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**Theoretical and Methodological
Study on Dynamic Growth
Regions and Factors Explaining
their Growth Performance**

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**Dynamic Regions in a Knowledge – Driven Global Economy:
Lessons and Policy Implications for the EU**

Workpackage No. 1
Comprehensive theoretical and methodological framework

Theoretical and methodological study on dynamic growth regions and factors explaining their growth performance

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ESRI	Economic and Social Research Institute (Co-ordinator)
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THE DETERMINANTS OF ECONOMIC GROWTH – A SURVEY OF THE LITERATURE

1. Introduction

Over the last two decades, the issue of economic growth has attracted increasing attention. Yet, the processes underlying economic performance are poorly understood and inadequately conceptualised, something which can be partly attributed to the simplistic and very abstract way conventional economics approach the issue.

Despite the lack of a generalised and unified theory, there are several partial theories that discuss the role of various factors in determining economic growth. Two main strands can be distinguished: the neoclassical, which is based on Solow's (1956) growth model and, the more recent, theory of endogenous growth developed by Romer (1986) and Lucas (1988). Additionally, important contributions on economic growth have been provided by Myrdal's (1957) cumulative causation theory, and by the New Economic Geography school (Krugman, 1991, Fujita et al. 1999).

Depending on its methodological foundations, each growth theory places emphasis on a set of different factors as key determinants of economic growth. For example, neoclassical growth theory stresses the importance of the rates of savings/investment (in the short-run), while endogenous growth theory has highlighted several "new" determinants of economic growth such as human capital and innovation activities. On a similar perspective, other approaches have emphasised the significant role that other, non-economic (at least in the conventional sense), factors play on economic performance: institutional economics underlines the substantial role of institutions (Matthews, 1986; North,1990; Jutting, 2003) and political science focuses its explanation on political determinants (Lipset, 1959). These developments gave rise to a discussion that distinguishes between "proximate" and "fundamental" (or "ultimate") sources of growth. The former refers to issues such as accumulation of capital, labour and technology while

the latter to institutions, legal and political systems, socio-cultural factors, demography and geography.

Theoretical developments have been accompanied by a growing number of empirical studies. Initially, research focused on the issue of economic convergence/divergence since this could provide a test of validity between the main growth theories (i.e. the neoclassical and the endogenous growth theory). Eventually, focus shifted to factors determining economic growth. Seminal studies in this field are conducted by Kormendi and Meguire (1985), Grier and Tullock (1989) and, especially, Barro (1991). This second 'wave' of empirical studies has been facilitated by the development of larger and richer databases (such as the Penn World Tables - PWT) and more advanced statistical and econometric techniques (mainly cross-sectional and panel-data ones), which enabled the identification of determinants of economic growth with higher precision and confidence. Although certain, mainly technical, problems on the development of these techniques have become evident, it is deemed that there are no better alternatives available at least for comparative growth analysis.

Finally, it is worth emphasising that due to the lack of a unifying theory on economic growth, a substantial volume of empirical research has multi-theoretical bases. This means that studies draw on several theoretical frameworks and examine factors that are taken from several sources. As a result findings are often contradictory and conclusions far from safe. This makes the development of a unifying theoretical model a job of paramount importance.

This paper is organized as follows: section 2 briefly discusses the main economic growth theories that is, neoclassical growth theory, endogenous growth theory, theory of cumulative causation and the theory of the New Economic Geography. Section 3 summarizes the most important factors that have been identified in the literature and discusses the empirical studies conducted at the international level. Section 4, after highlighting the weaknesses of cross-country regressions analysis, presents the findings

of a wide range of empirical econometric studies that have been carried out over the last years. Finally, Section 5 summarises the findings providing some tentative conclusions.

2. Main theories of economic growth

The starting point of conventional economic growth theorisation is the neoclassical model of Solow (1956). The basic assumptions of the model are: constant returns to scale, diminishing marginal productivity of capital, exogenously determined technical progress and substitutability between capital and labour. As a result the model highlights the savings or investment ratio as important determinant of short-run economic growth. Technological progress is another important determinant in the long run, although it is regarded as exogenous to the economic system in question. Turning to the issue of convergence/divergence, the model predicts convergence in growth rates on the basis that poor economies will grow faster compared to rich ones. Convergence would be absolute (or unconditional), moving towards a common steady-state, when economies are homogeneous (identical technology, savings rate, population growth rate and depreciation rate), or conditional, moving toward different steady-state positions, in the case of heterogeneous economies.

Although the neoclassical growth model places emphasis on labour and capital as key determinants of economic growth, other important elements remain unexplored and particularly the technological progress which is regarded as exogenous to the economic system in question. This shortcoming, coupled with contradictory empirical evidence, has turned researcher's attention to alternatives explanations. For instance, the role of technological progress as a key driver of long–run economic growth has been put in scrutiny from more recent studies that accept constant and increasing returns to capital. These theories, known as endogenous growth theories, propose that the introduction of new accumulation factors, such as knowledge, innovation, etc., will induce self-maintained economic growth. The seminal studies in this area are Romer (1986) and Lucas (1988). Romer presents a formal model that yields positive, long run growth rates

on the basis of technological progress driven by the role of externalities, arising from learning by doing and knowledge spillover. Lucas introduces a model in which human capital plays a fundamental role in perpetuating economic growth and preventing diminishing returns to physical capital accumulation.

Romer's and Lucas's work triggered research on the way technological progress affects economic growth. Three significant sources of growth are identified: new knowledge (Romer, 1990, Grossman and Helpman, 1991), innovation (Aghion and Howitt, 1992) and public infrastructure (Barro, 1990)[1]. As a result, and in contrast to the neoclassic counterpart, policies are deemed to play a substantial role in advancing growth on a long-run basis. Turning to the convergence/divergence debate, the endogenous growth models suggest that convergence would not occur at all (mainly due to the fact that there are increasing returns to scale). Apart from analysis at national level there have also been attempts to adapt endogenous growth theory to a regional context (see Magrini, 1997).

Another two strands of literature, possibly less influential and more oriented towards regions rather than countries, are the growth theory of cumulative causation and the New Economic Geography. Although originally proposed by Veblen (1915), the concept of cumulative causation was applied several decades after (Myrdal, 1957, Kaldor, 1970) in order to explain the different performance of economies. The main focus of this approach is the interregional interactions related to the growth process and their effect on national economic development. Essential to this theory is the argument of 'cumulative causation' in which initial conditions determine economic growth of places in a self-sustained and incremental way. As a result, the emergence of economic inequalities among economies is the most possible outcome and obviously, unconditional convergence does not take place. These theories are closely related with concepts such as agglomeration economies, growth poles, learning regions, and competitive advantage. Although there are centrifugal effects (positive spillovers) spreading growth from the more to the less advanced economies, they are incapable of bringing the system into a state of balance if market

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[1] It is important to note that these factors have already been identified in the literature before, but it is the first time that they are formalised and modelled.

forces alone are left at work. In other words, economic policy has to come into play to correct those imbalances. In contrast to theories mentioned above, theories of cumulative causation has a medium term view and often described as "soft" development theories due to a lack of applied mathematical rigour (Plummer and Taylor, 2001). However, certain similarities are evident between the cumulative causation approach and the theory of endogenous growth.

Similarly to the cumulative causation theory, New Economic Geography (NEG) asserts that economic growth tends to be an unbalance process favouring the initially advantaged economies (Kurgman, 1991, Fujita et al.,1999). However, in contrast to the former, this strand of literature develops a formalised system of explanations which places explicit emphasis on the compound effects of increasing returns to scale, imperfect competition and non-zero transportation costs. Given its basically microeconomic foundations, the emphasis is not on the economic system per ce but on the economic actors within economies. Central to this theory is that economic activity tends to agglomerate in a specific region and choose a location with a large local demand resulting in a self-reinforcing process. The spatial distribution of economic activity can be explained by agglomeration (or centripetal) forces and dispersion (or centrifugal) forces. The former include backward and forward linkages of firms, externalities and scaled economies while the latter include negative externalities, transport costs and intensification of competition. Consequently, NEG is mainly concerned with the location of economic activity, agglomeration and specialization rather that economic growth. However, growth outcomes can be inferred from its models.

3. Main determinants of economic growth

As mentioned before, a wide range of economic, social-cultural, political, demographical and institutional factors have been identified and proposed as possible determinants of economic performance. This section discusses the factors that have received attention in

the literature and presents the empirical findings of a number of key studies that focus their analysis on the international level.

3.1 Investment

Investment is the most fundamental determinant of economic growth identified by both neoclassical and endogenous growth models. However, while in the neoclassical model investment has impact on transitional period, in the endogenous growth models it may have more permanent effects. The importance attached to investment by these theories has led to an enormous amount of empirical studies examining the relationship between investment and economic growth. Nevertheless, the results are mixed.

Kormendi and Meguire (1985), examining 47 countries in the period 1950-1977, have found that investment-to-income ratio is critical for economic growth. De Long and Summers (1991) provided cross-country evidence that high levels of equipment investment for the period 1960-85 are linked to high levels of GDP per worker growth over this period, while non-equipment investment do not seem to relate to economic growth. In order to handle the problem of causality, the above researchers have used instrumental variables suggesting that investment drives growth. This finding, robust for a sample of both developed and developing countries, has opened a debate on the importance of investment in the economic growth process. Levine and Renelt (1992) have concluded that investment is one of the few robust factors affecting growth. The robustness of investment in cross-country regressions has also, been shown by Sala-i-Martin (1997). This positive and significant relationship has been found in a wide range of studies using both cross-section and panel analysis (e.g. Mankiw, 1992, Barro and Sala-I- Martin, 1995, Caselli et al., 1996, and Bond et al., 2001). However, such findings have been criticized for several reasons. Auerbach et al. (1994) criticize De Long and Summers's work on the grounds of empirical robustness problems, while Blomstrom et al. (1996) suggest that the causality link runs in the opposite direction for a sample of 101 countries. Podrecca and Carmeci (2001), using panel data, show that causality between

investment and growth runs in both directions, while Easterly (1997) finds an ambiguous role for investment using panel data analysis and a sample of 138 countries.

3.2 Human Capital, Innovation and R& D

Human capital, innovation, and Research and Development (R&D) are crucial and complementary determinants of economic growth, especially in the framework of endogenous growth theory. These are discussed next.

Human capital is the main source of growth in several endogenous growth models while it is one of the key extensions of the neo-classical growth model (see Mankiw et al., 1992). The term "human capital" refers principally to workers' acquisition of skills and know-how through education, training and experience. Moreover, advances in technological progress often have strong links with education via innovation. A wide range of variables has been used in order to measure the quality of human capital. Although human capital includes education, health and several other social aspects, the growth literature has, to a great extent, focused on education. Enrolment rates in primary and secondary school, adult literacy rates, highest level of education attained and (more recently) international mathematics and science test scores are some of the most used widely variables. However, the measurement of human capital is a very complicated task and a large number of scholars suggest that the result should be interpreted with caution.

At the international level, a large number of studies has found evidence suggesting that educated population is key determinant of economic growth. Barro (1991) showed a significant and positive link between growth rates of real GDP per capita and initial human capital (proxied by school-enrolment rates) for 98 countries in the period 1960-1985. Mankiw et al. (1992) provided similar findings approximating human capital with schooling enrolment rates of the labour force, as well as Brunetti et al. (1998), who measured human capital as secondary school enrolment for a sample of 73 countries. Interestingly, Barro and Sala-i-Marin (1995) found that higher education has the largest effect on growth compared to both secondary and primary schooling. More recently,

Hanushek and Kimko (2000), measuring the quality of education with tests of mathematics and scientific skills for a sample of 31 countries, reaffirmed the significant and positive link between education and growth. However, not all scholars came to the same conclusions. Levine and Renelt (1992), for instance, argued that secondary school enrolment is a fragile and not robust variable; Benhabib and Spiegel (1994) examining a sample of 78 countries suggested that changes in schooling capital are, virtually, unrelated to growth, and Pritchett (2001) found no significant and positive relation between schooling rates and economic growth. However, Topel (1999) asserted that those finding were biased due to the log specification of education in model whereas Krueger and Lindahl (2001) have specified the measurement errors that are responsible for the lack of a positive relationship.

Innovation and R&D activities can play a major role in economic progress increasing productivity and growth. This is due to increasing use of technology that enables introduction of new and superior products and processes. This role has been stressed by various endogenous growth models. Innovation activity can be measured by some indexes such as R&D investment and patent efforts like patent applications, patent grants and so on. However, all these measures are imperfect estimations of the innovation activity exhibiting a number of serious shortcomings (e.g. the fact that a large number of innovations are never patented). Fagerberg (1987) examining 25 industrial countries (19 OECD and 6 non-OECD) for the period 1960-1983 affirmed a close correlation between the level of economic growth and the level of technological development (measured through R&D or patent statistics). Lichtenberg (1992) investigating the impact of R&D expenditures on levels and the rate of growth of real GDP for a sample of 74 countries concluded that the link between R&D and growth is very strong. Finally, Ulku (2004) examining the impact of innovation on growth for a sample of 20 OECD and 10 non-OECD countries during the period 1981–97 with the use of panel-data techniques, found that innovation has a positive effect on per capita outputs for both group of countries but only developed (i.e. OECD) countries are able to increase their innovation by investing in R&D.

3.3 Economic Policies and Macroeconomic Conditions

Economic policies and macroeconomic conditions have, also, attracted much attention as determinants of economic performance since they can set the framework within which economic growth takes place. Economic policies can influence several aspects of an economy through investment in human capital (i.e. education, health) and infrastructure, trade policies, fewer distortions of private markets, improvement of political and legal institutions and so on, although there is disagreement in terms of which policies are more conductive to growth. Macroeconomic conditions are regarded as necessary but not sufficient conditions for economic growth (Fischer, 1993). However, in general terms, a stable macroeconomic environment may favour growth, especially, through reduction of uncertainty. Several macroeconomic factors with impact on growth have been identified in the literature. Much attention has been placed on inflation since it is considered that may have important adverse effects on long-run economic performance. Government fiscal policy is another macroeconomic factor that has been acknowledged in the literature. Large budget deficits or heavy tax burdens are capable of retarding growth by decreasing the private capital accumulation. In addition, macroeconomic instability may have a negative impact on growth through its effects on productivity and investment (e.g higher risk). Finally, financial systems may have strong impact on growth through different channels. For example, a well-functioning and efficient financial system may promote economic growth influencing the efficiency with which savings are transformed into investment and leading to increased productivity and faster growth (Levine and Zervos, 1993). Some of the most frequently used measures in empirical analysis are government size, price (in)stability, cyclical volatility of GDP, external imbalances and risk of balance-of-payments crises.

Several studies have sought to quantify the effect of governmental policies and macroeconomic factors on economic growth. Kormendi and Meguire (1985) using data from 47 countries in the period 1950-77, found a negative effect of both inflation growth and of the monetary variance on economic growth, and no evidence that growth in the ratio of government consumption to output adversely affects economic growth. Grierand

and Tullock (1989) have indicated a significant negative correlation between growth of government consumption and GDP growth. Similarly, Barro (1991) found that price distortions and the share of government spending (excluding defence and education) in total GDP are negatively related to growth while government investment has no statistically significant effect on it. Fischer (1993), applying cross-sectional and panel regressions, showed that growth is negatively associated with inflation, black market premium on foreign exchange and government deficits. He also concluded that a stable and sustainable fiscal policy is crucial for the development of a robust macroeconomic framework. King and Levine (1993a) using a sample of 80 countries show a significant link between the level of financial development and the level of growth. Levine and Renelt (1992) showed that high growth is associated with lower inflation, while Barro (1997) reaffirmed the strong and negative link between inflation and economic growth. Furthermore, Levine and Zervos (1993) showed that a negative relationship exists between government consumption to GDP and growth, though it is insignificant. Easterly and Rebelo (1993) employing both cross-section data for 100 countries in the period 1970 to 1988 and historical data for 28 countries in the period from 1870 to 1988, made evident that investment in transport and communication and the government's budget surplus are consistently correlated with growth while the effects of taxation are difficult to isolate empirically. Finally, Barro and Sala-i-Martin (1995) concluded that educational expenditures by governments have a very strong positive impact on growth.

3.4 Openness to Trade

Openness to trade has been used extensively in the economic growth literature as a major determinant of growth performance. There are sound theoretical reasons for believing that there is a strong and positive link between openness and growth. Openness affects economic growth through several channels such as exploitation of comparative advantage, technology transfer and diffusion of knowledge, increasing scale economies and exposure to competition. Foreign Direct Investment (FDI) has recently played a crucial role of internationalizing economic activity and it is a primary source of technology transfer. This major role is stressed in several models of endogenous growth

theory. Openness is usually measured by the ratio of exports to GDP. However, another measure, maybe more appropriate, is proposed by Sachs and Warner (1995). According to this, an economy is considered to be quite open if it satisfies the following five criteria: (a) average quota and licensing coverage of imports are less than 40%, (b) average tariff rates are below 40%, (c) the black market premium is less than 20%, (d) no extreme controls are imposed on exports, and (e) the country is not under a socialist regime. Despite its shortcomings, exposed by Rodriguez and Rodrik (1999), the index proposed by Sachs and Warner remains the most often used.

There is a substantial and growing empirical literature investigating the relationship between openness and growth. On the one hand, a large part of the literature has found that economies that are more open to trade and capital flows have higher GDP per capita and grew faster (Dollar, 1992, Sachs and Warner, 1995, Edwards, 1998, Dollar and Kraay, 2000). On the other hand, several scholars have criticized the robustness of these findings especially on methodological and measurement grounds. For example, Rodriguez and Rodrik (1999) after re-examining the work of Dollar, Sachs and Warner, and Edwards came to the conclusion that the aforementioned relation can not be sustained, since it heavily depends upon the index used and the methodology adopted. Similar evidence has been presented by Levine and Renelt (1992) who, by employing several trade indicators have questioned the robustness of the relation between openness and growth. So did Kormendi and Meguire (1985), who argued that countries which become increasingly open did not necessarily experience greater economic growth. Interestingly, Vamvakidis (2002), using historical data from 1870, came to the conclusion that since no positive correlation between openness and growth exists before 1970, this is only a recent phenomenon.

The empirical literature examining the impact of FDI on growth is also inconclusive. Borensztein et al. (1998), for instance, examined the relation between FDI and economic growth and the channels through which FDI might be conductive to growth. Using data on FDI flows from industrial countries to 69 developing countries over the period 1970-1989, they found a positive and significant link only for those countries that had

accumulated a minimum threshold stock of human capital. Hermes and Lensink (2003) using a sample of 67 developing countries in the period 1970-95, argued that the development of the financial system is a crucial precondition for a positive link between FDI and economic growth. Lensink and Morrissey (2006) applying both cross-section and panel-data analysis for 88 countries in the period 1970-1997, corroborated the positive and significant link but they attested not sensitivity to other explanatory variables such as human capital. Finally, Blomstron et al. (1992) indicated that FDI has a positive impact on growth only in higher income countries.

3.5 Institutional factors

Another important source of growth highlighted in the literature is the institutional framework. Although the important role institutions play in shaping economic performance has been acknowledged long time ago (Lewis, 1955, Ayres, 1962), it is not until recently that such factors have been inserted into formalised models. The term "institutions" refers to the formal rules, informal constraints and their enforcement characteristics that together shape human interaction (North, 1990). Rodrik (2000) highlights five key institutions: property rights, regulatory institutions, institutions for macroeconomic stabilization, institutions for social insurance and institutions of conflict management. All these factors exert influence directly on economic growth, as well as on the other determinants of growth such as the physical and human capital, investment, technical changes and economic growth process. For instance, a clear system of laws and property rights reduces transaction costs and uncertainty, attracts investment, and creates an environment conducive to economic growth while, in contrast, corruption may have adverse effect on growth through improperly allocation of human capital or less receiving on foreign direct investment. It is on these grounds that Easterly (2001) argued that none of the traditional factors would have any impact on economic performance if there had not been developed a stable and trustworthy institutional environment. The most frequently used measures of the quality of institutions in the empirical literature include government repudiation of contracts, risk of expropriation, corruption, the rule of law and bureaucratic quality (Knack and Keefer, 1995).

At the empirical level, until recently, there had been a lack of cross-country analysis, mainly, due to a lack of data. However, over the last years, a growing body of empirical literature has emerged using a number of variables that try to measure the quality of the institutional framework. All these studies have affirmed the strong and robust link that exists between institutions and economic performance. Knack and Keefer (1995), for example, examining 97 countries for the period 1974-1989, found a strong positive relation between economic growth and security of contracts and property rights. A positive relationship between intellectual property rights and economic growth has also been found by Park and Gunarte (1997). On a similar basis Acemoglu and Johnson (2003) asserted that property rights institutions have a first-order effect on economic growth while Acemoglu et al. (2002), investigating causation between institutions and growth, made clear that higher institutional quality is associated with higher per capita income and lower macroeconomic volatility. The same conclusions are also provided by Hall and Jones (1999), Mauro (1995) and Rodrik (1999) who found a positive link between measures of institutional quality and economic growth. Finally, Easterly and Levine (2001) showed that policies and geography do not have a major effect on incomes, once institutions are controlled for.

3.6 Political factors

The relation between political factors and economic growth has come to the fore by the work of Lipset (1959) who examined how economic development affects the political regime. Since then, research on the issues has proliferated making clear that the political environment plays an important role in economic growth. At the most basic form, political instability would increase uncertainty, discouraging investment and eventually hindering economic growth. The degree of democracy is also associated with economic growth, though the relation is much more complex. Thus it has been stated (Alesina et. al., 1994) that democracy may both retard and enhance economic growth depending on the various channels that it passes through. In the recent years a number of researchers have made an effort to measure the quality of the political environment using variables

such as political instability, political and civil freedom, and political regimes. Brunetti (1997) distinguishes five categories of relevant political variables: democracy, government stability, political violence, political volatility and subjective perception of politics. These factors are difficult to be measured directly and are usually proxied by some indirect variables.

Kormendi and Meguire (1985), Scully (1988) and Grier and Tullock (1989) are among the first researchers that explored the impact of political factors on economic growth in a cross-country framework focusing on civil liberty variables. Kormendi and Meguire, using a sample of 47 countries for the period 1950-77, showed that civil liberty has a marginal negative effect on growth but an important effect on investment. Scully (1988) studied 115 market economies and found mixed results which had been attributed to endogeneity problems. Grier and Tullock (1989), in turn, indicated a negative relationship between political factors and growth for the continent of Africa but no relationship for the Americas and Asia, during the period 1951-1980. Furthermore, Barro (1991), using a sample of 78 countries in the period 1960-1985, showed that political instability measured by the number of political assassinations and the frequency of revolutions and coups, is inversely related to economic growth. This view was supported by Alesina and Perotti (1996) who used other measures of political instability for the same time period with a sample of 70 countries. However, Levine and Renelt (1992) examined 83 countries without finding any robust relationship. Finally, Lensink et al. (1999) used a sample of about 100 countries for the period 1970-1995, and found a negative relationship between policy uncertainty and economic growth, arguing that the impact of the former depends on the development of the financial sector. Actually, the higher the level of financial development, the lesser is the negative impact of policy uncertainty on economic growth. This conclusion is robust to different measures of uncertainty. Similar conclusions have also been found by Lensink (2001) for the period 1970-1998.

3.7 Socio-cultural factors

Recently, there has been a growing interest in how various social-cultural factors may affect growth (see Huntington, 1996, Granato et al., 1996, Landes, 2000, and Inglehart and Baker, 2000). Several social-cultural factors have been put under scrutiny, including ethnic composition and fragmentation, language, religion, beliefs, attitudes and conflicts. However, the direction and strength of relationship in unclear since most of these factors affect growth indirectly. Thus, on the one hand, cultural diversity may have a negative impact on growth due to emergence of social uncertainty or even of social conflicts. On the other hand, cultural diversity may give rise to a pluralistic environment where cooperation can flourish leading to economic growth. Trust is another variable employed to measure the quality of the socio-cultural environment. Trusting economies are expected to have stronger incentives to innovate, to accumulate physical capital and to exhibit richer human resources, all of which conductive to economic growth (Knack and Keefer, 1997). Ethnic diversity, in turn, may have a negative impact on growth by reducing trust, increasing polarization and promoting the adoption of policies that have neutral or even negative effects in terms of growth (Easterly and Levine, 1997).

At the empirical level, Knack and Keefer (1997) using indicators of trust and civic norms for a sample of 29 market economies, showed that these indicators have a strong and positive association with growth (although other social factors, i.e. associational activity and membership in groups , were found to be insignificant). So did Zak and Knack (2001) who used a larger sample of countries and longer time period. Similarly, Granato et al. (1996), using cross-sectional analysis for 25 countries over the period 1960-1989, came to the conclusion that cultural attitudes, such as achievement motivation and post-materialism, are crucial determinants of economic growth. Temple and Johnson (1998), used the Adelman-Morris index of socioeconomic development, constructed in the early 1960s, to show that "social capability" has a major impact on economic growth. Interestingly, they also pointed out that this index can also be used in predicting growth. Easterly and Levine (1997), employed cross-sectional analysis to test the hypothesis that ethnic diversity influences economic growth. What they found was a strong and negative link. Finally, Barro and McCleary (2003) explored the impact of religion on the economy at the international level (using data from 1960 onwards), to find a positive association

between economic growth and religious beliefs and a negative link between economic growth and church attendance.

3.8 Geographical factors

The important role of geography on economic growth has been long recognized. Though, over the last years there has been an increased interest on these factors due to the fact that it was not until recently that they have been properly formalised and entered into econometric cross-country models (Gallup et al., 1999). As classical economics have stated, natural resources, topography and climate have a direct impact on economic growth affecting (agricultural) productivity, economic structure, transport costs and competitiveness (Sachs and Warner, 1997, Bloom and Sachs, 1998). Tropical climatic conditions, for example, may encourage the spread of diseases that lower workers' health and productivity levels while "landlockedness" may inhibit exports and economic competitiveness. Researchers have used numerous variables as proxies for geography including absolute values of latitude, distances from the equator, proportion of land within 100km of the coast, average temperatures and average rainfall, soil quality and disease ecology. (Hall and Jones, 1999, Rodrik et al., 2002, Easterly and Levine, 2003).

A number of empirical studies have attempted to quantify geographical conditions and to explore their impact on growth. Hall and Jones (1999) found a positive correlation between the absolute value of latitude (closely related to tropical climate) and the level of per capita income in a cross-section of countries. Gallup et al. (1999) for a broad sample of countries over the period 1965-1990 showed that location and climate can explain, to a great extend, the per capita income variation. Masters and McMillan (2001) stressed the positive effects of winter frost on agricultural productivity and, ultimately, on economic performance. Armstrong and Read (2004) examined the economic performance of 127 small states with population size fewer than five million and showed that remoteness from global markets, landlockedness and tropical climate have negative impact on growth. However, they did not find evidence that the small size of these states is a barrier to high per capita income levels. Turning to natural resources, Sachs and Warner (2001)

found that countries with more natural resources grow at a slower rate than countries with fewer natural resources. A number of explanations have been put forward with regard to this paradox, which is known as the "resource curse", placing emphasis on overvalued exchange rates, wasteful consumption, public investment behaviour and high uncertainty due to declining prices of natural resources (Asea and Lahiri, 1999, Sala- i-Martin and Subramanian, 2003). However, other studies contradicted the existence of this negative relationship (Sala-i-Martin, 1997, Hall and Jones, 1999, Bravo-Ortega and De Gregorio, 2005). Finally it is important to mention that there had been some studies (e.g. Rodrik et al. (2002) and Easterly and Levine (2003)) which found no effect of geography on growth after controlling for institutions.

3.9 Demographic factors

The relationship between demographic trends and economic growth has attracted a lot of interest for many decades although only recently the inclusion of demographic variables has been incorporated in cross-country empirical literature. Yet, many demographic aspects remain today unexplored. Of those examined, population growth, population density, migration and age distribution, seem to play the major role in economic growth. High population growth, for example, could have a negative impact on economic growth influencing the dependency ratio, investment and saving behaviour and quality of human capital. The composition of the population has also important implications for growth. A large working-age population is deemed to be conductive to growth, whereas population with many young and elderly dependents is rather an impediment. Population density, in turn, may be positively linked with economic growth as a result of increased specialization, knowledge diffusion and so on. Migration would affect growth potential of both the sending and receiving countries.

There have been a number of empirical studies that examined the impact of demography of growth. Grierand and Tullock (1989), using pooled cross-section/time-series data on 113 countries for the period 1950-81, did not find a significant impact of population growth on economic growth, while Kormendi and Meguire (1985) showed a significant

and positive link. Barro (1997) indicated that a decrease in the total fertility rate considerably increases the long run growth potential of a country. Pritchett (1996) using cross-country time-series data concluded that there is no correlation (or at least there is weak negative correlation) between economic growth and population growth. Brander and Dowrick (1994) examined the impact of population growth and fertility on economic growth for a sample of 107 countries during the period 1960-85 to point out a strong and negative link between birth rates and economic growth. Kelley and Schmidt (1995) found a strong and positive effect of declining youth dependency ratios on economic growth, while they showed that the negative link between population growth and economic growth depends on the time period of the analysis. Similar arguments have been expressed by other researchers such as Bloom and Williamson (1998). These scholars, moreover, have found a strong impact on growth by other demographic variables such as age distribution and population density. Furthermore, several studies suggested that initial life expectancy has a positive and significant influence on the pace of subsequent economic growth (Barro and Sala-I-Martin 1995; Sachs and Warner 1995). Finally, Kelley and Schimdt (2000) showed that larger populations, higher densities and declining population growth, fertility and mortality affect positively the per capita GDP in the period 1960-1995, for a sample of 86 countries, although these finding are not deemed to be universal.

4. Empirical Evidence

This section presents the findings of a wide range of empirical econometric studies that have been carried out over the last few years (using either cross-section or panel data approaches) where the dependent variable is the rate of economic growth. These studies are classified on the basis of the geographical location of the countries examined.

Before turning to the presentation of the studies it is considered important to point out some of the weaknesses of the econometric analysis in order to make clear its breadth and scope.

4.1 Qualifications of cross-country regression analysis

Even since 20 years ago, where the seminal studies of Kormendi and Meguire (1985), Grierand and Tullock (1989) and Barro (1991) had been conducted, it was made evident that econometric analysis can provide a rigorous and robust way to explore the determinants of economic growth. However, this approach suffer from a number of weaknesses which are addressed in this section.

An important weakness of cross-country regressions is the uncertainty of the developed models resulting from the high volume of independent variables (and factors) examined The problem is caused, to a great extent, by the absence of unifying, generally-accepted, formal theory of economic growth. As a result, determinants have mutli-theoretical bases, drawn, in many cases, from other than economics disciplines such as political science and sociology. In other words, econometric analysis rather than theory indicates which determinants of economic performance are important, something which is heavily affected by the combination of variables that put into the regression analysis. Up to now, the number of determinants that have been used in the empirical literature is over 150 and the majority of them has been found to be statistically significant (Duraluf et al., 2005). However, Levine and Renelt (1992) conclude that very few of them are robust and capable of explaining the long run growth rate, using a version of Leamer's (1985) extreme bounds analysis and a cross-section of 119 countries during the period 1960-1989. On the contrary, Sala-i-Martin (1997) expresses the view that the criterion employed by Levine and Renelt is too restrictive for any variable to pass the test. When a less restrictive criterion is used, the number of variables that are strongly related to growth increases substantially.

Some other significant weaknesses of the econometric analysis include parameter heterogeneity, outliers, endogeneity, measurement errors and error correlation. Heterogeneity is closely related with the basic hypothesis of cross-country regression analysis that growth qualities are the same for any country. However, this is the exception

rather than the rule. Panel data models with stochastic parameters could give a reliable solution but they demand more time series data. Outliers may also be a problem and it demands caution in interpreting results or selecting regression samples. A solution here is robust estimation procedures. Measurement errors is another issue, which is related to measurement imprecision of the factors examined. Although proxies are generally used, the danger of erroneous interpretations is apparent. Sensitivity analysis can be applied to reduce such effects. Endogeneity, closely related with model uncertainty, is a serious problem because several variables are bi-directional leading to causation links. The use of instrumental variable may alleviate, but not completely eliminate, this problem. Finally, error correlation exists since the disturbances in regressions may not be interpedently distributed. A reliable solution includes the use of spatial econometric methods (Anselin, 1998).

4.2 Empirical studies

CHINA

China, the most populous country, has presented an unprecedented economic expansion during the last two decades but, at the same time, has experienced huge spatial imbalances in the inside. In this perspective, the determinants of economic growth are seen with great interest. Several studies have been carried out recently, in order to examine the factors driving economic growth at the regional level. Chen and Feng (2000) focused analysis on 29 provinces (excluding 2 provinces) for the time period 1978-1989, applying cross-section analysis. It was found that private and semi-private enterprises, higher education (university enrolment as a percentage of population) and international trade are positively correlated with provincial growth. In turn, high fertility, high inflation, and the presence of state-owned enterprises (SOE) are found to be negatively correlated with provincial growth. Phillips and Chen (2004) investigated the sources of growth in 30 provinces of China in the period 1978-1999 using panel data econometric approach. Variables that had been found to be robustly positively correlated with provincial growth are innovation capital, bank deposit to GDP ratios, primary schooling

and phones per capita. Population migrating into a province, SOE's industrial output, SOE's staff and workers as percentage of total employment were found to be negatively correlated to growth rates. Remarkably, infrastructure investment, human capital as higher education teachers and openness were shown to be negatively correlated to growth.

Li et al. (1998) and Wei et al. (2001) tested the neoclassical and the endogenous growth models respectively for the case of China. Li et al., applying cross-section analysis for the period 1978-1995, found that the augmented Solow-Swan model works well. The growth rates of GDP per capita were correlated positively both with openness to foreign countries and investment in physical and human capital, while they were correlated negatively with population growth. However, this finding was not proved robust when the analysis used panel data methods (some variables either reversed their signs or ceased to be significant). Wei et al., using panel data for 27 provinces for the time period 1986-1995 showed that R&D investment, FDI, domestic capital investment and labour force were all positively related to economic growth, while human capital, although positive, was insignificant in all specifications.

Bao et al. (2002) investigated the effect of geography on regional economic growth in Chinese provinces during 1978-1998, indicating that geographic factors are more important than previously thought since they can explain more than 60% of the variation in growth. Among them, the effect of coastline length (as a proxy for FDI and other capital flows, as well as the labour and human capital inputs) were proved the most significant, followed by the proportion of the population within 100 km of the coastline or ocean-navigable waterway. The effects of distance and elevation, however, were relatively weak. Demurger et al. (2002) quantified the relative contributions of geography and preferential policy for Chinese provinces during the period 1979-1998, replacing the regional dummies (which are commonly used in the literature) with a measure of the ability to participate in international trade (geography) and a preferential policy index (policy). They showed that geography and policy variables had almost equal influence on

coastal regional growth, although geography affected growth with a much longer lag than policy.

Sandberg (2004) examined 30 provinces during the period 1985-2000 with spatial econometric approaches, to conclude that the distribution of industrial enterprises, FDI, infrastructure and governmental preferential policies are major sources of provincial growth in China. In contrast, human capital and transport capacity were not found statistically significant. Chen and Wu (2005) focused on 29 provinces during the period 1988-1998 employing pooled cross-section and time-series data analysis. The variables relating to employed population, changes in property rights and FDI, found to have a positive impact on economic growth, whereas the fixed assets variable and those relating to technological progress (human resources, R&D activity) were not statistically significant to growth. Ying (2003), employed cross-sectional analysis corrected for spatial autocorrelation with a sample of 30 provinces for the period 1978-1998, to conclude that important determinants of growth are the growth of non-farm labour force, manufactured products, capital stock, and realized FDI. Dacosta and Carroll's (2001) study, for the period 1978 to 1996, indicated that variables like physical capital, openness, township and village enterprises had a positive effect on growth, the population growth rate had a rather negative one, while human capital investments (measured by school enrolment) and natural resources found to be insignificant. Wu (2005) investigated the impact of region-specific factors on China's growth for the 1980s and 1990s. For technical reasons, he conducted his analysis in two periods (1982-1990 and 1991-1997) using panel data methods. Eight region-specific factors were examined: capital formation, initial income, infrastructure, labour productivity, economic reform, openness, human capital and foreign investment. All these factors, with the exception of initial income, were found to be correlated positively and significantly with growth, accounting for 70–90% of it. Finally, Fleisher et al. (2005), applying a two-stage least squares (2SLS) model for a sample of 28 provinces in period 1986-2003, indicated that FDI and human capital are positively related to Total Factor Productivity (TFP) growth, while there has been no evidence of any direct impact as regards the infrastructure capital.

INDIA

Nagaraj (1998) examined the growth performance of 17 Indian States during 1970-94, using panel data approaches. His main conclusion was that the structure of production, the infrastructure endowments, and the state-specific fixed effects in the growth regression are crucial factors determining income dynamics. Fixed effects were supposed, to reflect differences in the institutional and political environments, differences in technology and in the availability of natural resources. Adabar (2003) employing dynamic fixed effects panel growth regression for a sample of 14 major states of India from 1976 to 2000, showed that per capita investment, population growth rate and human capital along with state-specific effects are all crucial factors in regional growth process, confirming the augmented neoclassical model.

Sachs (2002) investigated the factors that determine regional growth for the 14 most populous states in Indian during the period 1980-1998. The set of factors that can explain the divergent growth pattern includes, except initial condition, a dummy variable for the Green Revolution, urbanization and a dummy for the Rajasthan state as an outlier. Ahluwalia (2000), investigating 14 states in the post reform period (1991 to 1999), concluded that private investment rate, literacy rate, telephone density, proportion of electrified villages and per capita energy consumption are all positively correlated with growth. Purfield (2006) examined the determinants of growth over the period 1973-2003 for 15 Indian states. The results showed that state-level polices are a key factor influencing the pattern of economic growth. Greater private sector investment, smaller governments, and better state-level institutions were found to be positively associated with growth performance. Fukumi (2004) focusing on the period 1980-1997, postulated that the development expenditures by the state had a positive impact on growth while social diversity (in terms of caste and religion) was negatively related to the development expenditure. On these grounds, he concluded that social diversity retards economic performance through the channel of the expenditure policies undertaken by the Indian state. Bandyopadhyay (2003) using an alternative method (distribution dynamics approach) for the period 1965-1998 showed income dynamics to be explained by the

disparate distribution of infrastructure and to a lesser extent by fiscal deficit and capital expenditure patterns. Finally, Abler and Das (1998) used state-level data from India in the period 1961- 90, to come to the conclusion that population growth and capital share are negatively correlated with growth.

REST OF ASIA

Guha-Khasnobis and Bari (2000) examined the determinants of growth in South Asia (India, Pakistan, Bangladesh, Sri Lanka and Nepal) in comparison with those of East Asia. Using cross-section analysis, they found that openness (measured by the Sachs-Warner index) explains a lot of the difference between the growth experiences of East and South Asia. However, the use of an alternative index (based largely on tariff rates prevailing in a country) was found insignificant. Furthermore, human capital, strength of institutions and government spending were positively correlated with growth whereas high fertility rates were correlated negatively. De Gregorio and Lee (2004) comparing the growth performance of East Asia and Latin America during 1970-2000, showed that the difference in growth can significantly be explained by differences in investment rate, human resources, fertility, institutional quality, macroeconomic stability and the degree of trade openness. Radelet et al. (1997) indicated that initial conditions, economic policies, structural factors, and favourable demographic changes are crucial determinants for the East Asian rapid economic growth. Bloom et al. (2000), investigating the relationship between demographic change and economic growth in Asia during 1965-1990, found that the overall rate of population growth had insignificant impact on growth but changes in life expectancy, age structure and population density were significantly correlated. Seguino (2000) examined the gender inequality as a main determinant of economic growth in Asian economies. Data covered the period 1975-95 using both cross-sectional and panel data analysis with a sample of 20 countries. The results showed that those Asian economies with the widest wage gaps between men and women grew the most rapidly. Labour supply and human capital are important determinants but less robust.

ARABIC WORLD

In the Arab world, Makdisi et al. (2000) studied the determinants of growth in the 21 countries since 1960, employing cross-country regressions and comparing the performance of these countries with these of East Asia (6 countries), Sub-Saharan Africa (15 countries) and Latin America (17 countries). They found that investment ratio, openness and human capital explain the low growth performance of the Arab countries, relative to the high performing East Asian group, while human capital, is the factor that explains the lower performance of the Arab countries in respect to Latin America. Furthermore, it was found that the quality of physical and human capital, rather than their quantity, can explain the relatively lower Arabic growth performance. Another study on Arab countries' growth determinants (Elbadawi, 2005) concluded that there are three sets of factors which prove significant: (1) location and ecology (which are associated with export competitiveness, attractiveness to FDI and the productivity of agriculture), (2) demography (referred mainly to a young-population growth) and (3) regional and civil conflicts (which have multiple direct and indirect negative consequences for development).

AFRICA

Africa's economic performance has recently received much attention in the literature. Many studies sought to explain the growth "tragedy" in Sub-Sahara Africa. Sachs and Warner (1997) presented one of the most comprehensive analysis of the sources of slow growth in Sub-Saharan Africa over the period 1965-1990. They suggested that slow growth could be explained in an international cross-country framework, without the need to invoke to a special explanation. They found that poor economic policies, such as openness to international trade, government saving and market-supporting institutions, are the key reasons behind the region's slow growth. In addition, geographical factors, such as lack of access to the sea, natural resource abundance and tropical climate, have also contributed to Africa's slow growth. Easterly and Levine (1997) studied the economic growth process in Sub-Saharan Africa during a period of 30 years to find that

low levels of education, political instability, poor financial development, large black market premiums, large government deficits, low provision of infrastructure are significantly and negatively correlated with economic growth. In addition, they showed that, Africa's high ethnic diversity lies behind the aforementioned characteristics and consequently it is a crucial determinant of growth. Masanjala and Papageorgiou (2003) examined whether determinants of economic growth are the same in Africa compared to the rest of the world. Using the Bayesian Model Averaging methodology, they showed that the determinants of growth in Africa are strikingly different from the rest of the world. Institutional variables proved particularly important in explaining African growth. Bloom and Sachs (1998) examining the factors that have hindered African economic growth, indicated that tropical geography, demography and public health are among the most important ones. On these grounds they concluded that "non-economic" conditions can explain about two-thirds of the regions' growth, whereas economic policy and institutions counts for the rest one-third.

Naudé (2004) examined the determinants of Africa's poor economic performance for the period 1970 to 1990, using both single period cross-section data and panel data. The main conclusion was that literacy, investment, FDI and urban agglomeration have a significant positive effect on GDP per capita growth while the latter is negatively affected by government expenditure, settler mortality, malaria, landlockedness and land-area. Azam et al. (2002) came to the conclusion that macroeconomic factors such as inflation, macroeconomic uncertainty, regional factors and human capital play a major role in the economic performance of African countries. Naudé and Krugell (2004) examined the determinants at sub-national level in South Africa, using a dynamic panel data model for 354 magisterial areas in the period 1998 to 2002. They showed that geography, human capital, export propensity and the capital stock of municipalities (reflecting institutional quality and governance on local government level) can explain the variation of economic growth rate. Earlier research by the same authors (2002) looked over the same local areas but for the period 1990 to 2000 (using not panel approach but cross-sections) to testify that the most significant determinants of growth are the initial unemployment, stocks of human capital and distance from harbours. Makdisi et al. (2000) explored the factors

affecting growth in the Middle East and North Africa (MENA) countries in comparison to other regions of the world over the period 1960-1998. The main conclusion was that, contrary to the rest of the world, physical capital is less efficient, the natural resource curse is more pronounced, trade openness is less beneficial, the impact of adverse external shocks is higher and the effect of output volatility on growth is more detrimental.

USA

In a seminal study, Richardson (1974) examined the determinants of regional growth at the state level, using gross state product for the period 1955-64 and drawing upon 28 independent variables. The results of this study were mixed. On the one hand, it was found that per capita income growth, locational preferences, migration, federal government spending and recreational expenditures have significant positive effect on growth. Oh the other hand, various plausible variables such as education, scientific and technical personnel, profit rate, gross savings, unemployment and air pollution either were insignificant or have a "wrong" sign. Richardson concluded that the regional growth process is a highly complex and interrelated phenomenon than that implied by the simple growth models. More recently, Crihfield et al. (1995) used a neoclassical growth model, augmented with public-sector and human capital, in order to analyze regional growth across the 50 states over the period 1955-1987. The model showed that growth in per-capita income increases with rates of investment, decreases with population growth and depreciation rates, and public-sector investment plays an ambiguous role. Connaughton (2004) examined growth during the 1950-2000 period and showed that the percentage of the population that lives in urban areas, the percentage of the population with a four-year college degree, and the percentage of the population employed in the service sector play a major role in growth process, while the racial composition of state populations do not.

Rupasingha et al. (2002) assessed the contribution of differences in social and institutional variables on growth rates for the period 1990-1997, indicating that social and institutional factors do matter in economic growth process. Ethnic diversity and higher levels of social capital have a positive effect on economic growth rates, while higher

levels of income inequality are associated with lower rates of economic growth. Furthermore, investment in human capital, accessibility and adjacency to urban areas proved beneficial to economic growth in counties. Morshed (2004), using cross-sectional analysis for 48 contiguous states over the period 1969-2000, found that geography, institutions and resource abundance are crucial determinants of income variation, although, there is no clear dominance of one factor over the others. Akai and Sakata (2002) testified that fiscal decentralization contributes to economic growth, examining 50 states of USA from 1992 to 1996. Finally, Monchuk et al (2005) focusing analysis on 734 regions of Midwest over the period 1990-2001, found that the state and local tax burdens, the amount of primary agricultural activity, recreational amenities and demographics are all important determinants of economic growth.

REST OF AMERICA

Gregorio (1992) examined growth determinants in 12 Latin American countries during the period 1950-1985 using panel data analysis. He concluded that investment is one of the main determinants of growth but its components have a differential impact since foreign investment appears to be more efficient than domestic investment. Other factors positively correlated with growth are the degree of political stability (measured as an increase in civil and political rights) and human capital (measured by literacy rates). However, human capital, measured by school enrolment indices, found to have no positive relationship with growth, whereas inflation and government consumption were negatively correlated to growth. Finally, the degree of openness of the economy, the terms of trade and the distribution of income were found to be insignificant. Cole et al. (2005) showed that stagnant TFP is the key explanation behind the fact that Latin American regions did not followed the growth patterns of the West. This stagnation was attributed to competitive barriers rather than to low quality of the human capital. Astorga et al. (2005) investigated the relative contribution of endogenous and exogenous factors in GDP and productivity growth in each of the six larger Latin American economies for the period 1900-2000. Applying an innovative approach, they found that resource allocation, advances in health and education and increased investment effort have a

positive effect on growth, while trade volatility, trade and interest rate shocks have a significant negative one. Loayza et al. (2005) showed that economic growth in Latin America increases with structural policies, improvements in education, financial depth, trade openness and investments in public infrastructure, while it decreases when governments impose excessive burdens on the private sector.

For Mexico, Oreggia (2005) examined which factors could affect regional growth for 32 states over the period 1970-2000 using cross-section analysis. The variables employed were human capital, stock of private capital and public infrastructure and share of the GDP accounted for by the primary sector. Different sets of regressions were carried out in order to measure the sensitivity of the variables in two time periods: 1970-1985 and 1985-2000. However, none of these factors proved significant in different set of regressions and in the different time periods. Chiquiar (2004) investigated the divergent growth pattern of regions for the period 1970–2001. Explanations that found significant were levels of human and physical capital and infrastructure (communication and transportation). Díaz-Bautista (2003) indicated that, over the period 1970-2000, human capital was a crucial factor of regional growth, whereas R&D spillovers were not. Decuir -Viruez (2003) tested the importance of institutional factors for the period 1994-2000. It was found that economic freedom has the most crucial impact on regional growth followed by social capital and trust. Finally, Ferreira (2000) examining 25 states in Brazil during the period 1970-1995, found that the initial income level, the rate of investment, average schooling, the rate of growth of the labour force and the rate of participation of the labour force explain a substantial amount of growth variation. All factors were positively correlated to growth, apart from initial income level and labour force growth rate that are correlated negatively.

EUROPEAN UNION (15)

Fagerberg et al.(1997) explored the determinants of European growth in the 1980s for a sample of 64 regions (from four countries). He showed that innovation and the diffusion of technology are significant factors, while there has been a negative relationship between

growth and unemployment. Magrini (1998) analysed the growth process of 122 European Functional Urban Regions (FURs) during the period 1979-1990. He found that research activities (especially the existence of universities) have a positive and significant effect on regional growth. In addition, it became evident that regions characterised by a higher degree of sectoral specialisation have grown faster than regions with a more diverse industrial structure. Badinger and Tondl (2002) investigating the growth factors of 128 EU regions in the period 1993-2000, concluded that accumulation of physical and human capital, innovation activity, international technology transfer and high foreign trade share are all crucial determinants of growth. Sterlacchini and Venturini (2006) analysed the economic performance of 150 developed European regions (NUTS II-10 countries) during the period 1995-2002. Using a set of knowledge base indicators, they showed that the change of GDP per capita was positively affected by population density and especially by the intensity of R&D and the share of adults with tertiary education. Kaldewei and Walz (2001) with a sample of 139 regions (NUTS-2) over the period 1980-1996, indicated that human capital, the size of the regional financial sector and agglomeration effects are all positively and significantly correlated with growth rates. However, they did not find empirical evidence of the role of investment and migration (both of which were emphasised by the neoclassical model) whereas the effects of transport costs were unclear. Beugelsdijk and Noorderhaven (2004) examined the relationship between entrepreneurship and economic growth using the European Values Studies (EVS) dataset on norms and values in 54 European regions. They found that regions with a culture that can be characterised as 'entrepreneurial' grow faster than the rest. Tondl (1999) focused analysis on the cohesion countries (Greece, Spain, and the Italian South) and Mezzogiorno for the period 1975 to1994 using panel data approach in a sample of 38 regions. The conclusions drawn from analysis indicate that the income level is primarily determined by employment/educational levels and past public investment, while the impact of private investment is not significant. Brodzicki (2005) studied the growth effects of economic integration within the EU. Using data for 27 advanced economies from 1960 to 1999 and the General Method of Moments (GMM) approach, he concluded that there is a positive long-term relationship between economic integration and growth rates of real GDP per capita while in the medium term this link is

negative. Badinger (2001) found a positive link between trade and economic growth, pointing out that GDP per capita would be approximately one fifth lower today, if no integration had taken place in EU since 1950.

Many studies explored growth determinants at a national level. De la Fuente (1997) researched the regional growth process in Spain during the period 1964-1991, showing that technological diffusion, human capital and employment are its three main determinants. Bajo-Rubio and Díaz-Roldán (2005) assessed the impact of FDI on economic growth of 17 Spanish regions from 1987 to 2000 but they were unable to establish a strong positive link. Similarly, Carbo et al. (2003) did not find any significant relationship between financial sector competition and regional economic growth, for five large regions in Spain over the period 1986–1998. Di Liberto (2005) examined NUTS II Spain regions during the period 1963-1997, to suggest the existence of a positive link between human capital and growth only for the more developed regions. Garcia-Milà and McGuire (1996) tested the relationship between grants from central government and the European Union and economic performance of 17 Spanish regions. They found no-positive link. Usai and Vannini (2005) using panel regressions with fixed effects for the 20 Italian regions from 1970 to 1993, showed that the size of financial sector has an insignificant impact on growth. Cooperative banks and special credit institutions have had a positive impact on growth, while the large private banks and public law banks had negative or insignificant effect on growth. Baici and Casalone (2005) investigating regional growth in Italy for the period 1980-2001, found human capital of a medium/high level to be a major determinant of growth, though the impact of more qualified human capital was not so strong. Auteri and Costantini (2004) examined the influence of public investment and public transfers on the economic performance of 20 Italian regions between 1970 and 1995. They declared a significant and positive link only for public investments, but not for public transfer payments. Audretsch and Keilbach (2005) using a dataset for 440 German counties and a two-equation system, found that both entrepreneurship capital and regional R&D intensity have a significant positive impact on regional economic performance.

Gustavsson and Persson (2003) explored determinants of economic growth with a spatial econometric approach using data on 24 Swedish counties for the period 1911-1993. A particular feature of this study was that it used regional incomes which had been adjusted for regional differences in cost-of-living. It was found that the net migration rate had a (negative) impact on per capita income growth independently of whether income was PPP-adjusted or not. Agglomeration and population age structure affected growth rates only when regional incomes were not PPP-adjusted. The former (measured by population density) has a positive impact, whereas the latter (measured as the share of population older than 65 and younger than 15 years) has a negative one. Lundberg (2003), focusing on the municipal level in Sweden during the 1980s, showed that policies directed to the local level to be important determinants of growth. Furthermore, the initial endowments of human capital proved to have a positive effect on growth, while initial unemployment rate had a negative one. Finally, Pelkonen and Ylonen (1998), investigating the impact of human capital on growth in 12 Finnish provinces during 1970-1995 and in 84 sub-regions during 1988-1995, were unable to find a strong link between human capital and growth.

TRANSITION COUNTRIES

Polanec (2004) investigated the economic growth determinants for a sample of 25 transition countries over the period 1990-2002. Splitting the period of analysis into three four-year sub-periods, he showed that for the early transition, initial conditions and war dummies were crucial in explaining divergent growth performance. Moreover, it was found that progress in economic reforms affected the growth of productivity with a four-year lag both in the intermediate and in the advanced stage of transition, while the current reforms has statistically insignificant positive effect on productivity. Campos and Kinoshita (2002) examined the effects of FDI on growth in the 25 Central and Eastern European and Former Soviet Union transition countries between 1990 and 1998. Their main conclusion was that FDI had a positive and significant impact on economic growth in these transition countries. This result was robust after correcting for reverse causality, endogeneity and omitted variable bias. Brunetti et al. (1998) argued that credibility explains differences in growth performance in 18 transition economies for period 1990-

1995 but this finding was not robust enough when a fuller sample of 51 countries was examined. The same researchers in another study (1997) using several indicators of the institutional framework such as property rights security, corruption, etc. across 20 transition economies, came to the conclusion that these indicators can account for differences in economic performance. Similarly, Havrylyshyn and Van Rooden (2000) using a sample of 25 transition countries over the period 1991-1998 and employing nine institutional indicators, concluded that development of an institutional framework has a significant positive impact on growth

Fidrmuc (2003) investigated the effects of democracy and liberalization on growth using a sample of 25 transition countries from 1990 to 2000. He showed that both factors have a positive impact on growth, although democracy's is rather indirect. De Melo et al. (1996) developed an index of the extent of liberalization and they found a strong positive link between liberalization and economic growth for the transition countries. However, Aslund et al. (1996) reported an insignificant such a link after including dummies for the former Soviet Union and for war-torn countries. Falcetti et al. (2002) indicated that both reforms in liberalisation and privatisation and macroeconomic stabilization have been particularly critical in terms of the economic performance of the 25 transition countries during 1989-1998. Fischer et al. (1996) investigating 26 transition economies during 1989-1994, found that high inflation rates to impede growth, while lower fiscal deficits and structural reforms to boost it.

Tondl and Vuksic (2004) analysed regional growth in 36 Eastern European regions from the Czech Republic, Slovakia, Hungary, Poland, and Slovenia for the period 1995-2000. Employing the feasible generalised spatial two stages least squares estimator, they found FDI and location factors to be very significant for growth, while the level of both the secondary education and innovation activity had no significant impact on growth. Iara (2005) cross-sectionally analysing 20 NUTS III Hungarian regions from 1994 to 2001, found that the share of agricultural employment and changes in export orientation of the regions to be key determinants of growth. Furthermore, investment per capita, changes in

the employment rate, FDI density and changes in regional specialisation shown to have a positive effect on regional growth (though not in all specifications).

RUSSIA

Russia has experienced rapid economic growth over the last years but at the same time has experienced enormous regional disparities in growth rates. Moreover, it is important to note that Russia has by far the most diverse sub national structure among all transition economies (Dolinskaja, 2002).

Solanko (2003) analysed economic growth for a sample of 76 Russian regions between 1992-2001. It was found that initial income level and the share of workers employed in agriculture have a clear negative effect on average growth rates, whereas the education variable and the share of extracting industries (a proxy of natural resources) have a significant positive effect. Berkowitz and DeJong (2003) looked for growth determinants within a smaller sample of 48 regions over the period 1993-1997 exploring in particular whether differences in reform policies can account for different growth rates. They showed that regional differences in price liberalization policies exhibit a positive direct link with growth. The same authors in an earlier study (2002), had asserted that new-enterprise formation exhibits a significant and positive relationship with economic growth. Ahrend (2002) for a panel of 77 Russian regions from 1990 to 1998, found that neither politico-institutional characteristics nor differences in the qualities of the economic reform or general reform orientation can explain the observed differences in regional growth rates, concluding that a region's initial industrial structure and resource endowment have the largest impact on its growth prospects.

Popov (2001) examined the important factors that account for the varying patterns of change of output and incomes in Russia's regions during the period 1990-1997. A main conclusion drawn from this study was that initial conditions and institutional strength of regional administrations, as well as their ability to create a stable business environment, have considerable impact on output and investment. Dolinskaja (2002) for a sample of 89

regions in the period 1991-1997 found that that initial industrial structure and natural resources are significant in explaining regional differences in growth rates while the development of the new private sector proved not significant. Lugovoy et al. (2006), specifying the econometric model as a system of simultaneous equations for a panel of 89 Russian regions over the period 1998-2004, attempts to explore the role of geography, infrastructure and some other 'deep determinants' of regional growth. Climate and physical geography seems to be crucial factors of regional growth affecting it through migration and investment. In addition, infrastructure quality and agglomeration proved also to be significant. Brock's (2005) analysis over the 1995-2000 period (plus two shorter periods, 1995–1997 and 1998–2000) on the structural changes showed that FDI is a major determinant of economic growth (though only during the first period), while no evidence was found to suggest that region-wide corruption hinders economic growth. Finally, human capital and gross domestic investment were found to be very important to growth.

OECD COUNTRIES

Bassanini et al. (2001) used a pooled cross-country time-series econometric approach for 21 OECD countries over the period 1971-1998. They found that the accumulation of physical and, especially, human capital, financial markets, R&D activities and trade openness to be the most significant determinants of economic growth. A negative impact had the degree of government's involvement in the economy and the level of inflation. Aiginger (2005) using panel data for 21 OECD countries for the period 1970–1999, found business enterprise, R&D intensity and the share of high-technology exports to be significantly and positively related to GDP per capita. The budget deficit and government consumption and the volatility of growth proved to be significant but negatively related to GDP per capita, while no evidence was found for the impact of taxation. Englander and Gurney (1994) put into scrutiny some of the factors that the international growth literature had proposed using a sample of 19 OECD countries, to conclude that only a few variables are robust, such as growth in the capital to labour ratio, secondary school enrolment rates and labour force growth. Lee (1995) using panel data for 16 OECD

countries found that private investment has a positive impact on growth, while government consumption and debt as well as inflation have a rather negative impact. Medoza at al. (1997) using also panel data but for 18 OECD countries, studied the impact of consumption tax rates, labour, capital and personal taxation on growth. The main finding was that all these factors are not significant determinants of growth. Frantzen (2000) examined the impact of human capital and R&D on TFP for a sample of 21 OECD countries for period 1961-1991 and found a strong and positive link. Finally, Coe and Helpman (1995) showed that stock of knowledge in one country, proxied by cumulated R&D expenditures, has a positive impact on productivity in foreign countries as well as in the same country.

5. Conclusions

Over the last two decades the determinants of economic growth have attracted increasing attention in both theoretical and applied research Growth literature has shifted its interest from proximate factors (such as physical and human capital) to more fundamental or deeper determinants. The latter includes socio-cultural, political, institutional, macroeconomic, demographic and geographical factors. In this framework, a wide range of variables have been found to correlate with growth. Of these, the most important are: investment, human capital, R&D expenditures, FDI, trade, agglomeration, government size, inflation, fiscal policy, property rights, corruption, rule of law, democracy, political stability, political rights, trust, ethnic diversity, civic participation, religion, fertility rate, population composition, life expectancy, climate, landlockedness and natural resources.

Although a lot of progress has been made in specifying the determinants of economic growth, much work has yet to be done. The processes underlying the performance of economies are not fully understood, especially, due to their inherent world complexity and the conceptual simplicity of the developed economic theories. Growth models provide a framework for examining a wide range of factors but the lack of a unifying

theory increases model uncertainty, on the one hand, and leads to contradictory findings and conclusions which are far from safe, on the other.

Some other crucial weaknesses in econometric modelling include parameter heterogeneity, outliers, endogeneity, measurement errors and error correlation. Several studies have highlighted the problems associated with these weaknesses but the majority of researchers do not take them into proper account. Notwithstanding all these difficulties and limitations in the field of econometrics, we believe that they can considerably enhance our knowledge base in terms of the determinants and explanations of economic growth, and provide robust basis for more in-depth analysis

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