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The Entrepreneurship Potential within Swiss Regions – A comparison based on cluster analysis

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Abstract

Based on empirical and theoretical literature, regions are clustered according to a set of relevant factors which determine entrepreneurial activity. The clustering results indicate that Swiss regions are distinct with regard to their antecedents for new venture creation. From the results it is possible to derive different strategies for the particular clusters. In particular, for most of the clusters containing agglomeration and urban regions as well as some semi-peripheral regions it may be advisable to strengthen entrepreneurship education in order to compensate for existing weaknesses such as the lack of role models. However, in the case of several clusters which contain peripheral regions it would be better to emphasise inherent dominant strengths rather than to compensate for existing weaknesses. Consequently, one potential strategy of Swiss regional policy towards structurally weak and peripheral regions is to focus on the potentials of their regional centres, which could then function as nucleui for the surrounding peripheral regions.

JEL-Classification: R11, M13, R58
Keywords: Regional Economics, Entrepreneurship, Start-ups, Regional Policy

1. Introduction

New businesses are considered to be important for regional economic development and growth (see e.g. Audretsch et al. 2006; Fritsch & Mueller 2008). New venture creation, however, varies considerably between regions, indicating differences in their endogenous potential and structural characteristics for new business formation. Taking both these factors into account, policymakers and stakeholders should strive to increase entrepreneurial activity at the national as well as at the regional level, in order to increase economic welfare. In Switzerland, the New Regional Policy (NRP) a policy instrument has been created, with the aim of increasing entrepreneurial activity in peripheral and semi-peripheral regions. One important question, however, is how to support this entrepreneurial activity in such a way that limited resources are used most efficiently and that any policy measures taken, best fit the prevailing regional structural conditions.

The present study examines the conditions for new venture creation in Swiss regions. The conditions for new venture creation include the resources, structural characteristics and abilities of a region to generate new firms. They are measured by a set of variables derived from theoretical and empirical literature on entrepreneurship. Answers are in particular being sought to two main questions. Firstly, in what way do Swiss regions vary with regard to their potential for venture creation and by which strengths and weaknesses are they characterised? Secondly, what can be derived from the characteristics of regions for the NRP to strengthen entrepreneurial activity?

Cluster analysis is used to identify homogenous groups of regions according to their entrepreneurship potential. It merges regions into classes with homogenous potential. The analysis is carried out at the level of Swiss 'mobilité spatial' regions (MS). MS regions are functional units based on economic interaction and commuting movements. This allows the identification of regions with high and low entrepreneurship potentials on the basis of those determinants used, and to discuss strengths and weaknesses of Swiss regions with regard to their potential for new venture creation. This is in particular important with respect to the formulation of policy recommendations because entrepreneurial determinants are a strong indicator of real entrepreneurial activity in regions. In order to foster entrepreneurial activity one should consider these determinants as they strongly indicate the likelihood of optimal conditions for new venture creation.

There are numerous studies dealing with new business formation and the related impact on regional economic growth. From the early 1990s, when firm formation data at the regional level became available, empirical studies have dealt with regional variation in new firm

formation rates, with the identification of explanatory determinants at the regional level (Reynolds et al. 1994; Audretsch & Fritsch 1994). Subsequent studies also distinguish between demand and supply side orientated determinants for entrepreneurship (for an overview see Verheul et al. 2002). While the demand side stresses the market side and the need for new products and services, the supply side includes human and social capital of the population of a region or nation. Regional economics literature provides further evidence supporting the relevance of agglomeration economies, in particular urbanization and localization economies. Numerous studies have highlighted the positive effects of agglomeration on the formation of new ventures, regional innovation activities and growth (e.g. Acs et al. 2002; Glaeser et al. 1992). Our study reviews this theoretical and empirical literature to identify the factors that determine entrepreneurial activity in regions. It extends the literature by using the established factors to compare regions with one-another,by employing cluster analysis as an approach to determine regional differences. Furthermore, it furthers current research on a regional level which uses and maps single individual pieces of data on entrepreneurial attitudes (Bosma & Schutjens 2009).

The remainder of this article is organized as follows. In the next section, we discuss the literature on determinants which influence entrepreneurial activity, their type of impact on start-up rates and the selection of the indicators. The third section describes the data set and methodology. The fourth section discusses the results.The concluding section summarizes the results and discusses selected political recommendations.

2. Factors accounting for regional entrepreneurial activity

Theoretical and empirical literature on entrepreneurship suggests that numerous determinants have an impact on start-up activities. In particular these are (1) factors of the demand side for entrepreneurship, (2) factors of the supply side for entrepreneurship, and (3) urbanization and localization effects.[1]

2.1 Demand side for entrepreneurship

The demand side for entrepreneurship stands for opportunities to create a venture. It is influenced by the market demand for new goods and services (Verheul et al. 2002). In particular, an increase in demand, technological and structural transformation goes hand in hand with changes in consumer preferences and leads to opportunities for venture creation. Economic development and structural change comes along with individualized, diversified

[1] A similar classification is used in the literature; see for example Bosma et al. (2008), Verheul et al. (2002).

consumer preferences for new, specialized and differentiated goods and services. It offers numerous entrepreneurial opportunities for new entrepreneurs in market niches, as new firms serve local markets first (Armington & Acs 2002). The structural change from the manufacturing sector towards the service industry is considered to have a positive impact on firm formation. The service sector is characterised by low start-up requirements, a small size structure and the number of firms increases with higher per capita income. These characteristics make new venture creation more likely, due to smaller start-up costs and lower market entry barriers (e.g. Fritsch 1997). Subsequently, a smaller business density of manufacturing firms also has a positive impact on the number of new firms being created (Reynolds et al. 1995).

A further demand side factor is the size structure of the regional industry. Small firms are more capable of responding to changing market needs for new and specialized products and services due to a more flexible approach and adaptability (Loveman & Sengenberger 1991). Additionally, small scale activity fosters regional competition and contributes to higher start-up rates (Fotopoulos and Spence 1999), while the role of scale economies has become less important for innovative industries and technological advancement in many sectors (Acs & Audretsch 1987).

There exists a negative relationship between the number of employees within a firm and the probability that an employee starts his or her own business. The reason is that small firms serve as better role models and provide more favourable conditions than those of large firms; whereby larger firms tend to restrict their employees from resigning from their posts and becoming self-employed (Storey 1994; Wagner 2004).

2.2 Supply side for entrepreneurship

The supply side for entrepreneurship deals with the endogenous potential of the regional population to create new firms. It includes factors such as the size and structure of the population, employment structure, age structure, human capital and share of immigrants (Verheul et al. 2002).

The population density in a region shows a high correlation with a number of factors such as business infrastructure, market proximity, wage level, educated work force and access to innovative products (e.g. from universities), and quality of communication infrastructure. Thus, this variable can be regarded as a catch-all variable for a variety of regional characteristics (Fritsch & Mueller 2008). The creation of new business activities in highly populated regions signals attractiveness to other businesses because of cooperation opportunities and spillover effects (Audretsch & Fritsch 2000).

Also, employment structure is relevant as a further factor for entrepreneurial activity. The literature indicates that a high number of self employed persons increases entrepreneurial activity in regions. Start-up activity is self reinforcing because existing entrepreneurs provide role models and information for regional stakeholders and potential entrepreneurs. (Minniti 2005; Mueller 2006). Furthermore, persons who are or who were already self employed (serial entrepreneurs) are predestined for further start-up activities (Westhead & Wright 1998; Thurik et al. 2009).

Not only the employment but also the age structure influences new venture creation. The Global Entrepreneurship Monitor (GEM) shows that people especially between 35 and 44 years of age, in other words mid-career, become self-employed (Reynolds et al. 2002). Further studies report that many entrepreneurs start a new venture in their mid-thirties and are typically between 25 and 40 years old (Storey 1994; Evans and Leighton 1989). Also, the level of entrepreneurial activities is declining with an increasing age of the population. Subsequently, nations with a higher number of persons in the age class of 25-44 years demonstrably have more start-up activities than others (Reynolds, Hay & Camp 1999). Furthermore, studies show that even if there are more opportunities to become self-employed for older than for younger persons, older employees are less willing to become self-employed (Van Praag and van Ophem 1995).

Additionally, the level of education, experience and background influences entrepreneurial success (Brüderl et al. 1998). There exists a positive relationship between the duration of professional education and training and the probability of starting a company. This indicates a higher ability to recognize business opportunities. Hinz (1998) concludes that individuals with a graduate degree are more inclined towards entrepreneurship and likely to start a company, particularly in knowledge intensive industries, although the relationship is not linear. Entrepreneurs tend to be people with a more hands-on educational background (vocational school, technical college, etc.) than an academic background.

The number of immigrants in a region plays an important role with regard to firm birth rates. First, it has indirect effects due to consequences of the age structure of a regional population because foreign families are usually younger and have more children. Second, studies have found a significant and positive effect of immigrants on new firm formation (Reynolds et al. 1995). In particular, there are two groups of immigrants. The first one consists of immigrants who lack skills, resources and networks; however, they still tend to be more predisposed to self-employment than non-immigrants. The second one consists of extremely well educated and skilled immigrants. They are highly engaged in technology start-up activities and can be particularly found in leading export and innovative regions (Saxenian 1999). Both groups

enrich a region with new ideas and cultures, create new business opportunities, and are risk takers (Lee et al. 2004).

A last supply factor could be the relationship between unemployment and self-employment. However, this link is ambiguous and still not conclusive (Parker 2004; Bergmann & Sternberg 2007). Serving as a supply side factor, unemployment reduces the opportunity of paid-employment and offers the option of becoming self-employed, in particular when there is shortage of alternative job opportunities. Nevertheless, high unemployment rates lower the demand for products and services that firms offer. Subsequently, the income and also the available capital for entrepreneurs are reduced and the risk of bankruptcy increases. This indicates a negative relationship between self-employment and starting a venture. Empirical results tend to reflect the method applied and does not represent 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 (see Parker 2004 for an overview).

2.3 Urbanization and localization economies

Urbanization and localization economies both belong to the broader concept of agglomeration economies, which dates back to Marshall 1920. The main argument is that firms benefit from spatial concentration, which leads to advantages due to market size, spillovers, synergies and labour market effects. Good access to markets enables firms to achieve relatively higher rents, so that the concentration of firm increases with market size. This forms a large workforce pool; enables technological spillovers by means of transfer of technology and knowledge and can intensify networking of enterprises. The difference between urbanization and localization economies is that the former arise for spatially concentrated firms irrespective of their industry. The latter refers to benefits for firms spatially concentrated within the same industry (Hoover 1948).

With regard to entrepreneurship and urbanization economies there is empirical evidence that urbanization economies have a positive impact on the new firm formation rate (Armington & Acs 2002; Reynolds et al. 1994). Urbanization economies provide 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, stimulating creativity and innovation which are necessary preconditions for entrepreneurship. Thus, urbanized and densely populated regions are attractive regions to start new business activities in.

Localisation economies show a similar linkage to that of 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 associated 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 with regard to gaining knowledge of the business environment, start-ups are attracted by regions where certain industries already exist (Audretsch et al. 2008).

Overall, our study is based on this theoretical and empirical literature when selecting the relevant variables with regard to the entrepreneurship potential of regions. The selected variables are industry structure; firm size structure, population density, self-employment, human capital and age structure of the population. The selected variables are all structural variables. This selection is not exhaustive, e.g. there are further links between entrepreneurship and institutional factors or cultural attitudes. However, due to the limited availability of appropriate data at the regional level we have abstained from introducing these concepts.

3. Data and methodology

3.1 Data and descriptive statistics

Our analysis aims to cluster regions according to their entrepreneurial potentials on the spatial level of 106 Swiss MS regions (mobilité spatiale). MS regions are functional units based on economic interaction and commuting movements of the labour workforce. They account for a differentiation on a more disaggregated level than the level of the 26 cantons in Switzerland, in particular, which are larger and contain different agglomeration categories. When selecting variables to describe the relevant factors for entrepreneurial activity, one has to take into account that the availability of statistical data is limited. The following table 3.1.1 and description gives a short overview of the variables selected.

Table 3.1.1 Indicators used in the study

Factors based on theory	Indicator name	Indicator	Influence of indicators on firm formation rate	Source
Demand /supply side/ agglomeration economies	Population density	Number of inhabitants 2007 per km2	Positive	Swiss Federal Statistical Office, ESPOP 2007[a]
Demand side/agglomeration economies	Density of business services	Number of firms of the business services per 1000 inhabitants 2005	Positive	Swiss Federal Statistical Office, UDEMO 2005[b], ESPOP 2005
Demand side/agglomeration economies	Density of manufacturing sector	Number of firms of the manufacturing sector 2005 per 1000 inhabitants	Negative (in special cases positive)	Swiss Federal Statistical Office, UDEMO 2005, ESPOP 2005
Demand side/supply side	Share of small firms	Number of small firms (until 49 employees) per 1000 inhabitants 2005	Positive	Swiss Federal Statistical Office, UDEMO 2005, ESPOP 2005
Supply side/agglomeration economies	Labour force	Labour force 2000 per number of inhabitants 2000 in per cent	Positive	Swiss Federal Statistical Office, VZ 2000[c], ESPOP 2000
Supply side/agglomeration economies	Graduate degree	Number of persons with graduate degree per number of inhabitants 2000 in per cent	Positive	Swiss Federal Statistical Office, VZ 2000, ESPOP 2000
Supply side	Diversity Index	Number of foreign born persons per number of inhabitants 2006 in per cent	Positive	Swiss Federal Statistical Office, ESPOP 2006
Supply side	Young people of 25-40 years	Number of 25-40-years old persons per number of inhabitants 2000 in per cent	Positive	Swiss Federal Statistical Office, VZ 2000, ESPOP 2000
Supply side	Self-employed persons	Number of self-employed persons (incl. family members) per number of inhabitants 2000 in per cent	Positive	Swiss Federal Statistical Office, VZ 2000, ESPOP 2000
Validation variable	Start-up rate	Average number of new firms 1999-2006 per 1000 workers		Swiss Federal Statistical Office, UDEMO 2005

[a] ESPOP: Annual Population Statistics *(Statistik des jährlichen Bevölkerungsstandes)*, - [b] UDEMO: Federal Establishment Census (*Unternehmensdemografie*), - [c] VZ: Federal Population Census *(Volkszählung)*.

The indicator population density represents the demand side and supply side for entrepreneurship as well as urbanization economies. Population density is highly correlated with a number of factors such as purchasing power[2], 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 high regional start-up rates. The variable can be regarded as a "catch-all indicator". It is defined as the number of population by square kilometres.

Density of business services is an indicator of the demand side and urbanization economies. It can be considered as a proxy for structural change and economic progress towards a service economy. The service sector shows a high rate of new venture creation due to its characteristics, e.g. low entry barriers. It is defined as the ratio of the number of firms in the service sector divided by 1'000 inhabitants.

Besides the density of the business sector, the density of the manufacturing sector is used as an indicator for the demand side as well. The linkage of this indicator to entrepreneurial activity is ambiguous. Firstly, a high manufacturing density indicates a retarded 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 specific industries exists. If so, a high industry share indicates a high potential for new 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.

The share of small firms indicates as a determinant of the demand side as well as indicator of the supply side. Firstly, it can be considered as a further indicator regarding structural change and flexible specialisation. Secondly, small firms serve as role models for other potential entrepreneurs. Hence, a high share 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 selected as indicator for the supply side of entrepreneurship as well as indicator of urbanization economies. It can be considered as 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.

[2] In fact population density is highly correlated with regional GDP per capita.

A further indicator for the supply side is the number of persons with a graduate degree. It is used as a proxy for high qualification since there is a positive relationship between education and entrepreneurial activity. It includes not only university degrees but an applied educational background, too. This background plays an important role for the probability of starting a company. Besides graduates with a university degree, also graduates from Höhere Fachschulen, which are more vocational schools, have been included. It 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 a venture.

Young highly qualified people are used as a further indicator of the supply side. Many entrepreneurs start their new venture typically between 25 and 40 years. Hence, the share of this age group in relation to the total number of inhabitants is selected.

A last indicator of the supply side 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 3.1.2 gives a brief summary of variables used in cluster analysis and their characteristics.

Table 3.1.2. Summary statistics of variables used in cluster analysis

Indicator name	Mean	Standard deviation	Minimum	Maximum
Population density	374.93	676.74	7.87	5006.14
Density of business services	9.85	4.50	3.83	37.40
Density of manufacturing sector	10.98	2.17	6.89	15.64
Share of small firms	40.32	7.92	29.11	74.34
Labour force	53.34	3.92	44.86	69.91
Graduate degree	6.43	3.15	2.11	17.05
Diversity index	17.39	6.86	3.40	37.32
Young people of 25-40 years	24.42	1.89	19.67	32.68
Self-employed persons	7.85	1.84	4.95	13.34

In addition to the aforementioned indicators which are included in cluster analysis; the number of new businesses is also considered. This variable serves as validation variable to verify the results of cluster analysis. This data only comprises information about newly founded independent firms, subsidiaries are not registered. Start-up rates are calculated based on the labour market approach. They are defined as the number of start-ups per 1'000 regional workforce.[3] This data varies considerably between the regions. In average over all regions the start-up rate is 2.5 new businesses per 1000 workers and year with a standard deviation of 1.2. The region with the highest start-up rate experiences 10.3 new businesses per 1000 workers in a year. The region with the lowest start-up rate sees only 0.9 new businesses. The region with the highest start-up rate, however, is clearly an outlier, but a start-up rate of 4 and more is common.

3.2 Cluster analysis

To compare different regions according to their structural potential for new venture creation, and to find out about weaknesses and strengths of regions with regard to their entrepreneurial activity, cluster analysis is used. The objective of a cluster analysis is to form homogenous groups of objects which are described by a variety of characteristics (see e.g. Hair et al. 2006; Backhaus et al. 2008). Here cluster analysis is used to form several homogeneous groups of Swiss labour market regions, the MS regions, according to their individual structural potential and for comparative purposes. The method of cluster analysis is an established instrument in regional economics which allows to reduce complexity and to identify relevant regions and measures for regional policy (Eckey et al. 2002). For example cluster analysis is used by the German Sachverständigenrat zur Begutachtung der Gesamtwirtschaftlichen Entwicklung (1999) to find out about regional disparities in East Germany and Kronthaler (2005) to compare the economic capability of East German regions with West German regions.

In the calculation of the clusters, first Ward's minimum-variance method is used. This technique belongs to the group of hierarchical agglomerative methods, in which every object is represented by an individual cluster at the beginning of the algorithm. The clusters are then successively joined together into groups until only a single cluster remains. The objective of Ward's method is to join two clusters at each step, such that the variance for the joined

[3] The start-up rate according to the labour market approach may be regarded as the propensity of a member of the regional workforce to start an own business. New ventures are usually located close the residence or the former workplace of the founder (Cooper & Dunkelberg 1987; Stam 2007). Thus, the number of firm founders who choose the location of their firm primarily on the basis of regional characteristics is very limited.

clusters is minimized. In comparison to other hierarchical fusion algorithms, which use minimization of the distance between clusters as the fusion criterion, several simulation studies have shown that the Ward technique appears to be superior to alternative approaches and forms very homogenous clusters (Everitt et al. 2001; Backhaus et al. 2008). However, since clusters which are merged using Ward's method cannot be separated again in subsequent steps, it has been suggested that the results from the Ward technique should be corrected in an additional step, e.g. by using an optimizing clustering algorithm, which allows for a reassignment of regions (see e.g. Hair et al. 2006; Everitt et al. 2001).

A first issue when applying cluster analysis is the question whether variables used are highly correlated, since such variables tend to dominate the cluster analysis and are liable to distorting the results (Backhaus et al. 2008). In literature it is recommended that variables with a correlation coefficient $r>0.8$ (Schmidt, 1995) or $r>0.9$ (Backhaus et al. 2008) should be excluded. Calculation of the correlation coefficients shows that none of the variables are correlated to this extent. Another problem is the possibly different weighting of the variables due to differing unit scales. To avoid this, variables are standardized by a z-transformation (Bacher 1996).

As mentioned above, the Ward algorithm stops when there is only one cluster left. To determine the optimal number of clusters we employ the agglomeration schedule, and the measure of homogeneity ETA^2.

The agglomeration schedule (see Appendix 1) reveals increases in the distances at each step of the fusion process. As an informal test high increases in these distance levels are checked, because a high increase suggests an optimal number of clusters. Jumps in the distance levels are apparent from cluster number 25 to 24, 21 to 20, 14 to 13, 10 to 9, 9 to 8, 7 to 6, and 5 to 4. Therefore several cluster solutions are possible and it has to be decided which cluster solution is preferable. Considering the jumps more precisely one can judge that the increases from 10 to 9 and 9 to 8 are the substantial ones, for that we proceed with the 10-cluster solution. This is in line with the objective of cluster analysis to reduce complexity and to facilitate interpretation of the cluster solution. Furthermore, it is in line with the second criteria, the measure of homogeneity of the cluster solution ETA^2. This measure describes the share of the variance which occurs between clusters. With the 10-cluster solution, ETA^2 is about 70%, meaning that most of the variance is between clusters.[4]

[4] More formal criteria to decide about cluster solution, is the use of Mojena test statistics I and II (Bacher, 1996). However, both tests normally provide different results and are not really reliable. Hence, we abstain from considering the test results, which both indicate different solutions.

Finally, with the help of a non-hierarchical clustering algorithm (k-means), the selected cluster solution is optimized using the cluster seeds resulting from the Ward algorithm. In 6 iteration steps 14 regions have been reassigned improving the original solution.

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. It is the quotient of the variance of a variable within the cluster and the variance of the variable in the population:

$$F_j^C = \frac{Var_j^C}{Var_j}. \qquad (1)$$

The smaller this quotient is then the more homogenous is the cluster. 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 characterise each cluster. It is the difference between the cluster mean value of the variable j and the mean value of the variable j of the population divided by the standard deviation:

$$t_j^C = \frac{\bar{X}_j^C - \bar{X}_j}{\sqrt{Var_j}}. \qquad (2)$$

Negative (positive) t-values therefore 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.

4. Results

According to the discussion of the results of the cluster analysis we were able to identify 10 clusters with different entrepreneurial potentials. Table 4.1 shows the characteristic profile of the clusters with the strengths and weaknesses of the respective clusters as well as the validation variable start-up rates. It can be observed that in these clusters where strengths outweigh the weaknesses, start-up rates are high and vice versa. This means that clusters with a high (low) potential have in fact high (low) venture creation rates. E.g. cluster A has high t-values in nearly all variables, which is in accordance with the relatively high start-up rate. As in this study start-up rates act as validation variable this means that cluster analysis performed well in identifying clusters with high, medium and low potentials for venture creation.

Table 4.1 Characteristic profile of the clusters

		Population density	Labour force	Diversity Index	Young people of 25 to 40 years	Self employed persons	Graduate degree	Share of small firms	Density of manufacturing sector	Density of business services	Validation variable: Start-up rate 1999 - 2006
ROR	Mean value	374.94	53.43	17.39	24.42	7.85	6.43	40.32	10.98	9.85	2.52
Cluster A (N=2)	Mean value	4543.01	57.48	29.55	28.76	6.29	14.25	50.77	7.00	21.93	4.08
	t-value	6.13	1.03	1.77	2.28	-0.84	2.47	1.31	-1.83	2.68	1.37
	F-value	0.47	1.88	0.01	4.27	0.03	0.41	0.70	0.00	1.10	0.15
Cluster B (N=16)	Mean value	888.94	56.02	24.67	26.01	6.32	11.67	37.88	8.12	12.60	3.05
	t-value	0.76	0.66	1.06	0.84	-0.83	1.66	-0.31	-1.31	0.61	0.47
	F-value	0.48	0.46	0.85	0.58	0.30	0.85	0.11	0.18	0.28	0.21
Cluster C (N=24)	Mean value	346.07	55.58	18.44	24.64	7.28	6.15	38.71	10.63	10.61	2.55
	t-value	-0.04	0.55	0.15	0.11	-0.31	-0.09	-0.20	-0.16	0.17	0.03
	F-value	0.07	0.24	0.29	0.20	0.17	0.15	0.26	0.25	0.16	0.15
Cluster D (N=19)	Mean value	146.18	53.48	11.39	24.43	8.21	4.93	34.36	10.81	6.93	1.95
	t-value	-0.34	0.01	-0.87	0.00	0.20	-0.48	-0.75	-0.08	-0.65	-0.50
	F-value	0.01	0.28	0.24	0.24	0.21	0.12	0.22	0.23	0.06	0.09
Cluster E (N=13)	Mean value	123.58	50.32	17.58	22.82	7.17	4.30	38.82	13.31	6.56	2.06
	t-value	-0.37	-0.79	0.03	-0.84	-0.37	-0.67	-0.19	1.07	-0.73	-0.40
	F-value	0.03	0.48	0.36	0.33	0.16	0.07	0.26	0.18	0.15	0.20
Cluster F (N=12)	Mean value	63.21	51.47	9.04	22.75	11.01	3.59	40.81	13.21	7.61	1.73
	t-value	-0.46	-0.50	-1.21	-0.88	1.71	-0.90	0.06	1.03	-0.50	-0.69
	F-value	0.01	0.30	0.25	0.26	0.48	0.09	0.51	0.39	0.20	0.33
Cluster G (N=3)	Mean value	165.35	62.51	18.71	27.77	9.91	5.72	60.19	13.65	15.23	3.48
	t-value	-0.31	2.30	0.19	1.76	1.12	-0.22	2.50	1.23	1.20	0.84
	F-value	0.09	1.93	0.19	0.52	0.84	0.06	0.15	0.06	0.98	3.04
Cluster H (N=1)	Mean value	527.00	58.34	20.91	28.12	7.10	10.55	74.34	11.22	37.40	10.35
	t-value	0.22	1.25	0.51	1.95	-0.41	1.30	4.28	0.11	6.10	6.83
	F-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cluster I (N=12)	Mean value	159.07	49.20	21.81	24.43	6.64	6.72	41.98	9.70	9.35	2.88
	t-value	-0.32	-1.08	0.64	0.00	-0.66	0.09	0.21	-0.59	-0.11	0.32
	F-value	0.04	0.14	0.67	0.35	0.24	0.25	0.52	0.10	0.49	0.82
Cluster J (N=4)	Mean value	13.56	48.59	13.66	21.34	11.52	4.47	57.73	14.75	10.09	2.15
	t-value	-0.53	-1.23	-0.54	-1.62	2.00	-0.62	2.19	1.74	0.05	-0.32
	F-value	0.00	0.33	0.22	0.29	0.46	0.13	0.46	0.09	0.01	0.18

In the following, each cluster is briefly described in terms of demand side factors, supply side factors, urbanisation and localisation economies and how they differ from each other.

Cluster A consists of two of the main agglomerations of Switzerland, Zurich and Basel. As such it is naturally well endowed with demand side factors, supply side factors, as well as urbanisation and localisation economies for specific industries. In particular, nearly all variables indicate a high entrepreneurial potential with the exception of the variable relating to self employed persons. With 6.3% of self-employed persons the proportion is relatively low compared to other cluster, thus indicating some weaknesses in one of the proxies for the supply side of entrepreneurship. One of the causes of the relatively low share of self-employed persons is certainly the fact that huge industries (banking in Zurich and chemistry in Basel) are located in this cluster. Overall, the high level of entrepreneurial potential in this cluster is shown by the relatively high start-up rate with nearly 5 new firms per 1000 workers in one year.

Cluster B is a cluster which is also comprised of some of the main agglomerations of Switzerland like Berne, Fribourg, Geneva, Neuchâtel, Lausanne as well as the greater Zurich area. Hence for cluster B the same assumptions are valid as those for cluster A. Nearly all variables for the demand side, supply side, and urbanisation and localisation economies show high entrepreneurial potentials. Exceptions are in particular again the number of self-employed persons with a share of 6.3% and the number of small firms with 37.9 small firms per 1000 workers.

Cluster C contains 24 regions such as St. Gallen, Chur, Davos and the Zurich lake area. It does not only include agglomerations and urban regions, but also semi-peripheral regions[5]. Overall, the potential for new venture creation is lower than in cluster A and B, but it is still middle to high. It has start-up rates of 2.5 per cent per 1000 labour force, which is slightly above the Swiss average start-up rate. Strengths lie in a high number of young and diversified people as well as in a high density of business services. Cluster C, in particular, features a high level of given labour force with 55.6 percent. Weaknesses can be seen, however, in a relatively low level of self employed persons and small firms.

To summarize, Cluster C shows all three categories of factors (supply and demand side, agglomeration economies) with a mixed picture of high and low levels of entrepreneurial potentials.

Cluster D mainly consists of semi-peripheral and peripheral regions which are mainly located in mountainous areas such as the upper Berne areas. They share some similar characteristics to cluster C. Still, there are differences with regard to specific variables such as a low diversity index

[5] Semi-peripheral regions are defined as regions which do not belong to Swiss agglomeration and urban regions but are classified as a middle-large town.

with 11.4 per cent of the total number of inhabitants and a low density of business services compared to cluster C. Overall, the potential for venture creation with regard to the underlying variables seems to be quite weak. Furthermore, weaknesses lie in a low population density, a lack in the number of young and or graduates.. Nevertheless, cluster D has with 8.2 per cent a relatively high number of self employed compared to the first three clusters A, B and C.

Belonging to the clusters with the lowest entrepreneurial potentials, cluster E has at least an average diversity index, while all other variables are clearly under average. The start-up rate is 2.1 per cent and therefore close to the average. With 13.3 per cent, cluster E has one of the highest shares of manufacturing firms.

Cluster F contains rural areas like the Toggenburg, Einsiedeln, Emmental and Appenzell. Like the clusters above, the characteristics of all three categories (demand and supply side and agglomeration economies) can all be found in this cluster. The entrepreneurial potentials are significantly below the average, in comparison to the other clusters. An exception is the number of self employed persons per number of inhabitants, which is very high for Swiss regions.

Cluster G only consists of three regions such as the Upper Engadine. These are semi-peripheral and peripheral regions with a relatively high potential for new venture creation. Strengths lie in most of the variables except for population density and the number of graduates. Young people 27.8 per cent (supply side). The four variables referring to the proportion of young people, self employed persons, small firms and the density of business services have very high values. They belong to both, the demand and the supply side.

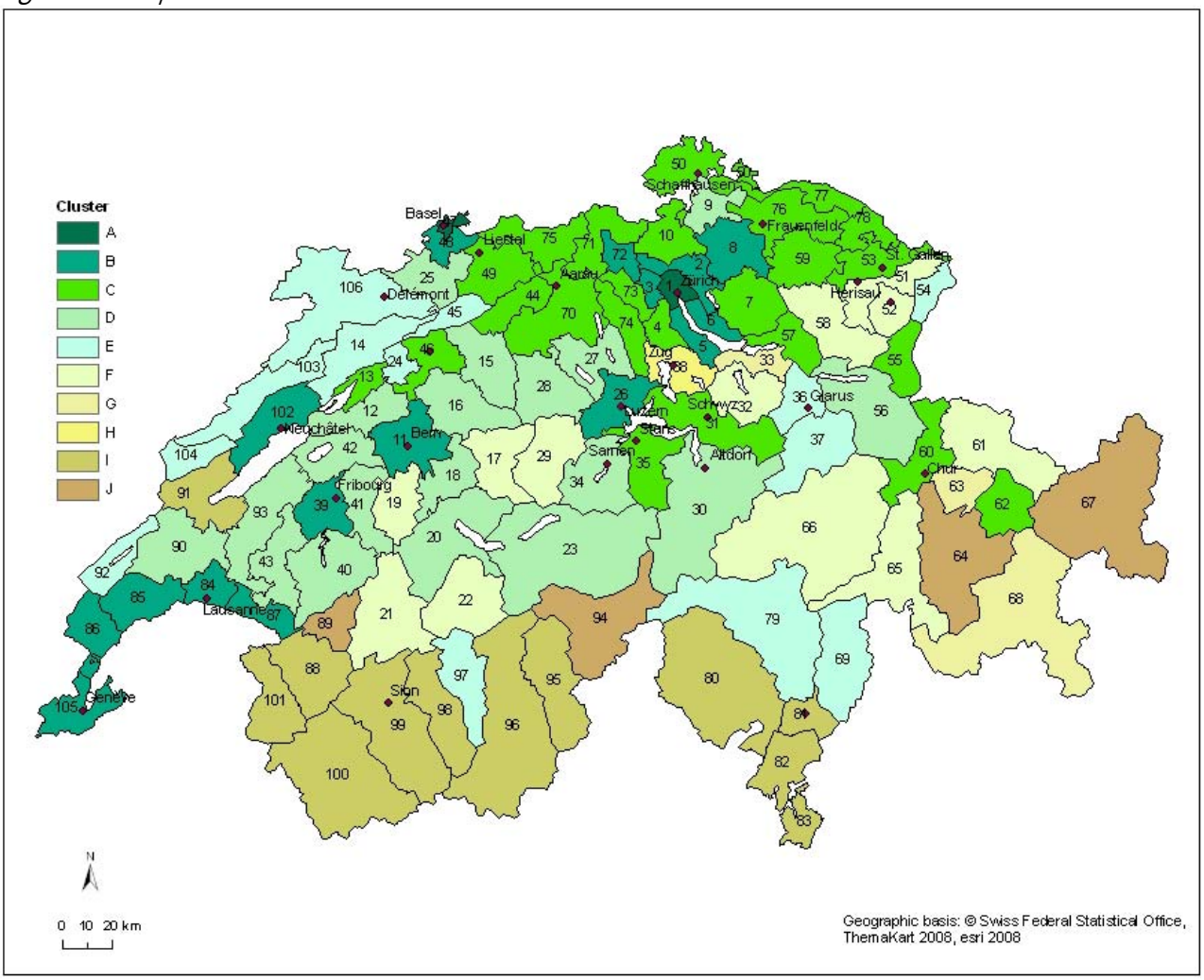
Cluster H can be considered as outlier consisting only of the region Zug, which is a small canton. It has a high potential regarding nearly all variables which is in line with an extraordinary high start-up rate of 10.4 per cent per 1000 labour force, which is indicated by our validation variable. Particularly, the values for the shares of small firms with 74 per 1000 inhabitants and of graduated people with 10.6 per cent of the regional population are extraordinary high.

Cluster I comprises twelve regions, all located in the southern valleys of Switzerland like Lugano, Bellinzona and Martigny. The diversity index, the number of young and graduated people and the share of small firms are all above average and all relate to the supply side factors.

In cluster J with regions like the Lower Engadine extreme differences exist regarding the levels of the entrepreneurial potentials. On the one hand, there are very high numbers of self employed persons (11.5 per cent of inhabitants) and shares of small firms (58 firms per 1000 inhabitants). On the other hand, there is a lack of regional labour force, young people and of young and graduated people.

The spatial distribution of the clusters is shown in figure 4.1.

Figure 4.1: Spatial distribution of Clusters



Considering the spatial dimension of the clusters it can be seen that the clusters A and B mainly consist of regions which are classified as agglomerations or urban regions in Switzerland.[6] Cluster C also comprises urban regions but includes semi-peripheral regions as well. Another urban cluster is the cluster H, which only contains the region Zug. All the other clusters (D, E, F, G, I, J) mostly consist of semi-peripheral and peripheral regions. With regard to this, one important result is that some semi-peripheral regions are within the same cluster like urban regions and therefore show a similar potential.

[6] The classification in agglomeration, urban and peripheral regions is based on the definition of the Swiss New Regional Policy.

5. Conclusions

The results of the cluster analysis, based on established factors in the literature, point out that those regions outlined are clearly unique and distinct with regard to their potential for venture creation. With these results it is possible to discuss different strategies for fostering entrepreneurial activity for the respective regions.

Cluster analysis has shown that in general agglomeration and urban regions such as cluster A and B have high entrepreneurial potentials compared to all other Swiss regions. These findings are internally consistent as they have high values regarding the supply side, the demand side and the agglomeration economies as well as high start-up rates. In spite of that, there seems to be a weakness shown by the low value in the number of self-employed people, which provide role models for venture creation. Furthermore, the value of the share of small firms is low in cluster B, indicating a lack of role models as well. However, this has to be interpreted in relationship to the already high start-up rate, meaning that role models already exist to some extent.

As it is illustrated in the description of the results, cluster H can be considered as an outlier consisting only of the region Zug, which is a small canton. It has a high potential regarding nearly all variables. Additionally, this region focuses on a low taxation rate[7] to attract venture creation and new businesses. Furthermore it is close to Zurich. All three points explain the extraordinary high start-up rate indicated by our validation variable. Overall, there seems to be no need for action for cluster A, B and H. This is in line with the Swiss NRP which does not target agglomeration and urban regions.

More important are the results with regard to semi-peripheral and peripheral regions which lie within the targeting area of regional policy. Some of these regions have a relatively high potential for venture creation but with some weaknesses (cluster C and G). Given that resources are limited within the NRP it can be discussed whether it would be a good strategy to focus on these regions. Fostering these regions might support the formation of regional focal points in the long run, which can act as nucleus for the surrounding area. However, this would also mean that already weak regions are neglected.

Cluster C is the most interesting cluster with regard to regional policy in Switzerland. It includes semi-peripheral regions with relatively high potentials; the profile shows explicit strengths and weaknesses (see section 'results'). With regard to this, two overall strategies are available. One

[7] A low taxation rate is considered in the entrepreneurial literature as positive environmental factor for venture creation, too. Unfortunately there is no data available at the regional level so that we were not able to include this data in our study.

would be to focus on already existing strengths. The other would be to compensate for existing weaknesses. Since strengths outweigh existing weaknesses it might be a valid strategy to concentrate on existing weaknesses. On the one hand there are only few existing weaknesses and furthermore such weaknesses lie in particular in the lack of role models for entrepreneurship, which can be straightforwardly/easily compensated through education. By using this strategy these regions could strengthen their ability to transfer their already existing entrepreneurship potentials into economic value by sustaining entrepreneurship education. Especially for these types of regions, universities of applied sciences can compensate for existing weaknesses. They play a major role for three reasons: First, they could provide role models through entrepreneurship education; second they strengthen the regional knowledge and human capital base of the population; third, they support existing regional small and medium sized firms and entrepreneurs with regard to their individual needs for innovation and research activities. However, if there is no higher education institution located, another option could be to implement entrepreneurial support and educational activities in the curricula of secondary school and at the vocational training level.

Considering all regions within the target area of the NRP the results can be used to identify the strengths and weaknesses of single regions and to extent the analysis with the help of case studies, if necessary. Based on this, policy makers should be able to formulate well founded strategies.

In cluster D, E, F, I, J the situation is completely different. In particular these peripheral and semi-peripheral regions only have a few strengths compared to the predominant existing weaknesses. Applying the same reasoning it might be more appropriate for these regions to focus on their existing strengths; because compensating for weaknesses would involve significantly more effort (would advocate the law of diminishing returns). With regard to these regions it seems to be the case that many have an existing small firm base and a relatively high number of entrepreneurs. Altogether this indicates that there might be some industry concentration consisting of small firms, e.g. in the agricultural sector, the craft sector, and in the tourism sector together with a plenty of entrepreneurial role models. In the framework of localization economies this indicates an especially high potential for venture creation in a specific industry. Therefore, strategies could be implemented to support the existing industrial sectors and to form industrial clusters. Moreover, the tourism industry might be a good focal point in some of these regions. The results, however, need to be deepened by further case studies.

In conclusion, the results provide means for benchmarking regions, i.e. regions can find out about their specific characteristics in comparison to other regions and clusters. Furthermore, the results can assist NRP decision makers to evaluate projects and to establish whether or not they are in line with regional policy strategy. Additionally, the results could serve as basis for case studies validating

and extending the knowledge of specific regions; specifically in the case of whole clusters containing many diverse regions. A further caveat of the study is the non-availability of data on a highly disaggregated regional level. From earlier studies it is known that both, individual and regional variables affect the decision to become self-employed. A better match of data bases on both levels should therefore be regarded as a major challenge for future research in this field.

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Appendix

Appendix 1. Agglomerations schedule (Ward technique, last 35 steps)

Number of cluster	Cluster combined		Sum of squares	Distance	Increase in distance	ETA^2 (%)
35	4	35	82.744	6.060	0.115	91.24%
34	20	28	85.804	6.120	0.060	90.92%
33	14	37	89.016	6.424	0.304	90.58%
32	40	96	92.380	6.728	0.304	90.22%
31	80	82	96.069	7.379	0.651	89.83%
30	67	89	99.777	7.415	0.036	89.44%
29	21	22	103.521	7.489	0.074	89.05%
28	23	69	107.390	7.736	0.247	88.64%
27	39	86	111.522	8.264	0.528	88.20%
26	24	27	115.823	8.602	0.338	87.74%
25	5	8	120.204	8.763	0.161	87.28%
24	9	20	125.399	10.389	1.625	86.73%
23	14	79	131.551	12.304	1.916	86.08%
22	4	62	137.716	12.329	0.025	85.43%
21	40	81	144.103	12.775	0.445	84.75%
20	2	5	152.216	16.227	3.452	83.89%
19	4	13	160.694	16.955	0.728	83.00%
18	21	23	169.647	17.907	0.952	82.05%
17	6	39	180.103	20.911	3.004	80.94%
16	33	63	191.945	23.683	2.772	79.69%
15	40	80	204.305	24.721	1.038	78.38%
14	2	6	216.796	24.981	0.261	77.06%
13	4	24	231.260	28.928	3.947	75.53%
12	17	21	246.863	31.207	2.279	73.88%
11	2	84	263.763	33.801	2.594	72.09%
10	1	47	281.334	35.141	1.340	70.23%
9	17	67	301.510	40.351	5.210	68.09%
8	33	38	327.522	52.024	11.673	65.34%
7	4	9	353.973	52.902	0.878	62.54%
6	14	17	388.363	68.781	15.878	58.90%
5	4	40	423.265	69.802	1.021	55.21%
4	1	2	495.382	144.235	74.433	47.58%
3	1	33	585.340	179.915	35.680	38.06%
2	4	14	691.327	211.974	32.058	26.84%
1	1	4	945.000	507.347	295.373	0.00%