Entrepreneurial attitude and economic growth; A cross-section of 54 regions

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Abstract

Literature stresses factors like entrepreneurial ability, regional innovative potential, and entrepreneurial human capital in explaining the economic success of regions. Using a unique dataset on norms and values in 54 European regions, we distinguish values that characterise self-employed, which enables us to construct a regional aggregate that reflects the average score on *entrepreneurial attitude*. We show that regions differ in entrepreneurial attitude, and that a high score on entrepreneurial characteristics is correlated with a high rate of regional economic growth. In this way we empirically establish the link between culture and economy at the regional level.

Keywords: entrepreneurial attitude, regional economic growth, Europe, EVS

1. Introduction

Entrepreneurship is 'at the heart of national advantage' (Porter, 1990, p. 125). Especially in the field of economic geography and regional economics there has been a recent upswing in the interest in the influence of regional culture on regional economic development. The literature on regional clusters increasingly stresses the role of entrepreneurship and an entrepreneurial culture in explaining the economic success of regions.

In an analysis of U.S. biotechnology clusters Audretsch (2001) argues that the existence of an entrepreneurial culture is an important factor in fostering the start-up and growth processes of biotech firms. But also in related literature stemming from theoretical concepts like 'industrial districts' (Marshall, 1920; Markusen, 1996; Ottati, 1994; Rabellotti, 1998; Storper, 1992), 'regional innovation systems' (Cooke *et al.*, 1997; Malecki, 1997) and 'the learning region' (Florida, 1995; Morgan, 1997) terms like 'regional innovative capacity' (Lawson and Lorenz, 1999), 'enterprise culture' (Amin and Tomaney, 1991), 'entrepreneurial ability' (Kangasharju, 2000), 'entrepreneurial human capital' (Georgellis and Wall, 2000) and 'regional cultures of innovation' (Thomas, 2000) are frequently used. It is argued that local social conditions play an important role in the genesis and assimilation of innovation and its transformation into economic growth. More specific, entrepreneurial skills are seen as the soft factors that contribute to a regional culture that facilitates the success of regional clusters and regional economies in general [1]. Still, empirical research on the link between entrepreneurship as a driving force of economic development is not well developed (Wennekers and Thurik, 1999).

The measurement of this entrepreneurial ability is difficult and especially on the regional level it is hard to obtain data. The scarce empirical studies that explicitly take regional culture into account only measure it in an indirect way, either by allowing for region-specific effects (e.g. Georgellis and Wall, 2000) or using a proxy for regional culture (e.g. Kangasharju, 2000).

This paper is an attempt to empirically test if certain societal characteristics are related to regional economic growth. In specific, we test if regions that can be characterised as 'entrepreneurial', grow faster than regions that score lower on entrepreneurial characteristics. Despite the growing literature in the field of economic geography and regional economics in which the role of an entrepreneurial culture is stressed, to our knowledge nobody has explicated the values that make up this entrepreneurial attitude at the regional level. It is in most cases a black box, which is commonly referred to, but never demystified.

The added value of the paper is twofold. Firstly, we show that entrepreneurs differ from the rest of the population in several ways. Our analysis shows that entrepreneurs are more individually oriented. Individual responsibility and effort are distinguishing characteristics.

Secondly, based on these entrepreneurial characteristics, we construct a regional aggregate of 'entrepreneurial capital'. We study 54 regions in Europe and show that regions that score higher on these entrepreneurial characteristics grow faster. By unravelling the soft factors influencing economic growth we open the black box of regional entrepreneurial culture. Doing so, we shed empirical light on the relationship between entrepreneurship and growth.

In this paper we start with a discussion why regional culture matters. Then, we study self-employed and compare their personality characteristics with the general working population. Based on a sample of 8,332 individuals we find 5 distinguishing characteristics of entrepreneurs. Building on these characteristics, the next step consists of constructing a score on entrepreneurial capital for 54 regions in Europe. By using principal components analysis, we construct a measure of entrepreneurial capital for each region. Based on standard growth analyses we test if regions that have more entrepreneurial capital grow faster. We conclude with suggestions for further research and discuss the policy implications of our findings.

2. Why would entrepreneurial culture matter?

Wennekers and Thurik (1999) investigate the relationship between entrepreneurship and economic growth extensively. Building on various perspectives like macro-economic growth theory, historical views on entrepreneurship, industrial economics (mainly Porter's view), and evolutionary economics they try to synthesize these insights to provide a broad picture of how economic growth is linked to entrepreneurship. In their view, entrepreneurship is a behavioural characteristic of persons. Therefore, 'linking entrepreneurship to economic growth means linking the individual level to the aggregate levels' (Wennekers and Thurik, 1999, p. 46). When describing the function of entrepreneurship in relation to economic growth, Wennekers and Thurik (1999) single out two major roles. The first has to do with the start-up rate of new firms. The second has to do with, what they call 'newness' in general. In the first role, the entrepreneur is seen as the founder of a new business. In the second case we think of enterprising individuals (intrapreneurs or corporate entrepreneurs) in large existing firms, who undertake entrepreneurial action.

Nations and regions that are characterised by a culture that is prone to entrepreneurship may have higher start-up rates. This may, in turn influence economic growth in a way that is in the eyes of many researchers what entrepreneurship is all about. In an analysis of the effects of regional characteristics on gross firm formation in Finland, Kangasharju (2000) argues there are a number of local characteristics. Besides local market growth, agglomeration and urbanisation effects, government policies, he argues that entrepreneurial ability is an important factor in explaining the profitability of firm formation.

According to Kangasharju (2000) this entrepreneurial ability in a region depends on the both the stochastic distribution of entrepreneurial talent among the inhabitants of a region and on region specific factors that enhance this ability. Georgellis and Wall (2000) study levels of entrepreneurship in terms of rates of self-employed across regions in Britain for the period 1983-1995. Besides labour market conditions, labour force characteristics and industry composition they find that the 'entrepreneurial human capital' of a region is an important explanatory factor.

However, entrepreneurship not only occurs through the formation of new small firms but also in the form of corporate entrepreneurship. Stopford and Baden-Fuller (1994) identify three types of corporate entrepreneurship. The first type is what they call corporate venturing. This implies the creation of new business units of businesses within the existing organisation. The second type relates to the transformation of strategic renewal of existing organisations. The third type is where the firm changes the 'rules of competition' for its industry. We can for example think of an innovation that fundamentally changes the industry. Intrapreneurship plays an important role in the process of strategic renewal of existing firms. It can be associated with alertness, finding new product-market combinations and innovation (Wennekers and Thurik, 1999). In the long run, it is expected to positively affect firms' competitiveness. According to Penrose (1959), entrepreneurs are important for the growth of firms since they provide the vision and imagination necessary to carry out opportunistic expansion. In sum, this *intra*-preneurial activity may yield efficiency advantages within firms, which on the aggregate level results in higher growth rates.

But besides intrapreneurial activity that Wennekers and Thurik (1999) discuss when discussing 'newness' in general, other authors have focused on technological development when explaining the role of social conditions. In a historical overview of growth differentials between countries Abramowitz (1986) has emphasised the role of social capability. Although he does not provide us with a clear definition, he argues that 'tenacious societal characteristics normally account for a portion, perhaps a substantial portion, of a country's past failure to achieve as high a level of productivity as economically more advanced countries. The same deficiencies, perhaps in attenuated form, normally remain to keep a backward country from making the full technological leap, envisaged by the simple hypothesis [of catching up]' (1986, p. 387). Abramowitz argues that a country's potential for rapid economic growth partly depends on societal characteristics, which he refers to as 'social capability'. A crucial element of Abramovitz's concept of social capability is adaptability. Some countries may be more fitted to adapt to the requirements of changing circumstances. He assumes that there is a link between technological advancement and social capability and that that link is established through the capacity to adapt to change, i.e. adaptability. Together, social capability and technological gap define a country's potential for productivity advance by way of catching-

up. Or, as he puts it very clearly himself (1986, p. 390): Countries that are technologically backward have a potential for generating growth more rapid than that of more advanced countries, provided their social capabilities are sufficiently developed to permit successful exploitation of technologies already employed by the technological leaders. In an analysis of European regions Pose (1999) uses a similar argument to explain the regional variance in innovativeness. He introduces so-called "innovation-prone" and "innovation-averse" societies. Innovation-prone regions are those featured by a weak social filter, which facilitates the transformation of innovation into growth. Though it can be questioned whether the term *weak* or *strong* social filter captures the issue correctly, it is clear what Pose (1999) means. The social structure may hamper or promote the regional economic growth process through its impact on technological development. Pose focuses on innovative capacity and social filters. Besides other factors like the amount of local resources devoted to R&D, the nature of the type of R&D, the local economic structure and the nature of local production factors, the capacity of a region to assimilate and transform its own or foreign R&D into economic activity depends on social factors. The social settings in which economic activity takes place play a crucial role in determining the passage from R&D to innovation and growth. Local social conditions act as a social filter.

In sum, entrepreneurial culture influences (regional) economic growth in several ways. First, value patterns prone to entrepreneurship may increase the start-up rate of new firms. Second, intrapreneurial activities may yield efficiency advantages within firms. Finally, social structures may influence the absorptive capacity and promote the degree to which countries or regions are able to adopt and adapt to new technologies. Social conditions may serve as a social filter, making societies innovation-prone or innovation-averse. Hence, 'wherever entrepreneurial employees reap the benefits of their abilities, within the firm or in a spin-off, their activities are likely to enhance growth at a macro-level' (Wennekers and Thurik, 1999, p. 45). In the next section we distinguish personality characteristics of entrepreneurs. Building on these characteristics, we construct a regional aggregate and test if entrepreneurial attitude is related to economic growth.

3. Entrepreneurial characteristics

Reviewing the literature on entrepreneurial trait research, Brockhaus (1982) identified three attributes consistently associated with entrepreneurial behaviour: need for achievement, internal locus of control, and a risk-taking propensity[2]. More recent research on entrepreneurial trait research comes to similar personality characteristics (Thomas and Mueller, 2000). The first attribute, 'need for achievement', can be traced back to McCelland's study (1961), whereas the second attribute, 'locus of control', dates back to Rotter (1966).

The concept of locus of control refers to the perceived control over events. Internal locus of control implies the individual's believe that he or she has influence over outcomes through ability, effort or skills. On the other side of the spectrum, external locus of control means the individual believes that forces outside the control of him or herself determine the outcome. It is clear that individuals with an internal locus of control are more likely to be entrepreneurs. The third attribute, risk-taking propensity, is also referred to as 'innovativeness' (Mueller and Thomas, 2000). As extensively described by Mueller and Thomas (2000), there appears to be strong evidence that entrepreneurs are more innovative than non-entrepreneurs. In sum, achievement motivation, locus of control and preference for innovation are seen as the classic themes in the entrepreneurial trait research (Stewart et. al. 1998).

3.1 Data and method

In order to operationalise the three theoretical constructs that were discussed in the previous section, we now turn to the data we have used. The data-set we use to find distinguishing characteristics of entrepreneurs is the European Values Survey (EVS). This is a unique dataset of norms and values in 13 countries, referring to data collected in 1990. We discuss the operationalisation of the dependent and independent variables, as well as the control variables we included in our analysis.

Dependent variables

Entrepreneurship is an ill-defined concept (OECD, 1998). Measurement of entrepreneurship is therefore difficult. Nevertheless, there are at least two basic ways in which entrepreneurship can be measured. Firstly, it can be operationalised as 'self-employment' or 'business ownership'. By measuring it this way, it serves as a *static* indicator. However, self-employment is a broader concept than the strict definition of entrepreneurs. Especially in the agricultural sector a large fraction of the total working population is self-employed, but it can be questioned if these are entrepreneurs in the true Schumpeterian sense. The same holds for small retail shops or the category of firms that are known as 'mom-and-dad'-shops. It is important to control for these factors in empirical research. Secondly, to capture the *dynamic* aspect of entrepreneurship, it is often measured as nascent and start-up activity, also referred to as turbulance rate (total of entry and exit). As most of the studies are of a cross-sectional nature, entrepreneurship is often measured as the level of self-employment.

In the EVS self-employment was measured by first asking whether the respondent was employed, and if the answer was positive, if he or she was self-employed. Thus our dependent variable is self-employment as indicated by the respondent him- or herself. We

estimate two different regression equations. In the first analysis we compare self-employed with the rest of the population, including unemployed, retired people, students, and housewives. The number of observations equals 14,846 of which 888 are self-employed (6 percent). In our second analysis the reference category in the self-employment equation is the wage- and salary earners. Here the number of observations is 8332 of which again 888 are self-employed (10.6 percent).

Independent variables

In order to test for personality characteristics of entrepreneurs, we selected a number of questions from the EVS, based on existing literature on entrepreneurial trait research. These questions pertained to ascribed reasons for personal success or failure, values instilled in children, attitudes towards future developments, preference for equality versus freedom, preference for state versus private ownership of business, state versus individual responsibility for welfare, attitude toward rights of unemployed to refuse job offers, and attitude towards competition.

In the EVS respondents are asked to rate the importance of a number of explanations of why people are living in need, which is related to the earlier discussed concept of locus of control. Four possible answers are given, of which the respondents are asked to rate the importance: “because they are unlucky”; “because of laziness and lack of willpower”; “because of injustice in our society”; and “because it’s an inevitable part of modern progress”. We re-coded the four answer categories as dummies, with 1 if this reason was indicated to be important, and 0 if not. We think the second reason, referring to the individual responsibility, may be assumed to correlate positively with entrepreneurship, and the other reasons, referring to external factors, negatively.

Respondents were also asked to indicate which values they considered important qualities to teach children. Related to the characteristic of innovative, frame-breaking behaviour we selected qualities like “independence”, “imagination” and “obedience”. Other qualities selected were “thrift”, “hard work”, and “determination, perseverance”, of which the latter two can be seen as indicators of achievement motivation. Thrift can be seen as an indicator of internal locus of control, assuming that savings can be used for later investments to better one’s condition. All these questions were also re-coded as dummies. We expect all values, except “obedience”, to correlate positively with entrepreneurship.

Another question in the EVS asked respondents whether they evaluated positively or negatively various future changes in the way of life. We selected two possible changes as potentially positively related to entrepreneurship. As an indicator for innovativeness we

selected “more emphasis on the development of technology”. Locus of control was proxied by the evaluation “greater emphasis on the development of the individual”.

We also selected a question in which the importance of freedom and equality was rated. A preference for freedom can be seen as an indication of an innovative attitude. Choosing freedom above equality suggests an interest in frame-breaking behaviour. We constructed a dummy variable, coded as 1 if freedom was considered more important than equality, and as 0 otherwise.

Then we chose a number of questions pertaining to the attitude of the respondent towards a number of social issues. In these questions respondents were asked to place their views on ten-point Likert-type scales with as anchors, respectively:

*	*Incomes should be made more equal*	Versus	*There should be greater incentives for individual effort*
*	*Private ownership of business and industry should be increased*	Versus	*Government ownership of business and industry should be increased*
*	*Individuals should take more responsibility for providing for themselves*	Versus	*The state should take more responsibility to ensure that everyone is provided for*
*	*People who are unemployed should have to take any job available or lose their unemployment benefits*	Versus	*People who are unemployed should have the right to refuse a job they do not want*
*	*Competition is good. It stimulates people to work hard and develop new ideas*	Versus	*Competition is harmful. It brings out the worst in people*
*	*In the long run, hard work usually brings a better life*	Versus	*Hard work doesn’t generally bring success – it’s more a matter of luck and connections*

In the scales, low values are associated with the statement on the left hand, and high values with that on the right hand. All statements refer to risk-taking, except for the first statement that refers to achievement motivation and the last that reflects locus of control. We expect a

negative correlation with entrepreneurship of all these variables, except for the first, where we expect a positive relationship.

Control variables

We included the GDP per capita (in 1990) to control for level of welfare (taken from Penn World Tables). Countries with a higher level of GDP and a corresponding lower share of the agricultural sector (Chenery, 1960) have lower levels of self-employed, as the number of self-employed in the agricultural sector is relatively high and the number of small-scale retail and craft establishments ('mom-and-dad' shops) decreases with the rise of the GDP.

Furthermore we included a number of controls in the self-employment equation. Both self-employment and personality characteristics are most probably related to factors such as age, wealth, sex, labour market experience and human capital. The dataset allows us to control for sex, age, income and socio-economic status.

With respect to sex, we take females as the reference group. Female self-employment rates are generally lower than those of men (OECD, 1998). These lower self-employment rates of women are caused by different factors (see Verheul et al, 2001). An important factor limiting female entrepreneurship is the combination of household and family responsibilities. Though there are arguments favouring female self-employment, for example flexible time schemes (Cowling and Taylor, 2001), we expect a positive relationship between male and self-employed.

Income is only measured in an indirect way. For reasons of privacy, income is not measured in a direct way by asking the gross or net monthly income in EVS. Instead, income is measured on a 10-point scale, which leaves room for perception and thus results in a rather subjective measure of income. Nevertheless, we decided to include it as a control variable.

Age is measured in number of years. For age we expect a curvilinear relationship, as young and old people are not expected to be self-employed. Other studies have also suggested this curvilinear effect (Evans and Leighton, 1989, Storey, 1994; Cowling and Taylor, 2001). Entrepreneurs tend to start a business when they are between 30 and 40 years old (Colombo and Delmastro, 2001). On the one hand, risk aversion and the costs of leaving an employment position are positively related to age, which decreases the age to be self-employed. On the other hand, young people may lack professional experience and relations and experience liquidity constraints, which have an upward effect on the age to start a business. As our data do not allow us to test when people have started their own business, we are not able to estimate the average age of a starting entrepreneur. Nevertheless, we still expect this curvilinear effect, as older people might have sold their business.

We also control for level of education or human capital. Lack of data does not allow us to use a direct measure of educational background. However, EVS contains information on socio-economic status. Interviewees are categorised in four groups. If the individual interviewed belongs to upper or upper-middle class it is coded 1. People belonging to middle class (non-manual workers) form the second group and the third class consists of manual workers (skilled or semi-skilled). The last group, coded 4, consists of unskilled manual workers.

Finally, we included country dummies to control for country-specific effects other than GDP. All kind of country specific effects may lead to national differences in the probability to become self-employed. Colombo and Delmastro (2001) find that the educational system in Italy lowers the percentage of self-employed. The institutional setting may influence the decision to become self-employed. Also the national bankruptcy and antitrust law are important factors in this respect (Golodner, 2001).

3.2 Method

To empirically test for personal characteristics associated with entrepreneurship we used a logit equation. We estimate two models. In the first model we estimate the probability of self-employed versus the general population. The second model uses wage and salary-earners as a self-reference group. When a variable is statistically significant, it implies that entrepreneurs are different from the non-entrepreneurs. In case a value is significantly positive (negative), it means that entrepreneurs score higher (lower) on this variable.

<Insert table 1 about here>

3.3 Findings

Results are well interpretable. The self-employed distinguish themselves both from the general population as well as from wage- and salary earners- in their stronger preference for greater incentives for *individual effort* and that the *state* should not take more *responsibility*. Moreover, they feel that *private ownership* should be increased, that unemployed should not have the *right to refuse a job* and s*uccess* is not a matter of luck and connections but of hard work. All these findings fit in a picture of self-employed attaching more value to individual freedom and responsibility, and by nurturing values consistent with the frame-breaking creative destruction associated with Schumpeterian entrepreneurs. We also find that self-employed differ from the general population with respect to values that the self-employed think are important in raising children. Self-employed attach significantly more importance to

hard work than the rest of the population. The non-significant finding in model 2 suggests that this characteristic is not a distinguishing factor between wage and salary earners and self-employed. In other words, our results suggest that *hard work* as a quality to teach children does not have to do with being self-employed, but with having a job, either as wage and salary earner, or as an entrepreneur.

As expected, the coefficient for GDP per capita is significantly negative. The predicted curvy-linear relationship between age and self-employment holds for the comparison of self-employed and the general population (model 1), but does not yield significant differences between self-employed and wage and salary earners. The reasons for the inverted-U shape in model 1is that individuals become self-employed when they are middle aged (end of their twenties or thirties) and probably sell their firm or retire when they reach a certain age. If we compare self-employed with wage and salary earners we use a reference group that also retires at a certain age. In other words, the wage and salary earners are a sub-group of the general population, which at a certain age share the same characteristic, namely being retired, as the self-employed. This is exactly the reason why we do not find a similar pattern regarding age in model 2 as in model 1.

As predicted, both models show a positive relation between being male and self-employed. The income effect is in both models significant (though only at 10%), with one crucial difference. In model 1 it is positively related to self-employment, whereas in model 2 it is negatively related. If we compare self-employed with the general population including retired people, students, and housewives, as we do in model 1, it can be expected that there is positive relationship between income and self-employed. The negative effect in model 2 is more surprising in this respect. It suggests that given our subjective measure of income, self-employed perceive their income as being lower than wage-and salary earners.

Socio-economic status is a significantly distinguishing factor between self-employed and the general population. Self-employed have a higher socio-economic status. Recall that socio-economic status indirectly reflects the educational profile of an individual (skilled-unskilled). The positive relationship between socio-economic status and being self-employed is logical if we compare this group with the general population. If we compare self-employed with wage and salary earners socio-economic status is not significant. The reason for this is that the variation in socio-economic status among the general population (including for example unemployed) is higher than among wage – and salary earners. In the first model the standard deviation of socio-economic status equals 1.32, whereas this standard deviation is 1.20 in the second model, which confirms our above reasoning.

The next step in our analysis consists of constructing a regional aggregate that captures the characteristics we distinguished. In order to construct one measure for entrepreneurial capital that is internally consistent and stable, we applied principle

components (PC) analysis on the items included in this measure. The items we used in our PC analysis are the five items that were significant in model 1 and model 2, i.e. both the general population as well as the wage and salary-earners. We estimated the PC by making use of the interval-scaled items 'individual effort', 'government ownership', 'state responsibility', 'unemployed' and 'success' (0-10). Using Varimax rotation we obtain the following component matrix.

<Insert table 2 about here>

The output shows that the 5 items can be divided in 1 component (groups of items). As table 2 shows, this component consists of the 5 items 'government ownership', 'state responsibility', 'unemployed' and 'success'.

In the following sections we have chosen to calculate regional scores on entrepreneurial capital on the basis of this five-item-based factor score. Our regional aggregate reflects the entrepreneurial behaviour at the regional level. We think of entrepreneurial behaviour as 'taking initiative, being innovative, shaping the environment according to one's ideas and goals, etc' (Brandstätter, 1997, pp. 160). We choose to name this regional aggregate as 'entrepreneurial capital'[3].

4. Empirical test

In order to test if entrepreneurial capital is related to economic growth, we have taken a standard growth framework. We analyse the period 1950-1998. The number of regions equals 54. The set contains 7 European countries: France, Belgium, Italy, Germany, Spain, The Netherlands and the Uinited Kingdom. The regional level is the NUTS1 level, which means that France is divided in 8 regions, Belgium 3, Italy 11 (including Sicily and Sardinia), Germany 11 (former eastern regions excluded), Spain 7, The Netherlands 4 and the UK 10.

Similar to Barro and Sala-I-Martin (1995), we have computed the regional growth figures by relating the regional GDP per capita information to the country mean[4]. There are two reasons to use the country mean as a correction factor. First of all we do not have regional price data. Secondly, the figures on regional GDP are provided in an index form that is not comparable across countries. Hence, we have used Gross Regional Product (GRP) figures that are expressed as deviations from the means from the respective countries. The 1950 data are based on Molle, Van Holst and Smits (1980), whereas the data for Spain refer to 1955 and are based on Barro and Sala-I-Martin's (1995) calculations. The 1998 data on GRP are based on Eurostat information.

The basis for our regression analyses is the standard 'Barro' type of a growth regression, including the investment in physical capital, human capital and the initial level of economic development.

Investment ratio is measured at country level. Data are taken from the Penn World Tables 5.6. We have calculated the average of the investment ratio for the period 1950-1992[5]. Apart from availability of data, another reason to take the *country* level investment data and not the regional scores, is the underlying assumption of a closed economy. Because of spatial interaction, regional investment figures would only provide a limited understanding of regional economic growth (Nijkamp and Poot 1998). Therefore we have taken the country level data.

School enrolment ratio measures the total number of pupils at the first and second level in 1977, divided by total number of people in the corresponding age group. The growth period we analyze is 1950-1998. The school enrolment rate in 1977 falls in between these dates and given the fact that school enrolment rates have increased since 1950, the 1977 information is a reasonable proxy for the average. Data come from Eurostat. Data on school enrolment rates in Spanish regions refer to 1985. We have taken uncorrected regional figures because it has been shown that migration plays only a minor role in European regions and the relation with per capita GDP is weak (Barro and Sala-I-Martin 1995; Begg 1995).

In order to control for concentration of human capital in agglomerations, we included a variable that consists of a dummy variable for the region in which an agglomeration is located multiplied by the score on the school enrolment rate[6]. Furthermore we tested if spatial correlation influences our results. Ideally one should use interregional input-output tables to calculate regional multipliers and construct a variable that controls for spatial correlation[7]. However, this information was not available. In order to control for spatial correlation, we applied Quah's (1996) approach and calculated the so-called neighbour relative income. This method implies that we use average per capita income of the surrounding, physically contiguous regions to control for spatial auto-correlation. In our sample however, the 1950 data are related to national average and therefore reflect regional welfare relative to country mean. By using these data we implicitly assume that scores for neighbouring regions in foreign countries influence regional growth if the welfare in this neighbouring region is relatively high compared to national average. Of the 54 regions in the sample, 19 have neighbouring regions in countries other than the region's own host itself. 4 had no neighbouring regions at all.

Hence, our basic regression analysis includes initial level of welfare (GRP1950), school enrolment rate (SCHOOL), investment ratio (INVEST), spatial auto-correlation (SPILLOVER) and a variable that captures the concentration of human capital (AGGLEDU). We considered log-specifications for the first three variables. Table 3a provides an overview

of the descriptive statistics. Table 3b plots the correlation coefficients between the variables used.

<Insert table 3a and 3b about here>

The first model we estimated is the standard model, only including basic economic variables. As the results show, all variables except for the school enrolment rate are significant at the 5% level. Schooling is significant at the 10% level. Initial level of welfare is strongly negatively related to economic growth, which corresponds with the convergence hypothesis.

< Include table 4 about here >

In the next step we included our construct of entrepreneurial capital. The result is shown in table 4. Initial level of welfare remains strongly negatively related to economic growth. Schooling becomes significant at 5% level. The investment ratio is insignificant and the spillover variable is only significant at 10% level. Our variable that measures entrepreneurial capital is significant at 1%. As the variable entrepreneurial capital is constructed by PC analysis and is scaled in the opposite way (in fact it measures 'lack of entrepreneurial capital'), the minus sign in the regression output means a positive effect of entrepreneurial capital on regional economic growth. A value system that reflects an entrepreneurial attitude is positively related to economic success, measured as regional economic growth. The question is if our finding on entrepreneurial capital is robust.

5. Robustness

We applied several robustness tests. First we tested for heteroskedasticity and multi-collinearity. As shown in table 4, the tests for heteroskedasticity show that this is not a problem. The Variance Inflation Factor (VIF) should not exceed values of 10 (Neter et al., 1996), and given the maximum value of 1.49 this indicates multi-collinearity is not a problem. In the next step we have tested for country-specific effects.

We have tested for country-specific effects in two ways. First we included country dummies. Second we have used cluster-based corrected standard errors where the clusters are defined on the basis of countries. When controlling for country specific effects, investment ratio is no longer significant. This is according to expectation, as the investment ratio is measured at the national level. In case country specific effects are included, the country effects pick up the variance in the investment ratio. More important is that entrepreneurial capital remains significant at the 5% level.

In the next step we have applied Extreme Bounds Analysis (EBA) as developed by by Leamer (1985). It labels a relationship between an independent variable and an explanatory variable X_i as robust if the relationship is of the same sign and statistically significant for any possible model specification. However, subsequent analysis relaxed this requirement. Sala-i-Martin (1997) introduced the criterion that the relationship should be significant in at least 95% of the cases, which has become known as the weak EBA test. For each variable, we calculate the fraction of significant results. The strong EBA test is fulfilled when a value of 1 is achieved. This means that a variable has the same sign and is statistically significant in all possible model specifications. If we choose to regress on all possible combinations of the explanatory variables, we estimate 32 regression models in which entrepreneurial capital is included.

<Insert table 5 about here>

The results indicate that entrepreneurial capital is significant and positive for all possible regression specifications. Hence, entrepreneurial capital fulfils the strong EBA test and can be considered robust. Besides statistical significance it is also interesting to look at effect sizes. As table 5 shows the average value of the estimated coefficient of entrepreneurial capital is -.519. More important is the fact that the confidence interval for this variable lies between -.54 and -.498, which indicates that the effect of entrepreneurial capital in terms of effects size can be considered relatively stable. We conclude that our robustness tests all indicate the persistent significance of entrepreneurial capital on economic growth in the European regions.

6. Implications and Limitations

We have shown that local social conditions contribute to regional economic growth. This finding has consequences for the current trend among policymakers to create technopoles, regional innovation systems or high-tech places. The capacity of each region to build a successful regional innovation infrastructure is related to social conditions. It has been argued that especially the cultural uniqueness of successful examples like Silicon Valley and Third Italy makes copying of these successful regions difficult if not impossible (Hospers and Beugelsdijk, 2002). Our results suggest that the lack of entrepreneurial capital may be an important reason for the failure to create regional innovation systems in certain regions. Policy makers should be aware that entrepreneurial capital differs from place to place and initiatives in the field of regional technology policy may end up unsuccessfully for lack of entrepreneurial capital. Hence, in promoting high-tech regions, governments may not only

develop R&D programs but also initiatives that aim at increasing the entrepreneurial capital. In line with the findings of Kangasharju (2000), the results of our study call for the encouragement of culture and tradition favourable to self-employment. This is a long term project, as it takes time for such a regional culture to be developed and take root in a region.

The main theoretical implication of our analysis is that regional cultural differences can be linked in a meaningful way to regional economic outcomes. Even controlling for national characteristics, regional variations are important enough to have a significant impact on economic growth. As the delimitations of regions was based on an administrative criterion (NUTS), rather than on substantive social or economic criteria, the regional effects we found are likely to be underestimations of the real effects. Our findings raise the question what factors within regions lead to the formation and persistence of cultural characteristics inductive to economic growth.

An important question remains through what mechanisms entrepreneurial capital influences this aggregate economic outcome. On the one hand it can be argued that regions with a higher score on entrepreneurial capital have higher start-up rates, which results in a relatively high share of self-employed. This may influence economic growth in a traditional Schumpeterian way. On the other hand, higher scores on entrepreneurial capital do not necessarily imply a higher start-up rate, but may also yield *intra*-preneurial activity. This *intra*-preneurial activity may yield efficiency advantages within firms, which on the aggregate level results in higher growth rates. Future research might focus on the intermediating mechanisms between entrepreneurial capital and regional economic growth. A logical next step would be to test if high scores on entrepreneurial capital go together with a high level of entrepreneurship (number of self-employed). It is interesting to test if for example rate and level of technological development of firms in regions is related to entrepreneurial capital. Another question is if the success or failure of regional development programs is related to entrepreneurial capital in a certain region. It might be that regions in the process of structural change are better able to cope with the necessary re-structuring of the regional economy, if they have a higher 'amount' of entrepreneurial capital. However, lack of regional data on European regions will probably be a problem.

One of the limitations of our study is the fact that we used data on values from 1990 and estimated regional economic growth for the period 1950-1998. Lack of data concerning regional origin of respondents prevents us from using the 1981 wave of the EVS surveys of values and norms in Europe. However, as cultural characteristics are persistent in time (Hofstede, 2001), the possible lack of internal validity is probably limited. Moreover, we minimized the possible effect of endogeneity by testing the effect of entrepreneurial capital on the regional-economic growth between respectively 1970-1998 and 1984-1998. As described under table 4 the conclusion on entrepreneurial capital does not change.

7. Conclusion

In this paper we have established an empirical link between entrepreneurship and economic growth. Entrepreneurship as a behavioural characteristic has been determined by means of an empirical test in which we compare self-employed with respectively the general population and wage-and salary earners. Based on these distinguishing characteristics we calculated a regional aggregate that reflects the average score of this entrepreneurial attitude of a population in a region. We have estimated post-war economic growth for 54 European regions and we have shown that entrepreneurial attitude matters. We have opened the black box of entrepreneurial culture, which in this literature often is designated to be important, but rarely empirically analysed. Using a unique dataset on norms and values in 54 European regions, we have shown that regions do indeed differ in entrepreneurial attitude, and that a relatively high score on entrepreneurial characteristics is correlated with a relatively high rate of regional economic growth. A logical next step is to identify intermediating mechanisms through which entrepreneurial capital influences regional economic growth. The existing case studies on regional systems of innovations and clusters provide sufficient conceptual ideas.

Notes:

1. For a critical reflection on this literature on regional clusters see Hospers and Beugelsdijk (2002).
2. It goes beyond the scope of this paper to extensively review the existing studies on entrepreneurial trait research. Our only aim is to provide theoretical ground for the choice of our questions by means we measure entrepreneurial capital. Our goal in this paper is not to add insights to the literature on entrepreneurial trait research, but to open the black-box of regional culture. For an extensive overview of the entrepreneurial trait research we refer to Stewart et. al. (1998) and Mueller and Thomas (2000).
3. We choose to define it in terms of capital in line with 'social capital'. In a recent debate (Netherlands innovation lecture, december 3, 2001) in The Hague, Michael Porter used the term 'attitude' to express similar thoughts.
4. Gross Regional Product of a region in 1950 is divided by the mean of the Gross Regional Products of all regions belonging to a certain country. A similar formula is applied to calculate the 1998 relative regional product. Regional growth over the period 1950-1998 is then based on these two indices.
5. Penn World Tables 5.6 provide data up to 1992.
6. Major agglomerations are the Western parts of the Netherlands, Greater Paris, Berlin, London, the Barcelona area, Brussels, and the Italian region Lazio (Rome).
7. There exist other ways to have a more refined control variable that can be taken into consideration, for example the physical length of abutting boundaries or the physical characteristics of the border terrain. However, these kinds of extensions go beyond the scope of the current paper.

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Table 1: Probability of being self-employed

People live in need	Model 1 Self-employed versus general population	Model 2 Self-employed versus wage- and salary earners
Because they are *unlucky*	-0.23 (-1.22)	-0.22 (1.10)
Because of *laziness* and lack of willpower	0.13 (0.73)	0.12 (0.69)
Because of *injustice* in our society	-0.12 (-0.70)	-0.11 (0.59)
Because it's an *inevitable* part of modern progress	-0.15 (-0.82)	-0.16 (0.84)
Important qualities to teach children		
Independence	-0.03 (-0.37)	-0.05 (0.63)
Hard work	0.17 (2.03)**	0.10 (1.18)
Imagination	0.85 (1.01)	0.11 (1.24)
Thrift	-0.006 (-0.07)	0.04 (0.45)
Determination, perseverance	-0.05 (-0.63)	-0.025 (0.30)
Obedience	-0.12 (-1.46)	-0.11 (1.24)
Evaluation of future developments		
More emphasis on the development of *technology*	0.05 (0.63)	0.05 (0.60)
Greater emphasis on the development of the *individual*	-0.073 (-0.69)	-0.16 (1.53)
Freedom is more important than equality	0.12 (1.58)	0.089 (1.16)
Attitude towards social issues		
There should be greater incentives for *individual effort*	0.02 (3.34)***	0.02 (3.05)**
Government ownership of business should be increased	-0.02 (1.88)*	-0.027 (2.22)**
The *state* should take more *responsibility*	-0.03 (2.36)**	-0.029 (2.03)**
Unemployed should have the right to refuse a job	-0.03 (2.50)**	-0.027 (1.91)*
Competition is harmful. It brings out the worst in people	0.007 (1.07)	0.005 (0.75)
Success is a matter of luck and connections	-0.04 (2.85)***	-0.04 (3.02)***
Control variables		
GDP per capita 1990	-0.1 (8.79)***	-0.1 (8.84)***
Age	0.18 (11.28)***	0.027 (1.55)
Age squared	-0.002 (11.25)***	0.00005 (0.25)
Sex	0.71 (9.30)***	0.25 (3.15)***
Income	0.03 (1.74)*	-0.03 (1.79)*
Socio-economic status	-0.096 (2.73)***	-0.028 (0.81)
N	14846	8332
Chi^2	658.02	512.28
Log Likelihood	-3032.95	-2570.89

The dependent variable is 1 if self-employed. The reference group in model 1 is the general population, whereas the reference group in model 2 are the wage- and salary earners. Key-words in variable names in italics. T-statistics are in parentheses. *** = significant at 1% , ** = significant at 5%, * = significant at 10%.. GDP per capita in 1000 USD. Country dummies not reported. Estimation is logit in STATA. For the exact formulation of the questions see http://evs.kub.nl

Table 2: Rotated component matrix (Varimax rotation)

1 component extracted	
Individual effort	-.384
Government ownership	.679
State responsibility	.720
Unemployed	.577
Success	.628

Table 3a: Descriptive Statistics

	Mean	Std. Dev.
Investment	24.3	3.74
Schooling	0.51	.067
Entrepreneurial Capital	0.15	0.27
Spillover	0.92	0.30
Aggl.Edu	0.06	0.16
Growth1950-1998	0.029	0.33

N=54; investment data are national.

Table 3b: Correlation table

	Growth 1950-1998	Schooling	Investment	Spillover	Aggl. Edu	Entrepreneurial capital	GRP1950
Growth 1950-1998	1	-0.149	0.13	0.051	-0.072	-0.43*	-0.55*
Schooling		1	-0.31*	-0.049	-0.098	0.28*	0.29*
Investment			1	-0.189	-0.028	-0.39*	-0.0058
Spillover				1	-0.189	-0.19	0.169
Aggl. Edu					1	-0.02	0.35*
Entrepreneurial capital						1	0.02
GRP1950							1

* denotes 10% significance

Table 4: Regression results

Entrepreneurial capital and Regional Economic Performance, 1950-1998

Model	1	2
Dependent Variable	**Regional Economic Growth**	
Method	OLS	
Constant	-1.44	-.11
	(.62)	(.62)
GRP1950	-.97	-.93
	(.20)***	(.169)***
Investment	.48	.14
	(.20)**	(.18)
Schooling	.53	.65
	(.32)*	(.30)**
Aggledu	.53	.44
	(.20)**	(.18)**
Spillover	.31	.18
	(.09)***	(.10)*
Entrepreneurial Capital		-.49
		(.13)***
R-square	.41	.53
VIF factor (maximum)	1.49	1.49
CW test	.69	.95

*Standard errors (White corrected) between parentheses. $N = 54$. *** 1% significance, ** 5% significance, * 10% significance. We have tested for heteroskedasticity (residual plots and Cook-Weisburg (CW test) and multi-collinearity (Variance Inflation Factors) and found no indications of a possible bias. If we observe the period 1970-1998 or 1984-1998, the conclusion on entrepreneurial capital does not change.

Table 5: Extreme Bounds Analysis

Variable	Number of models	Mean value	Left side of confidence interval	Right side of confidence interval	Fraction of significant positive values	Fraction of significant negative values
GRP1950	32	-0.794	-0.853	-0.736	0	1
Schooling	32	0.055	-0.254	0.364	0	0
Investment	32	0.113	-0.046	0.272	0	0
Spillover	32	0.086	-0.0041	0.175	0.0313	0
Aggl. Edu	32	0.094	-0.133	0.321	0.0313	0
Entrepr.Cap.	32	-0.519	-0.54	-0.498	0	1