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Abstract: We examine the relationship between entrepreneurship and education length and field. Entrepreneurship and education are both used as policy vehicles for achieving employment and economic growth, regionally and nationally. If entrepreneurship in the form of new firms is the objective, then how will more education influence its achievability? We examine this question at the individual level using a full population data-set, and analyze the influence of education length and field on the propensity of leaving employment in 2007 for self-employment in 2008. The fields of education we investigate is: education, humanities and arts, social sciences, business and law and science. The effect of education on the probability of an individual turning from wage-employment into self-employment is positive overall, but differs considerably with respect to field of education on average and on the margin. The positive effects seem to almost exclusively come from the fields, science, social sciences and business and law. For the other fields the effect is essentially zero or even negative. In the empirics we control for a large set of variables controlling for individual, employer, and regional heterogeneity.

Keywords: Self-employment, Entry, Human capital, Education, Industry, Region
JEL classification codes: C21, L26, R10.

1 Introduction

A large body of research analyzes the causes and consequences of entrepreneurship. The significance of entrepreneurship for the development and growth of regional economies is generally acknowledged (e.g. Acs & Armington, 2004; Westlund et al., 2014). As a consequence policy makers appear more and more interested in encouraging entrepreneurship as a tool for policy. Entrepreneurship in general and firm start-ups in particular are thought of as a remedy for problems such as unemployment and regional unevenness in different dimensions.

Encouraging higher education is another supported policy instrument for essentially the same set of problems. Human capital have long been considered important for economic growth; this view has been strengthened by the development of endogenous growth theory with its emphasis on human capital, knowledge and innovation (e.g. Lucas, 1988; Romer, 1990).

In many countries these two related policies have been pursued over the past decades. The policies are put into place in order to support the renewal and innovativeness of the economy in order to promote economic growth. The two policies are aimed at increasing the educational level of the population and promoting entrepreneurship in the form of new firms.

As an example the Swedish government have launched a program called "A national strategy for regional competitiveness, entrepreneurship and employment"[1] as a steering document supposed to guide all policy areas. This policy is derived from the level of the European Union as part of its cohesion policy. These policies are explicitly aimed at increasing entrepreneurship levels in all sectors and all regions with the goal of accomplishing greater competitiveness and employment. New firms are perceived as essential in promoting structural change, innovation and the creation of new jobs that decrease unemployment.

Starting from the policy goal, economic growth, it may be true that higher education leads to economic growth and it may also be true that a higher level of entrepreneurship leads to economic growth. What is the relationship between these policies? Are they independent or do they reinforce or counteract each other? Furthermore, is the relationship different between education and entrepreneurship in different education fields and for different levels of education?

It is often claimed that the relationship between education and entrepreneurship may be U-shaped (e.g. Block et. al. 2013, Van der Sluis, 2008). At low levels of education we may find

[1] See Ministry of Enterprise, Energy and Communications, http://www.government.se/sb/d/574/a/77417

what is usually called necessity entrepreneurs. At the other end of the education distribution we are more likely to find opportunity entrepreneurs. Some firms are started because the entrepreneur cannot find suitable employment and some firms are started in because the entrepreneur have identified business opportunities in the market. If this is the case we should expect to find a non-linear relationship between individual education levels and propensities for starting a new firm. This means that at some intermediate level of education entrepreneurship propensity is at a minimum.

Governments usually have a strong direct impact on the provision and financing of the education system. This being the case public policy in this area have major effects on human capital accumulation (Barro, 2013).

In a cross-country setting Barro (2013) finds that the average years of schooling attainment at the secondary and higher levels have positive and significant effects on growth rates. The quality of the school system, however, is quantitatively more important.

In this paper we assess the interrelationship between entrepreneurship and education length. In particular we investigate if the nature of this relationship is different for different education fields. The measure that we use for entrepreneurship is self-employment and in particular the transition to self-employment. In order to answer questions concerning the relation between entrepreneurship and education we investigate the impact of the number of years of schooling and the particular field of education. The set of interrelated questions we explore has to do with if education policy is strengthening entrepreneurship policy or if it is hampering it.

The rest of this study is organized as follows. In the next section we present relevant earlier research and present a straightforward theoretical framework for our analysis. In section 3 the data used is presented together with some preliminary descriptive analyses. Section 4 is devoted to presenting the empirical model used and gives the major results from running slight variants of the model. The paper concludes with and discussion of the results and gives some suggestions for further study.

2 Earlier research and theoretical framework

In the following section we go through the literature on self-employment and human capital as well as providing theoretical arguments for the inclusion of the explanatory variables used in the empirical section of this study.

In going through the literature it is soon revealed that there does not seem to exist a universal consensus on the relationship we seek to uncover.

In a recently executed extensive literature review Heinrichs and Sascha (2013) fail to establish a positive relationship between education and the propensity to become self-employed using meta-analysis techniques. Also, a relatively new survey and meta-analysis of the literature on entrepreneurship selection van der Sluis et. al. (2008) come to the conclusion that there is no evidence that education has a significant impact on the transition probabilities from wage employment into self-employment. They point out that this result does not contradict economic theory since it predicts that education has two opposite effects on entry.

These two effects can be described as follows. The first effect would increase the probability of an individual becoming an entrepreneur through the enhancement of managerial ability through higher levels of education. The second effect decreases the abovementioned probability by giving the individual better options to choose from on the regular labor market (higher wage and better conditions in general). This obviously will decrease the entrepreneurship probability. A priori there is no way to know which of the opposing effects that will dominate the other. (van der Sluis et. al. 2008)

If it indeed is the case that these offsetting forces balance each other on average there is still the possibility that the relative strength of the effects is different for different education fields.

Wagner and Sternberg (2004) study the determinants of becoming a nascent entrepreneur. They focus on the interrelationships between two sets of variables. These two are individual characteristics and the regional milieu. Among their individual level variables they find that having a higher education increases the probability of entering into entrepreneurship. Turning to the regional level variables, their result indicate that entrepreneurship is a more probable outcome in regions with high population densities and high growth rates of population in the recent past. Also, regions with high start-up rates in the past are more likely to foster new entrepreneurial activities.

Tamasy (2006) study determinants of start-up activities and finds a positive effect for higher education. However, when controlling for personal entrepreneurial attributes the effect becomes insignificant. As a second step these attributes are regressed on (among other variables) higher education and the result is highly significant. So, in this set-up the effects of education of start-up propensity is positive but mediated through these attributes.

A recent study by Fritsch & Sorgner (2013b) investigate determinants of entrepreneurship for individuals belonging to the so-called creative class. For the variable education they find a positive and significant relationship to self-employment not much different than for other groups. The major difference is for the "creative core" for which the education variable is insignificant.

The human capital retained by an individual plays a pivotal role in the decision of whether to enter self-employment or not. However, the human capital can be measured in various ways, for example past experience (Lazear, 2004). Lazear proposed that a "balanced skill set" is important for entrepreneurs in that they have to possess skills in a number of different areas. Stuetzer et. al. (2013) analyze the validity of the "jack-of-all-trades" interpretation. Their study lend support to that this view is important for explaining success in the venture creating process. They also find that there is a positive interrelationship between innate entrepreneurial ability and the prior investment in entrepreneurial skills

Block et. al. (2013) find a strong effect of education on the probability of being self-employed.

Davidsson and Honig (2003) find that formal education is a strong predictor of future attempts to start a new business. However, according to their study education did not seem to have an influence in determining success.

In a comparative study between the US and Australia Meyer and Blanchflower (1994) study the characteristics of young people entering into self-employment. Broadly their conclusion is that the individual characteristics are similar between the countries. The main difference they find is that additional years of schooling had a positive impact on the probability of being self-employed in the US while in Australia they find no education effects.

According to Tamásy (2006) the literature on entrepreneurship usually make a distinction between three sets of variables used to explain different phenomena. These sets of variables describe; the new firm, the entrepreneur and the environment in which the process takes place.

In this present study we observe the potential entrepreneur, i.e. the person making the transition into self-employment or stays in wage employment. The environment in which this occurs is described in terms of the geographical region and the industry into which the entry is made.

In the literature it has sometimes been argued that becoming an entrepreneur or starting a new business is a process with several stages rather than a simple binary choice of starting a new business or not (Grilo & Thurik, 2008). From a policy perspective this may be important to take into account, especially if determinants work in opposite directions between such stages towards setting up a new firm. Grilo and Thurik test this process approach and come to the conclusion that their result do not conflict with the binary choice approach.

Since we are including quite a few variables in the analysis we find it appropriate to group them in three distinct groups according to the level of analysis. The three groups are labeled individual, regional and industry. The individual level variables are those that control for characteristics of the individual such as wage, human capital and former job. The set of regional variables aims to control for variations between regions in terms of size, the level of entrepreneurship in the region and employment conditions in the region. The industry variables are intended to control for differences between the industries into which the entrepreneur enters as self-employed. These variables measures the growth/decline of the industry at the national and regional levels and the degree to which the industry in concentrated in the region where the entrepreneur starts up compared to the other regions.

A utility maximizing individual chooses the occupation that gives the highest expected utility. In each time-period the individual compares different occupation choices including self-employment. If the expected utility is the highest for the status where he is in he remains, but if some other status bring a higher expected utility he changes.

The expected utility is, of course, influenced by many things in his environment. This should be understood as there are many things that enter the utility function, e.g. the region the entrepreneur prefers. Also, the entrepreneur is faced by imperfect information and uncertainty.

3 Motivation for three sets of explanatory variables

In this section we introduce background and motivations for the three sets of variables that are used in the empirical section to explain individual's propensity to move from wage-employment into self-employment. We introduce the variables under the headings: individual, region and industry.

3.1 Individual factors

If we are to predict the probability that an individual enters into self-employment it seems important to know something about that individual's human capital. According to the entry "human capital" in the new Palgrave dictionary of economics the term refers to the productive capacity of individuals. Capital is some stock which is valuable since it is a source of current and future flow of output and income. Human capital then can be viewed as such a source embodied in individuals. The direct measurement of human capital is difficult so proxies need to be used. Such proxy-variables can be e.g. age, experience and education. Reasons why older more experienced people may become entrepreneurs may include the following (Parker. 2004). Older people are more likely to have accumulated monetary funds, some forms of human capital may most effectively be acquired through prior employment (though valuable in entrepreneurship). Older people may choose entrepreneurship in order to avoid mandatory retirement.

Of course human capital is not limited to the result of formal education but also comprises experience and on the job learning as well as less formal education that is not visible in degree transcripts etc. (cf. Becker, 1962). Human capital is usually understood as broader than just education. Other things that is sometimes included in human capital is health, and parts of social capital. The focus of the current study is on formal education.

Considering education as a proxy for human capital there are arguments for both positive and negative relationships between education and entrepreneurship. Highly educated persons may select themselves into occupations where entrepreneurship is more common, for instance, managerial types of jobs. There may be more opportunities for entrepreneurship in knowledge-intensive sectors. Also, individuals with higher education may be better informed about possible business opportunities. (Parker, 2004)

However, a counteracting force may be that the monetary returns to education is greater in wage-employment compared to self-employment.

The wage prior to entering into entrepreneurship (or staying in wage-employment) can be expected to have an important effects on the probability of entering (or staying out). The reason being that the higher the relative wage prior to entering will affect negatively the wage differential when entering. This will influence the financial reward of entering negatively and reduce the entry probability. Somewhat surprising, the robustness of this effect is not overwhelming according to Parker (2004, pp. 69-70). Reasons for this can simply be an artifact of that the data on self-employment is poor in many research settings. Or it can also point to that pecuniary motives may not be the most important. For example, other motives can include lifestyle considerations (being your own boss, freer working hours etc.).

Since what we are exploring in this study is the transition from wage-employment into self-employment variables reflecting the experience at the initial (if there is a switch) job is likely to be important. We try to proxy this using four different variables. These are tenure, plant size, firm close-down and plant close-down. Here we define tenure as the number of years that the individual held on to his former job. The longer this period is the more likely it is that the match between employer and employee is a good one (cf. Farber, 1994). This matching may reflect more things than merely the wage, which we already control for. It may be interpreted as how happy or satisfied the individual is with his position reflecting things like stimulating work tasks, good colleagues etc.

The variable plant size is intended as a measure of the extent of the division of labor at the plant. The greater the division of labor the more probable it is that the individual is holding a job that fits that persons particular skill-set. The bigger the plant the more specialized the tasks is expected to be.

If either the plant or the whole firm where the individual works discontinues it means that the workers need to find a new job or risk facing unemployment. If finding a new job proves difficult an alternative to unemployment may be self-employment. This situation is often referred to as a "push" effect since it may be that individuals are more or less forced into entrepreneurship because of lack of other options (c.f. Acs, 2006).

3.2 Regional factors

Research has shown that there are large and persistent regional differences between entrepreneurship levels (Andersson & Koster, 2011; Fritsch & Wyrwich, 2013) as well as innovative activity (Audretsch & Feldman, 1996).

Larger regions generally means that these are places with higher levels of demand. It can be argued that regional demand is especially important for newly self-employed individuals. First, it may take some time to build a network of customers and the first customers may be some you already know and the probability is that you know more people in your own region. Second, self-employment generally means that the business is small and have limited resources to overcome distance. These two facts are especially relevant for service sector firms. Thus, a larger region can accommodate more firms. A higher level of demand also means that there is room for different forms of specialization. Firms tending to niche markets may find sufficient demand in a larger region. Our general size measure is market potential. Measuring size as a potential means that we can take care of neighbor effects. Demand may come from a neighboring region. We discuss this variable at some length in a later section. Market potential measures have also been shown to be a fruitful way of capturing agglomeration gains (e.g. Grek et al. 2011; Andersson et al., 2013; Larsson, 2014).

Role models for entrepreneurship may also be essential. In some places strong traditions of entrepreneurship may reinforce further entrepreneurship. In such places there may evolve a local culture conducive to entrepreneurship in different forms. We proxy this with just a variable recording the average size of firms. This variable also capture the opposite effect. In regions or towns dominated by one or just a few large firms an "employment culture" may develop.

The functioning of the labor market is probably an influential factor explaining entrepreneurship and new firm entry. In regions where employment opportunities are scarce individuals may be pushed into self-employment because of lack of other opportunities. If the only other option open to individuals is unemployment or moving to another region becoming self-employed may be an alternative. On the other hand high employment rates signal that the region offers a fertile economic environment with opportunities for new ideas and businesses.

Haapanen and Tervo (2009) study the importance of regional factors for the duration of self-employment spells in urban and rural regions of Finland. They find that survival time is longer in rural as compared to urban regions.

In a study by Brixy and Grotz (2007) the authors try to shed light on several regional-level questions. In essence they find the following. In regions with high new-firm formation rates survival rates are low, probably because of competition among the new firms. Agglomeration influences entry rates positively but survival rates negatively. Entry rates as well as survival rates are positively influenced by prospering regions, measured as regions with growing employment. In their study this effect outweighed the possible push-effect of unemployment.

Robson (1998) show that regional factors are important in explaining the incidence and growth rates of self-employment. The author show that the industry mix seem to be important but that the major component are regional fixed effects suggesting that there are inherent long-run effects that reflect fundamental differences in cultural and socio-economic characteristics that make some regions more fruitful for self-employment than others.

3.3 Industry factors

If for some reason a particular industry has located a large part of itself in a particular region it must mean that there are some attractive features pertaining to the industry in that region. In the literature this kind of clustering effects are often explained by the existence of some kind of agglomeration economies. In general terms agglomeration economies benefit individual firms that locate near other firms. Typically, agglomeration economies are divided into two broad groups. *Localization economies* follow from the geographic clustering of similar types of firms, while *urbanization economies* result from the geographical clustering of all types of firms. These economies are thought to be achieved through principally three channels. These are i) information spillovers, ii) local non-traded inputs and iii) local skilled-labor pool. (McCann, 2001, pp. 55-59)

If it is the case that the industry is agglomerated in a few places the probability is that this attractiveness also holds for new start-ups. If industry turbulence in terms of entry and exit is constant across regions for an industry then a large industry leads to a large number of start-ups.

In this analysis we use three different variables to catch various, but related, industry-size effects. Our first variable is simply regional industry employment. The second is industry concentration measured as a simple employment location quotient. This quotient measures the relative size of the industry compared to other regions. The third is industry employment growth or decline.

4 Data and descriptive statistics

In this section we provide information on the data employed for the empirical analysis. The dataset is a full population, matched employer-employee audited register dataset, maintained by Statistics Sweden (SCB). The data monitor all Swedish citizens aged 25-64 with labor market participation in 2007. The data inform on basic individual observables such as age, sex, immigration status, education length, and education specialization. Further, we have data on the work place level (such as plant size, and entry-exit behavior), as well as on the regional level.

We define self-employment as an individual who is registered as being primarily self-employed in 2007 - either in an incorporated business or a sole proprietorship. Key to our analysis is information on who held this status in 2008, allowing us to focus on startup behavior, rather than an analysis of the stock of entrepreneurs. In the empirical part of this paper, we focus the analysis on determinants of entry into self-employment for individuals who choose to leave employment to become self-employed between 2007 and 2008. Hence, the dependent variable in the empirical analysis is a binary outcome variable indicating if an individual left employment to become self-employed or not.

We use the accessibility to the sum of all wages in a municipality as the representation for market potential in that municipality. The sum of all wages in a place is a reasonable measure of the amount of economic activity that is taking place there. By calculating the accessibility to wage sums we take care of wage sums in neighboring places and recognize the fact that there almost certainly exist spillover effects across municipal boundaries. Let W_r be the sum of all wages in region r and t_{rm} denote the distance measured in travel time between region r and region m. Also, let the λ*:s* be distance-decay parameters. Then the accessibility to wage sums in region r can be calculated as:

$$A_r = W_r e^{-\lambda_1 t_{rr}} + \sum_{s \in R} W_s e^{-\lambda_2 t_{rs}} + \sum_{s \notin R} W_s e^{-\lambda_3 t_{rs}} \qquad (1)$$

Where, A_r is the accessibility measure for region r summing over all regions in the country. The further away (bigger t), the smaller the contribution, the speed of the decrease depending on the three λ*:s*. Following Johansson et. al. (2003) we recognize that the influence of accessibility may differ between different categories of regions. To permit for this, the sum in equation (1) is

the product of three quantities. Starting with the region the accessibility is to be calculated for, that part of the sum is separated. Second, the regions belonging to the same functional economic region (FER)[2] as the region we calculate the accessibility is also taken out from the sum. The last term consists of the municipalities (regions) in the rest of the country. When calculating the three sub-sums we use the finding in Johansson et. al. (2003) and recognize that the λ:s are not the same but particular for each component. For the municipal part (λ_1) it is 0.02, for the regional (λ_2) 0.1, and for the extra-regional (λ_3) 0.05.

Definitions of all variables employed are presented in table 1. The motivations for including these variables in the models can be found in earlier sections.

[2] Typically a FER is a group of regions (municipalities) between which there are frequent cross-border interactions. These interactions are in the form of commuting, retail travel and unplanned service contacts. Sweden is divided into 290 municipalities (regions) which are divided into 81 FER:s based on the level and frequency of such cross-border relationships.

Table 1: *Definition of all variables*

Variable	Description
Start-up	Dummy variable indicating whether the individual has left employment for entrepreneurship between years 2007 and 2008.
Schooling	Number of theoretical years of schooling associated with the highest achieved level of education.
Schooling^2	The squared value of the schooling variable
Age	Number of years since birth
Age^2	The squared value of the age variable
Male (dummy)	Dummy variable indicating if the person is male.
Immigrant (dummy)	Dummy variable indicating if the person is an immigrant to Sweden.
Wage (ln)	Yearly wage derived from employment in 2007
Plant size	Number of employees working for the employer (firm) in 2007.
Tenure	Number of consecutive years spent with the same employer (firm), since 1991.
Close-down (firm)	Dummy variable indicating whether the firm discontinued its operations in 2007.
Close-down (plant)	Dummy variable indicating whether the plant (place of work) discontinued its operations in 2007.
Industry size in the region	Number of employees working for the same NACE 2-digit industry in the same labor market region in 2007.
Industry concentration (lq)	Location quotient indicating relative industry concentration on the labor market region level in 2007.
Growth of industry (region)	Growth (in absolute number of workers employed) in the same 2-digit NACE industry on the labor market region level in the period from 2002-2007.
Growth of industry	Growth (in absolute number of workers employed) in the same 2-digit NACE industry on national level in the period from 2002-2007.
Market potential (ln)	Time-travel discounted accessibility to purchasing power in 2007.
Share of small firms	Share of firms on the labor market region level with less than 20 employees.
Employment rate	Share of working-age individuals listed as employed on the labor market region level in 2007.

Summary statistics on averages for all variables are presented in table 2.

Table 2: *Overall averages and for each educational field*

	Overall (N=2,896,082)	Education (N=255,470)	Humanities and arts (N=151,829)	Social sciences, business and law (N=617,180)	Science (N=96,930)
Start-up	0.011	0.005	0.016	0.012	0.012
Schooling	13.11	14.87	13.50	13.21	14.94
Age	41.11	45.24	35.34	43.13	39.99
Male (dummy)	0.508	0.246	0.401	0.400	0.609
Immigrant (dummy)	0.146	0.121	0.174	0.139	0.219
Wage (SEK, ln)	7.736	7.665	7.390	7.824	7.893
Plant size (no. employees, ln)	4.497	4.103	4.277	4.300	4.826
Tenure	6.493	9.140	4.211	6.361	5.113
Close-down (firm)	0.081	0.035	0.137	0.087	0.086
Close-down (plant)	0.028	0.016	0.038	0.032	0.027
Industry size in the region	20.10	21.48	14.39	19.72	20.45
Industry concentration (lq)	1.861	1.146	1.442	1.628	1.958
Growth of industry (region)	0.056	0.039	0.068	0.059	0.067
Growth of industry	0.044	0.039	0.054	0.048	0.041
Market potential (ln)	11.41	11.31	11.76	11.62	11.74
Share of small firms	0.922	0.922	0.921	0.922	0.920
Employment rate	0.778	0.779	0.771	0.778	0.772

5 Empirical model and results

In the following section we introduce our empirical model based on earlier given theory and previous research.

The logit model we estimate can be defined as:

$$\Pr\left(E_{i,t}=1\middle|\mathbf{x_{i,t-1}}\right)=\frac{1}{1+\exp\left[-\left(\Phi\left(\mathbf{x'_{i,t-1}\Gamma}\right)\right)\right]} \quad (2)$$

Where $E_{i,t}$ is a dummy variable indicating whether the individual switched from employment to self-employment between 2007 and 2008, i.e. 1 indicates that a switch has taken place and 0 that it has not. $\mathbf{x}_{i,t-1}$ contains the lagged covariates. Further, I, Z, and R, contain individual, firm-level, and region-level covariates, respectively.

$$\mathbf{x'_{i,t-1}\Gamma}=\alpha+\mathbf{I'_{i,t-1}\beta}+\mathbf{Z'_{i,t-1}\gamma}+\mathbf{R'_{i,t-1}\sigma}+\varepsilon_{i,t} \quad (3)$$

In a first step, the entire population (N=2,896,082) is analyzed. Then, in order to assess heterogeneities across industries, we split the data according to the education specialization of the founder. We differentiate between four specializations: (i) education, (ii) humanities and arts, (iii) Social sciences, business and law, and (iv) natural sciences and engineering. The distinction is made based on the 1-digit ISCED-97 standard.

The output from estimating (2) irrespective of education specialization is displayed in Table 3.

Table 3: *Explaining the individual level probability of turning from wage-employment into self-employment (logit, marginal effects)*

	(A)	(B)	(C)	(D)
Schooling	0.000763***			0.000596***
	(9.61e-05)			(9.16e-05)
Schooling (squared)	-1.22e-05***			-7.50e-06**
	(3.28e-06)			(3.12e-06)
Age	0.000486***			0.000471***
	(1.31e-05)			(1.25e-05)
Age (squared)	-4.24e-06***			-4.10e-06***
	(1.42e-07)			(1.35e-07)
Male (dummy)	0.00371***			0.00337***
	(6.53e-05)			(6.32e-05)
Immigrant (dummy)	-0.000141**			-0.000326***
	(6.60e-05)			(6.11e-05)
Wage (ln)	-0.00236***			-0.00225***
	(2.90e-05)			(2.83e-05)
Plant size (no. employees, ln)	-0.00187***			-0.00154***
	(1.44e-05)			(1.59e-05)
Tenure	-0.000264***			-0.000222***
	(6.11e-06)			(5.85e-06)
Close-down (firm)	0.000909***			0.000412***
	(0.000101)			(8.89e-05)
Close-down (plant)	-0.00142***			-0.00109***
	(7.94e-05)			(8.29e-05)
Industry size in the region		-0.000392***		-7.06e-05***
		(3.91e-06)		(2.68e-06)
Industry concentration (lq)		-0.000157***		-3.27e-06
		(2.46e-05)		(1.08e-05)
Growth of industry (region)		-0.000255		-2.78e-06
		(0.000242)		(0.000131)
Growth of industry		0.0174***		0.00456***
		(0.000786)		(0.000414)
Market potential (ln)			0.00177***	0.000626***
			(5.00e-05)	(2.08e-05)
Share of small firms (region)			0.0856***	0.0148***
			(0.00367)	(0.00146)
Employment rate (region)			-1.05e-05	0.00433***
			(0.00163)	(0.000652)
Pseudo R2	0.185	0.042	0.0054	0.193
Observations	2,896,082	2,896,082	2,896,082	2,896,082

Note: standard errors in parentheses. *** $p < 0.01$; * $p < 0.05$; * $p < 0.1$.

The schooling variable exhibits an inverted U-shape, with a positive linear term and a negative quadratic form, albeit of modest magnitude. This means that, in the aggregate, the effect of schooling is positive, at a slightly diminishing rate.

This result is similar to the result of Fritsch & Sorgner (2013a) where they run a probit estimation with probability of future self-employment is the dependent variable. The same thing can be said about the age variable, reflecting experience and life cycle choices proxying another facet of human capital.

Earning a higher wage in the previous period is associated with a lower propensity to start a new venture, as is plant size (reflecting e.g. division of labor), and tenure (reflecting the quality of the employer-employee match). Plant and firm exit are both positively associated with startup propensity.

The coefficient of the variable indicating the size of the industry in the region is negative, indicating that startups in a particular industry is less probable if the local market is saturated. The industry concentration (location quotient) variable is essentially zero in the fully controlled model D. Consistent with this interpretation, industry growth on the regional level during the 2002-2006 period does not appear to have a significant impact on start-ups in the relevant industry, while industry growth on the national level does have a significant, positive impact.

The regional level variables perform as expected for the full population. Increased market potential is positively associated with startup propensity, indicating that startups are more common in regions with thick markets, with increased possibilities for local specialization, as well as potential to benefit from spillover phenomena. The variable indicating the share of small firms is highly positive, reflecting thresholds effects in the local economies. Further, the region employment rate is positive.

In table 4, we re-estimate the fully controlled model for the split-up population, basing the categories on education specialization.

Table 4: *Explaining the individual level probability of turning from Wage-employment into Self-employment for different education fields(logit, marginal effects)*

Field of Education	Education	Humanities and arts	Social sciences, business and law	Science
Schooling	-0.000968**	0.000535	0.00220***	0.00200***
	(0.000468)	(0.000649)	(0.000309)	(0.000532)
Schooling (squared)	3.36e-05**	-1.98e-05	-5.86e-05***	-5.70e-05***
	(1.48e-05)	(2.20e-05)	(1.09e-05)	(1.60e-05)
Age	0.000258***	0.000494***	0.000608***	0.000486***
	(3.81e-05)	(6.51e-05)	(3.69e-05)	(8.89e-05)
Age (squared)	-1.12e-06***	-3.57e-06***	-5.18e-06***	-3.93e-06***
	(3.81e-07)	(7.23e-07)	(3.87e-07)	(9.66e-07)
Male	0.00191***	0.00262***	0.00438***	0.00269***
	(0.000207)	(0.000319)	(0.000172)	(0.000321)
Immigrant	-0.000199	-0.000150	-0.000484***	-0.000997
	(0.000174)	(0.000356)	(0.000163)	(0.03156)
Wage (ln)	-0.00158***	-0.00425***	-0.00262***	-0.00235***
	(6.73e-05)	(0.000164)	(6.71e-05)	(0.000162)
Plant size (no. employees, ln)	-0.000399***	-0.00173***	-0.00183***	-0.00185***
	(3.45e-05)	(7.97e-05)	(4.06e-05)	(9.58e-05)
Tenure	-0.000195***	-0.000441***	-0.000269***	-0.000245***
	(1.42e-05)	(4.41e-05)	(1.50e-05)	(4.16e-05)
Close-down (firm)	0.000548*	-0.00152***	0.000747***	-0.00121***
	(0.000325)	(0.000392)	(0.000237)	(0.000424)
Close-down (plant)	-0.00107***	-0.00300***	-0.00106***	-0.000455
	(0.000198)	(0.000398)	(0.000228)	(0.000632)
Industry size in the region	-7.90e-05***	-0.000155***	-0.000107***	-8.88e-05***
	(8.50e-06)	(2.07e-05)	(6.49e-06)	(1.54e-05)
Industry concentration (lq)	2.72e-05	6.10e-05*	5.06e-06	1.40e-05
	(1.96e-05)	(3.52e-05)	(2.95e-05)	(7.02e-05)
Growth of industry (region)	0.000816*	-0.000428	0.000169	-0.000897
	(0.000442)	(0.00101)	(0.000359)	(0.000715)
Growth of industry	-0.000132	0.0211***	0.00207*	0.00564**
	(0.00122)	(0.00299)	(0.00110)	(0.00259)
Market potential (ln)	0.000197***	0.00116***	0.000751***	0.000883***
	(5.58e-05)	(0.000127)	(5.65e-05)	(0.000132)
Share of small firms	0.00596	0.0364***	0.0229***	0.0167*
	(0.00402)	(0.00984)	(0.00390)	(0.00943)
Employment rate	-0.00214	-0.00508	0.00655***	0.00508
	(0.00176)	(0.00379)	(0.00174)	(0.00397)
Pseudo R2	0.216	0.238	0.174	0.186
Observations	255,470	151,829	617,180	96,930

Note: standard errors in parentheses. *** p < 0.01; * p <0.05; * p < 0.1.

Evidently, the aggregated picture is obscuring some rather heterogeneous outcomes. With respect to the individuals' education specialization, the schooling variable is positive in social sciences, business and law, and in science, about zero in humanities and arts, and negative for individuals in education. The squared schooling variable reveals that the attenuation phenomenon also differs. In science and in social sciences, the propensity to start a business diminishes with years of schooling after a certain point. As with schooling in general, the squared term is close to zero in humanities, while it is larger in education, indicating an increasing propensity to start a firm for the highest levels of education.

The individual's age appears to affect startup propensity in a similar manner across specializations, with a positive linear term and an attenuating affect as indicated by the negative quadratic term. Other individual control variables largely maintain the same signs as was obtained in the aggregated results from table 3. The difference is the immigration coefficient, which was weakly negative in table 2, and is now zero for all fields, except for social sciences, where it is weakly negative.

Local industry size is a deterrent for startups for all four specializations, while the effect of industry concentration is essentially zero across the board. As with the overall picture, the variable indicating local industry growth in the 5 preceding years has a small or zero effect in all groups. Industry growth on the national level is a positive and significant in humanities, exhibits a modest effect in social sciences and science, and is zero in education.

When looking at the regional variables, the effect of market potential is positive but small for individuals specialized in education, and positive for all other fields. The variable indicating the regional average firm size has no apparent effect on startups in education, and only a small effect on science specialized individuals.

In figure 1 we show the predicted probabilities of switching from wage-employment into self-employment by length of education for the different education fields.

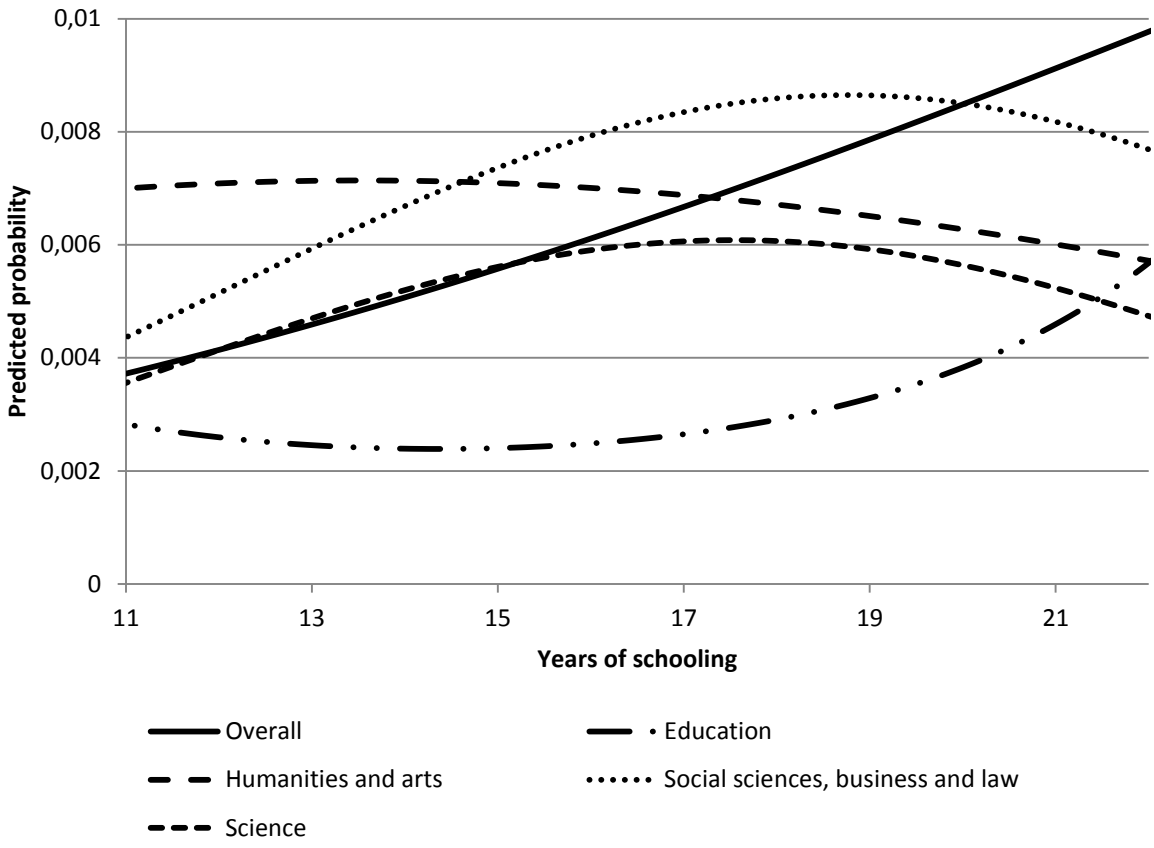

Figure 1: *Years of schooling and probability of transition into self-employment*

From the figure we see that the overall effect is almost linearly positive. This however hides the fact that the effects are very different between the different fields. The overall effect of schooling on startup propensity seem to almost exclusively come from the fields, science and social sciences, business and law. For the other fields the effect is very small or even negative. Note that what is interesting in this regard is the slope of the curves and not the absolute levels. As can be seen, individuals specialized in humanities and arts, for instance, have a rather high startup propensity; that propensity does not vary much with education length, however.

6 Conclusion

In this study we have analyzed the association between the propensity of turning from wage-employment into self-employment, and education length and field. The rationale for analyzing this relationship is because both entrepreneurship and education is used as policy levers for attaining economic growth in general and regional development in lagging regions.

We ask the question if the propensity of an individual to turn from wage-employment into self-employment differ by education length and field.

The conclusions suggested from the analysis is that the effect of education on the probability of an individual turning from wage-employment into self-employment is dependent on the number of years in school, but also on the field of education. The overall effect of more education on the self-employment propensity is positive. However, this effect seems to almost exclusively come from the fields, science and social sciences, business and law. For the other fields the effect is very small or even negative. In the empirics we have controlled for a large set of variables.

In conclusion our investigation suggest that a policy maker should be aware that promoting education across the board may both be hindering and promoting self-employment at the same time for different groups of individuals depending on their individual characteristics, such as choice of education field.

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