Entrepreneurship, Innovation Activities and Regional Growth

Paper submitted for the
45th European Congress of the Regional Science Association
Aug. 23 - 27, 2005, Amsterdam

Abstract:

There is a huge literature for the role and the implications of entrepreneurship on innovation activities and economic growth.

This paper attempts to define the main determinant factors of entrepreneurial and innovation activities.

In particular, the paper attempts to analyze, using an econometric approach, the effects of entrepreneurship on innovation activities and furthermore to clarify the implication on competitiveness and growth.

Key Words: Growth, Innovation Activities, Competitiveness, Entrepreneurship

Aikaterini Kokkinou[1]

[1]Aikaterini Kokkinou, Department of Geography, University of the Aegean, Greece, and Coordinator of Administration Office, Public Debt Management Agency, Ministry of Finance and National Economy, Greece, Corresponding Address: 1st Panainou Str. 104-43, Athens, Greece, tel. +30-697-2418402, email: kokkinou@pdma.gr

1. Introduction

In the last three decades, significant changes have taken place in the business environment all over the world. In today's globalised markets new businesses and corporations have emerged, trying intensively to find new investment opportunities and new channels for their products. Firms all over the world are described taking part in a race seeking the most appropriate and effective ways that could provide them with the strengths and opportunities necessary to obtain and sustain a competitive advantage over their rivals. In this competitiveness race, which has currently been extremely rapid and intensified, improvement of the processes used and commodities produced is of great importance for the success, or at least, for the survival of today's corporations, in the face of uncertainties generated by domestic and international competition.

These changing conditions have imposed a great number of challenges to organisations in every sector. Corporations seek to find new resources and opportunities to develop their capabilities and obtain a wider variety of organizational mechanisms to become and remain more competitive than their rivals. Firms in every industry, and especially those related with high technology, have found themselves struggling to acquire and accumulate new knowledge, apply it to their business, and then profitably commercialise the newly produced technology.

Under these circumstances, growth rate is considered to be the result of a wide range of economic, social and political factors. Firstly, economic growth may be the result of physical, as well as human, capital accumulation (Jones and Manuelli, 1990; Rebelo, 1991; King and Rebelo, 1993). Secondly, economic growth may be attributed to the existence of external economies and the interactions among the investments of different private or public enterprises and business entities (Arrow, 1962, Lucas, 1988). Thirdly, growth may result from the creation and adoption of new ideas and the accumulation of technological knowledge (Romer 1990, Grossman and Helpman 1991, and Aghion and Howitt 1992). In this perception, science, technology and innovation are major elements towards economic growth and development.

Schumpeter (1942) initiates the first clear debate concerning innovation in economic science with his innovation theory. This theory represents the first attempts to investigate the contribution of the technology to economic growth. He considered technological innovation as products endogenously produced by the capitalistic system, through a dynamically creative-destructive process. The degree of concentration and accumulation of the capital is closely related with the continuous technological change and innovation. Concluding, Schumpeter believes that the main element of capitalist growth is the continuous change, innovation, technology, new products and processes, and new markets, procedure which may be effectively done by R&D laboratories within the business organizations.

Technological change, innovation and technology creation and diffusion are an important factor to economic progress. While innovation may lead to divergence between firms or nations, imitation through diffusion and dissemination tends to erode differences in technological competencies, and hence lead to convergence (Fagerberg and Verspagen, 2002). On the other hand, entrepreneurship is the factor which energizes and combines the production functions in order to create and disseminate innovations, which leads to improvements in productivity and economic development (Malecki and Varaia 1986; Malecki 1991, Fagerberg and Verspagen, 2002).

2. Economic Development and Innovation

Innovation refers to the creation and successful market implementation of a new or improved product or production process. Ulijn and Weggeman, 2001). Innovation is a term which includes 'the search for, discovery, development, improvement, adoption, commercialisation of new processes, new products, and new organisational structures and procedures and it is a process that involves uncertainty, risk taking, probing, reprobing, experimenting, and testing. Above all, innovation is a cumulative activity that involves building on what went before, whether it is inside the organisation or outside the organisation, whether the organisation is private or public, whether the knowledge is proprietary or in the public domain' as in definition given by Jorde and Teece (1989).

Innovation involves two kinds of action, Research and Development (R&D). Research is the production of information and development is the embodiment of the acquired information into new commodities and processes. The R&D process as a whole is the non-commercial generation of scientific knowledge and its transformation into commercial technology engaged in the business procedures of the organisation, in order to meet the market needs and lead to financial success.

In Solow (1957), technology is considered as a public good, which can be consumed free by everyone and nobody can be excluded by its consumption. This good is an exogenously given factor explaining the economic development. Solow predicts that, in the long run, the differing national growth rates will converge in an international level, due to technology nature as a public good, which will be utilised by every country to enhance its economic capabilities. Arrow (1962) was the first to systematically appreciate the importance of innovation and technological change in the capital formation and economic growth. He observed that increases in income per capita couldn't be explained by increases in capital to labour ratio, and concluded that the power behind the increase in productivity is the acquisition of knowledge and learning experience created and acquired during the production procedure.

The systematic analysis and the theoretical framework of the effects of innovation on the economic efficiency, productivity and growth is based on endogenous growth theory developed by Solow, 1957, Arrow, 1962, Romer 1986 and 1990, Lucas, 1990 and 1993. Endogenous growth theory claimed that not only the accumulation of capital, but mainly the development and accumulation of knowledge and technological change leads to increased and sustainable growth.

Endogenous growth theory, as represented by Romer (1986), takes innovation as an endogenous variable which can explain the different national growth rates and why economies, even with different rates, do not converge to long-run steady state equilibrium. The reason is that the long-run productivity decrease is avoided, due to capital accumulation through the qualitative-technological improvements of natural and human capital. According to Romer (1986, 1990), knowledge and technological progress are the main engines of economic dynamism and the economy grows endogenously through the accumulation and spillover of knowledge. Growth rate depends on the amount of technological activity within the economy and on the ability

of the economy to exploit external technological achievements (Martin and Ottaviano, 1999, Grossman and Helpman, 1994, Coe and Helpman, 1995). Increasing returns and technical change are incorporated within the production function as determinants of the endogenous growth rate (Romer 1986, Lucas 1988, Grossman and Helpman 1994, Barro and Sala-i-Martin, 1997) and economic growth is sustained because of the continuous creation and diffusion of knowledge.

An important contribution of the endogenous growth theory (Romer, 1987 and 1990) has been to identify the central role that knowledge and knowledge spillovers play in creating and sustaining growth. Pavitt and Soete (1982) examined growth as a result of the development of new knowledge in a country and the diffusion of knowledge between countries. According to Fagerberg (1987) there is a close relation between a country's economic and technological level of development. The rate of economic growth of a country is positively influenced by technological level of the country and its ability to increase it through imitation and exploitation of the possibilities offered by technological achievements elsewhere. Krugman (1991) identified the major role that knowledge spillovers play in generating increasing returns and higher growth. Geroski and Machin (1993) asserted that innovations positively affect the development of enterprises and economies. Moreover, according to Silverberg and Verspagen (1995), technological change and diffusion constitute important factors in long-run macroeconomic growth and development. Moreover, Barro and Sala-i-Martin (1995 and 1997) asserted that growth rate may increase in correlation with technological growth. Furthermore, Freeman and Soete (1997) focused on the importance of technology and innovation claiming that lack of innovation leads to economic death. At the same point of view. Sternberg (2000) said that in industrialized economies the rate of long-term macroeconomic growth depends on the ability of constant development of innovative products and processes.

Innovative actions are considered to be rather important to economic growth, development and welfare. Firstly, they stimulate investments which introduce new commodities and processes, which improve the living standards of the society. Moreover, they lead to new developments, which increase the comparative advantage of an economy and affect positively the trade performance and competitiveness of a

country worldwide. These effects result in a greater level of economic growth. On the other hand, innovation is rather important to an individual firm for two main elements, namely a double role in the incentives of the companies to pursuit and invest on it.[2] Firstly, a corporation, which undertakes R&D programmes, acquires new information and knowledge to embody in the new commodities, as well as new production and marketing processes, ready to be employed in product and process innovation. As a result, through innovation, a company is able to develop directly new products and processes and bring them to the market acquiring an advantage over its competitors. Furthermore, it can enhance the ability of the firm to develop and maintain capabilities to absorb and expand technology information available by external sources, and identify, assimilate and exploit new knowledge and technology produced elsewhere (Cohen and Levinthal, 1989).

There are two reasons, which pursue companies to engage in investments that augment their R&D activities. The first objective, which companies try to achieve, is the reduction of the production cost of their current product set and the development of new products, which can contribute to the firm's profitability. This incentive would be applied even if the firm was not in an innovation race against its rivals, and even if it was to take R&D investment decisions in isolation. That is why Grossman and Shapiro (1987) and Katz and Shapiro (1987) called this incentive 'the stand-alone' or 'profit' incentive to R&D investments. The second objective is the provision of the firm with a strategic advantage over its competitors by either increasing its market share relative to its rivals, or introducing a competitive threat to them, through the development of a better process or product, so the firm may have the opportunity to foreclose the market and reap the highest amount of benefits. Beath, Katsoulacos, and Ulph (1989) analysed this 'competitive' or 'replacement threat' incentive as the desire of the firm to be the first innovator in an industry and not to be replaced by its rivals in its current market position, and emphasised to the difference between the firm's profits if it innovates before its competitors, and its profits if one of its competitors innovated first.[3]

---

[2] Cohen and Levinthal (1989) called this double role of innovation 'dual role'.

[3] Arrow (1962) focused on such an incentive and he recognised that a competitive market structure tends to pursue firms to conduct more innovation investments than a monopolistic industry. As Grossman and Shapiro (1987) say, firms are in a technological race, in which the first firm to innovate is also the one to obtain the largest share of the industry profits. If patents can protect the discovery and

3. Economic Development and Innovation[4]

As far as the characteristics of innovation are concerned, it is influenced by many factors, both internal and external to the firm (Dosi 1988). Innovation refers to the collective learning process between several departments within a company, as well as to external collaborations with external bodies (Cooke et al. 2000) and it is characterized by two features: uncertainty (risks) and accumulation (Camagni 1991)[5]. What is more, as far as the innovation process is concerned, the necessary information is asymmetrically available, which makes it rather difficult and costly to collect and exploit it. Moreover, the necessary inputs, as well as their attributes are difficult to be defined and, as a consequence, it becomes, also difficult to evaluate their potential effects and results. Furthermore, innovation process requires cooperation and collaboration of a great number of different actors, which, to a large extent, incorporates high transaction cost and high uncertainty level.

Because of these qualities of knowledge, namely uncertainty, asymmetries and high transactions cost – entrepreneurship becomes more important in a knowledge-based economy, since entrepreneurship activities are closely related with uncertainty, risk, investment, return and profits and of course with innovative actions. As Jorde and Teece (1990) believe, success in R&D does not lead automatically in financial business success. New commodities and processes do not yield any benefits, unless they are commercialised. Profitable commercialisation requires that the innovative firm had a blend of all the appropriate complementary assets, services, and technologies, which can transform the generated knowledge into commodities produced and sold on competitive terms.

Entrepreneurship is a process of exploiting opportunities that exist in the environment or that are created through innovation in order to create value (Wennekers and Thurik, 1999, Drucker, 1985, Mueller and Thomas, 2000, Ulijn and Weggeman, 2001).

'inventing around the patent' is not possible, then the followers in the race may have little or no earnings.

[4] For an extensive analysis, see Audretsch D.B. and Thurik R. OECD, 2001

[5] As quoted in Beugelsdijk, 2004

Entrepreneurship refers to activities undertaken in order to convert ideas into economic opportunities. These activities include factors such as opportunity seeking, risk and uncertainty bearing, innovativeness, coordination, capital supply, decision making, ownership and resource allocation. Then, entrepreneurship focuses on creating the adequate economic opportunities in order to introduce new ideas in the market. In accordance to these characteristics, entrepreneurship could be mainly considered to be the exploitation of technological opportunities by profit seeking agents, process which actually leads to economic growth and development.

Entrepreneurship is generally considered to be of great importance for economic development as a source of economic growth by a great number of researchers, such as Brock and Evans, 1989, Porter, 1990, Baumol, 1993, Audretsch and Thurik 2001.

Since early, differences in economic success have been related to the presence or lack of entrepreneurial activities. More specifically, 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. Acs – Audretsch (1989) claimed that entrepreneurship generates innovations. Shane (1992, 1993) has related cultural norms to levels of innovation, which he assumes would precede economic development[6].

In generally, entrepreneurship and innovation activity can be seen as key factors to promoting growth and increasing productivity. According to this view, economic success and competitiveness result from the combination of favorable entrepreneurial environment, network systems and innovative behavior and the establishment of new combinations of factors of production is a process that will become the engine that drives economic development (Schumpeter 1934, Schumpeter 1942, Thurik and Wennekers 1999).

On the other hand, as mentioned before, due to information asymmetries, uncertainty and high cost features of innovation, entrepreneurship becomes more important in a modern economy, since it may provide one of the mechanisms by which new

---

[6] As quoted in Beugelsdijk, 2004

economic knowledge is disseminated into different networks. Entrepreneurship generates growth because it serves as a link between innovation and change. Thus, by serving as a vehicle for knowledge transmission and spillover, entrepreneurship plays a key role in the link between knowledge and growth (van Stel and Thurik, 2001).

Economic success depends a great deal on the quality of the internal innovation network within an economy and the collective learning process is seen as being extremely important for the quality of the innovation network (Harmaakorpi and Pekkarinen, 2002). The relationship between entrepreneurial culture and economic growth is considered to be rather strong and entrepreneurial economies are more innovative and subsequently grow faster (Beugelsdijk, 2004).

In the modern knowledge economy, growth depends extensively on the presence or the formation of a network and environment favorable to innovation, which is based on the endogenous development capabilities. Even though the firm-specific factors are important determinants of innovation activity, technological opportunities and favorable entrepreneurial environment have a positive effect on innovation activity, as well.

4. Econometric approach

A production function is a relationship between output and inputs. For a single country the production function may be written as:

$$y_{it}=F_i(X_{i1t},X_{i2t},.......,X_{imt}, t)$$

where: y_{it} is the quantity of output produced per producer unit and X_{ijt} is the quantity of the jth input employed per producer unit (j=1,2,....m) in the ith country for the period t. In order to specify the inputs and output relationship, we begin with an aggregate production function:

$$Y_t=F(K_t, L_t, t),$$

where: Y_t, K_t, and L_t, are the quantities of aggregate real output, physical capital and labor respectively at time t, in order to assess what proportion of any increase in the output over time can be attributed first to increases in the inputs of factors in the production. Solow (1956) postulated that the level of output depended on the level of productivity

$$Y \quad = \quad A(t).F(K,L)$$

where Y is the level of aggregate output, namely economic growth, K is the level of the capital stock, L is the size of the labor force, A is total factor productivity (a measure of the current level of technology) and t is time. Total-factor productivity is measured as the difference between output and input change, in addition to increases in aggregate output due to capital or labour accumulation and endogenous growth theory asserts that increases in TFP are seen as the key to long-term economic growth.

Under this approach, Fagerberg (1987, 1988) created a model of endogenous technological change, focusing on the importance of innovation on economic growth. According to Fagerberg (1987, 1988) economic growth is explained as the combined result of three factors, namely the potential for innovation creation (proxied by patent growth), the potential for innovation diffusion (proxied by the level of productivity or GDP per capita) and the exploitation of these potentials (proxied by complementary factors, such as investment as a fraction of GDP). Extending this model, and following the theory presented in this paper, an additional complementary factor is included, that is entrepreneurship (proxied by the number of self employed persons in the economy).

Referring to the above mathematical equation, as well as to the above mentioned model, we obtain our estimating equation for the specification for the growth rate of real GDP:

$$Y_t = F(RD_t, Prod_t, Invest_t, Entrepr_t)$$

Where

RD_t refers to innovation creation activities, proxied by Research and Development expenditure measure,

$Prod_t$ refers to innovation diffusion, proxied by the level of GDP per capita, representing productivity,

$Invest_t$ refers to the exploitation of these potentials, proxied by the investment level as a fraction of GDP, and finally,

$Entrepr_t$ refers also to the exploitation of these potentials, proxied by the the number of self employed persons

The data apply to the economy of Greece and they cover a period of 50 years, from 1950 to 2000. The measures of GDP and GDP per capita are adjusted in constant PPPs standards, the Research and Development expenditure is also measured in constant prices and the investment level is represented by the Gross Fixed Capital Formation, also in constant prices. The data have been extracted from the OECD, Eurostat and the University of Pennsylvania databases.

Regression Analysis Results
Insert table here

The model shows that innovation and entrepreneurship in Greece play a significant positive role in economic growth level, as proxied by the output level. On the other hand, this role does not seem to be rather strong. As far as Greek economy is concerned, this kind of relationship could be attributed to the fact that Research and Development, as well as entrepreneurial activities, represent only a limited part within the Greek economy. This situation could be considered especially first due to the limited R&D expenditure both from the state and the private agents, and second to the unfavorable investment and entrepreneurial environment, characterised by the complicated tax system and bureaucracy, which does not allow the efficient exploitation of interactions between investment, production, employment, human capital and specialized factors of production.

5. Prospects

As it has been asserted in this paper, globalization and worldwide competition has shifted the comparative advantage of corporations and economies towards the factor of knowledge and innovation, where entrepreneurship based on the endogenous development capabilities plays a rather important role, as far as the growth, productivity and competitiveness enhancement are concerned. In order to promote innovation activities and technological opportunities entrepreneurship enhancement seems to have a significant importance not only to business success, but also to the long run performance of the economy as a whole.

Under this perspective, among others, growth policies should focus on creating favorable environment for the co-operation between firms and institutions that support the development and exploitation of knowledge and innovation. Furthermore, policies should promote the entrepreneurial relations between firms and institutions, fostering the development and dissemination of the expertise, the mobility of human and physical capital and the enhancement of the relationships between business and research entities. Specifically, they should encourage actions such as, promoting innovation, start-ups of specialized business services, technology transfer and interactions between firms and higher education and research institutes, networking and industrial co-operation and support for research and technology supply infrastructure.

6. References

Acs, Z.J. and Audretsch, D.B. (1989) Patents as a measure of innovative activity, *Kyklos* 42 (2): 171–180.

Acs, Z.J., Audretsch, D.B. and Feldman, M.P. (1994) R&D spillovers and recipient firm size, *Review of Economics and Statistics,* 76: 336–340.

Aghion P. and Howitt P. (1992) A model of growth through creative destruction, *Econometrica*, 60(2): 323-351.

Arrow, K.J. (1962) The economic implications of learning by doing, *Review of Economic Studies*, 29(3): 155-173.

Audretsch D.B. and Thurik R. (2001) Linking entrepreneurship to growth, *OECD, STI Working Papers* 2001/2, DSTI/DOC (2001)2.

Barro, R.J. (1991) Economic growth in a cross-section of countries, *Quarterly Journal of Economics,* Vol. 106 (2): 407-443.

Barro, R.J. and Sala-i-Martin, X. (1995) *Economic Growth*, New York: McGraw-Hill.

Barro R. and Sala-i-Martin X. (1997) Technological diffusion, convergence and growth, *Journal of Economic Growth,* 2: 1-26.

Baumol, W. (1993) *Entrepreneurship, management, and the structure of payoffs*. MIT Press, Cambridge.

Baumol, W. (1986) Productivity growth, convergence, and welfare: what the long run data show, *American Economic Review* 76: 1072-1085.

Beath, J., Katsoulacos, Y., and Ulph, D. (1989) Strategic R&D policy. *The Economic Journal*, 99, pp.74-83.

Beugelsdijk, S. (2004) Entrepreneurial Culture, Regional Innovativeness and Economic Growth, *Proceedings of ERSA 2004 Conference*, Porto

Brock, W.A. and Evans, D.S. (1989) Small business economics, *Small business economics* 1 (1): 7–20.

Camagni, R. (Ed.) (1991) *Innovation Networks—Spatial Perspectives*. Belhaven Press, London.

Coe, D. and Helpman E. (1995) International R&D spillovers, *European Economic Review*, 39: 859-887.

Cohen, W.M. and Levinthal, D.A. (1989) Innovation and learning: the two faces of R&D. *The Economic Journal*, 99, pp.569-596.

Cooke, P., Boekholt, P. and Todtling, F. (2000) *The Governance of Innovation in Europe: Regional Perspectives On Global Competitiveness*. Pinter, London.

Dosi G. (1988) Sources, procedures, and microeconomic effects of innovation, *Journal of Economic Literature*, vol. XXVI: 1120-1171.

Drucker P. (1985) *Innovation and Entrepreneurship*, Harper and Row. N. York.

Fagerberg, J. (1988)a. International competitiveness, *Economic Journal,* 98, 355–374.

Fagerberg, J. (1988) b Why growth rates differ. In: Dosi, G., Freeman, C., Nelson, R.R., Silverberg, G., Soete, L. (Eds.), *Technical Change and Economic Theory,* Pinter, London, pp. 432–457.

Fagerberg, J. (1987) A technology gap approach to why growth rates differ. *Research Policy*, 16, 87–99.

Fagerberg, J. and Verspagen B. (2002) Technology-gaps, innovation-diffusion and transformation: an evolutionary interpretation, *Research Policy,* 31: 1291–1304.

Freeman, C. and Soete, L. (1997) *The Economics of Industrial Innovation*, 3rd Edition. Pinter, London.

Georgellis, Y. and Wall, H. (2000) What makes a region entrepreneurial? Evidence from Britain, *The Annals of Regional Science,* 34: 385-403.

Geroski, P., Machin, S., Van, R., Geroski, J. (1993) Innovation and profitability, *Rand Journal of Economics,* 24 (2): 198–211.

Grossman, G.M. and Helpman, E. (1994) Endogenous innovation in the theory of growth, *Journal of Economic Perspectives*, 8: 23–41.

Grossman, G.M. and E. Helpman (eds.) (1991) *Innovation and Growth in the Global Economy,* MIT Press, Cambridge, Mass.

Grossman, G.M. and Shapiro, C. (1987) Dynamic R&D competition. *The Economic Journal*, 97, pp.372-387.

Harmaakorpi V. and Pekkarinen S. (2002) Regional Development Platform Analysis as a tool for regional innovation policy, *Proceedings of the ERSA 2002 Conference*, Dortmund

Jones L. E. and Manuelli R. (1990) A convex model of equilibrium growth: Theory and policy implications, *Journal of Political Economy,* 98: 1008–1038.

Jorde, T.M. and Teece, D.J. (1989) Innovation, cooperation, and antitrust: balancing competition and cooperation. *High Technology Law Journal*, 4(1), pp. 1-113.

Jorde, T.M. and Teece, D.J. (1990) Innovation and cooperation: Implications for competition and antitrust. *Journal of Economic Perspectives*, 4(3), pp.75-96.

Easterly W., King R., Levine R., and Rebelo S. (1991) How do national policies affect long-run growth?, *The World Bank*, October.

Katz, M.L. and Shapiro, C. (1987) R&D rivalry with licensing or imitation. *American Economic Review*, 77(3), pp.402-420.

Krugman, P. (1991) Increasing returns and economic geography, *Journal of Political Economy,* 99: 483–499.

Lucas, Robert E., Jr. (1988) On the Mechanics of Economic Development, *Journal of Monetary Economics,* 22: 3-42.

Lucas, R. (1993) Making a miracle, *Econometrica,* 61: 251-272.

Malecki E. J. (1991) *Technology and economic development: the dynamics of local regional and national change*, (eds.) Longman Scientific and Technical.

Maillat, D. (1995) Territorial dynamics, innovative milieus and regional policy, *Entrepreneurship and Regional Development,* 7: 157-165.

Malecki, E.J., Varaia, P. (1986) Innovation and Changes in Regional Structure in *Handbook of Regional and Urban Economics,* Vol.I, ed. P. Nijkamp, Elsevier Science Publishers.

Mankiw N.G., Romer D., Weil D.N. (1992) A contribution to the empirics of economic growth, *Quarterly Journal of Economics*, 107 (2): 407–437.

Martin P. and Ottaviano G.I.P. (1999) Growing locations: Industry location in a model of endogenous growth, *European Economic Review* 43: 281- 302

Pavitt, K., Soete, L. (1982) International differences in economic growth and the international location of innovation. In: Giersch, H. (Ed.), *Emerging Technologies: The Consequences for Economic Growth, Structural Change and Employment*. Mohr, Tübingen, pp. 105–133.

Penrose, E. (1959) *The theory of the growth of the firm*. Blackwell, Oxford.

Porter, M. (1990) *The Competitive Advantage of Nations,* Macmillan, London.

Rebelo S. (1991) Long run policy analysis and long run growth, *Journal of Political Economy,* 99: 500–521.

Romer, P. M. (1990) Human Capital and Growth: Theory and Evidence, *Carnegie-Rochester Conference Series on Public Policy,* Vol. 32: 251-86.

Romer, P.M., (1990) Endogenous Technological Change, *Journal of Political Economy*, vol. 98: 71-102.

Romer, P. M. (1986) Increasing Returns and Long-Run Growth, *Journal of Political Economy,* Vol. 94: 1002-37.

Schumpeter J.A. (1912) *The theory of economic development*, Leipzing, Duncker and Humblot.

Schumpeter J. A. (1934) *The theory of economic development*, Cambridge, MA, Harvard Economic Studies.

Schumpeter J. A. (1939) *Business Cycle*, I –II, New York, McGraw Hill.

Schumpeter J. A.: (1942) *Capitalism, socialism and democracy*, New York, Harper.

Silverberg, G., Verspagen, B. (1995) Long term cyclical variations of catching up and falling behind. An evolutionary model, *Journal of Evolutionary Economics* 5: 209–227.

Shane, S. (1993) Cultural influences on national rates of innovation, *Journal of Business Venturing* 8: 59-73.

Shane, S. (1992) Why do some societies invent more than others? *Journal of Business Venturing* 7, 29-46.

Solow, R. (1957) Technical change and the aggregate production function, *Review of Economics and Statistics* 39: 312–320.

Solow, R. (1956) A Contribution to the Theory of Economic Growth, Quarterly Journal of Economic Growth, *Quarterly Journal of Economics.* Vol. 50: 65-94.

Sternberg, R. (2000) Innovation Networks and Regional Development – Evidence from the European Regional Innovation Survey (ERIS): Theoretical Concepts, Methodological Approach, Empirical Basis and Introduction to the Theme Issue, *European Planning Studies*, 8: 389-407.

Thomas A. and Mueller S. (2000) A case for comparative entrepreneurship: assessing the relevance of culture, *Journal of International Business Studies* 31: 287-301.

Ulijn J. and Weggeman M. (2001) Towards an innovation culture: what are its national, corporate, .marketing and engineering aspects, some experimental evidence, in Cooper C., Cartwright S. and Early C. (eds) *Handbook of Organizational Culture and Climate,* London, Wiley, 487-517.

Wennekers, S. and Thurik R. (1999) Linking entrepreneurship and economic growth, *Small Business Economics* 13: 27-55.