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Working Paper No. 50

**Differences between entrepreneurs and employees in their educational paths**

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# **Differences between entrepreneurs and employees in their educational paths<sup>\*</sup>**

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## **Abstract**

This paper examines whether individuals who become either entrepreneurs or employees follow systematically different educational paths to a given educational level. Following Lazear's jack-of-all-trades theory, we expect that entrepreneurs aim at a balanced set of different skills (academic or vocational), while employees specialize in one skill. This means that entrepreneurs follow educational paths that combine different types of education, while employees follow same-type paths while climbing up the educational ladder. We use the Swiss Labor Force Survey to test our hypothesis. Our empirical findings are in line with Lazear's theory. Individuals who change between different types of education are more likely to become entrepreneurs. Thus, the permeability of a national educational system is one crucial determinant for entrepreneurship.

**Keywords:** Entrepreneurship, Jack-of-all-trades, Educational paths

**JEL Classification:** I21, J24, M50

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## 1. Introduction

National educational systems offer different ways for individuals to pursue a certain educational level as for example measured by the number of years in education. While climbing up the educational ladder, individuals can combine different types of skills or different types of education. In our paper, we focus on academic education as one type and vocational education with systematic on-the-job training as another type of education. For example an individual reaches an educational level worth fifteen years of education by going to a gymnasium (i.e., a high school) and then getting a bachelors degree at a university of applied science. Or this person also reaches an educational level worth fifteen years of education by going through an apprenticeship and then going for a bachelor at a technical college. The first educational path would combine different types of education while the second would be a pure vocational path. So, individuals not only have to decide on their level of education but also on the path they take to get there.

This paper investigates whether individuals who want to become entrepreneurs systematically choose different educational *paths* than those who become employees. Thus we are not concentrating on the relation between an individual's level of education and the probability to become an entrepreneur, the question that has been frequently analyzed in previous literature. Our paper, instead, is about differences in individuals' educational *paths* and the probability to become an entrepreneur.

We use Lazear's jack-of-all-trades theory (Lazear 2005) to explain why we expect a systematic relationship between educational *path* and the likelihood to become entrepreneurs or employees. This theory states that (potential) entrepreneurs are characterized by a balanced skill set, while (potential) employees specialize in one type of skill. Applying this theory to our problem of systematic differences in individuals' educational paths we expect (potential) entrepreneurs to follow educational paths that combine different types of education. By contrast, we expect (potential) employees to follow specialized educational paths.

To test this hypothesis we use data from the Swiss Labor Force Survey (SLFS) and find that the theoretical predictions are to be borne out in the data. Thus, this paper provides another test of Lazear's jack-of-all-trades theory – only for a slightly different than the original skills analysis.

Previous studies have not looked into the relationship between different types of educational path and entrepreneurship, but only focused on the effect of different levels of education on entrepreneurship. Thus, our results are innovative and they bear novel and important policy implications. Our findings suggest that educational systems enabling its population to switch from one type of education to another encourage entrepreneurship. The opposite is true for educational systems that hamper changes in the type of education for individuals while climbing up the educational ladder. Thus, an analysis of a nation's entrepreneurship climate also has to include the permeability between different educational tracks and - associated with this - the probability of individuals to actually change between different educational tracks. In this sense the paper also provides an important contribution to entrepreneurship research.

The structure of this paper is as follows: The next section gives a description of Lazear's jack-of-all-trade theory and the hypothesis we test. Section 3 provides a discussion of the available empirical literature, an explanation of the chosen estimation method for analyzing the decision to become an entrepreneur versus an employee, and an overview of the data, i.e., the Swiss Labor Force Survey (SLFS), we use for the empirical analyses. Section 4 presents the results of the empirical analysis. Section 5 concludes.

## 2. Educational paths and entrepreneurship: a theoretical analysis based on Lazear's jack-of-all-trades theory

According to Lazear's entrepreneurship model, potential entrepreneurs choose a broader educational path than potential employees. To illustrate the jack-of-all-trades explanation he uses a theoretical model based on two types of skills,  $x_A$  and  $x_B$ . In our application, skill type  $x_A$  represents *academic skills* individuals gain during full-time education in schools or colleges and  $x_B$  represents *vocational skills* individuals gain by apprenticeship training mainly on the job.

According to Lazear (2005) potential employees need specialized skills and therefore concentrate on the one skill that they do best, i.e. they invest time and effort in improving this one type of skill (either  $x_A$  or  $x_B$ ). Their earnings are based on their best skill and are given by

$$W_{\text{Employee}} = \max(x_A, x_B)$$

Entrepreneurs, on the contrary, need a broad spectrum of balanced skills to become successful and thus invest in different types of skills to keep their skill bundle balanced. Their earnings are restricted by their weakest skill and depend on the market value of entrepreneurial activities:

$$W_{\text{Entrepreneur}} = \lambda \min(x_A, x_B),$$

where  $\lambda \geq 1$  is a parameter for the market value of entrepreneurial activities. It is higher if entrepreneurial activities are valued more in a country or market (for example because the number of potential entrepreneurs is more scarce) and it is lower if entrepreneurial activities are valued less in a country (for example because there is no demand for a certain type of business).

Therefore, according to Lazear (2005), rational individuals decide to become entrepreneurs if, and only if, their entrepreneurial earnings are higher than their employee earnings would be, i.e. individuals become entrepreneurs when

$$\lambda \min(x_A, x_B) > \max(x_A, x_B).$$

This condition is visualized in a simple diagram given in Figure 1. If individuals have completely balanced skills ( $x_A = x_B$ ), then, according to the model, they decide to become entrepreneurs. However, if the entrepreneurial premium  $\lambda$  is large enough, even individuals without completely balanced skills will become entrepreneurs. This relation is characterized by the shaded area in Figure 1. If  $\lambda$  increases, both lines move to the outside, the area in which it pays to become an entrepreneur increases and more people decide to become entrepreneurs. If, on the contrary, there is no premium for entrepreneurial skills, i.e.,  $\lambda$  is equal to 1, both lines overlap with the 45° line and no one decides to become an entrepreneur. Because the minimum of any combination of the two skills can never exceed the maximum of the combination, the condition for individuals to become entrepreneurs never holds. Figure 1 also illustrates that given any  $\lambda$ , individuals with more balanced skill bundles, i.e. with skill combination closer to the 45° line, are more likely to become entrepreneurs.

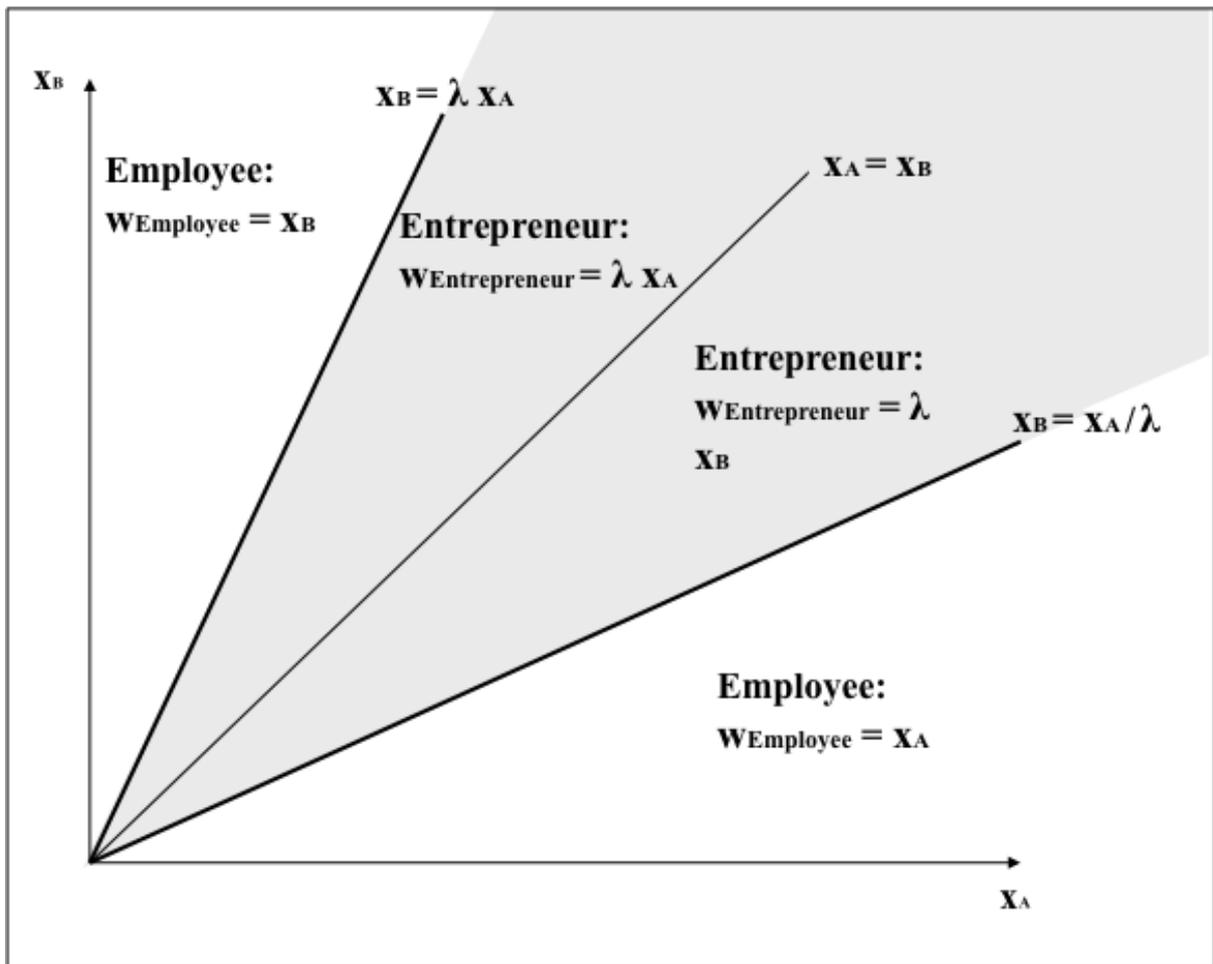


Figure 1: Entrepreneurship decision

Source: Own illustration based on: Lazear (2005, p. 653)

Applying Lazear's model to our question of different educational path, we expect that individuals who are interested in becoming entrepreneurs follow a more balanced investing strategy, i.e. they choose mixed educational paths; individuals who are interested in becoming employees follow a specialized investment strategy and choose specialized educational paths. Thus, in our empirical part we test the following hypothesis:

*Individuals who invested in a mixed educational path (including academic and vocational education) are more likely to become entrepreneurs than individuals who invest in either a pure academic or a pure vocational education (the level of education kept constant).*

### 3. Empirical analyses, estimation approach and data

Although no empirical study has looked at the relation of different educational paths and entrepreneurship so far, Lazear's theory has been tested a number of times. All studies find more or less strong evidence in favor of the jack-of-all-trades model. In his own study, Lazear (2004, 2005) uses data on Stanford alumni to investigate how the education of today's entrepreneurs and employees differed during their years of study. He shows that individuals who chose a broader curriculum are more likely to become entrepreneurs and to start businesses (Lazear, 2005, p. 676). He concludes that entrepreneurs are jacks-of-all-trades, meaning they acquire a variety of different but balanced skills as opposed to employees who keep specializing more and more during their career. More recently, a number of authors have been testing the predictions of (parts of) the jack-of-all-trades theory in various educational settings and with different types of data. These studies focus on work experience, different education levels, skill sets, and the number of roles a person has worked in. The evidence is somewhat mixed. Strong support for Lazear's model is found in Backes-Gellner & Moog (2008); Baumol, (2004); Davidsson & Honig, (2003); or Wagner, (2003, 2006<sup>1</sup>), who find that people completing a more diverse education are more likely to become entrepreneurs. By contrast, Astebro (2006) does not observe differences in the educational behavior of entrepreneurs and employees. Nevertheless, Lazear's finding that people with a more diverse career are more likely to become entrepreneurs is also supported by various authors using different data: by Astebro & Thompson (2007) with Canadian data, by Baumol (2004) with U.S. and international data, by Davidsson & Honig (2003) with Swedish data. Silva (2007) in addition raises the question whether being a jack-of-all-trades is an inherent skill.

In our paper, we built on this evidence and study whether a *particular* combination of certain types of education, namely the combination of vocational and full-time academic education in an individual's educational path also has an influence on the likelihood to become an entrepreneur. In analogy to Lazear's original model for two skills, we expect that entrepreneurs need two types of education, i.e. vocational skills gained by training on the job, and more abstract and analytical skills gained by full-time education. First evidence suggesting such a relationship is provided by the study of Tuor & Backes-Gellner (2010) on complete educational paths. The authors for the first time point out that individuals with a mixed educational path are more likely to be entrepreneurs. Nevertheless, their study focuses on earnings and risk-return trade-offs of different educational paths and does not investigate the probability to become an entrepreneur or employee. But in the following empirical analysis we built on their classification of different types of education and of different educational paths. We first explain our estimation method, which we use to analyze the likelihood to become an entrepreneur. Second, we give an overview over the data set. Third, we provide a detailed description of our variables and descriptive statistics.

#### 3.1 Estimation model

To empirically analyze the likelihood of becoming an entrepreneur depending on different educational paths we use a probit regression because the dependent variable "entrepreneur" is a binary variable. "*Entrepreneur*" has a value of 1 if the person is an entrepreneur and 0 if an employee. The basic model we estimate to analyze the likelihood of becoming an entrepreneur is as follows:

$$\begin{aligned} \text{Entrepreneur} = & \beta_1 * \text{educational paths} + \beta_2 * \text{work experience} + \beta_3 * (\text{work experience})^2 \\ & + \beta_4 * \text{individual characteristics} + \varepsilon \end{aligned} \quad (1)$$

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<sup>1</sup> However, Davidsson & Honig (2003) and Wagner (2003, 2006) only consider nascent entrepreneurs in their studies. According to them, a more accurate analysis is hereby possible since normally, as in Lazear (2002), only successful businesses are considered, and therefore the results might be biased. People who either plan to become self-employed or are currently building their own company are defined as nascent entrepreneurs (Wagner, 2003, 2006).

The key independent variables are several dummy variables indicating different educational paths. Basically pure vocational paths are distinguished from pure academic and mixed educational paths. We give a detailed definition of these explanatory variables “educational paths” and the control variables “experience” and “individual characteristics” in section 3.3. The error term  $\varepsilon$  of the equation is assumed to underlay a standard normal distribution. But before we can come to detailed definitions of our variables we have to introduce the data set that we use.

### 3.2 The Swiss Labor Force Survey (SLFS)

The data we use stem from the Swiss Labor Force Survey (SLFS). The SLFS is a household survey of the permanent resident population of Switzerland starting at the age of 15. The Federal Statistical Office (FSO) conducts the survey annually since 1991, and aims to collect information about individuals’ working lives and the labor market in general. Data collection is done through household surveys by phone. The sample size since 2001 is about 33,000 people (before that around 16,000) (FSO, 2008). Accordingly, each person in the data set represents, on average, 130 members of the permanent resident population aged 15 or older in Switzerland (FSO, 2004). The SLFS is a rotating and unbalanced panel: a chosen person stays in the panel for five consecutive years before he or she is replaced. In other words, every year, about 20% of the individuals in the survey, are substituted by new ones. Since the sampling is conducted randomly, the estimation methods basically remain the same (Wooldridge, 2002, p. 577-581).

In this study, we include full-time employed Swiss only, while we exclude unemployed, non-employed and foreign persons. Because we assume Non-Swiss individuals to have been educated more likely in a different educational system, we do not include them in our analysis. The classification of foreigners’ education into a particular educational path that we specifically compose for Switzerland would be too difficult and arbitrary in the end. In addition, we restrict the sample to people aged 20 to 64 with an educational paths leading to a tertiary degree. This allows us to clearly analyze educational level and composition effects. Concerning our key independent variables, i.e. the educational paths, the survey questions have been extended after 1999. Therefore, the econometric analysis will be based on data from 1999 to 2005.

The Swiss Labor Force Survey is particularly suitable for our study because its education data are collected annually and because it exactly applies international definitions in the educational variable. Additionally, the data set provides rich information we can use to categorize workers into entrepreneurs and employees.

### 3.3 Definition of main variables

Following Lazear (2005) several types of entrepreneurs can be distinguished when testing his theoretical predictions. The different entrepreneurship definitions are shown in Table A1 in the Appendix.

A first definition (*Entrepreneur 1: ownership structure*) aims to identify the differences between entrepreneurs and employees based on the ownership structure and not on the performed tasks. Within this definition we define individuals as entrepreneurs if they own a company (Ahmad & Seymour, 2008, p. 12). Therefore, we consider all self-employed individuals or employees of their own company – regardless of whether the company has employees or not – to be entrepreneurs. In the sample of 15,395 individuals the proportion of entrepreneurs according to this ownership structure definition is 24.25%, as can be seen in Figure 2.

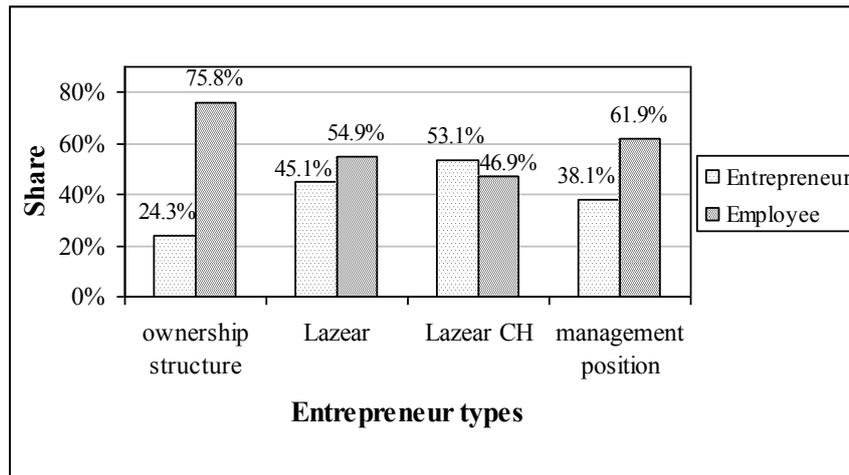


Figure 2: Types of entrepreneurs: Proportion of entrepreneurs and employees

Source: Own illustration based on: Swiss Labor Force Survey, FSO.

A second definition following Lazear's approach to identify entrepreneurs depends on whether workers have a controlling function (*Entrepreneur 2: Lazear*). In this case, Lazear differentiates between entrepreneurs, self-employed with employees, and members of the management board on the one hand and employees and self-employed without employees on the other hand. Self-employed without employees are not counted as entrepreneurs in this definition because they do not need to manage others and therefore they do not need the same amount of overview and skills as entrepreneurs. The proportion of entrepreneurs according to this definition is 45.11% (cf. Figure 2). The high number indicates that this definition is exceptionally broad. Particularly when comparing with other entrepreneurship research we have to interpret the empirical findings with great care when using this definition.

The third definition (*Entrepreneur 3: Lazear CH*) is an extension of Lazear's model, taking into account that the empirical analysis is done with Swiss data. To have a balanced skill set might also be advantageous for self-employed without any other employees, at least in Switzerland. Thus, people who are either self-employed or employees of their own company – regardless of whether they have employees or not – are coded 1. For this definition, the proportion of entrepreneurs is 53.11% (cf. Figure 2). Because it is only a code conversion of the groups, the data basis stays the same.

For the fourth option (*Entrepreneur 4: management position*) we look at employees only. Because the classification of the self-employed is most ambiguous, we exclude them in this definition to find out whether the results still hold for this reduced sample of workers. This narrow definition, focusing on employees only, increases the clarity of the respective results but also reduces the sample size to 11,658. A member of the management board has the value 1, while all other employees are coded 0. Thus 38.10% (cf. Figure 2) are defined as entrepreneurs.

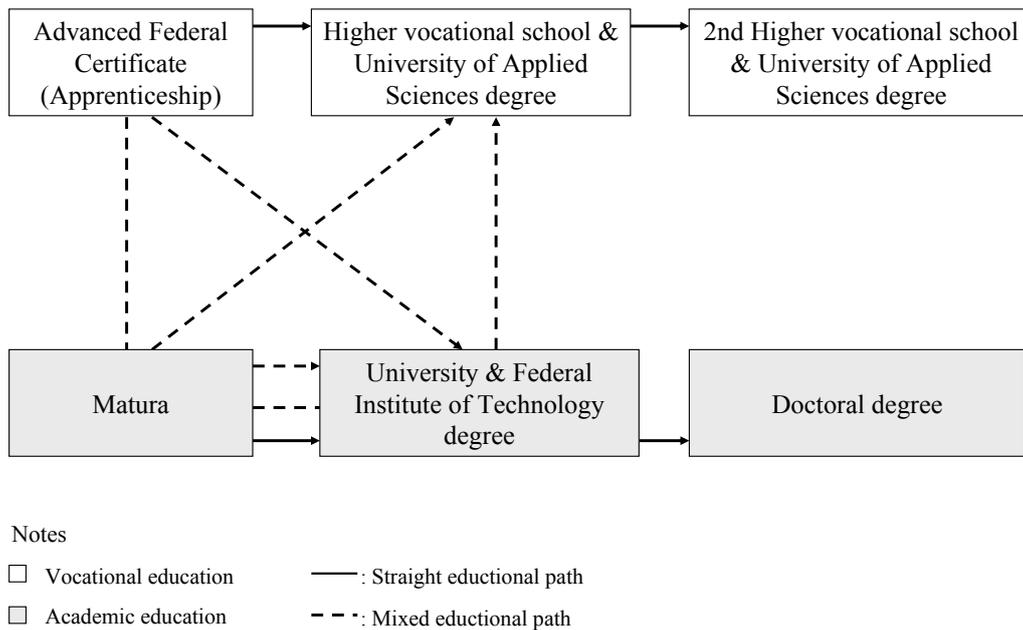


Figure 3: Overview of educational paths

Source: Own illustration

Regarding the independent variables we focus on our explanatory variables “*educational paths*”. Tuor & Backes-Gellner (2010) have demonstrated the importance of using complete educational paths instead of solely relying on the highest educational degree. The focus on complete educational path is possible because in our sample in every year, individuals are not only asked to report their highest educational degree at that point but also all educations completed to get there. Therefore, using this data, we can define the various educational paths that are important for this analysis. Figure 3 gives an overview of the different educational paths and their definitions. A comprehensive descriptive overview of all dependent and independent variables is given in Table A2 in the Appendix.

We categorize individuals depending on whether they have taken a purely vocational, a purely academic or a mixed educational path. As individuals with an academic educational path, referred to as *purely academic path (acadpath)* in the following, we classify individuals who attended gymnasium and then obtained a degree from a university or a federal institute of technology. If individuals further obtain a doctoral degree, they followed a specialized academic educational path, referred to as *purely academic and highly specialized path (spec\_acadpath)*.

A vocational path is based on mostly on-the-job training. A *purely vocational path (vocpath)* represents an educational career with an apprenticeship and an attendance of a higher vocational education and training school or a university of applied sciences. This educational path is used as reference category in the multivariate data analysis, because the majority of individuals in the survey (49.60%) choose this path. The different proportions in the various paths can be seen in Figure A1. Also, in this context, there are people having completed two of the above mentioned higher educations. An example is an individual who has attended a higher vocational school after the apprenticeship and then decided to get a degree at a university of applied sciences. This path will be denoted as a *purely vocational and highly specialized path (spec\_vocpath)*

Additionally, there are educational paths combining academic and vocational education. These mixed paths are important, because they can be used as indication of the broader educational behavior of entrepreneurs. There are two different ways to follow a mixed path:

On one hand, people have the option to switch to academic education after finishing an apprenticeship, i.e., after a vocational entry. This path is called *mixed path with vocational entry and academic exit* (*mix\_vocpath*). There is again a specialized form of this path. If workers first followed a purely vocational educational path, i.e. after apprenticeship they attended a higher vocational education and training school or a university of applied sciences, but then switched to academic education and obtained a university or federal institute of technology degree, then these workers have taken a *mixed path with specialized vocational entry and academic exit* (*mix\_specvocpath*).

On the other hand, people have the option to start with an academic education and afterwards switch to a vocational education. There are individuals who attended a gymnasium and then a higher vocational education and training school or a university of applied sciences. This educational career will be referred to as a *mixed path with academic entry and vocational exit* (*mix\_acadpath*). If an individual follows a purely academic path first and then, after having attained a higher academic education degree, switches to a vocational education, i.e. attends a higher vocational education and training school or a university of applied sciences, then we speak of an individual with a *mixed path with specialized academic entry and vocational exit* (*mix\_specacadpath*).

In addition to our explanatory variables we use a number of control variables. As in most similar studies, we apply workers' labor market experience as a control variable (amongst others: Astebro, 2006; Astebro & Thomson, 2007; Honig, 1996; Robinson & Sexton, 1994). Because workers' age is highly correlated with their labor market experience (0.7343), we do not include the former variable in the empirical analysis. In line with similar papers, further control variables, in the estimation model (1) referred to as individual characteristics, are gender, children and marital status (amongst others: Astebro & Thomson, 2007; Backes-Gellner & Moog, 2008; Lazear, 2005; Wagner, 2003, 2006). Gender and children are two dummy variables taking the value one if a person is male and has children below the age of 15, respectively. Regarding marital status the variable can take four different values: single, married (reference), divorced and widowed. Definitions of and further information pertaining to the described variables are also given in Table A2 in the Appendix.

Figures A2-A5 show that the proportion of people who have completed a mixed path is higher for entrepreneurs of types one (*ownership structure*), three (*Lazear CH*) and four (*management positions*) as compared to the employees. The opposite is true when looking at entrepreneurs of types two. This counterintuitive result, however, is not very surprising given that this definition of entrepreneurship is not really appropriate for Switzerland where our data stem from. Moreover, the figures show that workers with a vocational path are more likely to be employees. The academic path is more dominant for entrepreneurs.

In addition, Figures A6-A9 provide an overview of the different mixed paths. For entrepreneurs and employees, a mixed path with academic entry (and vocational exit) (*mix\_acadpath*) is the most common path. Yet, the proportion for employees is higher than that for entrepreneurs. The mixed path with vocational entry (and academic exit) (*mix\_vocpath*) has the lowest participation rate, and the proportion for entrepreneurs is a little higher than for employees. So our descriptive results already provide first evidence supporting Lazear's explanation of systematic differences in educational paths of entrepreneurs and employees.

#### 4. Results for the likelihood of becoming an entrepreneur

Table A4 provides empirical results for our estimation equation (1). To make the interpretation of results more intuitive the coefficients in the Table refer to the marginal effects at the mean of the independent variables. Results of our econometric analyses support the descriptive findings regarding

the impact of mixed educational paths on the probability to become an entrepreneur. As expected, in general, we find a significantly positive relation between the likelihood to become an entrepreneur and having followed a mixed educational path in comparison to a specialized educational path. This result is most pronounced for the third entrepreneurship definition (Lazear CH) and the fourth (management position), which, as we have argued previously, are the most appropriate definitions for Switzerland. Therefore, we focus on these two estimations.

Although there is a clear pattern demonstrating a positive relation between mixed educational paths and entrepreneurship, there is some variation within the group of mixed educational paths. First, the coefficient is strongest for workers with a mixed path with vocational entry and academic exit (*mix\_vocpath*). An example for such a worker would be an individual with both an apprenticeship training as a computer scientist and a university degree in Business Science. This individual has the specific skills required for being a good computer scientist as well as the general knowledge of how to handle a business. Thus, we assume such a worker to be a successful entrepreneur. Second, the coefficient for a mixed path with academic entry and vocational exit (*mix\_acadpath*) is positive, but not significant. This insignificant effect is against our hypothesis. However, according to Lazear's theory, we explain this as follows: individuals who have already chosen a broad education during university in the first step are not broadening their scope but narrowing it down by going into vocational education afterwards. If this interpretation is true, workers with this mixed educational path would – according to theory – indeed be expected not to become entrepreneurs but employees. Moreover, workers with a purely academic and highly specialized paths (i.e., with a doctoral degree) are also more likely to be entrepreneurs. This is the only exception within the group of pure educational paths. We argue that this is a level effect (rather than a composition effect).

Carrying forward these empirical results to the entrepreneurship-diagram introduced in Figure 1, we provide a positioning of different educational paths in the two-dimensional entrepreneurship plane (cf. Figure 4). The diagram shows all but one mixed paths in the shadowed area. Workers with a pure academic path (*acadpath*) further show a higher probability of entrepreneurship compared to workers with a pure vocational path (*vocpath*), implying that academic path is closer to the entrepreneurial area in Figure 4 than the vocational path.

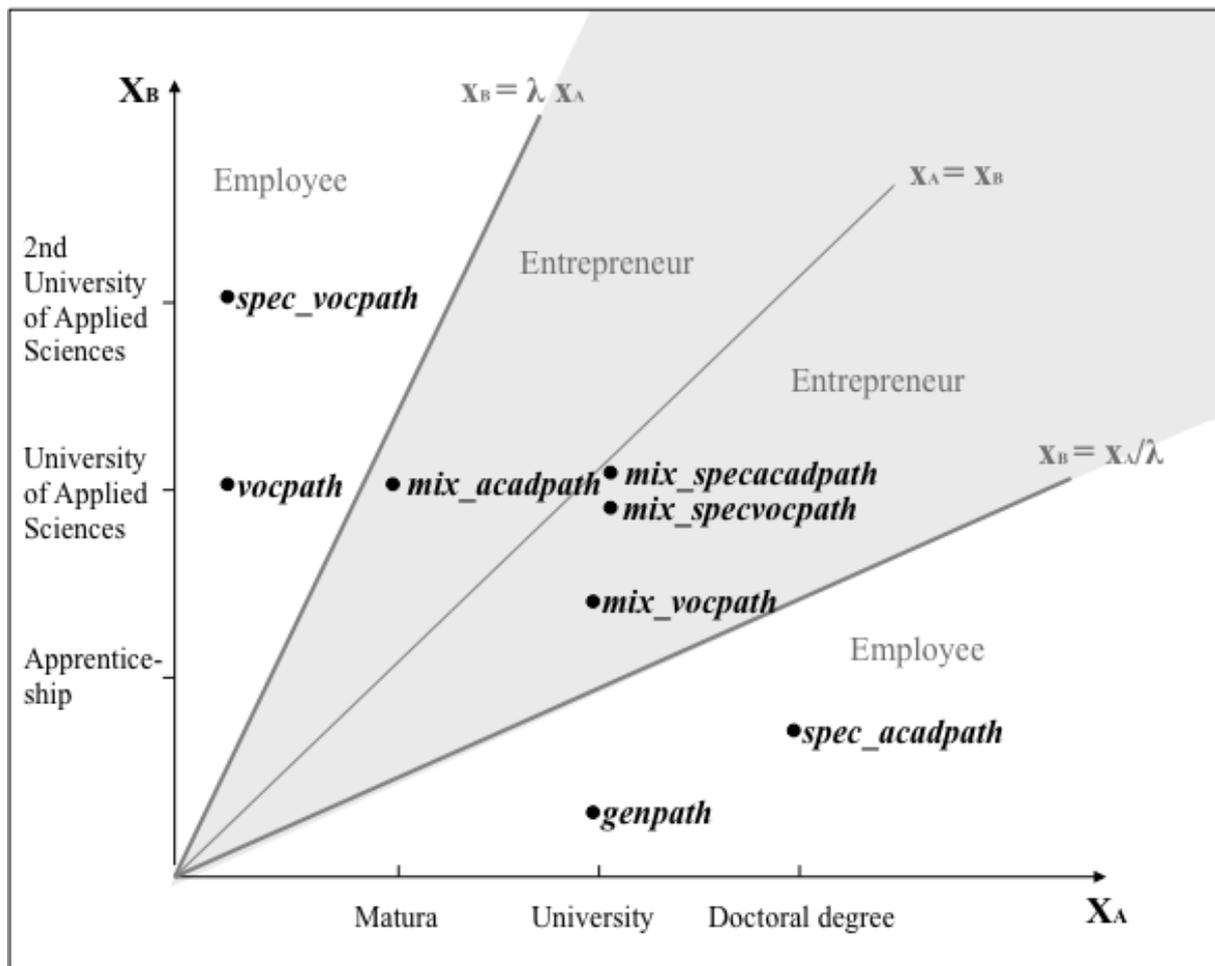


Figure 4: Educational paths and entrepreneurship decision

Source: Own illustration based on: Lazear (2005, p. 653)

Unfortunately, it is not possible to directly compare our empirical results with the coefficients of other studies (Wagner, 2003, 2006; Silva, 2007; Lazear, 2005). The reason is that these studies use the number of different tasks as explanatory variables. This measure is conceptually different from the types of education we use in our study. Nevertheless, theirs as well as our study are similar in that they all provide evidence supporting the hypothesis that individuals are more likely to become entrepreneurs if they have a more balanced set of skills or educations.

With respect to our control variables we find similar results as previous studies. We find a concave effect of *workexperience* as Lazear (2005) and Wagner (2003). The effect of work experience is positive but declines over time. Consistent with other papers (Astebro & Thompson, 2007; Honig, 1996; Astebro, 2006), the negative coefficients of the variables *single household* and *widowed* indicate that married people have a higher likelihood of becoming entrepreneurs. The variable *men* has a positive significant effect, meaning that males are more likely to become entrepreneurs than females. This

finding is also consistent with previous studies.<sup>2</sup> If the estimation is done separately for men and women, the findings are robust for men, but for women, only a few variables are significant. The reason probably lies in the small number of females in our sample, and shows that the results are driven by men. Noticeable, though, is that the variable *children* remains positive and significant, regardless of whether we carry out a joint or separate estimation. This result contradicts the negative effect of children found by Backes-Gellner & Moog (2008), but supports the findings of, amongst others, Robinson & Sexton (1994).

As a robustness check we estimate another specification of equation (1) only including the educational variables (and not controlling for work experience or other individual characteristics). The results remain stable (cf. Table A5): workers with mixed educational paths are generally more likely to be entrepreneurs than workers with pure educational paths.

To summarize, our empirical results provide strong evidence in favor of our hypothesis. Individuals who have followed a mixed educational path (who combine academic and vocational education) are more likely to become entrepreneurs than those who followed a pure academic or vocational path. Furthermore, the likelihood of becoming an entrepreneur is higher for individuals who have first completed a vocational and then an academic education (*mix\_vocpath*) than for those who have completed the educations the other way around (*mix\_acadpath*).

## 5. Conclusion

We have examined whether individuals who become entrepreneurs or employees follow systematically different educational paths to a given educational level. We use Lazear's jack-of-all-trades theory to derive how individuals' educational paths may differ. We expect that entrepreneurs aim at a balanced set of academic and vocational skills while employees specialize in either of the two. Thus the likelihood of entrepreneurs should be higher among individuals with mixed educational path combining academic and vocational types of education. By contrast, we expect employees to follow the same type of education through their educational career because such a pure educational path allows them to specialize in their strongest qualification. Accordingly, the likelihood of becoming an entrepreneur should be lower for individuals with pure academic or pure vocational education paths. We test this hypothesis with the Swiss Labor Force Survey. We find that entrepreneurs and employees indeed choose systematically different educational paths. Consistent with Lazear's theory, entrepreneurs choose mixed and more balanced educational paths whereas employees choose pure and more specialized educational paths. Therefore the likelihood of entrepreneurship could be increased by easing changes between different educational segments and allowing individuals to more easily switch from vocational to academic educational tracks and back.

Switzerland, in this context, has an interesting educational system enabling a switch from one type of education to another and offering so called "Passerellen" or official pathways leading from one segment of the educational system to the other. According to our theoretical considerations, Switzerland should therefore also have a comparatively high proportion of entrepreneurs. This is indeed supported by data for example from Eurostat<sup>3</sup> showing an entrepreneurship quote of 14% for Switzerland in comparison to e.g. 11% for Germany or 13% for UK. Taken this argument further, the evidence suggests that the permeability of a national system of education as opposed to strong demarcation lines between different types of education should be an important factor to explain differences in entrepreneurship rates. Future entrepreneurship research should thus also study the permeability of education-

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<sup>2</sup> Lazear (2005), Wagner (2003, 2006), Honig (1996) and Backes-Gellner & Moog (2008) amongst others find the same positive correlation.

<sup>3</sup> [http://epp.eurostat.ec.europa.eu/portal/page/portal/employment\\_unemployment\\_ifs/data/database](http://epp.eurostat.ec.europa.eu/portal/page/portal/employment_unemployment_ifs/data/database)

al systems as one important factor to fostering the national entrepreneurship rate. In previous research the focus was mainly on the level of education but our results clearly show that the level of education is not sufficient to study the preconditions an educational system has to meet to foster entrepreneurship.

Appendix

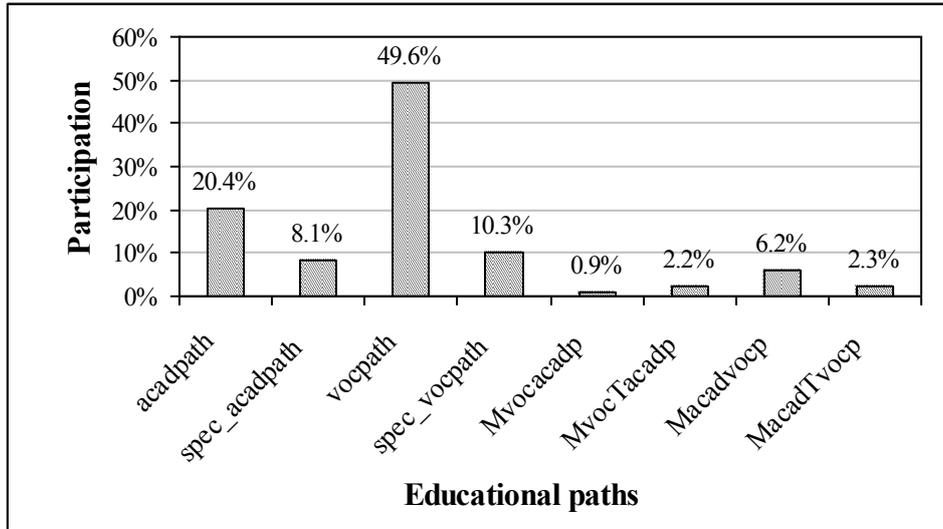


Figure A1: Participation rates of the different educational paths  
 Source: Own illustration based on: Swiss Labor Force Survey, FSO.

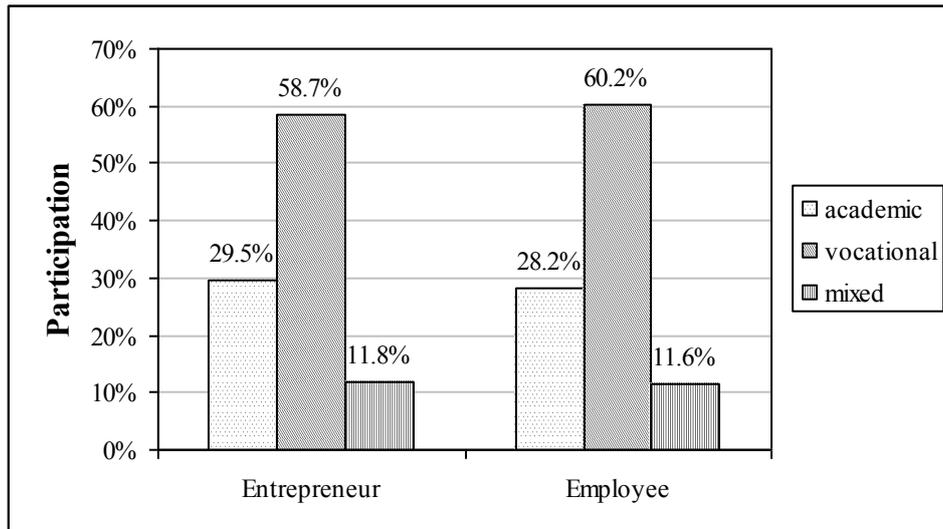


Figure A2: Participation rates of educational paths of entrepreneurs and employees (Entrepreneur 1: Ownership structure)  
 Source: Own illustration based on: Swiss Labor Force Survey, FSO.

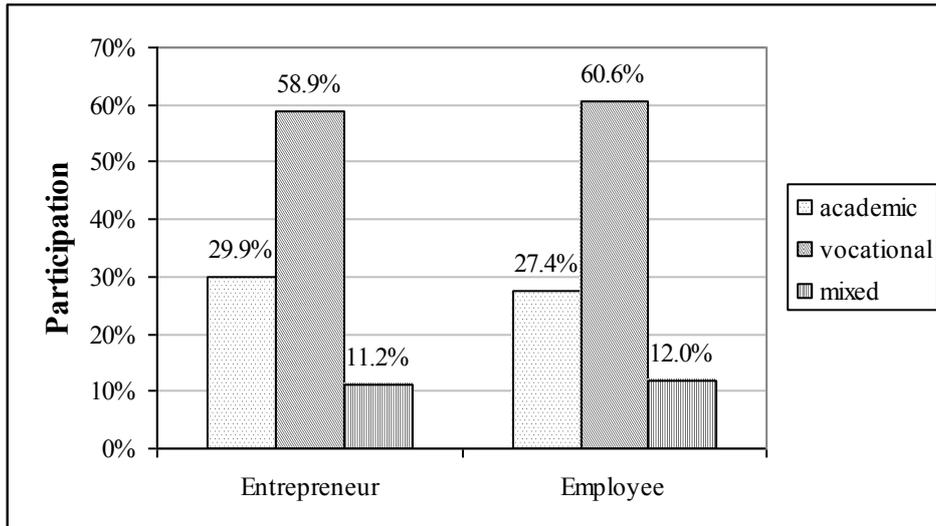


Figure A3: Participation rates of educational paths of entrepreneurs and employees (Entrepreneur 2: Lazear)  
 Source: Own illustration based on: Swiss Labor Force Survey, FSO.

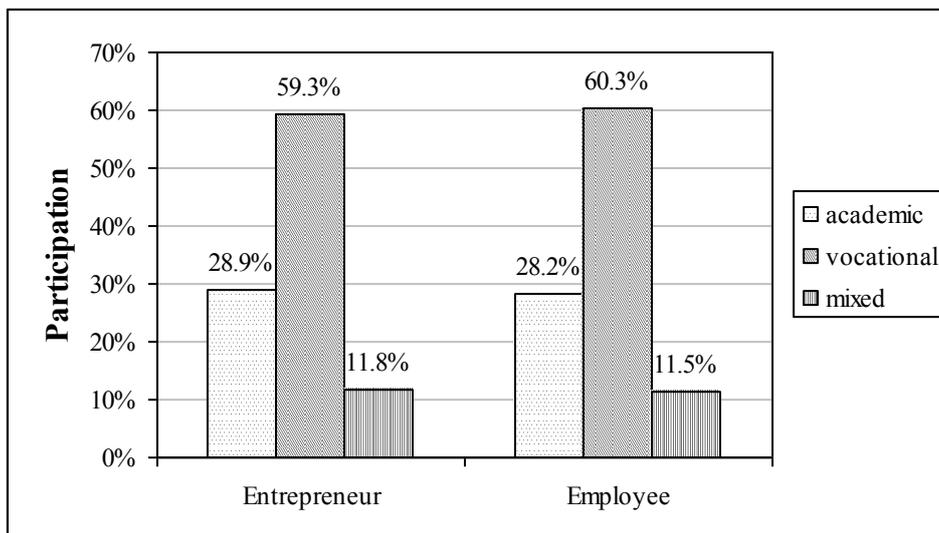


Figure A4: Participation rates of educational paths of entrepreneurs and employees (Entrepreneur 3: Lazear CH)  
 Source: Own illustration based on: Swiss Labor Force Survey, FSO.

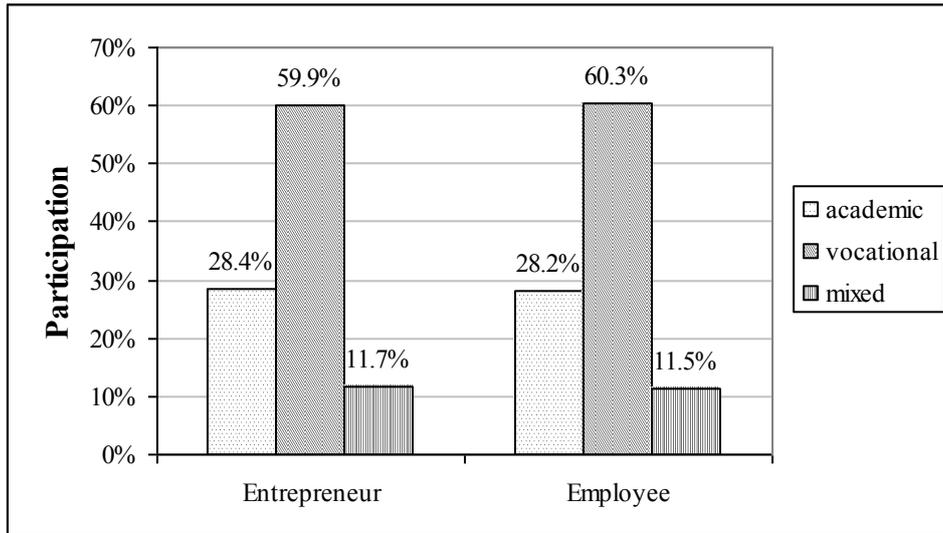


Figure A5: Participation rates of educational paths of entrepreneurs and employees (Entrepreneur 4: Management position)  
 Source: Own illustration based on: Swiss Labor Force Survey, FSO.

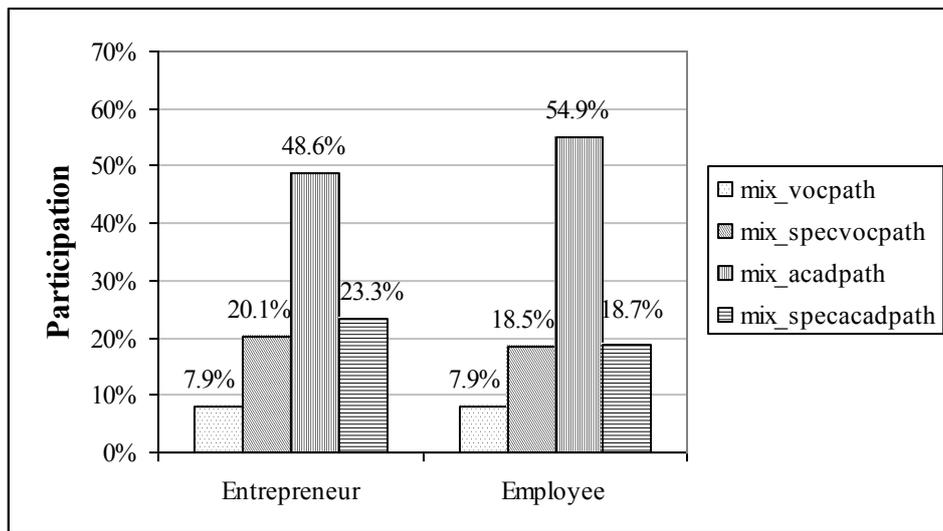


Figure A6: Participation rates of mixed educational paths of entrepreneurs and employees (Entrepreneur 1: Ownership structure)  
 Source: Own illustration based on: Swiss Labor Force Survey, FSO.

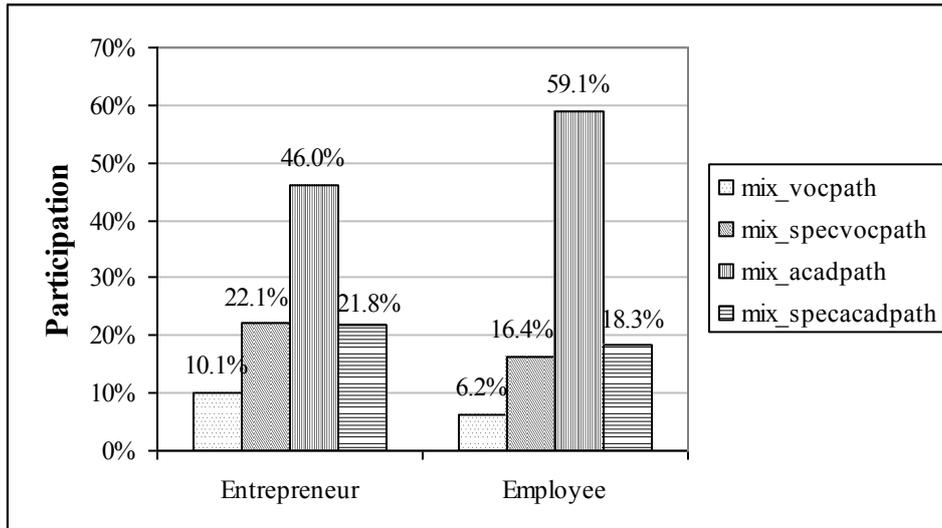


Figure A7: Participation rates of mixed educational paths of entrepreneurs and employees (Entrepreneur 2: Lazear)  
Source: Own illustration based on: Swiss Labor Force Survey, FSO.

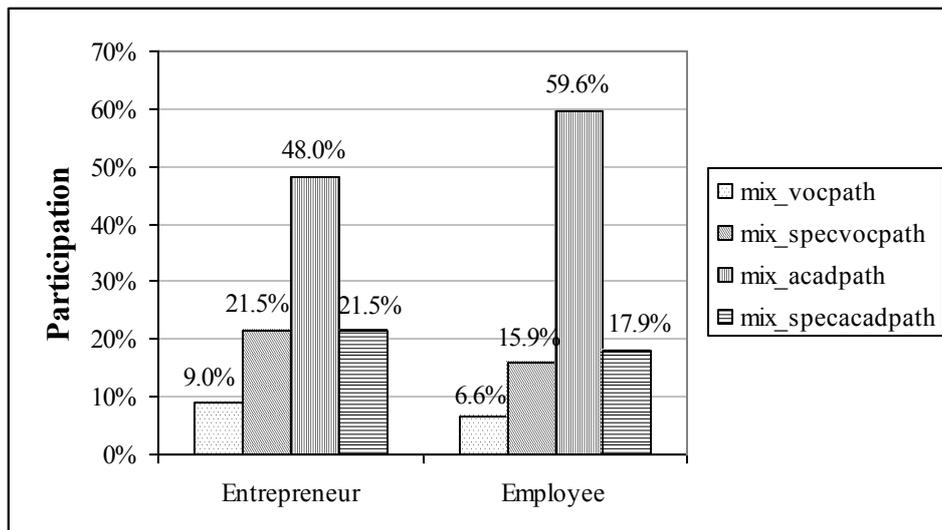


Figure A8: Participation rates of mixed educational paths of entrepreneurs and employees (Entrepreneur 3: Lazear CH)  
Source: Own illustration based on: Swiss Labor Force Survey, FSO.

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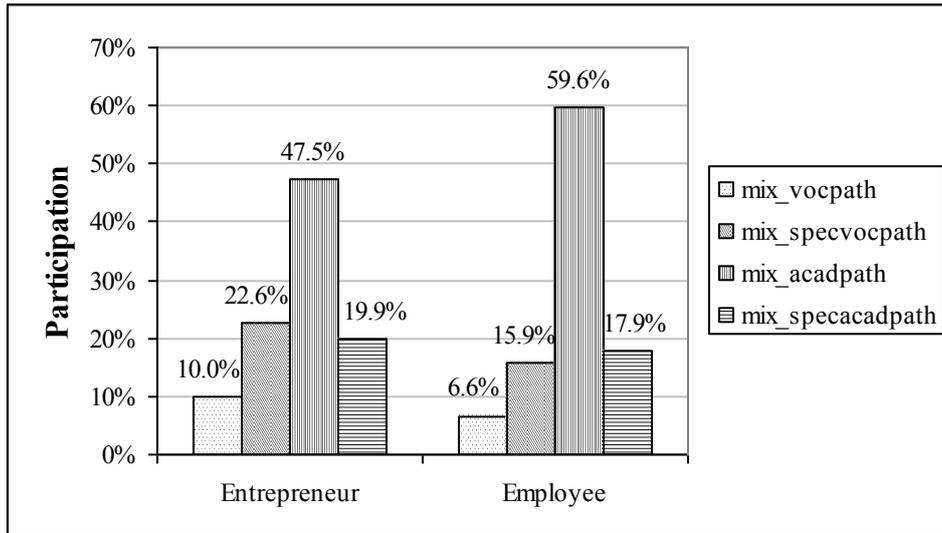


Figure A9: Participation rates of mixed educational paths of entrepreneurs and employees (Entrepreneur 4: Management position)

Source: Own illustration based on: Swiss Labor Force Survey, FSO.

<i>Professional position</i> / <i>Definition</i>	<b>Entrepreneur 1 ownership structure</b>	<b>Entrepreneur 2 Lazear</b>	<b>Entrepreneur 3 Lazear CH</b>	<b>Entrepreneur 4 management position</b>
Self-employed/ employee of own company with employees	1	1	1	Not included
Self-employed/ employee of own company without employees	1	0	1	Not included
Employee	0	0	0	0
Employee in management position	0	1	1	1

Table A1: Definition of Entrepreneur

Source: Own illustration.

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VARIABLE	DEFINITION OF VARIABLE	Entrepreneur 1: ownership structure		Entrepreneur 2: LAZEAR		Entrepreneur 3: LAZEAR CH		Entrepreneur 4: management position	
		Entrepre- neur N=3737	Employee N=11658	Entrepre- neur N=6950	Employee N=8445	Entrepre- neur N=8182	Employee N=7213	Entrepre- neur N=4445	Employee N=7213
		Mean (Std.dev.)	Mean (Std.dev.)	Mean (Std.dev.)	Mean (Std.dev.)	Mean (Std.dev.)	Mean (Std.dev.)	Mean (Std.dev.)	Mean (Std.dev.)
Entrepreneur 1: ownership structure	Dummy = 1, if self-employed or employee of his own company with or without employees	0.2425 (0.4286)							
Entrepreneur 2: Lazear	Dummy = 1, if self-employed or employee of his own company with employees, or member of the management board			0.4511 (0.4976)					
Entrepreneur 3: Lazear CH	Dummy = 1, if self-employed or employee of his own company with or without employees, or member of the management board					0.5311 (0.4990)			
Entrepreneur 4: management position	Dummy = 1, if member of the management board							0.3810 (0.4856)	
<b>Educational paths</b>									
acadpath	Dummy = 1, if „Matura“ and University or Federal Institute of Technology degree	0.1635 (0.3699)	0.2170 (0.4122)	0.1911 (0.3932)	0.2147 (0.4106)	.0.1871 (0.3900)	0.2232 (0.4164)	0.2070 (0.4052)	0.2232 (0.4164)
spec_acadpath	Dummy = 1, if „Matura“ and University or Federal Institute of Technology and doctoral degree	0.1317 (0.3382)	0.0653 (0.2470)	0.1085 (0.3110)	0.0591 (0.2358)	0.1018 (0.3024)	0.0582 (0.2342)	0.0767 (0.2662)	0.0582 (0.2342)
vocpath	Dummy = 1, if Advance Federal Certificate (Apprenticeship) and Higher Vocational School or University of Applied Sciences degree ( <b>Reference</b> )	0.4996 (0.5001)	0.4938 (0.5000)	0.4843 (0.4998)	0.5042 (0.5000)	0.4934 (0.5000)	0.4973 (0.5000)	0.4882 (0.4999)	0.4973 (0.5000)
spec_vocpath	Dummy = 1, if Advance Federal Certificate (Apprenticeship) and Higher Vocational School or University of Applied Sciences degree and 2 <sup>nd</sup> Higher Vocational School or University of Applied Sciences degree	0.0870 (0.2818)	0.1080 (0.3104)	0.1040 (0.3053)	0.1020 (0.3026)	0.1000 (0.3000)	0.1062 (0.3081)	0.1109 (0.3141)	0.1062 (0.3081)
mix_vocpath	Dummy = 1, if Advance Federal Certificate (Apprenticeship) and „Matura“ and University or Federal Institute of Technology degree	0.0094 (0.0963)	0.0091 (0.0949)	0.0114 (0.1060)	0.0073 (0.0854)	0.0106 (0.1026)	0.0075 (0.0862)	0.0117 (0.1075)	0.0075 (0.0862)

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mix_specvocpath	Dummy = 1, if Advance Federal Certificate (Apprenticeship) and Higher Vocational School or University of Applied Sciences and University or Federal Institute of Technology degree	0.0238 (0.1523)	0.0214 (0.1446)	0.0247 (0.1554)	0.0197 (0.1388)	0.0253 (0.1570)	0.0182 (0.1335)	0.0265 (0.1608)	0.0182 (0.1335)
mix_acadpath	Dummy = 1, if „Matura“ and Higher Vocational School or University of Applied Sciences degree	0.0575 (0.2329)	0.0637 (0.2443)	0.0515 (0.2211)	0.0710 (0.2569)	0.0565 (0.2308)	0.0688 (0.2531)	0.0556 (0.2291)	0.0688 (0.2531)
mix_specacadpath	Dummy = 1, if „Matura“ and University or Federal Institute of Technology and Higher Vocational School or University of Applied Sciences degree	0.0276 (0.1637)	0.0217 (0.1457)	0.0245 (0.1545)	0.0220 (0.1468)	0.0253 (0.1570)	0.0207 (0.1422)	0.0234 (0.1512)	0.0207 (0.1422)
<b>Work experience</b>									
Work experience*	Work experience per 10 years	2.2230 (1.1136)	1.8185 (1.1504)	2.1483 (1.0896)	1.7260 (1.1718)	2.1463 (1.1101)	1.6562 (1.1490)	2.0817 (1.1031)	1.6562 (1.1490)
...squared	Work experience per 10 years squared	6.1816 (5.3876)	4.6301 (5.0013)	5.8023 (5.1554)	4.3520 (5.0357)	5.8386 (5.2469)	4.0631 (4.8484)	5.5502 (5.1084)	4.0631 (4.8484)
<b>Individual characteristics</b>									
Men	Dummy = 1, if male	0.8603 (0.3467)	0.8192 (0.3849)	0.8745 (0.3313)	0.7918 (0.4060)	0.8645 (0.3423)	0.7891 (0.4080)	0.8679 (0.3386)	0.7891 (0.4080)
Children	Dummy = 1, if children (below the age of 15)	0.3631 (0.4810)	0.3193 (0.4662)	0.3898 (0.4877)	0.2806 (0.4493)	0.3718 (0.4833)	0.2824 (0.4502)	0.3791 (0.4852)	0.2824 (0.4502)
<b>Marital status</b>									
Single	Dummy = 1, if single	0.2101 (0.4074)	0.3470 (0.4760)	0.2236 (0.4167)	0.3879 (0.4873)	0.2331 (0.4228)	0.4052 (0.4910)	0.2524 (0.4344)	0.4052 (0.4910)
Married	Dummy = 1, if married ( <b>Reference</b> )	0.6620 (0.4731)	0.5511 (0.4974)	0.6714 (0.4698)	0.5012 (0.5000)	0.6511 (0.4767)	0.4952 (0.5000)	0.6418 (0.4795)	0.4952 (0.5000)
Divorced	Dummy = 1, if divorced	0.1193 (0.3242)	0.0925 (0.2897)	0.0973 (0.2963)	0.1004 (0.3006)	0.1079 (0.3103)	0.0889 (0.2846)	0.0983 (0.2978)	0.0889 (0.2846)
Widowed	Dummy = 1, if widowed	0.0086 (0.0922)	0.0094 (0.0967)	0.0078 (0.0878)	0.0104 (0.1016)	0.0079 (0.0888)	0.0107 (0.1028)	0.0074 (0.0859)	0.0107 (0.1028)

\*The variable age is not included because it has a high correlation to work experience and does therefore not alter the results.

Table A2: Descriptive Overview: Entrepreneur – Estimation  
Source: Swiss Labor Force Survey, FSO. Own calculations.

	Type 1: ownership structure			Type: Lazear			Type 3: Lazear CH			Type 4: management position		
	Men	Women	N	Men	Women	N	Men	Women	N	Men	Women	N
mix_vocpath	94.29%	5.71%	35	87.34%	12.66%	79	86.21%	13.79%	87	80.77%	19.23%	52
mix_specvocpath	97.75%	2.25%	89	97.67%	2.33%	172	97.10%	2.90%	207	96.61%	3.39%	118
mix_acadpath	73.95%	26.05%	215	83.29%	16.71%	359	79.27%	20.73%	463	83.87%	16.13%	248
mix_specacadpath	70.87%	29.13%	103	77.65%	22.35%	170	74.88%	25.12%	207	78.85%	21.15%	104

Table A3: Share of men and women in the different mixed educational paths

Source: Own estimations based on: Swiss Labor Force Survey, FSO.

Dependent variable: Entrepreneur									
Variables	Type 1: ownership structure		Type 2: Lazear		Type 3: Lazear CH		Type 4: management position		
	Coeff	P-Value	Coeff	P-Value	Coeff	P-Value	Coeff	P-Value	
acadpath	-0.018	0.228	0.042	0.009***	0.024	0.141	0.043	0.013**	
spec_acadpath	0.152	0.000***	0.172	0.000***	0.153	0.000***	0.096	0.000***	
vocpath	0.000	Ref.	0.000	Ref.	0.000	Ref.	0.000	Ref.	
spec_vocpath	-0.038	0.025**	0.013	0.506	-0.013	0.514	0.012	0.575	
mix_vocpath	0.015	0.785	0.166	0.004***	0.129	0.023**	0.165	0.013**	
mix_specvocpath	0.023	0.505	0.059	0.143	0.084	0.039**	0.092	0.034**	
mix_acadpath	0.012	0.598	-0.012	0.642	0.016	0.523	0.009	0.744	
mix_specacadpath	0.080	0.035**	0.092	0.026**	0.112	0.006***	0.095	0.034**	
Work exp. (per 10 yrs)	0.110	0.000***	0.221	0.000***	0.212	0.000***	0.189	0.000***	
Work exp. Sq (per 10 yrs)	-0.014	0.000***	-0.035	0.000***	-0.030	0.000***	-0.028	0.000***	
Men	0.016	0.272	0.075	0.000***	0.063	0.000***	0.064	0.000***	
Children	0.011	0.436	0.055	0.000***	0.045	0.003***	0.050	0.003***	
Married	0.000	Ref.	0.000	Ref.	0.000	Ref.	0.000	Ref.	
Single	-0.062	0.000***	-0.091	0.000***	-0.089	0.000***	-0.061	0.001***	
Divorced	0.021	0.250	-0.047	0.019**	0.008	0.713	-0.011	0.628	
Widowed	-0.061	0.219	-0.122	0.042**	-0.142	0.032**	-0.127	0.056*	
	N	15395	N	15395	N	15395	N	11658	
	Wald chi2	304.80	Wald chi2	639.39	Wald chi2	654.38	Wald chi2	397.59	
	Prob > chi2	0.000***	Prob > chi2	0.000***	Prob > chi2	0.000***	Prob > chi2	0.000***	
	Pseudo R2	0.040	Pseudo R2	0.057	Pseudo R2	0.059	Pseudo R2	0.046	

\*\*\* significant on 1%, \*\* on 5%, \* on 10% level

Table A4: Entrepreneur – Estimation with control variables

Source: Own estimations based on: Swiss Labor Force Survey, FSO.

Dependent variable: Entrepreneur								
Variables	Type 1: ownership structure		Type 2: Lazear		Type 3: Lazear CH		Type 4: management position	
	Coeff	P-Value	Coeff	P-Value	Coeff	P-Value	Coeff	P-Value
acadpath	-0.051	0.000***	-0.020	0.192	-0.042	0.006***	-0.014	0.393
spec_acadpath	0.144	0.000***	0.160	0.000***	0.136	0.000***	0.071	0.008***
vocpath	0.000	Ref.	0.000	Ref.	0.000	Ref.	0.000	Ref.
spec_vocpath	-0.039	0.022**	0.016	0.411	-0.012	0.515	0.015	0.478
mix_vocpath	0.002	0.972	0.115	0.039**	0.083	0.139	0.109	0.092*
mix_specvocpath	0.018	0.610	0.066	0.088*	0.081	0.041**	0.095	0.025**
mix_acadpath	-0.020	0.354	-0.068	0.006***	-0.046	0.065*	-0.044	0.108
mix_specacadpath	0.044	0.233	0.036	0.364	0.052	0.192	0.034	0.421
	N	15441	N	15441	N	15441	N	11696
	Wald chi2	78.97	Wald chi2	74.09	Wald chi2	64.19	Wald chi2	20.77
	Prob > chi2	0.000***	Prob > chi2	0.000***	Prob > chi2	0.000***	Prob > chi2	0.004***
	Pseudo R2	0.012	Pseudo R2	0.008	Pseudo R2	0.007	Pseudo R2	0.003

\*\*\* significant on 1%, \*\* on 5%, \* on 10% level

*Table A5: Entrepreneur – Estimation without control variables  
Source: Own estimations based on: Swiss Labor Force Survey, FSO.*

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