Entrepreneurial Culture, Regional Innovativeness and Economic Growth

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Abstract

This paper presents the results of an empirical study on the relationship between entrepreneurial culture, regional rates of innovation and regional economic growth. Recent literature mainly in regional science and economic geography has emphasized the role of an entrepreneurial culture in explaining the economic success of regions. Most of these contributions are however conceptual or case-based. Building on Leibenstein's view of the entrepreneur as the 'input completer' and the Austrian school in which entrepreneurial activity is attributed a central role I hypothesize that regions which can be characterized as having an entrepreneurial culture are more innovative and grow faster. I use a standard economic growth model and test this hypothesis on a sample of 54 European regions. The results confirm the importance of an entrepreneurial culture.

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1. Abstract

This paper presents the results of an empirical study on the relationship between entrepreneurial culture, regional rates of innovation and regional economic growth. Recent literature mainly in regional science and economic geography has emphasized the role of an entrepreneurial culture in explaining the economic success of regions. Most of these contributions are however conceptual or case-based. Building on Leibenstein's view of the entrepreneur as the 'input completer' and the Austrian school in which entrepreneurial activity is attributed a central role I hypothesize that regions which can be characterized as having an entrepreneurial culture are more innovative and grow faster. I use a standard economic growth model and test this hypothesis on a sample of 54 European regions. The results confirm the importance of an entrepreneurial culture.

2. Introduction

Entrepreneurship is generally considered to be of great importance for economic development (Porter, 1990; Baumol, 1993; OECD, 1998). In his overview on the role of entrepreneurship, Baumol writes the following: 'If we seek to explain the success of those economies that have managed to grow significantly, compared with those that have remained relatively stagnant, we find it difficult to do so without taking into consideration differences in the availability of entrepreneurial talent and in the motivational mechanisms that drive them' (Baumol, 1993, p. 5). When conjectures are offered to explain slowdowns or great leaps in economic growth, the entrepreneur is one of the usual suspects that are regularly rounded up. Either the culture's need for achievement has atrophied resulting in a decline of entrepreneurship, or the flowering of entrepreneurship accounts for the economic success (Baumol, 1993, p. 25).

The claim that differences in economic success may be related to the presence or lack of an entrepreneurial culture is not new (Hoselitz, 1957; Baumol, 1968; Leff, 1979; Soltow, 1968). What is new however, is the regional dimension. Recent literature mainly in field of regional science and economic geography increasingly attributes the economic success of regions to non-economic elements, of which the presence of an entrepreneurial culture is frequently mentioned[1]. Numerous schools with different concepts exist and as a result there is an extensive literature on embeddedness (Granovetter, 1985), industrial districts (Harrison, 1992; Markusen, 1996), innovative milieu (Maillat, 1995), untraded interdependencies (Storper, 1995), social capital (Putnam, 1993; Westlund and Bolton, 2003), learning regions (Florida, 1995; Morgan, 1997) and clusters (Saxenian, 1994; Hospers and Beugelsdijk, 2002). The common ground in this 'New Regonalism' is that they all point to the importance of non-economic factors in the regional environment (Keating et al., 2003).

The trend to explain regional economic success in terms of non-economic factors has resulted in numerous ill-defined concepts generally referring to the role of an entrepreneurial culture, 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), 'entrepreneurial climate' (Malecki, 1994; Goetz and Freshwater, 2001) and 'regional cultures of innovation' (Thomas, 2000; Venkataraman, 2004). These authors argue that local social conditions play an important role in the genesis and assimilation of innovation and its transformation into economic growth. Entrepreneurial culture is seen as an important element of a regional culture facilitating the success of regional clusters and regional economies in general. Still, empirical research on the link between culture and entrepreneurship as a driving force of economic development is not well developed (Wennekers and Thurik, 1999).

The contribution I aim to make in this paper is confined to an empirical attempt to complement existing mainly conceptual literature on the role of entrepreneurial spirit in explaining regional economic success and the relation between culture and economic development in general. In specific, I theorize on the relationship between entrepreneurial culture and economic growth and subsequently test if regions with a culture that can be characterized as 'entrepreneurial' are more innovative and subsequently grow faster than regions that have a less entrepreneurial culture. Despite

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[1] This regional approach is not only limited to regional scientists or economic geographers. In a recent paper in the *Journal of Business Venturing* Venkataraman (2004) asks himself why for example Silicon Valley has been more successful than Central Virginia, and argues that especially the 'intangibles of entrepreneurship' are important. In a similar vein, Porter (2003) has studied the role of innovation rates in explaining the differences in economic success between US regions.

the growing literature in the field of economic geography and regional economics in which the role of an entrepreneurial culture is stressed, to my knowledge as yet nobody has empirically investigated the relation between entrepreneurial culture, regional innovativeness and economic growth.

The sample I study consists of 54 European regions. Though the popularity of the 'New Regionalism' referred to above is rather universal (see e.g. Audretsch, 2001 for an application to the US), its ideas and concepts have especially become popular among European scholars, as it fits in the relatively strong European tradition of regions as an object of research. This is not surprising given the historical role of regions in Europe. In some countries regions constituted an obstacle to centralized state and nation building, and remained an element in the polity and culture of these countries. In these countries unification happened only at the end of the 19th century (Germany, Italy). In other countries nation building started much earlier than the 19th century (France, Great-Britain, the Netherlands). The leeway for regional politics and culture has recently increased because of ongoing modernization processes, such as economic integration and globalization (Ohmae,1995) Globalization and European integration have made some territorially based production factors (especially with regard to Fordist large scale, standardized modes of production for national markets) become less important, enhancing the freedom of firms to choose locations at will. At the same time, however, 'new' regional production factors such as those mentioned earlier have become of critical importance, especially for post-Fordist small scale, flexible modes of production for global markets (Martin and Sunley, 1998). Therefore a time of globalization and European integration became also a time of resurgence of regional economies. The development of the internal market in Europe has encouraged each region to increasingly specialize in its comparative advantages. The European Commission took advantage of this trend by extending the subsidiarity principle to what it called *l'Europe des regions.*

The remainder of this paper is structured as follows. The next section is a attempt to theorize on the relationship between entrepreneurial culture and economic growth. I build on Leibenstein's view of the entrepreneur as an 'input completer' and follow the Austrian school in which entrepreneurship is attributed a central role. After that I describe the data and test the hypothesis that entrepreneurial culture is related to regional economic success. After extensive robustness analysis I conclude by a brief discussion of the main results and discuss the limitations of the paper to explore potentially attractive options for future research.

3. Towards a theory of entrepreneurial culture and economic growth

Entrepreneurship is a multi-faceted phenomenon (Adaman and Devine, 2002; Nijkamp, 2003). Numerous definitions and approaches exist and it is beyond the scope of this paper to discuss all. Broadly speaking one can identify three main streams of research, corresponding to the three underlying disciplines, i.e. socio-psychology, management and economics (Stevenson and Jarillo, 1990). Building on classical contributions like those from Cantillon (1931[1755]), Schumpeter (1934), and Kirzner (1973) the core question in the field of economics refers to the economic effects of entrepreneurship. Sociologists and psychologists on the other hand have tried to explain the 'causes' of entrepreneurial behaviour, which has resulted in a number of studies on entrepreneurial traits (see e.g. McCelland, 1961; Rotter, 1966; Brockhaus, 1982). Scholars in the managerial tradition have tended to concentrate on the managerial practice of entrepreneurship, or normatively, 'how to succeed as an entrepreneur', including the formation of strategy in entrepreneurial firms (cf. Stevenson and Jarillo, 1990). The issue of corporate entrepreneurship, or intra-preneurship is also included in this approach.

In an attempt to bridge the different approaches to entrepreneurship, Suarez-Villa (1989) discusses the role of entrepreneurship from different theoretical angles. Regarding the importance of entrepreneurial culture, he writes that differences in economic performance between regions, as reflected in their achievement motivation structures, could provide significant insights in the process of long term spatial economic development (Suarez-Villa, 1989, p. 17). By referring to achievement motivation, Suarez-Villa (1989) explicitly builds on the ideas proposed by McCelland (1961). Although Schumpeter (1934) was one of the first to argue that entrepreneurial action requires aptitudes that are present in only a small fraction of the population and to characterize entrepreneurs by an autonomous drive to achieve and create for its own sake, it was the seminal contribution of McCelland (1961) in which it was shown that entrepreneurial behavior can be associated with personality characteristics like high need for achievement, moderate risk-taking propensity, preference for energetic and or novel activity, and the tendency to assume personal responsibility for successes or failure. Since then numerous studies in this field of socio-psychology have been performed. In general, achievement motivation, locus of control and preference for innovation are seen as the classic themes in the entrepreneurial trait research (Stewart et. al. 1998).

In an empirical test of McCelland's need for achievement as an index of the entrepreneurial values present in a society, Freeman (1976) found support for the significant role of entrepreneurial culture in explaining differences in national product. An analysis of corporate entrepreneurship and its relation with the degree of Hofstede's (2001) measure of individualism-collectivism in different countries including the US, showed that entrepreneurship declines the more collectivism is emphasized (Morris, et al. 1994). Though it was also found that dysfunctional (high) levels of individualism exist, this result suggests that cultures in which group-thinking may outweigh individual initiative few individuals would put their (perhaps latent) entrepreneurial ambitions into action. Also Shane (1992, 1993) has related cultural norms to levels of innovation, which he assumes would precede economic development. Despite these insightful contributions, it must be concluded that the majority of the studies that aim to link entrepreneurial values to aggregate economic outcomes only do so indirectly. For example, in explaining the regional variance among European regions by so-called 'innovation-prone' and 'innovation-averse' societies Pose (1999) does not actually measure culture. In most cases, entrepreneurial culture is included in some kind of region-specific fixed effect (Guerrero and Serro, 1997; Wagner and Sternberg, 2002). Apart from measurement problems this may also be due to problematic theory.

Though the increased popularity of hypothesizing a relationship between entrepreneurial culture and (regional) economic success suggests that a well articulated theory of this relationship exists, this is not true. There is no fine-grained theory on how an entrepreneurial culture affects the process of economic growth. To an important extent this may be caused by the fact that mainstream (neoclassical) economic theory does not leave much room for the role of the entrepreneur (Leibenstein, 1968; Baumol, 1968, 1993; Kirzner, 1997). If entrepreneurial activity is incorporated, it is usually done by means of assumptions based on exogenous factors, like for example the exogenous stock of entrepreneurial talent in Lucas (1978), or in Kihlstrom and Laffont (1977 as cited in Lucas, 1978) who developed an equilibrium theory in which agents differ in their attitudes towards risk with the relatively least risk averse becoming entrepreneurs.

Although the main contribution of this paper is empirical, I will nevertheless attempt to theorize on entrepreneurial culture and its relation with economic growth. To do so, I build on Leibenstein's theory of the entrepreneur as an input completer and the Austrian aproach which attributes a central role to entrepreneurial activity in explaining economic development.

According to Leibenstein (1968), the main difficulty of the misfit of the entrepreneur in mainstream (neoclassical) thinking is caused by the conventional theory of the production function, in which the complete set of inputs is specified, known and has a fixed relation with output. He argues that this is not realistic. In his view, the entrepreneur is someone who extends the production function by broadening the existing set of inputs. Leibenstein calls this the 'input completing capacity' of entrepreneurs.

However, entrepreneurial activities do not only arise because of market imperfections. First of all, some gaps in markets are inherent in all cases. In this respect it is appropriate to refer to Leibenstein's idea on X-efficiency (Leibenstein, 1966, 1979), implying that under certain circumstances depending on the internal and external motivational state of the firm and the industry the level of directed human effort may be low resulting in slack, and thus yielding entrepreneurial opportunities. The basic idea is that existing firms do not operate on their production possibilities frontier (Leibenstein, 1966, 1979)[2]. More important is the fact that the input completing capacity of the entrepreneur implies that the entrepreneur has to employ ill-defined inputs who are 'vague in their nature' and whose output is indeterminate. The capacity to do so is not uniformly distributed and the ability and willingness for such a risky process of gap filling and input completing can be considered a scarce talent.

The application of his static micro theory to a dynamic growth framework is not so well articulated. Regarding growth Leibenstein (1968, p. 77) argues that (a) per capita income growth requires shifts from less productive to more productive techniques per worker, the creation or adoption of new commodities, new materials, new markets, new organizational forms, the creation of new skills, and the accumulation of knowledge; (b) part of the growth process is the interaction between the creation of economic capacity and the related creation of demand so that some rough balance between capacity growth and demand growth takes place. The entrepreneur as a gap filler and input completer is argued to be the prime mover of the capacity creation part of these elements of the growth process. In

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[2] Leibenstein's 1966 paper triggered quite some fellow economists to study and criticize his concept of X-efficiency. For an overview of the pros and cons I refer to a special issue of the *American Economic Review* titled 'X-efficiency after a quarter of a century', 1992, vol. 82.

sum he argues, entrepreneurial activation improves the efficiency of the process of production (Leibenstein, 1968).

An approach that attributes a central role to entrepreneurial discovery has been the Austrian school. The core of the Austrian approach is the conviction that standard neoclassical microeconomics, for which the general equilibrium model is the analytical core, fails to offer a satisfying framework for understanding what happens in market economies (Kirzner, 1997; Rosen, 1997; Yeager, 1997). Building on the works of Mises (1949) and Hayek (1948), scholars in this tradition theorize that the market is an entrepreneurially driven process in which market participants acquire better knowledge concerning the plans made by fellow market participants. Entrepreneurs are crucial in this process for their willingness to take risk in pursuing market opportunities. This view corresponds with Leibenstein's view on the entrepreneur as an input completer. Mises (1949, p. 253 on cit. Kirzner, 1997) claims that 'in the imaginary construction of the evenly rotating economy [a general market equilibrium] there is no room left for entrepreneurial activity'. In other words, entrepreneurship is a disequilibrium phenomenon (Rosen, 1997). This corresponds with Leibenstein's argument that if all inputs would be known there is no role for entrepreneurs. Entrepreneurial activities are only possible when knowledge and information are incomplete and dispersed. In contrast to the neoclassical world an entrepreneur in the Austrian approach operates to change price/output data (Kirzner, 1997). For Mises, an entrepreneur is 'an acting man in regard to the changes occurring in the data of the market' (Mises, 1949, p. 255 on cit. Kirzner, 1997), and entrepreneurship is human action 'seen from the aspect of uncertainty inherent in every action'. Acknowledging there is a difference between risk and uncertainty (Knight, 1921), this view corresponds with Leibenstein's idea on an entrepreneur taking risk.

Although the above suggests that the entrepreneurial market process and the inherent advancement of knowledge (of inputs in Leibenstein's view) may gradually converge towards some kind of equilibrium, this is not guaranteed according to the Austrians (Kirzner, 1997; Yeager, 1997). First of all, there are continual changes in tastes, resource availabilities and technological capabilities that prevent this equilibrative process from fully completing, and secondly, entrepreneurial intentions may not always yield profits, but may result in entrepreneurial losses as well, thereby resulting in diverging forces. This is important, because it shows that in contrast with mainstream economic thinking there is no guaranteed convergence to or existence of a (general) equilibrium in the Austrian approach.

The logic developed above is interesting and relevant for the thesis on the relationship between entrepreneurial culture and (regional) economic growth I aim to develop in this paper. In Leibenstein's view, the set of individuals with gap filling and input completing capacities is exogenous and the personality characteristics of these entrepreneurs are important. The Austrians argue that it is this relatively scarce willingness to take risk that allows an economy to develop and grow. Hence, if more people possess these entrepreneurial traits it can logically be argued that this results in increased economic dynamism and economic growth in the end. Alternatively, countries and regions that are characterised by a culture that is conducive to entrepreneurship may be more innovative. This, in turn, may influence economic growth.

One may in first instance think of the effects of an entrepreneurial culture in terms of higher start-up rates. In an empirical analysis of the effects of regional characteristics on new firm formation in Finland, Kangasharju (2000) argues there are a number of significant local characteristics. Besides local market growth, agglomeration and urbanisation effects, and government policies, he argues that 'entrepreneurial ability' is an important factor in explaining the probability of firm formation. According to Kangasharju (2000) this entrepreneurial ability in a region depends on both the stochastic distribution of entrepreneurial talent among the inhabitants and on region-specific factors that enhance this ability. A regional analysis of entrepreneurship in Sweden showed that regional rates of new firm formation partly depend on entrepreneurial values (Davidsson, 1995). 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.

Though start-ups are undeniably important for economic dynamism and growth, the theoretical logic developed earlier allows an entrepreneurial culture to positively influence economic development in a broader way. Entrepreneurship is not only associated with the formation of new firms, but with entrepreneurial action in the sense of starting something new. This may also take the form of intra-preneurship, or corporate entrepreneurship. Intra-preneurship 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 (cf. Leibenstein's (1966) argument on X-

efficiency). 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.

Following the line of arguments and logic I developed above, the following section is devoted to an empirical test of the hypothesized relationship between entrepreneurial culture and regional economic growth. As I have mentioned in the introduction, the sample consists of 54 European regions (NUTS 1 level).

4. Empirical test

In order to test if entrepreneurial culture is related to economic growth, I have taken a standard growth framework, in which economic growth is explained by a number of key economic variables (Barro, 1991; Baumol, 1986; Mankiw et. al., 1992). These type of empirical growth regressions typically include initial level of GRP per capita, and proxies for human and physical capital (mostly the school enrolment ratio and the investment ratio), and are also referred to as Barro-regression (after Barro, 1991). The sample consists of 54 regions in 7 European countries: France, Belgium, Italy, Germany, Spain, the Netherlands and Great-Britain. The regional level is the NUTS1 level, which means that France is divided in 8 regions, Belgium 3, Italy 11, Germany 11 (former German Democratic Republic excluded), Spain 7, The Netherlands 4 and Great-Britain 10.

I closely follow Barro and Sala-i-Martin (1995) who explain regional growth differentials in Europe between 1950 and 1990. As I have more recent economic data, I initially analyze the period 1950-1998. In the robustness analysis I also test for shorter periods. Similar to Barro and Sala-I-Martin (1995), I have computed the regional growth figures by relating the regional GDP per capita information to the country mean[3]. There are two reasons to use the country mean as a correction factor. First of all I 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, I have used Gross Regional Product (GRP) figures that are expressed as deviations from the means from the respective countries. An additional advantage of using relative data versus non-relative data is the direct control for national growth rates that might bias regional growth rates. The 1950 data are based on Molle et al. (1980), except for the data for Spain which 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 the 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. I control for country specific effects by country based adjusted standard errors. In the robustness analysis I also apply a fixed effects method.

Due to unavailability of reliable regional investment data[4], investment ratio is measured at country level. Data are taken from the Penn World Tables (Summers and Heston, 1991). Data limitations at the regional level do not enable me to measure the school enrolment ratio as some average over time, but there are data on the total number of pupils at first and second level in 1977, divided by total number of people in the corresponding age group. The basic growth period I 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 may be a reasonable proxy for the average over the entire period. Data come from Eurostat. Data on school enrolment rates in Spanish regions refer to 1985. I 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, I include an interaction variable. It consists of a dummy variable for an agglomeration multiplied by the score of the school enrolment rate[5]. Instead of including a general dummy indicating whether agglomeration effects are present in a region, this interaction variable is a more precise control variable, because it designates a function to the dummy. It measures the concentration of human capital in agglomerations.

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[3] 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 subsequently based on these two indices.

[4] Eurostat and Cambridge Econometrics do provide data on Gross Fixed Capital Formation. However, data are incomplete for some countries or in time.

[5] Major agglomerations are the Western parts of the Netherlands, Greater Paris, Berlin, London, the Barcelona area, Brussels, and the Italian region Lazio (Rome).

Furthermore I control for spatial correlation. Acknowledging that testing for spatial dynamics is important (Le Gallo and Ertur, 2003), it is beyond the scope of this paper to extensively do so. Ideally one should use interregional input-output tables to calculate regional multipliers and construct a variable that controls for spatial correlation[6]. However, this information was not available. Instead I have chosen to control for spatial autocorrelation in a limited way, i.e. by applying Quah's (1996) approach of the neighbor relative income. This method implies that I use average per capita income of the surrounding, physically contiguous regions to control for spatial auto-correlation.

Hence, the basic regression analysis includes initial level of GRP per capita, investment ratio, school enrolment rate, spatial auto-correlation and a variable that captures the concentration of human capital in major agglomerations. In addition I include variables that measure entrepreneurial culture and regional innovativeness.

I operationalize entrepreneurial culture by means of a single construct consisting of multiple items measuring the general climate towards risk-taking, individual (vs state) responsibility and the importance of incentives for individual effort (see table 1 for an overview of the items included). These items are related to characteristics of entrepreneurs as described in the social-psychological literature, like locus of control (Rotter, 1966; Evans and Leighton, 1989; Mueller and Thomas, 2001), need for achievement (McCelland, 1961) and risk-taking behavior (Brockhaus, 1982; Thomas and Mueller, 2000; Stewart et al., 1998; Nijkamp, 2003). At the individual level, this Likert based scale has been shown to empirically usefully distinguish between entrepreneurs and non-entrepreneurs (Beugelsdijk and Noorderhaven, 2004). The database that has been used to construct this measure is the European Values Studies (EVS)[7].

(Table 1, Page 15)

I measure regional innovativeness by the 1980-1990 average number of patents per capita in a region (Paci and Usai, 2000). The variation in patenting across regions ranges from essentially 0.48 patents per capita in Central Spain (excluding Madrid) to over 185 in Baden Wurttemberg (see fig. 1). Fig. 1 confirms the tendency for concentration of innovation in a few regions. Acknowledging the potential weaknesses of patents as a measure of innovativeness, it has been shown that it is correlated with aggregate measures of economic performance like labor productivity (see Paci and Usai, 2000 for EU regions). In an analysis of US regions, Porter (2003) showed that regions differ considerably in their innovation rate which subsequently affects differences in overall regional economic performance. Due to the skewness in the measure for regional innovativeness (see Fig. 1) I have used the log value of this measure.

(Figure 1 and 2, Page 17)

Fig. 2 shows the relation between average number of patents per capita (regional innovativeness) and the measure for entrepreneurial culture. The latter is re-scaled between 0 (low entrepreneurial culture) and 100 (high entrepreneurial culture). The upward slope of the line plotted in fig. 2 suggests a positive relationship. The correlation between entrepreneurial culture and regional innovativeness is 0.54.

(Table 2, Page 15)

Table 2 gives the descriptive statistics of all variables. Correlations between the independent variables are typically moderate to low, implying little multi-collinearity problems. Model 1 in table 3 presents the OLS regression results for the default growth model, only including basic economic variables. As the results in table 3 show, all variables except for Investment are significant. This result is not

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[6] 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.

[7] Compared to the EVS, The World Values Survey (WVS) is more well-known (see e.g. Inglehart and Baker, 2000; Knack and Keefer, 1997). It is important to note that the WVS dataset and the EVS used in this paper have much in common, but are also to some extent different. WVS comprises not only the European countries of EVS, but also a large number of other Western and non-Western countries. It should be mentioned however, that the majority of the survey questions in EVS and WVS are exactly the same.

surprising given our control for country specific effects and the fact that the investment ratio is measured at country level. Schooling is significant at the 10% level. Economic growth is negatively related to the initial level of GRP per capita, which supports the convergence hypothesis. This corresponds with other findings on regional convergence in Europe (Martin and Sunley 1998). However, if I take shorter periods of time (e.g. 1984-1998) I cannot find proof for the convergence hypothesis. This is in line with previous studies on country (Levine and Renelt 1992) and regional level (Fagerberg and Verspagen 1995). The period in the eighties can be roughly characterized by divergence instead of the observed convergence in the period before (Maurseth 2001).

(Table 3, Page 15)

Model 2 tests if differences in economic growth are related to differences in regional innovativeness. The variable on patents per capita is added to the default model. As table 3 shows, regional innovativeness is significantly positive (p < .01) related to growth. However, as theorized earlier, I hypothesize that there exists a positive relationship between entrepreneurial culture and economic success. In model 3 I have crafted a simple path model in which economic growth is related to regional innovativeness which is subsequently related to entrepreneurial culture. I use a 2SLS approach to test this. As the results show, instrumenting for regional innovativeness by entrepreneurial culture does not affect the significant relationship with growth. More important is the fact that entrepreneurial culture is significantly positively (p < .01) related to regional innovativeness. Hence, I find that differences in growth are partly due to differences in the innovativeness which can be explained by differences in entrepreneurial culture. The question is if these finding are robust.

As model 3 is a 2SLS estimation, the robustness analysis as shown in table 4 contains two columns referring to the first stage of the regression analysis in which regional innovativeness is instrumented by entrepreneurial culture (column 4, model 3b) and the second stage in which the estimated value of the the measure of regional innovativeness is used as an explanatory variable in the growth regression (column 3, model 3a). I explore the robustness of my results along several dimensions. First, I test for alternative methods to control for country specific effects. Second, I test for alternative growth periods. Third, I test for the influence of outliers.

I have tested the robustness of the results for country-specific effects in two ways. In table 3 I have estimated with cluster adjusted standard errors. The use of country based adjusted standard errors may yield inconsistent estimates, if the unobserved variables effecting growth are correlated with observed characteristics (cf. Greene, 2003). Therefore, as an additional test, I parametrized this relationship by entering country averages of my variables of interest as additional variables. This specification is often referred to as a quasi-fixed effect model (Hsiao, 1986). However, in addition to this quasi fixed effect approach I also use a (more conventional) fixed effects method by directly including country dummies. In table 4 I report results when using these alternative methods. In case of the quasi-fixed effect model, I have estimated the regional effect when controlling for the national average of the same variable. As the results of table 4 show, the result on entrepreneurial culture as shown in table 3 is rather robust for the inclusion of country dummies, but not to the quasi-fixed estimator.

The second robustness test consists of changing the growth period, i.e. my dependent variable (and the period-related independents like initial level of GRP). Given that regional innovativeness is measured as the average patents per capita between 1980 and 1990 and that entrepreneurial culture is measured in 1990, I have tested two alternative growth periods; 1984-1998 and 1990-1998. Apart from data driven logic, it may also be theorized that entrepreneurial culture can both be the cause and the result of economic growth. High growth regions may attract entrepreneurs and in the long run one may expect this to positively influence the general attitude towards entrepreneurial activity. Hence, the causality might run the other way around. Although more careful analysis is required, the positive and significant finding when estimating growth between 1990-1998 supports the theoretical (causal) argument that entrepreneurial culture affects economic growth. As table 4 shows, the findings of table 3 are robust to changes in the growth period.

Finally, I have tested for potential outliers by applying the recursive method. As fig. 3 shows, there are a couple of regions which score high on regional innovativeness. In the robustness analysis I have tested for the influence of these outliers by excluding these observations. The recursive method implies that based on the order in which the observations are represented observations are deleted and the estimated coefficients are based on this smaller sample. I have chosen to order the 54 regions according to growth and the variables proxying regional innovativeness and entrepreneurial culture. When applying the recursive method with respect to growth, I estimate the effect of the latter two

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variables when the four slowest and four fastest growing regions are excluded. In a similar way, I perform the regression analysis and exclude the four regions with the highest, respectively lowest scores on the variables for regional innovativeness and entrepreneurial culture.[8] As table 4 shows, the main results presented in table 3 are robust to the exclusion of observations.

(Table 4, Page 16)

5. Conclusion and discussion

Literature has stressed the role of an entrepreneurial culture in explaining the economic success of regions. In this paper I have theorized and empirically tested this hypothesis. After extensive robustness analysis, I conclude that regions that have experienced higher economic growth rates and which are more innovative have a culture that can be characterized as entrepreneurial. However, an entrepreneurial region is more complex than a list of variables or ingredients (Malecki, 1994, p. 125). Sectoral structure, industry life cycle, firm level factors and national institutions are all related to the extent to which a region can be called entrepreneurial. In this paper I focused only on one element, i.e. the role of entrepreneurial culture. Clearly, the principal components of a theory of entrepreneurial culture and regional economic success need to be integrated in a more thorough manner than has been achieved in this paper. The theory on entrepreneurial culture and economic growth is not well developed. In this paper I have sketched a potential route that can be followed by building on Leibenstein's theory of the entrepreneur as the input completer and the Austrian school. Evidently, this is not the only theoretical route that can be followed. Theories only grow stronger once confronted with alternatives. Nevertheless, by concentrating on the role of entrepreneurial culture I have attempted to contribute to the recent - mainly conceptual - discussion in regional science and economic geography on the potential importance of an entrepreneurial culture in achieving regional economic success. Evidently, there are a number of limitations of the approach taken.

First of all, the measurement of (regional) innovativeness by patents per capita entails a number of weaknesses (Griliches, 1990; Jaffe et al. 1993). Though lack of data has forced me and many other scholars studying the empirics of innovation at the regional level (Paci and Usai, 2000; Piergiovanni and Santarelli, 2001; Bottazzi and Peri, 2002; Porter, 2003) to use an incomplete measure as patents, it is widely acknowledged that there are a number of problems with patents. Not all firms use patents, especially smaller firms. In some cases firms explicitly not patent their innovations because they try to keep their inventions tacit as long as possible for reasons of competitive fears. Though patent citations may partly solve this problem, it remains a difficult task to distinguish patents in terms of degree of relative importance. Hence, the patent system does not cover all innovative activity (Porter, 2003).

Secondly, in this paper I refrained from the role of networks. However, it has been shown that the local environment may offer all kinds of networks which influence the degree of entrepreneurship (Camagni, 1991; Yeung, 1997 on political networks; Kaplan, 1997 on ethnic networks). Relatedly, the role of clusters and industrial districts, but also that of urban diversity (Jacobs, 1961) has been neglected. An approach which explicitly aims to include these aspects in the explanation of innovativeness, is the systems of innovation approach. Though mainly applied at the national level, the National Systems of Innovation (NSI) has also been a source of inspiration for regional scholars (e.g. Cooke et. al. 2003; Evangelista et. al. 2002; Acs, 2000; see Moulaert and Sekia, 2003 for a critical overview). According to NSI, innovation and national (regional) competitiveness are determined by the interplay of a large number of factors, of which national (regional) specialization in production and institutions are assumed to be the most important (Lundvall, 1992; Nelson, 1993; Edquist, 1997).

This brings me to the following important remark. By no means the result of this paper should be interpreted in a way that economic growth depends on an entrepreneurial spirit, which waxes and wanes for unexplained reasons (cf. Baumol, 1993), and that 'underdevelopment is just a state of mind' (Harrison, 2000). It is clear that cultural features *together* with the institutional setting jointly determine the allocation of entrepreneurial activity (Desai et. al., 2003). For reasons of comprehensiveness and the sake of my argument (and also data availability) I refrained from the formal rules of the game in this paper, but future research might consider a more explicit role of institutions. I would like to stress that it is the interplay of the formal *and* informal rules of the game that determines the degree of

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[8] In principle the recursive method allows a graphical representation of the estimated coefficients when all 54 observations are subsequently deleted. For reasons of clarity and comprehensiveness I have chosen to show only the results when the four highest/lowest observations are deleted.

entrepreneurial activity in an economy. The fact that the United States and the United Kingdom have higher turbulence rates (= total of entry and exit) than for example the Netherlands and Germany cannot only be accounted for by a stronger entrepreneurial spirit in the these Anglo-Saxon countries (see Global Entrepreneurship Monitor), but is also caused by the type and degree of regulation in the European countries[9]. Based on the results presented in this paper, I do think that entrepreneurial climate is beneficial for economic growth, but as Baumol already wrote in 1968, 'the view that this [economic growth] must await the slow and undependable process of change in social and psychological climate is a counsel of despair for which there is little justification. Such a conclusion is analogous to an argument that all we can do to reduce spending in an inflationary period is to hope for a revival of the Protestant ethic and the attendant acceptance by the general public of the virtues of thrift' (Baumol, 1968, p. 71). In other words, whereas the results of this paper suggests that policy makers should try to change the general atmosphere towards entrepreneurship, this should be complemented by changing the formal rules and regulations regarding entrepreneurial behavior (cf. Venkataraman, 2004). As Leff puts it, 'sociologists and psychologists may be better able to answer such questions as the social conditions and personality traits that affect the capacity for bearing risk and uncertainty. But economists are needed to take account of the economic conditions under which preferences are transformed into actual investment behaviour' (Leff, 1979, p. 58)[10]. Let me elaborate on this. The degree to which people are willing to take risk is also related to the opportunity costs of becoming an entrepreneur. One of the factors driving the process to become self-employed is the dissatisfaction associated with being unemployed (Noorderhaven et. al. 2004). Now, the relative opportunity costs are higher in Anglo-Saxon countries than in European countries, because of the relative extensive social security system in Europe. Even in case of the presence of an (latent) entrepreneurial attitude, the lack of incentives in the latter system limits the extent to which people really put their entrepreneurial ambitions into action.

Fourthly, though empirically validated, I only used one single measure of entrepreneurial culture. It should be noted however, that the characteristics and items used in this measure may not be *universal* drivers of entrepreneurship and innovativeness. Begley and Tan (2001) have shown in a comparison between six East Asian countries (Indonesia, Korea, Philippines, Singapore, Taiwan and Thailand) and four Anglo-Saxon countries (US, Canada, Australia and New Zealand) that the social status of entrepreneurship differs significantly in these groups of countries resulting in different characteristic requirements. In a similar vein, Temple (1999) has argued that countries differing widely in social, political and institutional characteristics are unlikely to fall on a common surface. In other words, countries (and regions) may differ in their relevant proxies for entrepreneurial culture. Though the sample I used in this paper only consists of European countries and it can therefore be expected that this problem is of minor importance, Begley and Tan's study does suggest that one should be careful in developing and interpreting single measures that aim to measure entrepreneurial culture in a large number of countries.

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[9] Strictly speaking, if it would only be the lack of entrepreneurial spirit in country A, then the availability of individuals in other countries that do not lack an entrepreneurial attitude would – ceteris paribus – result in an inflow of these potential entrepreneurs in country A thereby restoring equilibrium.

[10] In policy circles it is quite popular to claim that educational programs should be developed to train potential entrepreneurs. Apart from the fact that is unclear how individuals can be trained to become entrepreneurs, further education may even be dysfunctional in that it increases the opportunity costs of potential entrepreneurs and may in fact decrease the supply of entrepreneurship (Leibenstein, 1968).

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Table 1: items included in the measure of entrepreneurial culture

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

Source: EVS (1990). Scales range between 1-10 and higher scores imply a higher score on the measure of entrepreneurial culture. See Beugelsdijk and Noorderhaven (2004) for details.

Table 2: descriptive statistics and correlations

Variable	Mean	S.D.	1	2	3	4	5	6	7
1. Growth 1950-1998	.029	.33							
2. Initial GRP per cap.	-.002	.25	-.55						
3. Investment	24.25	3.74	.14	.00					
4. Schooling	.51	.067	-.17	.30	-.28				
5. Spillover	.92	.30	.05	.17	-.18	-.08			
6. Agglomeration	.06	.17	-.07	.34	-.03	-.08	-.18		
7. Regional innovativeness	50.31	49.84	.34	.12	.16	-.12	.14	.08	
8. Entrepreneurial culture	56.95	24.06	.42	-.02	.41	-.29	.18	.02	.54

N=54

Table 3: Main results

Model	1	2	3
	OLS	OLS	2SLS
Dependent variable:		Growth 1950-1998	
Initial GRP per capita	-.971 (.059)***	-1.115 (.121)***	-1.165 (.143)***
Log investment	.476 (.265)	.496 (.087)***	.503 (.073)***
Log schooling	.528 (.267)*	.643 (.140)***	.683 (.106)***
Agglomeration	.528 (.164)**	.451 (..206)*	.424 (.235)
Spillover	.308 (.091)**	.177 (.059)**	.131 (.061)*
Regional innovativeness (Log patents per capita)	-	.094 (.021)***	.127 (.049)**
Instrument: Entrepreneurial culture	-	-	.045 (.007)***
R-squared	.41	.57	.55
N	54	54	54

Country based cluster adjusted standard errors between parentheses*** p < 0.01 ** p < 0.05, * p < 0.1. The 2SLS procedure in model 3 uses entrepreneurial culture as an instrument for regional innovativeness.

Table 4: robustness analysis of the variables of interest, i.c. regional innovativeness and entrepreneurial culture.

Model: Type of change	Model 2 Regional innovativeness	Model 3a Regional innovativeness	Model 3b Entrepreneurial culture	N
Default model (see table 3)	.094 (.021)***	.127 (.049)**	.045 (.007)***	54
Country specific effects				
1a. country dummies	.141 (.049)***	.401 (.257)	.011 (.006)*	54
1b. quasi fixed effect	.085 (.062)	.488 (.626)	.273 (.258)	54
Change of growth period				
2a 1984-1998	.294 (.027)***	.396 (.131)**	.044 (.007)***	54
2b 1990-1998	.511 (.122)***	.622 (.220)**	.043 (.007)***	54
Observations/outliers				
3a excl. 4 fastest growing regions	.073 (.019)***	.107 (.048)*	.041 (.008)***	50
3b excl. 4 slowest growing regions	.098(.023)***	.150 (.060)**	.041 (.008)***	50
3c excl. 4 highest scores on regional innovativeness	.079 (.021)***	.109 (.049)*	.041 (.008)***	50
3d excl. 4 lowest scores on regional innovativeness	.098 (.025)***	.159 (.057)**	.032 (.006)***	50
3d excl. 4 highest scores on entrepreneurial culture	.080 (020)***	.098 (.044)*	.047 (.008)***	50
3e excl. 4 lowest scores on entrepreneurial culture	.100 (.024)***	.151 (.050)**	.043 (.009)***	50

Country based cluster adjusted standard errors between parentheses except in specifications 1a and 1b; *** $p < 0.01$,** $p < 0.05$, * $p < 0.1$.
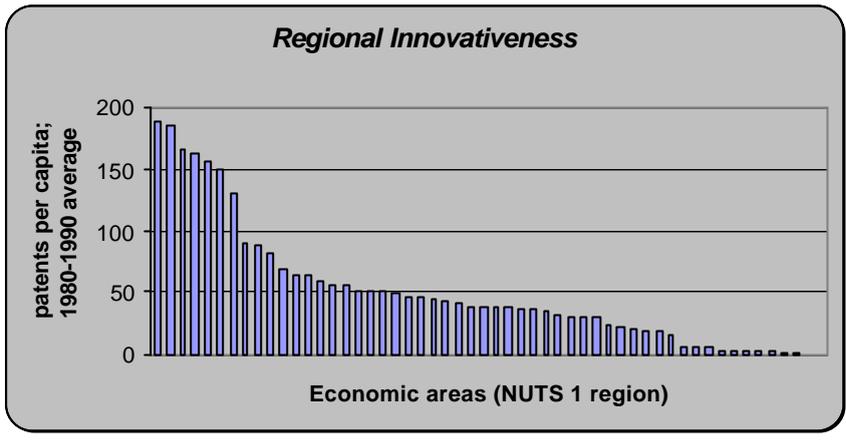
Source: Eurostat
Figure 1: distribution of regional innovativeness over 54 European regions
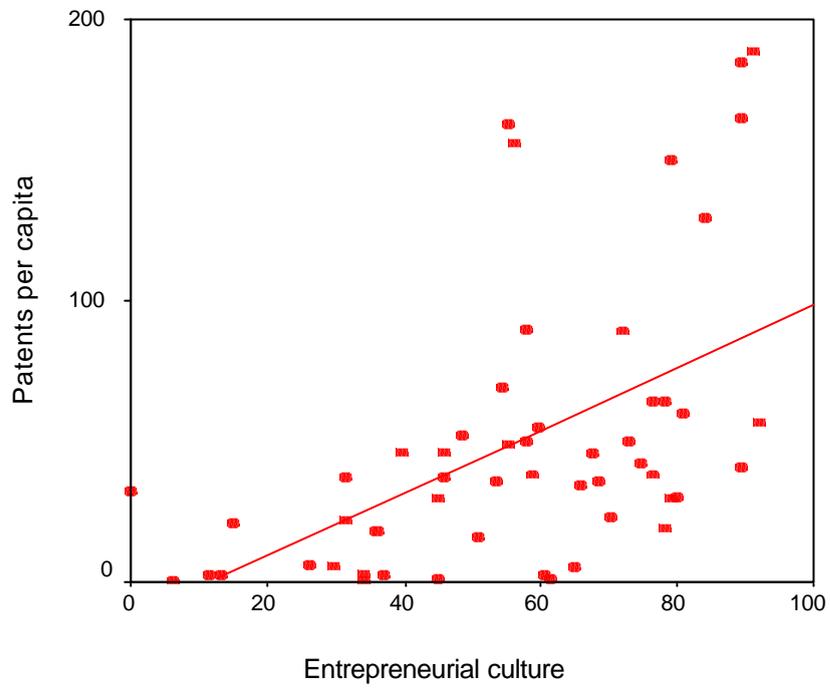

Figure 2: scatter plot of entrepreneurial culture and regional innovativeness