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## Combination of regional characteristics for start-up activity in Switzerland

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# Combination of regional characteristics for start-up activity in Switzerland

Katharina Becker, Franz Kronthaler<sup>1</sup> & Kerstin Wagner

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## Abstract

This study assumes that the combination of the determinants, which are considered to have an impact on firm formations rates, influences regional start-up activity. To test this assumption, first, Swiss regions are classified with the help of cluster analysis according to their regional characteristics favouring firm formation. Second, the different categories of regions are tested with regard to differences in their firm formation rates. In this way it is possible to see whether different regional combinations of factors lead to similar start-up rates. The results show that regions with an overall high potential, due to their factor endowment, have in fact high start-up rates, whereas regions with a low potential have low start-up rates. Furthermore, the combination of factor endowments seems to be important as well. Completely different regional combinations of factors conducive for entrepreneurial activity can lead to similar high or low start-up rates. Not only single factors have the ability to influence firm formation rates. It is also the combination and interrelationship of the various parameters which can be important for different types of regions. Policy makers should not only take single factors into consideration. Rather they should focus on their region-specific set of determinant.

JEL-Classification: R11, L26, R58

Keywords: Regional economics, Entrepreneurship, Business formation

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## 1. Introduction

In Switzerland, the New Regional Policy (NRP), a policy instrument has been created in 2008 with the aim to foster innovation, value creation and competitiveness in semi-peripheral and peripheral regions. The regional policy initiative supports entrepreneurial initiatives, particularly in geographically and structurally disadvantaged regions. It is assumed that entrepreneurial activities contribute to the dynamics of a region, fostering competitiveness and structural change. However, entrepreneurial activity varies considerably between regions. Structural characteristics of regions influence the type and level of entrepreneurial activities in regions (see e.g. Audretsch and Fritsch, 1994; Armington and Acs, 2002; Lee et al., 2004; Tamásy, 2006). It is the regional endowment that facilitates entrepreneurial opportunities, and entrepreneurs shape the regional entrepreneurial environment (Audretsch et al., 2010).

The present study examines the interrelation between the regional characteristics and their impact on entrepreneurial activities across hundred-six Swiss regions. The assumption is that not only single determinants but the combinations of regional characteristics have an impact on firm formation rates. Answers are sought to two questions. Does the combination of specific determinants has an impact on new firm formation rates? Are there specific combinations of determinants for different types of regions, which lead to high firm formation rates?

The paper uses a two step procedure employing cluster analysis combined with non-parametric testing. Firstly, homogenous types of regions with regard to their structural characteristics conducive for entrepreneurial activities are formed with the help of cluster analysis. Secondly, Kruskal-Wallis test and Mann-Whitney test are used to find out whether the different types of regions with a specific composition of factors perform equally in new firm formation. The analysis is based on the spatial level of Swiss 'mobilité spatiale' regions (MS-regions). MS-regions are functional units based on economic interaction and commuting movements. At this level, it is possible to distinguish between peripheral, semi-peripheral, urban regions and agglomerations.

There are numerous studies with regard to national and regional differences in entrepreneurial activity. Typically, these studies focus on single determinants and their influence on venture creation, with other variables being controlled. They indicate that several factors contribute to the explanation of entrepreneurial activity in regions (for an overview of empirical and theoretical literature see the following section two). This analysis tries to contribute to the existing studies in so far that it analyzes whether the regional composition of determinants is important for firm formation. Furthermore, it tries to find out if a specific combination of determinants is favourable for different types of regions.

The remainder of this article is organized as follows. In the next section, the literature on determinants which influence entrepreneurial activity is discussed. The third section describes the method and the data used. Chapter four discusses the results. The last section summarises the results and presents policy recommendations.

## **2. Regional characteristics and entrepreneurial activity**

There are numerous studies explaining regional variation in firm formation rates through specific characteristics of regions for different countries. From the early 1990s, when firm formation data on the regional level have become available, empirical studies deal with the identification of determinants explaining entrepreneurial activity on the regional level.<sup>2</sup>

Audretsch and Fritsch (1994), for example, found strong evidence that the birth of new firms is related to population density and population growth. In particular, densely populated regions provide urbanisation economies and therefore access to highly educated people and a large workforce in general, infrastructure, research institutions and universities, customers, capital, suppliers, markets and demand for products and services. Jacobs (1969) argued that an open and diverse city attracts talented people and stimulates creativity and innovation which are necessary preconditions for entrepreneurship. Population density shows a high correlation with a number of factors mentioned above and can be regarded as a catch-all variable for a variety of regional characteristics (Fritsch and Mueller, 2008). The establishment of new business activities in regions with a high population density signals potential and attracts other businesses because of cooperation opportunities and spill over effects (Audretsch and Fritsch, 1994; Reynolds et al., 1994).

Localisation economies show a similar linkage like urbanization economies with respect to entrepreneurship. They stress the relevance of knowledge spillover within the same industry. Knowledge spill over supports firms in reducing uncertainty which is in particular important when dealing with innovation activities. Furthermore, existing industries foster competition and force new firms to implement their new products on the market. Because of the lower costs for gaining knowledge from the business environment, start-ups are attracted by regions where certain industries already exist (Audretsch et al., 2008). Generally, industry cluster foster competition, they generate a favourable business environment, and provide available knowledge and a general reduction of costs. This in turn leads to start-up business ventures being attracted to regions where industry clusters already exist (Audretsch et al., 2008).

Technological and structural transformation leads to opportunities for new firm formation. Structural change from the manufacturing sector towards the service industry comes along with individualized, diversified consumer preferences for new, specialized and differentiated goods and services. This offers numerous entrepreneurial opportunities for new entrepreneurs in market niches (Armington and Acs, 2002). The service sector is characterised by low start-up costs and a small size structure which make venture creation more likely and a more attractive prospect, due to

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<sup>2</sup> Today, these determinants are classified by several conceptual frameworks under different headings. Verheul et al. (2002) distinguish demand and supply side orientated determinants for entrepreneurship. Bosma et al. (2008) build up on this classification and add determinants concerning agglomeration effects, cultural aspects and the policy environment. Recently, Audretsch et al. (2010) divide the regional characteristics into infrastructure, specialization and diversity issues.

smaller start-up requirements and lower entry barriers (e.g. Fritsch, 1997). Hence, a smaller share of manufacturing firms also has a positive impact on the number of new firms being created (Reynolds et al., 1995).

Furthermore, studies highlight that the firm size seems to be important. There is a negative relationship between the number of employees within firms and the probability that an employee starts their own business. More favourable conditions in large firms discourage employees from the prospect of resigning from their jobs and becoming self-employed (Storey, 1994; Wagner, 2004). In contrast, small firms are supportive for the start-up activity in a region. They act as role models encouraging potential entrepreneurs and provide information for regional stakeholders. Employees in small firms learn first-hand information about starting and managing a business. They are in direct contact with the owner who is acting as entrepreneurial role model. Furthermore, employees in small firms have little career options, once they are in a managerial position. All these factors may enhance the likelihood of employees to start their own venture (Parker, 2004; Wagner, 2004). Due to this, start-up activity is self reinforcing. A high number of self employed persons leads to higher regional entrepreneurial activity (Minniti, 2005; Mueller, 2006). Moreover, persons who are already self-employed are predestined for further start-up activities (Westhead and Wright, 1998).

Next to the industrial structure, also socio-economic factors play a role in determining new firm formation rates. The Global Entrepreneurship Monitor (GEM) shows that especially people in their mid-career period, between 35 and 44 years of age, become self-employed (Reynolds et al., 2002). Moreover, it has been reported that many entrepreneurs start a new venture in their mid-thirties and are typically between 25 and 40 years old, and thereafter, the level of entrepreneurial activities declines with increasing age of the population (Evans and Leighton, 1989; Storey, 1994). Subsequently, regions with a higher number of persons in the age class of 25-44 years demonstrably have more start-up activities than others (Reynolds et al., 1999). In addition, studies show that even if there are more opportunities to become self-employed for older rather than for younger persons, older employees are less willing to become self-employed (Van Praag and van Ophem, 1995).

Studies concerned with human capital indicate that entrepreneurship is related to education, qualification and work experience since the level of education, experience and background influences entrepreneurial success (Evans and Leighton, 1989). There is a positive relationship between the duration of professional education and training and the probability of starting a company because this indicates a higher ability to recognize business opportunities. Additionally, Hinz (1998) points out that those individuals with a graduate degree are more inclined towards entrepreneurship and are thus more likely to start a company, particularly in knowledge intensive industries.

As another socio-economic factor, unemployment is considered. However, the discussion is ambiguous since the linkage between unemployment and entrepreneurial activity is not conclusive (Parker 2004; Bergmann and Sternberg, 2007). On the one hand, unemployment reduces the

opportunity of paid-employment and offers the option of becoming self-employed, in particular when there is a shortage of alternative job opportunities. On the other hand, high unemployment rates lower the demand for products and services that firms offer. Subsequently, the income and available capital for entrepreneurs are reduced and the risk of bankruptcy increases. This indicates a negative relationship between high unemployment and starting a venture. Empirical results tend to reflect the method applied and do not show a significant quantifiable result. While cross-section studies mainly show a negative relationship between unemployment and entry rates, most of the time-series studies demonstrate positive effects of unemployment rates on new firm formation rates.

Additionally, the number of immigrants in a region can influence the level of entrepreneurial activity since they are more likely to be entrepreneurs than the local inhabitants (Saxenian, 1999). First, it has indirect effects due to consequences of the age structure and growth of a regional population because foreign families are usually younger and have more children. Reasons for this can be seen in cultural or religious backgrounds. Second, studies have found a direct significant effect on new firm formation. It is assumed that immigration itself is an act of taking risks for which a certain attitude is needed, which is similar when starting a business (Reynolds et al., 1995; Verheul et al., 2002; Fairlie and Woodruff, 2004; Schuetze and Antecol, 2007). Further main reasons for higher entrepreneurial activity are disadvantages and discrimination with regard to the wage level, problems of barriers such as language, lack of integration and discrimination. By starting a new business they try to escape their unprivileged situation (Verheul et al., 2002; Wong and Ng, 2002). Last, highly educated and skilled immigrants are more often engaged in technology start-up activities (Saxenian, 1999). They enrich a region with new ideas and cultures, create new business opportunities and jobs, and are risk takers. People from different backgrounds foster diversity and creativity, which leads to a high level of innovative activity and new businesses (Lee et al., 2004).

Beugelsdijk et al. (2006) show that also cultural aspects have to be considered when looking at differences in regional economic development. Aoyama (2009) finds out that the attitudes of entrepreneurs are influenced by the prevailing norms and cultures of the regions in which they are embedded. However, the results of Davidsson and Wiklund (1997) for Swedish regions indicate limitations concerning the impact of culture on entrepreneurial activity on the regional level. While demographic and economic-structural determinants play a major role in explaining regional differences in start-up rates, cultural factors seem to be of marginal relevance. Similar results exist for Switzerland. Bergmann (2011) found no evidence that cultural factors as well as institutional factors like tax policy influence entrepreneurial activity between the three language areas of Switzerland. Differences in start-up activity between the language areas are mainly explained by structural characteristics.

Other factors influencing entrepreneurial activity are legislations, regulations and governmental policies. Policy measures are sometimes designed to influence new firm formation and to change attitudes and preferences of persons with regard to entrepreneurial activity (Verheul et al., 2002).

For example, instruments to foster entrepreneurial activity are taxation or interest rates, which are assumed to have influence particularly on the national level (Bosma et al., 2008). For Switzerland, however, Bergmann (2011) found no evidence that tax rates directly influence firm formation rates on the regional level.

Recently, studies have started to combine the regional and individual level in a multilevel analysis, in which start-up activity is explained by both regional characteristics and individual variables. On the individual level, studies focus on the decision-making process by individuals and the motives of people to become self-employed. Research focuses on personal factors by using micro data such as the GEM population survey or the German Socioeconomic Panel (SOEP) (Mueller, 2006; Tamasy 2006; Bosma 2009). A combined approach shows that a large share of regional variance of start-up rates can be explained by bringing together the macro and micro level.

However, the literature so far does not focus on the interrelation and combination of factors which may be favourable for specific types of regions. The present study tries to extend the existing knowledge exactly at this point. It asks whether the combination of different determinants influences regional dynamics with regard to start-up rates and whether certain combinations of factors are favourable for specific types of regions.

### **3. Data and method**

In order to investigate whether the composition of regional conditions influences firm foundation a two step approach using cluster analysis and non-parametric testing is used.

In a first step, cluster analysis is employed to generate homogenous groups with regard to the available variables explaining entrepreneurship. This enables us to form groups of regions which have similar endowments with the aforementioned characteristics (see e.g. Everitt et al., 2001; Hair et al., 2006; Backhaus et al., 2009). In particular, Ward's minimum variance method is used to shape cluster according to the characteristics which influence start-up rates. Additionally, with k-means an optimizing algorithm is employed to optimize the result generated by Ward's minimum method.

In a second step, with the help of the Kruskal-Wallis test and Mann-Whitney test, this classification of regions has been utilised to examine whether group differences exist between the clusters with regard to their start-up rates. The Kruskal-Wallis test indicates whether  $K$  independent samples differ significantly in terms of start-up rates. Afterwards, the Mann-Whitney test is employed to find out whether there are differences between certain clusters. For the pairs of clusters for which we cannot reject the null hypothesis of the Mann-Whitney test, i.e. there is no significant difference between the clusters with regard to the start-up rate, the analysis is extended. This extension examines whether the clusters have the same endowment with variables supporting firm formation

rates. This allows us to show that different combinations of variables can lead to similar high or low start-up rates.

The analysis is based on the spatial level of Swiss *mobilité spatiale* regions (MS-regions). MS-regions are functional units based on economic interaction and geographical mobility of labour workforce. Switzerland is divided into 106 MS-regions. At this regional level, data useful for the study is available. However, in comparison to the more aggregated level of the 26 Swiss cantons the information available is partially limited. The advantage using MS-regions is the more disaggregated level. MS-regions are further classified as agglomerations, urban, semi-peripheral and peripheral regions.

Based on the literature presented in section 2, the following variables are included in our study: population density, economic structure, firm size structure, self-employment, labour force, human capital, diversity as well as age structure of the population. This selection is not exhaustive due to data limitations with regard to institutional and cultural factors and individual characteristics. However, in order to show that different combinations of factors can lead to the same outcome it is not necessary to integrate all factors discussed in the literature.

In the following, the variables used in the study are briefly presented and described in terms of how they are built and how they are used for interpretation (see appendix table A2 for a short description of data).

#### *Start-up rate*

The firm formation rate shows the effective firm formation activity within the regions considered. The data on start-ups is provided by the database UDEMO of the Swiss Federal Statistical Office. The database comprises information about authentic newly founded independent firms of the secondary and tertiary sector. Subsidiaries and public institutions are not registered. Since regions are structurally different, absolute figures are standardized based on the labour market approach by dividing the absolute number of firm formation, which is the average number of new firms 2006-2008, by the regional labour force (per 1'000). In this way, the endogenous potential of regions, namely the potential founders, is taken into account.

In contrast to the firm formation rate all other variables are proxies for determinants influencing firm formation activity in regions. The data used is from the Swiss Federal Statistical Office out of the the Annual Population Statistics, the Federal Establishment Census and the Federal Population Census, which is updated every 10 years.

*Population density* is considered as a determinant which influences start-up activity in regions. Furthermore, this determinant seems to exhibit a significant correlation with a number of factors such as purchasing power, business infrastructure, market proximity, access to innovative products and quality of communication infrastructure, etc. and stands for specialised and individualised consumer preferences. A high population density indicates a high regional potential for



entrepreneurship. The variable can be regarded as a “catch-all indicator”. It is defined as the number of population per square kilometre.

The *density of business services* can be considered as a proxy for structural change and economic progress towards a service economy. A high value stands for high potential for entrepreneurial activity because, due to its characteristics, e.g. low entry barriers, the service sector shows a high rate of venture creation. It is defined as the ratio of the number of firms in the service sector divided by 1’000 inhabitants.

Furthermore, the *density of the manufacturing* sector is used in the study. However, the linkage of this indicator to entrepreneurship is ambiguous. Firstly, a high manufacturing density indicates a low economic level of development and it can be assumed that it influences entrepreneurial activity negatively. Secondly, it can be considered as an indicator for localization economies if a regional concentration of a specific industry exists. If this is the case a high industry share indicates a high potential for venture creation. As two interpretations are possible this indicator has to be used carefully. It is defined as the ratio of the number of firms in the manufacturing sector divided by 1’000 inhabitants.

Additionally, the *share of small firms* can be considered as a further indicator of structural change and flexible specialisation. Since small firms serve as role models for other potential entrepreneurs, a high density of small firms is supposed to have a positive impact on new firm formation. It is measured by the proportion of the number of small firms relative to the total number of a regional population.

*Labour force* is a selected indicator for the availability of new entrepreneurs and future employees for new and young firms. It is defined as the ratio of available work force per inhabitants.

A further indicator employed is the number of persons with a *graduate degree*. Due to the positive relationship between education and entrepreneurial activity it serves as a proxy for high qualification. This variable includes not only university degrees but also a practical skills based educational background, which plays an important role for the probability of starting a company. Besides graduates with degrees from Universities, also graduates from colleges ‘Höhere Fachschulen’, which are institutes which advocate more practically oriented or applied skills, are included. The indicator is defined as the number of inhabitants with a graduate degree compared to the total number of inhabitants.

The share of immigrants in a region is expressed by the *diversity index*. It is the proportion of foreign born persons in a region relative to the total number of inhabitants. A high value indicates a large potential for venture creation because both, well and low qualified foreigners, have a high probability to create or become involved in a potential new business venture.

*Young people* are used as a further determinant influencing entrepreneurship. The point is that many entrepreneurs start their new business venture typically between 25 and 40 years. Hence, the

proportion within this age group in relation to the total number of inhabitants was chosen as a representative factor.

The last indicator employed is the number of *self employed persons*. On the one hand, self employed persons act as role models for potential entrepreneurs. On the other hand, self employed persons are likely to be serial entrepreneurs. This indicator is defined as the number of self employed persons per number of the regional population.

The following table 1 gives a brief statistical summary of the variables used in the study.

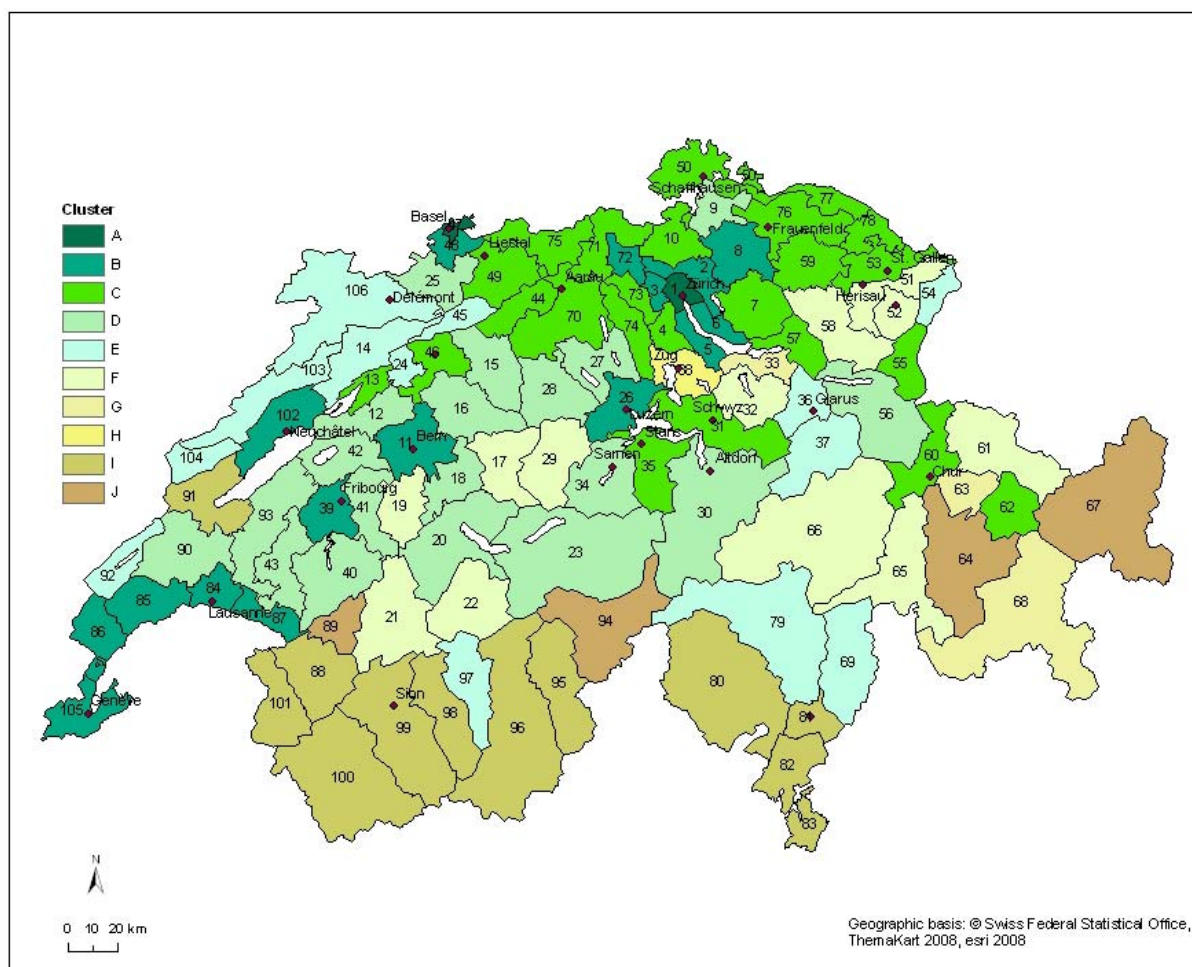
*Table 1. Statistical summary of variables used*

Indicator name	Mean	Standard deviation	Minimum	Maximum
Start_Up	2.6	1.5	0.8	11.9
Pop_Den	374.9	677.0	7.9	5006.1
Business_Den	9.9	4.5	3.8	37.4
Manu_Den	11.0	2.2	6.9	15.6
Small_Firms	40.3	7.9	29.1	74.3
Labour_Force	53.4	3.9	44.9	69.9
Grad_Deg	6.4	3.2	2.1	17.1
Div_Ind	17.4	6.9	3.4	37.3
Young_People	24.4	1.9	19.7	32.7
Self_Empl	7.9	1.8	5.0	13.3

## 4. Empirical results

Altogether, cluster analysis identified 10 clusters with a similar endowment of variables supporting firm foundation.<sup>3</sup> In the following figure the different clusters are displayed (see figure 1).

Figure A1: Spatial distribution of clusters



<sup>3</sup> The cluster solution is found with the help of Ward's minimum-variance method and k-means method. Ward's minimum-variance method belongs to the group of hierarchical agglomerative methods, in which every object is an individual cluster at the beginning of the algorithm. The clusters are then successively joined together into groups until only a single cluster remains. To determine the optimal number of clusters we employed the agglomeration schedule, and the measure of homogeneity  $ETA^2$ . The agglomeration schedule reveals increases in the distances at each step of the fusion process. It indicates that the 10-cluster solution would be appropriate. With this solution  $ETA^2$  is about 70%, meaning that most of the variance is between clusters as it should be. Afterwards the cluster solution is optimized using a non-hierarchical clustering algorithm (k-means). In 6 iteration steps 14 regions have been reassigned improving the original solution.

Considering the spatial distribution as well as the characteristic profile (see appendix table A1)<sup>4</sup> the clusters can be briefly described as follows:

Cluster A – Main agglomerations. This group of regions consists of Zurich and Basel. It is naturally characterised by urbanisation effects, the availability of human capital and multicultural aspects. It has altogether the highest endowment with determinants favouring start-up rates.

Cluster B – Agglomerations plus surrounding. This group comprises other relatively important agglomerations of Switzerland like Berne, Fribourg, Geneva, Neuchâtel, Lausanne as well as the greater Zurich area. The endowment with the chosen determinants is similar to that of cluster A, but the values show a slightly lower level.

Cluster C – North East Swiss urban centres. The regions in this group consist mainly of urban regions like St. Gallen, Chur and Davos. It does not only include urban regions, but also semi-peripheral regions in the North East of Switzerland. It is characterised by an average endowment with the mentioned determinants. It has some strengths with regard to the given labour force and the share of small firms as well as some weaknesses concerning the variable self employment.

Cluster D – Inner Swiss alpine regions. The regions of cluster D mainly consist of semi-peripheral and peripheral regions which are basically located in mountainous areas such as the upper Berne areas. Overall, the potential for venture creation with regard to the underlying variables seems to be quite weak compared to the other clusters. Weaknesses lie especially in a low population density, a lack of qualified graduates and small firms, diversity and business services.

Cluster E – Specialized industrial centres. The regions of cluster E belong to the clusters with the lowest entrepreneurial potentials. In nearly all of the variables the endowment is below average. However, cluster E has one of the highest shares of manufacturing firms. This is due to the fact that in this cluster important specialized industrial centres like the Swiss Jura are located. This area is for example known for its watch industry and its emerging instrumental and medicinal technique industry.

Cluster F – Inner Swiss rural areas. Cluster F contains inner rural areas of Switzerland like Appenzell, Einsiedeln, Emmental and Toggenburg. Like in cluster D, the endowment with variables is below the average in comparison to the other clusters. An exception is the number of self employed persons per number of inhabitants, particularly resulting from agriculture.

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<sup>4</sup> To interpret the individual clusters the F-values, t-values, and mean values of the variables are used. The F-value provides information about the homogeneity of the individual groups. F-values smaller than one indicate homogeneous clusters (the variance of the variable j within the cluster is smaller than the variance of the variable j within the population). The t-value is used to characterize each cluster. Negative (positive) t-values indicate that the variable j is lower (higher) than the mean of the population. In addition to the t-value, the mean value of the variable is used in the interpretation, because it provides information about the variables in their original scale.

Cluster G – Specialised tourism regions. Cluster G consists only of three regions, two of them, St. Moritz and Arosa, are famous tourism regions. These regions are relatively well endowed with factors favouring start-ups. Strengths lie in the number of young people and self-employed persons, the share of small firms and business services. The latter ones are a result of the tourism industry. A weakness exists especially in the low population density.

Cluster H – Zug. This cluster consists only of the region Zug, which is a small canton. Zug shows particular characteristics in some aspects. First, it has a high potential regarding nearly all variables which is in line with an extraordinary high start-up rate in this region. Secondly, it conducts a very special tax policy, which attracts firms and rich people.

Cluster I – Industrialized tourism regions. This cluster comprises in particular regions in the south of Switzerland. These regions are in particular tourism regions but with an export orientated industrial sector. For example, the touristic centre Zermatt is part of the MS-region Visp, in which a strong chemical industry is also located. Altogether, the factor endowment is rather low. Strengths can be seen in the diversity index and the share of small firms.

Cluster J – Further tourism regions. The cluster can be characterized by touristic regions, containing old and emerging tourism regions, e.g. the Lower Engadine or Mittelbünden. On the one hand, the endowment with factors is rather weak. On the other hand, a high number of self-employed people and a high number of small firms exist. Both are maybe an indicator of the diverse and not strongly concentrated tourism industry in these regions.

When comparing the start-up rates of the clusters, it can be seen that they vary quite a lot (see table 2).

*Table 2. Start-up rates of the clusters*

Cluster	Average start-up rate 2006 to 2008 per 1000	
	workers	Standard deviation
Cluster A	4.01	0.89
Cluster B	3.10	0.76
Cluster C	2.40	0.57
Cluster D	2.00	0.81
Cluster E	2.12	0.60
Cluster F	1.81	0.92
Cluster G	3.78	3.49
Cluster H	11.92	0.00
Cluster I	3.45	1.46
Cluster J	1.59	0.80

An extraordinary high start-up rate can be found in cluster H, which consists of the canton Zug, with approximately 12 start-ups per year per 1000 workers. This region can be regarded as outlier due to its special tax policy mentioned above and, therefore, is not considered in the further analysis. Without Zug, the start-up rate varies from 4.0 to 1.6. A comparison of the start-up rates and the potentials of the clusters shows that typically the clusters with a high endowment have higher start-up rates (compare table 2 and appendix table A1).

The fact that the clusters have different start-up rates is also indicated by the non-parametric Kruskal-Wallis test, which rejects the null hypothesis of no differences in the start-up rates at the 1 percent level (see table 3).

*Table 3. Kruskal-Wallis test: Differences in start-up rates between clusters*

Test variable: Start-up rate 2006 to 2008		
Chi <sup>2</sup> -value	Degrees of freedom	p-value
42.03	9	0.000

The objective of the paper is not, however, to prove that regions perform differently with regard to start-ups. It is rather aimed to show that completely different endowments can lead to the same outcome.<sup>5</sup> The Mann-Whitney test gives us hints in this respect (see table 4).

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<sup>5</sup> In this context it is worth mentioning that a simple OLS regression with the start-up rate as dependent and the endowment variables as independent variables explain around 80% of the variance in the start-up rate. This means, that the chosen variables contribute a lot to the explanation of the start-up rate in the regions.

Table 4. Mann-Whitney test: Differences in start-up rates between the single clusters

Test variable: Start-up rate 2006 to 2008 <sup>a</sup>									
	Cl_A	Cl_B	Cl_C	Cl_D	Cl_E	Cl_F	Cl_G	Cl_I <sup>b</sup>	Cl_J
Cl_A		0.91 -1.55	1.61 -2.12**	2.01 -2.04**	1.89 -2.04**	2.20 -2.01**	0.23 -0.57	0.56 -0.91	2.42 -1.85*
Cl_B			0.70 -3.12**	1.10 3.78***	0.98 3.46***	1.29 3.25***	-0.68 -0.34	-0.35 -0.28	- 2.84***
Cl_C				0.40 -2.54**	0.28 -2.23**	- 2.62***	-1.38 -0.46	- 2.75***	0.81 -1.58
Cl_D					-0.12 -1.06	0.19 -0.81	-1.78 -0.53	- 3.60***	0.41 -0.65
Cl_E						0.31 -1.52	-1.66 -0.61	- 3.05***	0.53 -0.57
Cl_F							-1.97 -1.01	- 3.06***	2.19 -0.36
Cl_G								0.33 -0.58	2.19 -1.41
Cl_I									1.86 -2.42**
Cl_J									

<sup>a</sup> The first figure in the cells shows the difference in the average start-up rate between the compared clusters; the second figure is the Z-value with the significance level. – <sup>b</sup> Cluster H is left out due to the fact that it consists only of one region.

\*\*\* Significant at the 1% level; \*\* Significant at the 5% level; \*Significant at the 10% level.

The results show that regions with different potentials can have similar start-up rates, which is indicated by the non-significant differences between clusters. This means that the null hypothesis, i.e. no differences in the start-up rate, cannot be rejected. It allows us to answer the question whether or not different combinations of regional endowments with determinants explaining firm foundation, can lead to the same start-up rate. In the following, 3 examples are chosen to discuss the assumption (see table 5). In table 4 further examples can be found.

Table 5. Comparison of selected clusters with similar start-up rates but different endowments

Variables	Example 1			Example 2			Example 3		
	Cl_A <sup>a</sup>	Cl_G	Differenz <sup>b</sup>	Cl_B	Cl_I	Differenz	Cl_C	Cl_J	Differenz
Pop_Den	6.13 (++)	-0.31 (-)	6.26*	0.76 (+)	-0.32 (-)	1.08***	-0.04 (+-)	-0.53 (-)	0.49***
Labour_Force	1.03 (nc)	2.32 (nc)	-1.29	0.66 (+)	-1.08 (--)	1.74***	0.55 (+)	-1.23 (--)	1.78***
Div_Ind	1.77 (++)	0.19 (+-)	1.58*	1.06 (++)	0.64 (+)	0.42	0.15 (+-)	-0.54 (-)	0.69**
Young_People	2.29 (nc)	1.77 (++)	0.52	0.84 (+)	0.00 (+-)	0.84***	0.11 (+-)	-1.62 (--)	1.73***
Self_Empl	-0.85 (-)	1.12 (++)	-1.97*	-0.83 (-)	-0.66 (-)	-0.17	-0.31 (-)	1.99 (++)	-2.30***
Grad_Deg	2.47 (++)	-0.23 (+-)	2.70*	1.66 (++)	0.09 (+-)	1.57***	-0.09 (+-)	-0.62 (-)	0.53**
Small_Firms	1.31 (++)	2.51 (++)	-1.20	-0.31 (-)	0.21 (+)	-0.52*	-0.20 (+)	2.19 (++)	-2.39***
Manu_Den <sup>c</sup>	-1.83 (++)	1.23 (--)	-3.06*	-1.31 (++)	-0.59 (+)	-0.72***	-0.16 (+-)	1.73 (--)	-1.89***
Business_Den	2.68 (++)	1.20 (++)	1.48	0.61 (+)	-0.11 (+-)	0.72***	0.17 (+-)	0.05 (+-)	0.12

<sup>a</sup> The first and the second column of the examples show the t-value of the respective clusters. In cluster analysis the t-value is used to characterise clusters. Positive (negative) values indicate that the variable j is higher (lower) than the mean of the population. The brackets below give an overview in a rough way, how the variables characterise the cluster (++) = t-value  $\geq 1$ ; (+) = t-value  $\geq 0.2$ ; +- = t-value  $> -0.2$  and  $< 0.2$ ; - = t-value  $\leq -0.2$ ; -- = t-value  $\leq -1$ ; nc = not considered, because the cluster is inhomogeneous as indicated by the F-value, see appendix table A1).

<sup>b</sup> The third column of the examples shows the difference between the two t-values as well as the significance level with which the Mann-Whitney test rejects the null hypothesis of no differences between clusters (\*\*\*) Significant at the 1% level; \*\* Significant at the 5% level; \*Significant at the 10% level).

<sup>c</sup> The linkage between manufacturing density and start-up rates is ambiguous. Two interpretations are possible: Either it is argued that a high manufacturing density influences entrepreneurial activity negatively or a high industry share indicates strong localisation economies (see section 3).

The chosen examples show that a completely different combination of variables explaining firm foundation rates can lead to the same outcome. Example 1 compares cluster A and G which have similar high start-up rates. Cluster A is the cluster with the highest potential for start-up activity. In fact it can be seen that it has a significant higher start-up rate compared to most of the other clusters except for the clusters B, G, and I.



When analysing cluster A and G more precisely, it can be seen that their potential for firm formation is generally high, but quite different with regard to specific variables. While the population density, the diversity index and the number of highly qualified people is high in cluster A, it is lower in cluster G. The opposite is valid for the number of self-employed persons and the manufacturing density. Altogether cluster A and G show different combinations of variables which nevertheless lead to similar start-up rates. An explanation might lie in the different structure of the cluster regions. Cluster A consists of the two main agglomerations of Switzerland, whereas cluster G comprises in particular specialised tourism regions. In the latter one, start-ups are more tourism related than in cluster A, and, hence, need other factor endowments than start-ups in cluster A.

The second example refers to cluster B, having an overall high potential for entrepreneurial activity and a high start-up rate, and to cluster I. Both have a similar start-up rate. In comparison to the example shown above, where both clusters have a high but different potential for venture creation, cluster B and I differ in terms of the single determinants and the overall potential. While in cluster B the overall potential seems to be quite good, it is not in cluster I. Main differences lie in the variables population density, labour force, young and qualified persons, small businesses, and in the density of manufacturing sector and business services. Mostly, variables of cluster B show higher values than variables of cluster I, except for small businesses where cluster I has an advantage. Again, start-up rates may be explained by structural conditions of the different clusters. While cluster B consists of agglomerations plus the surrounding area, cluster I comprises industrialized tourism regions. In the latter one, the combination and interrelationship between a relatively high share of small firms together with a favourable diversity mix may form an environment conducive to business development in these regions.

The third example refers to cluster C and J. Both clusters are characterized by similar medium to high start-up rates. With regard to their potential they differ substantially. The overall potential for firm formation is medium in cluster C, and low in cluster J. Differences exist in nearly all variables. The only exception is the density of business services. In these variables the clusters are more or less similar. On the one hand, in cluster C, the factors population density, labour force, diversity, young and well qualified people as well as the density of manufacturing sector show a higher potential for entrepreneurial activity. On the other hand, cluster J performs better in the variable self-employed and small businesses. One explanation could be that the combination in the “North East Swiss urban centres” cluster C is not optimal although the potential in the respective variables is better than in cluster G. Additionally, cluster G is quite specialised in tourism and has with a high share of small firms and self-employed persons a factor combination which works well for these types of regions.

All in all, the results indicate that not only the endowment with single characteristics favours entrepreneurial activity. Rather it seems to be the case that for different types of regions specific factor combinations are favourable.

## 5. Conclusions

The paper has dealt with two main questions. First, it is asked whether different combinations of determinants supportive for venture creation can lead to similar start-up rates. The second question is if there are specific combinations of determinants which are conducive for different types of regions and lead to high rates of firm formation.

The results of this study are in line with previous research from other countries and from Switzerland. They show that regional structural variables have an influence on start-up rates and that the overall endowment of regions with this determinants matter (see e.g. Audretsch, 2010; Bergmann, 2011). We find that regions in Switzerland with an overall high potential, like it is the case in agglomerations, have high start-up rates, whereas regions with a low potential have low start-up rates, for example like the “Inner Swiss rural areas”. However, the results also indicate that the combination of factor endowments matter as well. The study has shown that completely different regional combinations of factors can lead to similar high or low start-up rates. Hence, not just only one single factor in isolation has the ability to influence start-up rates but the combination and interrelationship of the various parameters is important, too. For example, the cluster of “North East Urban centres” has an overall better factor endowment than the cluster of “Further tourism regions”, although both have similar high start-up rates. In the latter one, however, just a few variables show extraordinary high values. Hence, the specific factor combination, consisting of a high share of manufacturing firms, self-employed persons and a high number of small-firms, is important for this cluster in generating start-ups. Furthermore, it seems to be the case for Switzerland that in regions, partially depending on tourism industry, a specific factor combination is needed. It is striking that tourism regions with overall lower potentials still can achieve similar high start-up rates like agglomerations and urban regions with overall higher potentials. This is evident of the cluster “Agglomerations and surrounding” compared to the cluster “Industrialized tourism regions”, which both have similar start-up rates but different potentials.

The findings of this study may have implications for policy makers in that they have not only the opportunity to influence single factors in order to increase the dynamics of entrepreneurial activity in their region. They need to focus on the region specific structure. It also means that other regions cannot easily be used as a benchmark. For regional policy, each region has to incorporate its own specific combination of factors conducive for new venture creation.

The main limitation of the study is that it is not able to point out in advance, which combinations of factors can lead to high start-up rates for specific regions. This study has found evidence for Switzerland that a certain factor combination supports regions with a touristic structure in generating start-ups. In other countries this is maybe the case as well for other structural regions. Further research may support this assumption.

## Appendix

Table A1: Characteristic profile of clusters

		Pop_Den	Labour_Force	Div_Ind	Young_People	Self_Empl	Grad_Deg	Small_Firms	Manu_Den	Business_Den	
ROR	Mean value var j	374.9	53.4	17.4	24.4	7.8	6.4	40.3	11.0	9.9	
Cluster N=2	A	Mean value	4543.0	57.5	29.5	28.8	6.3	14.2	50.8	7.0	21.9
		t-value*	6.13	1.03	1.77	2.29	-0.85	2.47	1.31	-1.83	2.68
		F-value**	0.47	1.88	0.01	4.27	0.03	0.41	0.70	0.00	1.10
		Mean value	888.9	56.0	24.6	26.0	6.3	11.7	37.9	8.1	12.6
Cluster N=16	B	t-value	0.76	0.66	1.06	0.84	-0.83	1.66	-0.31	-1.31	0.61
		F-value	0.48	0.46	0.85	0.58	0.30	0.85	0.11	0.18	0.28
		Mean value	346.1	55.6	18.4	24.6	7.3	6.1	38.7	10.6	10.6
Cluster N=24	C	t-value	-0.04	0.55	0.15	0.11	-0.31	-0.09	-0.20	-0.16	0.17
		F-value	0.07	0.24	0.29	0.20	0.17	0.15	0.26	0.25	0.16
		Mean value	146.2	53.5	11.4	24.4	8.2	4.9	34.4	10.8	6.9
Cluster N=19	D	t-value	-0.34	0.01	-0.87	0.00	0.20	-0.48	-0.75	-0.08	-0.65
		F-value	0.01	0.28	0.24	0.24	0.21	0.12	0.22	0.23	0.06
		Mean value	123.6	50.3	17.6	22.8	7.2	4.3	38.8	13.3	6.6
Cluster N=13	E	t-value	-0.37	-0.79	0.03	-0.84	-0.37	-0.67	-0.19	1.08	-0.73
		F-value	0.03	0.48	0.36	0.33	0.16	0.07	0.26	0.18	0.15
		Mean value	63.2	51.5	9.0	22.8	11.0	3.6	40.8	13.2	7.6
Cluster N=12	F	t-value	-0.46	-0.50	-1.21	-0.88	1.71	-0.90	0.06	1.03	-0.50
		F-value	0.01	0.30	0.25	0.26	0.48	0.09	0.51	0.39	0.20
		Mean value	165.4	62.5	18.7	27.7	9.9	5.7	60.2	13.7	15.2
Cluster N=3	G	t-value	-0.31	2.32	0.19	1.77	1.12	-0.23	2.51	1.23	1.20
		F-value	0.09	1.93	0.19	0.52	0.84	0.06	0.15	0.06	0.98
		Mean value	527.0	58.3	20.9	28.1	7.1	10.5	74.3	11.2	37.4
Cluster N=1	H	t-value	0.22	1.25	0.51	1.95	-0.41	1.30	4.28	0.11	6.10
		F-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Mean value	159.1	49.2	21.8	24.4	6.6	6.7	42.0	9.7	9.4
Cluster N=12	I	t-value	-0.32	-1.08	0.64	0.00	-0.66	0.09	0.21	-0.59	-0.11
		F-value	0.04	0.14	0.67	0.35	0.24	0.25	0.52	0.10	0.49
		Mean value	13.6	48.6	13.7	21.3	11.5	4.5	57.7	14.8	10.1
Cluster N=4	J	t-value	-0.53	-1.23	-0.54	-1.62	1.99	-0.62	2.19	1.73	0.05
		F-value	0.00	0.33	0.22	0.29	0.46	0.13	0.46	0.09	0.01

\* The t-value is used to characterize each cluster. Negative (positive) t-values indicate that the variable j is lower (higher) than the mean of the population. - \*\* The F-value provides information about the homogeneity of the individual clusters. F-values smaller than one indicate homogeneous clusters in the respective variable, F-values larger than one indicate heterogeneity within the cluster in the respective variable.

*Table A2: Indicators used in the study*

Indicator	Abbreviation	Indicator	Source
Start-up rate	Start_Up	Average number of new firms 2006-2008 per 1000 workers	Swiss Federal Statistical Office, UDEMO 2011
Population density	Pop_Den	Number of inhabitants 2007 per km <sup>2</sup>	Swiss Federal Statistical Office, ESPOP 2007 <sup>a</sup>
Density of business services	Business_Den	Number of firms of the business services per 1000 inhabitants 2005	Swiss Federal Statistical Office, UDEMO 2005 <sup>b</sup> , ESPOP 2005
Density of manufacturing sector	Manu_Den	Number of firms of the manufacturing sector 2005 per 1000 inhabitants	Swiss Federal Statistical Office, UDEMO 2005, ESPOP 2005
Share of small firms	Small_Firms	Number of small firms (until 49 employees) per 1000 inhabitants 2005	Swiss Federal Statistical Office, UDEMO 2005, ESPOP 2005
Labour force	Labour_Force	Labour force 2000 per number of inhabitants 2000 in per cent	Swiss Federal Statistical Office, VZ 2000 <sup>c</sup> , ESPOP 2000
Graduate degree	Grad_Deg	Number of persons with graduate degree per number of inhabitants 2000 in per cent	Swiss Federal Statistical Office, VZ 2000, ESPOP 2000
Diversity Index	Div_Ind	Number of foreign born persons per number of inhabitants 2006 in per cent	Swiss Federal Statistical Office, ESPOP 2006
Young people between the ages of 25-40 years	Young_People	Number of 25-40-years old persons per number of inhabitants 2000 in per cent	Swiss Federal Statistical Office, VZ 2000, ESPOP 2000
Self-employed persons	Self_Empl	Number of self-employed persons (incl. family members) per number of inhabitants 2000 in per cent	Swiss Federal Statistical Office, VZ 2000, ESPOP 2000

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