Owner	
	(1)	(2)
Way of Teaching	0.94^{*}	1.03^{***}
	(0.52)	(0.40)
Perceived Capabilities	0.09^{***}	0.09^{***}
	(0.02)	(0.02)
Fear of Failure	0.25^{***}	0.21^{***}
	(0.07)	(0.04)
Perceived Good Opportunities	0.14^{**}	0.12^{***}
	(0.07)	(0.05)
Fear of Failure x Perceived Good Opportunities	-0.005^{**}	-0.004^{***}
	(0.002)	(0.001)
Constant	-7.67^{***}	-6.82^{***}
	(2.78)	(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

Unimputed (Equation 1) — Percent Entrepreneurship Owner vs. Way of Teaching

Imputed (Equation 2) — Percent Entrepreneurship Owner vs. Way of Teaching

Unimputed (Equation 1) — Percent Entrepreneurship Owner vs. Percent Perceived Capabilities

Imputed (Equation 2) — Percent Entrepreneurship Owner vs. Percent Perceived Capabilities

As we can see from the regression output table, using the Amelia program to generate additional data expanded the observations analyzed from 172 to 318, and increased the statistical significance of our explanatory variable. In addition, the positive slope of this equation is consistent with what we expected after our analysis of existing literature on this topic. In addition, this process reduced the variance in our simulation results, suggesting it improved the accuracy of this model. Despite this, we have several concerns regarding the reliability of existing GEM data (which will be discussed later in this paper), which makes us question the effectiveness of using this data to generate additional observations.

Perceived opportunities

Perceived Opportunities Over Time
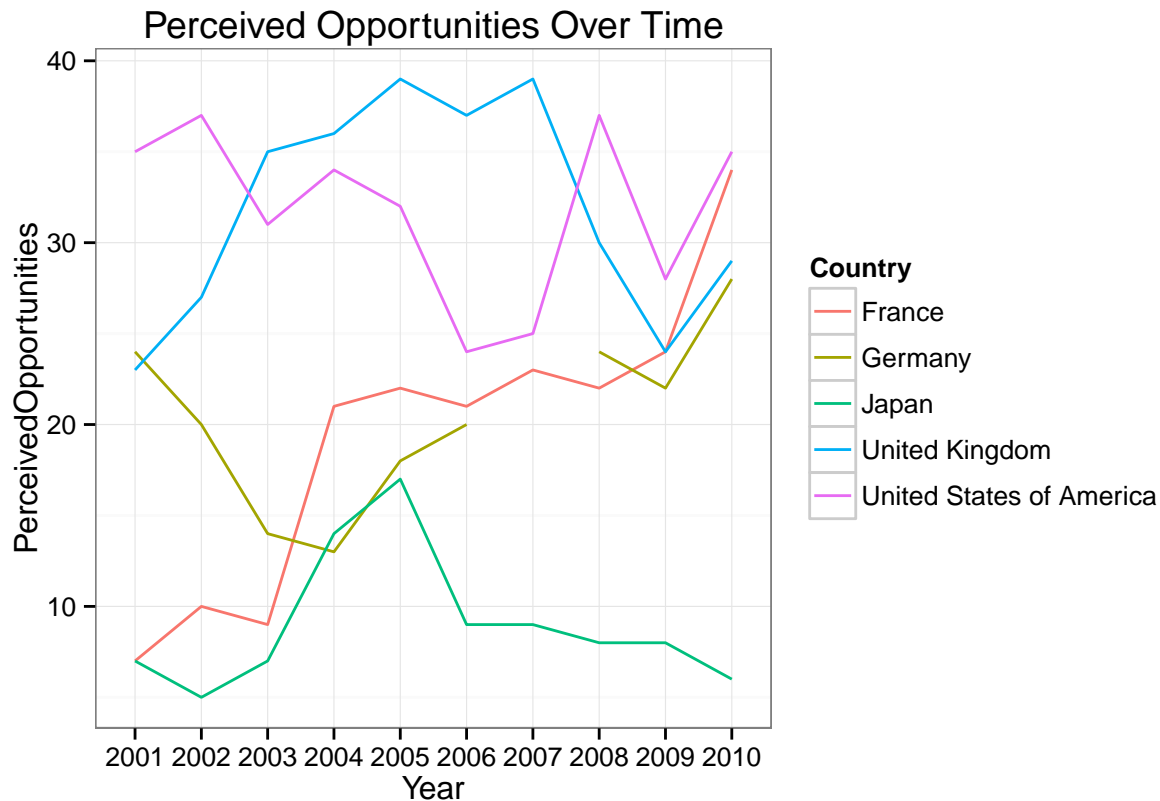
Results

Limitations of the data

From the results and from the description of the data made earlier, one can easily foresee quite a few 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. Besides, the national teams hired by GEM Coordination Team were reported by GEM itself to manage time allocated for data collection rather poorly. That is, while they had five months at their

disposal to approach and survey four experts for each framework condition, they happened on a regular basis to be in a hurry in July and therefore ended up relying on their personal connections to answer the surveys.

Regarding the D01 indicator that 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 culture related and as such should be much less fluctuant. At most, they should vary due to reforms being implemented at national, federal or state level, but that does not take place every year, rather every four or five years, sometimes only once a decade or even less frequently. Thus this yearly change is very unlikely to be a faithful figuration of how supportive of students' self-confidence teaching is like in a given country. On top of that, we purposely selected one item among the six used to characterised potential entrepreneurial education. That one item cannot be compensated by others in our study, which probably worsened the effect. The scale between 0 and 5 makes the assessment even more approximate. As a result of all these flaws combined leads to some variations of up to 1 point for some countries, like for Denmark for instance.

Now looking at GEM Adult Population Survey (APS), even if the data is directly collected by GEM from representatives samples of the population (around 2000 peole), once again we observe huge variation for indicators such as the perceived opportunities, which are unlikely to fluctuate that much in reality. That very indicator was used as a proxy for many potential control variables regarding economic outlook and other environmental determinants of entrepreneurship, and we do not expect the level of financing, the level of public programmes or the GDP growth for instance to vary that much from year to year. The subjective perception this indicator entails should have been compensated by the representativity of the sample and thus should not show so much variance. Once more, even if we are very doubtful about that data.

Last but not least is the scarcity of the data. For the perceived capabilities, perceived opportunities and fear of failure, there are already a few missing data but this gets much worse regarding the way of teaching. For that key explanatory variable, many countries have only data for have the years we were looking into, those who had the most data were at least missing three years, and three countries (Estonia, Luxembourg and Slovak Republic) had no data available at all.

Adding up all these limitations of the data we used, it does not come as a surprise that we could hardly get significant coefficients and could only observe general trends.

Conclusion

Education systems tend to be assessed in terms of numbers of students, ratios of teachers among other quantitative measures but what we tried to suggest here is that they could be looked at in quite a different way. As governments allocate public funds for education, they happen to make a long term investment, and, although this may not come as news, we intended here to propose a different rationale in doing so. Without denying the importance of all the classic determinants of entrepreneurship, we suggest that education systems could turn out to be one of those determinants that favour start up activites.

From the research we attempted to conduct here, due to poor quality and inconsistent data, we cannot ascertain our point but we still firmly believe there could be something happening out there and this should be looked into more. Now that would mean collecting the adequate amount of data and computing a new kind of indicators that are not yet available. This surely is a prospect for future research.

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