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Dynamic Regions in a Knowledge-Driven Global Economy
Lessons and Policy Implications for the EU

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Dynamic Growth Regions, Innovation and Competitiveness in a Knowledge Based World Economy: A Survey of Theory and Empirical Literature

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Workpackage No. 1
Comprehensive theoretical and methodological framework

Dynamic Growth Regions, Innovation, and Competitiveness in a Knowledge Based World Economy: A Survey of Theory and Empirical Literature

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DYNREG

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Consortium Partners:

ESRI	Economic and Social Research Institute (Co-ordinator)
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UTH	University of Thessaly
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1. UNDERSTANDING WORLD DYNAMIC GROWTH PERFORMANCE

A number of research areas have addressed the various aspects or **determinants** of **differential economic performance** in space and time using different theoretical and methodological frameworks. Although the issue is as old as the inquiry into the causes of welfare and comparative advantage (Smith, 1776; Ricardo, 1817), the discussion and debate continues in a number of old and new fields.

In the **regional economic literature** this issue is a central one and has been debated since the 1950s with the 'growth poles', 'linkages' and 'cumulative causation' models (Perroux, 1955; Myrdal, 1957; Hirschman, 1958; Kaldor, 1970). The concepts of 'threshold', 'critical scale of activities' and 'home market effect' used by the new economic geography (Krugman, 1991, 1993, 1995; Fujita, 1993; Fujita et al 1999), are to a large extent refined versions of these early theories. The basic idea here is that economic activity tends not to be evenly spread over space and that 'initial conditions' and increasing returns play a decisive role in growth performance. In the same line, endogenous growth models (Romer, 1986; Lucas, 1988) associate increasing returns to scale with human capital and consider regional divergence to be the most likely outcome. Their attempts to **endogenize** the process of technical progress has led to particular emphasis on **the role of knowledge** and its production. The **knowledge production function** introduced by Griliches (1979) has been used intensively in empirical studies both at the national and the regional level.

Technical progress is to a large extent driven by **research and development** (R&D) activities. This has been incorporated into growth models as the **accumulation of knowledge** (e.g. Romer, 1986) or improvements in the **quality of intermediate inputs** (e.g. Aghion and Howitt, 1992, 1998). In the Romer model, learning by doing results from the investment process which implies that the knowledge of the workforce is a function of the capital stock. Since the state of knowledge is embodied in capital it is in effect a public good available to all individual producers. Thus, investment by individual producers generate an externality through an increase in this public good, which gives rise to increasing returns at the aggregate economy wide level.

Romer (1990) goes further by dropping the assumption of perfect competition which cannot hold if knowledge/technology is a non-rival partially excludable good. Thus he derives a model where R&D is subject to fixed costs and where the market structure is characterised by monopolistic competition. In this model research is carried out by individuals with high human capital, and the **stock of human capital** generates growth. In equilibrium there is not enough human capital.

The relationship between **human capital and economic growth** has received considerable attention in recent years. Theoretical studies suggest that both the l**evel and accumulation of human capital** are important components in the growth process. Lucas (1988) postulates that human capital is a factor of production and an increase in this input leads to capital deepening and a period of accelerated growth towards a new steady state growth rate. Human capital is also necessary for the creation of ideas and is required to facilitate technology diffusion, thus the stock of human capital is an important determinant of growth (Romer 1990, Nelson and Phelps 1969).

Benhabib and Spiegal (1994) and Foster and Rosenzweig (1995) consider a model where human capital facilitates the adoption of foreign technologies. Further, Benhabid and Spiegel (2005) assume a tradeoff in relatively technological backwardness: on the one hand, there is an advantage of backwardness since the country can choose to adopt new technologies from a larger menu. On the other hand, it is harder to adopt more complex, skilled-biased technologies if the country lags behind the world technology frontier. It follows that technological laggards may converge or diverge in terms of productivity and growth depending on their level of human capital. Ciccone and Papaioannou (2006) drawing on Nelson and Phelps (1966) find positive effects of human educational levels and greater education improvements on output and employment growth in human-capital-intensive industries. The policy implications of distinguishing between education as a factor of production or technology diffusion (TFP) are significant. In the former, the benefit of a rise in education is its marginal product, while in the latter it is the sum of its effect on all output levels in the future. Benhabib and Spiegel (1994) discriminate between both effects empirically.

Human capital encompasses many human attributes. **Education** is accepted as one of the components which is vital in determining growth. Various measures of education are used in the literature as proxies for human capital, with varying degrees of success. Early measures include literacy rates and enrolment rates, others include average years of schooling. Each **human capital measure** has its own limitations. Enrolment rates do not accurately reflect the aggregated level of education as investment flows add to the stock of capital after a considerable lag. Estimates of average years of schooling (e.g. Kyriacou 1991; Barro, 1993,1996,2000; Nehru Swanson and Dubey, 1995; De la Fuente and Doménech, 2006; Cohen and Soto 2001) cannot account for differences in quality of one year of education. In addition, tertiary education is regarded as relatively more important in determining productivity. However average years of schooling measures used in the literature generally do not account for this. Years of schooling measures only account for the quantity and not the quality of human capital. A number of measures have been constructed to account for labour force quality and are shown to be significant in explaining output growth. For example, Hanushek and Kim (2000) construct a labour force quality measure based on international maths and science tests and show that labour force quality has a consistent and strong relationship with economic growth.

Empirical analyses, which use growth regressions to estimate the contribution of human capital to growth have been less conclusive than theoretical findings. Early empirical studies find the **level of education** as significant in output growth, however **output elasticities** are implausible high (Mankiw, Romer and Weil, 1992 and Barro and Sala-i-Martin, 1995). There is a number of studies (Knight et al, 1993; Benhabib and Spiegal, 1994; Islam, 1995; Caselli et al., 1996; Hamilton and Monteagudo, 1998; Pritchett, 1999) that suggest no significant relationship exists between educational attainment and growth or that educational variables have the ‘wrong’ sign in growth regressions, particularly panel specifications and estimates in first differences (De la Fuente, and Doménech, 2006).

More recent research shows more favourable results. De la Fuente and Doménech, (2006), Cohen and Soto (2001), Krueger and Lindahl (2000) argue that measurement error is a significant contributory factor to earlier discouraging results. De la Fuente and Doménech, (2006), Cohen and Soto (2001) construct new data sets of educational attainment and, using a variety of growth specifications, reaffirm the link between

human capital and output growth. Cohen and Soto (2001) and Bassanini and Scarpetta (2001) estimate that the return to human capital is 8 and 6 per cent respectively. This is in line with microeconomic studies. Labour economists using a Mincer human capital earnings function estimate the private return to schooling to be in the region of 5 to 15 per cent depending on time and country (Card, 1999).

A different strand of the literature focuses on strategic complementarities between human capital and production. Kremer (1993) assumes a special production function where production consists of different production processes. In each production process workers can make mistakes with a certain probability depending on their quality. Thus, it differs from the standard specification in the sense that the quality of workers cannot be substituted by the quantity in each production process. The specification yields strategic complementarities in human capital and hence multiple equilibria. Finally, some authors stress **differences/persistences in the world income distribution** due to a **complementarity between technology and skill** (skill based technologies), e.g. Redding (1996), Basu and Weil (1998), Acemoglu and Zilibotti (2001) or Jovanovic (1996). This complementarity leads to imperfect technology diffusion and hence international income differences. Hence, it provides a microeconomic foundation for the Benhabib and Spiegel (1994)-approach. Moreover, it implies growth-effects due to improvements in human capital, higher protections of intellectual property rights and lower import tariffs. In general, strategic externalities in human capital exhibit a promising approach to refine our understanding of (local) knowledge interactions and hence the process of technology diffusion.

Further, the **growth accounting literature** shows support for the effect of accumulation of human capital on growth (Jorgenson et al., 1987; Jorgenson and Yip, 1999; Maddison, 1987, 1991; Young, 1995; Temple, 2001). Young finds that in the four Asian economies examined, the improving educational attainment of the workforce raised the annual growth rate of effective labour input by about 1 percentage point. As noted by Temple (2001) growth accounting results depend on the estimation procedures used and do not take into account the indirect effects of educational attainment nonetheless it provides an important insight into the role of educational attainment on growth.

Within the broad field of **spatial economics and development**, several lines of research have contributed to one or another degree to a better understanding of the underlying processes. In the **urban economics literature**, a number of studies indicates that **agglomeration economies** (defined broadly as external economies of scale) is a major contributor to growth (Evans,1972; Wheaton and Shishido 1981; Nakamura, 1985; Henderson, 1986; Moomaw, 1988), either due to urban services, size and infrastructure (urbanization economies) or due to intense relations among **clusters of firms** producing similar (localization economies) or different products (input-output relations). Thus, large urban areas are considered to produce advantages to their firms, leading to differential growth.

In a parallel literature, the process of **internationalization** has been considered as a major force of change at the regional level, associated with increasing differences in performance (Amin et al 1992), as regions with unequal endowments in resources and technology and different economic structures are exposed to **international competition**. An interesting characteristic of the new environment is that regions which increasingly compete in the international markets, becoming gradually autonomous from their national context as spatial entities (Castells and Hall 1994).

The role of the international markets to foster growth has been another issue where concerns tend to question classical and neoclassical orthodoxy. The **imperfectly competitive** nature of international markets, which are made up by firms operating under increasing returns, allows for possible strategic trade policies on behalf of national governments (Krugman 1986). Such policies of building competitive advantages have been used with relative success in S.E. Asia (Pitelis, 1994). However, the imperfectly competitive nature of these markets imply that the benefits of trade may not be evenly distributed, allowing for the possibility for some countries or regions being net losers.

The variety of responses to changing economic environments gave rise to questions about **regional competitiveness** (Cheshire, Gordon 1998; Poot 2000; Scott and Storper 2003). Although the concept is still vague and controversial (Krugman 1994 and 1996, Lovering 2001, OECD 1996, Porter 1990, EU 2000), with inherent problems of its measurement (Wong, 1998; Barnett 2001), a common base in the discussion is the significant increase in the variation of regional performance as a result of greater regional competition. Although the focus of discussion is still on how to measure competitiveness, an equally important topic of research is to reveal the factors, conditions or policies fostering or inhibiting regional competitiveness.

In the academic literature there seems to be widespread consensus that **knowledge, learning and innovation** are the key to economic development and competitiveness for firms, regions and nations (Tödtling and Trippl, 2004). At the same time, however, it is evident that we lack understanding of the mechanisms that tie these concepts together. Recently attention has shifted to innovative regions and milieux (Camagni, 1991; Ratti et al. 1997; Crevoisier, 2001), high-tech-areas (Keeble and Wilkinson 1999, 2000), clusters of knowledge based industries (Cooke, 2002) and knowledge spillovers (Audretsch and Feldman 1996; Bottazzi and Peri 2003). Empirical studies concentrate on the analysis of well-performing regions, dealing with the questions of why such industries concentrate in particular locations, which kinds of linkages and networks exist, and to which extent **knowledge spillovers** can be observed.

In recent years, **institutional economics** have been examining the economic, political, legal and social arrangements accounting for the performance of different economies (Veblen, 1904; Hodgson, 1988, 2000; North, 1990). **Neo-institutional economics** expands conventional explanations asserting that regional economic growth is achieved when mechanisms of **economic coordination** minimize transaction costs. Markets, hierarchies and networks can function efficiently only when strong **property rights** and sound **legal and political institutions** are in place (Eggertsson, 1990; Williamson,1985). New institutionalists adopt an **evolutionary** stance, perceiving local economic development in relation to the credible commitment of society to adjust and readjust its institutional framework to provide an environment hospitable to change, that is, an environment which enables cooperative solutions to be achieved (North, 1990, 1993). In contrast, old institutionalists regard the socio-economy as a complex, dynamic and open-ended system (Hodgson, 1988; Samuels, 1995 Stanfield, 1999) and shift emphasis to **socio-cultural characteristics** of the locality (Healey, 1997; Amin, 1999). Here, economic success is related to advancement of institutional characteristics that generate consensus on the kind of collective game to play and the way to play it (Healey, 1998: 1542). Amin and Thrift (1994, 1995) use the term 'institutional thickness' to describe these qualities, whereas Healey (1998) develops the concept of '**institutional capital**' which maintains an analytical distinction between intellectual capital (this is knowledge resources), social capital (trust,

reciprocity, cooperative spirit and other social relations), and political capital (capacity of collective action).

The **institutional-cultural environment**, however, plays a multiple and complex role in the process of economic development. This is because it does not only constrain agency behavior, but also provides a cognitive framework through which raw information is interpreted and transformed into meaningful knowledge (Hodgson, 1988). On these grounds, **regional economic growth** is perceived as essentially a **cognitive, learning and knowledge-building process** (Hodgson, 1996, 2000; Knight, 1995).

Overall, there are several strands of literature that examine the various aspects and determinants of regional performance and the factors, conditions and policies at the international, national, regional and institutional level that can play a decisive role. New research with a **synthetic character** in these fields may provide **better knowledge** and **critical insights** in issues of great importance in **international development policies**.

2. FDI AND GROWTH IN DYNAMIC EMERGING REGIONS

The impact of **foreign direct investment** (FDI) on growth and development processes of the host economies has been discussed at length since the 1970s (Reuber et al. 1973; Lall and Streeten, 1977). Very recently, a significant increase in FDI flows towards **emerging regions** as well as **theoretical advances** in **growth and international trade theory** have renewed the academic and policy debate. According to several policy makers and academics, FDI can have important positive microeconomic and macroeconomic effects on host country's development efforts.

From a **microeconomic perspective**, FDI is a source for **technology and transfer of know how**. Technology transfer may occur directly from the parent firms to their affiliates, and indirectly from foreign affiliates to other local firms. In fact, it has been demonstrated that by fostering **linkages** with domestic firms, FDI can help jumpstarts of the economy (Hirschman, 1958; Markusen and Venables, 1999; Rodriguez-Clare, 1996). Moreover, FDI can also result in positive **technological and productivity spillovers** to the local economy through **competition, imitation and training** (Blomstrom and Kokko, 1997). Needless to say, these positive effects are not automatic, but depend, on the one hand, on the characteristics of the **technological capabilities** that parent firms wish to transfer to their affiliates; on the other hand, they strongly depend on the **social capabilities** of the host economies and the absortive capacities of indigenous firms (Dunning, 1994, 1996; Verspagen, 1991).

From the **macroeconomic** point of view, FDI can have an immediate impact on the external position of the host country and, consequently, on its **prospects for growth**. Generally speaking, FDI flows are **less volatile** than other sources of finance, such as portfolio investments, since investments in capital assets are difficult to liquidate and foreign investors usually make long-term commitments. Moreover, FDI often promotes exports and is largely not debt - creating.

Despite all these potential benefits, growth theories have not completely acknowledged the role played by multinational enterprises (MNEs) in growth processes.

Neo-classical theories suggest that an exogenous increase in FDI will have only temporary effects on the growth rate of the host economy because of the diminishing returns on capital hypothesis. In order to positively affect long run growth rates, FDI should generate technological change or increase the labour force.

More **recent growth theories** implicitly recognize the potential of FDI for growth. According to new growth theories, **technical change, technological learning and knowledge diffusion** are important determinants for growth (Temple, 1999). Thus, to the extent that FDI is made not only by financial capital but mainly by fixed assets, **knowledge (tacit and codified) and technology**, then it may be expected to create growth endogenously through direct transfer of technology or spillovers. However, very few endogenous growth models explicitly consider FDI as an engine for long run growth (De Mello, 1997; Grossman and Helpman, 1991; Baldwin et al., 1999).

Recent empirical studies based on **new growth theories** find mixed evidence concerning the role played by FDI in fostering long run growth. More precisely, these empirical studies tend to highlight under which conditions FDI is more likely to be associated with economic growth. These conditions vary from the level of **human capital** in the host country (Borensztein et al., 1998), the **degree of openness** of the host economies (Balasubramanyam et al. 1996), the **development of local financial markets** (Alfaro et al. 2002), while it is not clear whether and to what extent the **distribution of FDI** across different economic activities (agriculture, mining, manufacturing and services) may affect the intensity of the **FDI-growth nexus** (Alfaro, 2003, Nunnekamp and Spatz, 2003). Firm level studies of particular countries show that FDI boosting growth and positive spillovers from foreign to domestic firms are not the rule but the exception (Aitken and Harrison, 1999; Haddad and Aitken, 1993; Konings, 2000; Altomonte and Resmini, 2002). It is interesting to note that most of these studies do not pay serious attention to the possibility of a bi-directional relationship between FDI and growth, even though the existence of bi-directional causality is a real possibility. GDP, GDP growth rates and their determinants (such as the development of infrastructures and well-functioning institutions) and impacts (demand) may influence FDI as well. The few existing studies that explicitly address this issue provide evidence of both unidirectional and bidirectional causality (Ericsson and Irandoust, 2001; Zhang, 2001).

Although these studies offer an invaluable contribution to understand possible links between **FDI and growth**, they indicate that those links should be demonstrated and, where they exist, that they are not being shared equitably. Moreover, there are still diverging views on how **public policies** may help in maximizing the **benefits of FDI** for economic growth, while reducing the costs.

This project will contribute to this debate by offering a **comprehensive overview** of FDI-led growth, adopting a comprehensive framework, which allows a comparison of the same effects across different emerging regions over the same period of time. In particular, we will explore whether and to what extent FDI-led growth is **sustainable**. For this purpose, it will be useful to analyse the experience of countries that have a long history as **recipients of FDI**, such as **Brazil** and **Mexico** in Latin America or some **South East Asian** countries, and draw from it some lessons for the future of more recent favourite destinations of FDI such as **China**, and though to a lesser extent, **Central European new EU countries** and **Russia**.

In addition to FDI, **licensing agreements** (Eaton & Kartom 1996) and **international trade via imports of intermediate products and capital equipment** as well as through l**earning-by-exporting** into developed countries are identified as the principle channels of **international technology transfer**. Empirical studies demonstrate the impact the above channels have on firm innovations and productivity (Alverez and Roberston 2004, Keller and Yeaple 2003, Damijan et al 2003). There is however a lack of evidence on the relative importance of each of the three possible sources.

Analytical work on the linkages between FDI, international trade and growth can help to develop and maintain open policies towards FDI and international trade and explain the continuing relevance of these policies for both developed and developing regions. Moreover, it can help to identify key issues that call for national or international actions.

3. KNOWLEDGE, INNOVATION, AND ECONOMIC GROWTH

Investment in knowledge (education, R&D) is of critical importance for economic progress and prosperity. Science used to be an individual knowledge activity in past centuries, but the functioning of modern societies is so much determined by the pervasive nature of scientific knowledge. And indeed, modern economic development is to an important extent determined and driven by the fruits of the **knowledge economy**.

As a consequence knowledge has in recent years become a key driver for growth of firms, cities, regions and nations. **Access to knowledge** is, therefore, generally recognised as a key condition for **innovative activities** in our modern society. Consequently, also the creation and dissemination of new knowledge may act as a critical success factor for urban, regional and national growth (Shane 2004). Knowledge has, however, important characteristics of a **fluid good**, which gets also easily obsolete. It also has various features of both **public** and **private goods**.

There is a need to address more specifically **the impact of R&D expenditures on growth.** Examining the contribution of R&D expenditure to productivity growth of UK firms Wakelin (2001) and Cameron et al. (2005) show that R&D expenditure significantly increases the rates of innovation success (interestingly Wakelin (2005) shows that more innovative firms also have a higher rates of return on their R&D. Comin (2004) tests the impact of R&D investments on economic growth, finding that its contribution to productivity growth is smaller than half of a percentage point. Aghion et al. (2006) analyze the effect of market entry on incumbents' innovative activity and find (on a sample of UK data) that firms in technologically advanced sectors increase their innovative activity in order to deter new entry, while firms in laggard sectors are discouraged to innovate (as their expected rents from innovation are reduced). Parisi et al. (2006) analyze the effect of process and product innovation on productivity. In addition to finding that process innovation has a large impact on productivity, they also confirm that R&D spending strongly increases the likelihood of introducing a new product (fixed capital spending, on the other hand, increases the probability of introducing a process innovation. Guellec and Van Pottelsberghe (2001) using industry level data for OECD countries find strong evidence of a positive effect of R&D on productivity. Firm level analyses by Hall and Mairesse

(1995) on France, Mairesse and Hall (1996) on France, Harhoff (1998) on Germany, Klette and Johansen (1998) on Norway, and Parisi (2001) for Italy confirm the positive effect of R&D expenditure on productivity.

The central importance of science – and more specifically scientific research (including R&D) – was also recognized in a recent study of the Science and Policy Research Unit at the University of Sussex (SPRU, 2001) where broadly the following expected benefits of expenditures and investments in science and technology were distinguished:

- Production of new scientific information and of relevant insights for society.
- Better education and training of students.
- Construction and use of new scientific networks and international cooperation.
- Improvement and extension of problem-solving capacities in our society.
- Creation of innovative business life.
- Generation of scientific knowledge in favour of culture and society.

It is an intriguing question whether different R&D efforts in different countries have led to contrasting patterns. The following conclusions can be drawn from The European Report on Science and Technology Indicators (European Commission, 2003):

- there is a significant variety in R&D spending patterns among many countries
- the same applies to other input measures, such as knowledge workers
- there is a global association between R&D growth and scientific and economic performance, but this does not necessarily hold for each individual country.

Innovation is an important driver of long run productivity. The development of new projects and processes (and their improvement) is crucial in maintaining firms' competitiveness over their rivals.

Research on the **determinants of innovation** and the subsequent success of the firms follows two main directions of inquiry with one focusing on the structural factors impacting innovation strategies of companies (e.g. the degree of concentration of an industry (Levin et al., 1985), demand stimulus on innovation (Scherer, 1982), the existence of technological opportunities (Klevorick et al., 1995), suitability for appropriation (Levin et.al., 1987) or the existence of spillovers (Eaton and Kortum, 1996; Engelbrecht, 1996; Borensztein et al., 1998; Branstetter, 2000, 2001; Fritsch and Franke, 2004; Damijan et al., 2005).

Other research focuses on the **characteristics of firms** which could serve to determine primarily the innovative capacity and the subsequent actual innovative activity of firms (e.g. firm size (Cohen and Klepper, 1996), mechanisms for coordination between departments (Gupta et al., 1985) capacity for self-financing (Grabowski, 1968), the role of human capital (Engelbrecht, 1997) and the type of diversification strategy adopted (Scott and Pascoe, 1987).

The literature on **Innovation Systems**, which is relatively recent, provides a new understanding of the nature of innovation, viewing it as an interactive process between many actors over time (Edquist 1997).

A number of factors are identified which highlight the importance of the regional dimension in studying innovation. First, there are huge regional differences in industrial specification and innovative performance (Howells 1999; Breschi 2000; Paci and Usai 2000). Second, knowledge spillovers are often spatially bound (Audretsch and Feldman 1996; Anselin et al. 1997) suggesting that face –to-face contact is necessary for the transferring of tacit knowledge (Storper 1997; Morgan 2004). Finally, institutions and policy competencies are bound to sub national regions

The concept of **spatial clusters** has received much attention from academic scholars. The existing literature highlights a number of **advantages of clustering**. These involve "agglomeration and external economies", reduced transaction costs due to trust, positive impact on innovation, concentration of skilled human resources in the region, the flexibility and entrepreneurship of small firms involved in clusters etc. However on the **negative side**, there can be agglomeration dis-economies (due, for example, to "congestion effects") and also the possibility of "institutional sclerosis" (that is, a lack of adaptability).

Spatial clustering of rivals has positive effects on innovation, competitiveness and firm growth. (Porter 1990, 1998; Feldman 1994; Saxenian 1994; Audretsch and Feldman 1996; Pouder and St. John 1996; Baptista 1998; Feldman 2000; Keeble and Wilkinson 2000; Malmberg and Maskell 2002; Enright 2003). Studies have shown that growth is stronger (Baptista and Swann 1998) and the diffusion technology much quicker (Baptista 2000, 2001) in clusters owing to local knowledge spillovers (Jaffe (1989), Audretsch and Feldman (1996), Anselin et al. (1997) and Bottazi and Peri (2003). Other mechanisms that contribute to the dynamics and innovativeness of clusters include market transactions, the creation of formal networks, and connections to national and global knowledge sources (Amin and Cohendet 2004; Maskell et al. 2004). Recently, the argument has been put forward that both extensive relations within local clusters and strong connections to national and global knowledge sources are of relevance (Bathelt et al. 2004; Gertler and Levitte 2005; Tödtling and Trippl 2007a, 2007b). This view clearly challenges the assumption of the dominance of one spatial level over another. On the contrary, Bathelt et al. (2004) have pointed out that "global pipelines" should be regarded as important complements to the "local buzz" produced in clusters.

However, the literature on clusters almost totally lacks conceptual foundations. The classic works on **industrial districts** (e.g., Pyke et al, 1990), **increasing returns**, and **"new" economic geography** (e.g., Krugman 1991, 1998a, 1998b, Audretsch 1998), and **"clusters"** (notably Porter 1990, 1998a, 1998b) draw on the advantages of, among others, agglomeration, locational proximity and linkages to describe existing formulations, and/or to explain their absolute advantages (e.g. "external economies", reduced transaction costs because of "trust", high "social capital" etc.). As Coase (1937) and Richardson (1972) have convincingly shown, the issue is not one of absolute advantages (or costs) but of comparative ones. For example, that clusters reduce transaction costs, need not imply that they do so more than "integration". Similarly, Porter (1990,1998a, 1998b) discussion of the benefits of "related and supporting industries" fails to address the same issue, i.e., why does an integrated larger firm not possess the same or even larger benefits? In both cases, unless one explains the comparative disadvantages of clusters, one only has a partial and incomplete explanation of the phenomena in hand.

Clusters are a particular form of **inter-firm co-operation** (IFC) however the conceptual foundations of IFC remain at best underdeveloped. Existing perspectives, notably the industrial organisation, transaction costs and resource-based, have different implications on IFC. Importantly, the existing theories on IFC are rarely brought to bear on a comprehensive comparison between alternative modes of organising economic activity, such as markets and hierarchies (e.g., firms-integration).

Richardson's(1972) contribution is the only available conceptual framework aimed at explicitly dealing with IFC vis-à-vis market and integration. Richardson produced a template, or "good practice", for the choice of mode of organising economic activity, in terms of his proposed concepts of **similarity and complementarity of activities**. Similar activities are those requiring the same capabilities, while complementary activities require complementary ones. Similar and complementary activities are amenable to integration and are best produced by a single firm. Dissimilar yet complementary activities are best undertaken through co-operative arrangements. Markets are best, when activities are both dissimilar and non-complementary.

In developing a more comprehensive IFC theory framework all of the above elements would arguably be important. IFC would be a starting point for a theory of clusters.

Exporting and innovation activity have long stirred the imagination of researchers both at the aggregate level of regions and nations and, as of late, the level of firms and plants. Although both measures of innovation and exporting have been explored in depth as **indicators of international competitiveness and economic growth**, their interdependence has not yet been fully explored.

There is mounting evidence that **innovating firms are more likely to export** and have a higher share of exports than those that do not engage in research and development, as shown, for example by Kumar and Siddhartan (1994) for Indian firms, Braunerhjelm (1996) for Swedish manufacturers, Nassimbeni (2001) and Basile (2001) for Italian plants, Özçelik and Taymaz (2004) in the case of Turkey. Although a small number of studies show evidence that innovation does not effect the exporting decisions at all (Pavitt, 1984; Wakelin, 1998; Lefebvre and Bourgault, 1998; Becchetti and Rossi, 1998).

There is also some (considerably more infrequent) evidence of **the impact of exporting on innovation and innovative activity**. Salomon and Shaver (2005) and Salomon (2006) show that exporting is associated with increased innovation activity. Criscuolo, Haskel and Slaughter (2005) use data on Italian firms and show that higher propensity to innovate can in fact be attributed to globally engaged firms once knowledge inputs are controlled for (though they only consider multinational firms). Castellani and Zanfei (2006) using a similar sample of firms show that, after controlling for sector, location, firm age and size, multinational firms show the greatest innovative capability, followed by exporting firms, while non-internationalized firms display the least amount of innovative activity. This seeming endogeneity between exporting status and ability (and willingness) to innovate has not been explored yet in a comprehensive way.

Research has shown that there is a strong interrelation between **entrepreneurship, innovation and economic growth**. Ripsas (1998) postulate that the intrinsic dynamics of an economic system are caused by the entrepreneur. And growth and progress will be hampered in a static economic system.

Acs and Armington (2002) also found evidence that regions that have more entrepreneurial activity are more competitive and grow faster. A healthy entrepreneurial climate attracts investors who invest in knowledge and capabilities (human capital), in research and development (innovation), and in capital goods, that in turn lead to new products, processes and sustainable solutions to social problems. More precisely, a good entrepreneurial climate seems to lead to more innovation, and innovation has a positive influence on economic growth.

Entrepreneurship and stable and pro-active institutions seem of crucial importance in the economic growth process of a country Literature research seems to support the idea of **three stages in the economic growth process**. The first stage in the development of the economy is centred on **the state and its ability to lead the transformation** from the old to the new system. The state first needs to create a good infrastructure or the seedbed conditions for economic growth. (e.g. a positive entrepreneurial climate through education and financial and political stability).Viewed from the angle of entrepreneurship and economic growth the most vital concepts seem to be the incentives and the competition rules Wennekers and Thurik (1999). **The growth of the non-state sector** is the second stage in the growth process developing countries. Entrepreneurs especially play an important role in spurring economic growth. Small and medium sized firms create a dynamic atmosphere serving as agents of change by their entrepreneurial activity, being the source of considerable innovative activity, stimulating industry evolution and creating an important share of the newly generated jobs Acs (1992). This literature is complemented by studies by (Carree and Thurik 1998; Audretsch and Thurik 2000; Wennekers and Thurik 1999). The third and last stage of the economic development is when the most developed countries, then, compete mainly in terms of **innovation and the productivity** of their enterprises inducing an intense **demand for entrepreneurship** (Audretsch and Thurik 1998). The theories of Schumpeter (1934, 1943) gain more relevance in this stage Giersch (1984).

Many questions remain unanswered on entrepreneurship in relation to economic growth. This is partially due to the difficulty in defining **the role of the entrepreneur** and formalizing its measurement for empirical modeling. It would be especially interesting to measure the **influence of the institutional framework** on entrepreneurship and innovative behaviour of entrepreneurs and how this affects economic growth. A comparison of the amount of **state influence on entrepreneurship** and the amount of entrepreneurship between different emerging national economies might provide an interesting scale for measuring the effect of national policy and entrepreneurship on economic growth.

4. COMPARATIVE ADVANTAGES, COMPETITIVENESS, INEQUALITIES AND CONVERGENCE IN A KNOWLEDGE - DRIVEN WORLD ECONOMY

The **theoretical analysis** of the **relations between growth and trade** was initially directed to the examination of the effects of the various forms of growth on the volume and **patterns of trade**, on the **terms of trade** and on **welfare**. These analyses, usually consider growth and its causes (factor growth, technical progress) as given with its impact on trade flows to be explored. Results are far from being univocally determined. At constant terms of trade, a standard Rybczynski outcome emerges: **growth** may be **pro-trade**, **anti-trade** or **neutral**, according to its effect on export goods and supply (Johnson, 1958). If growth affects the **terms of trade**, the latter may improve, deteriorate or leave unchanged **social welfare**. It has been proven that a deterioration of the terms of trade is a necessary but not a sufficient condition for the decrease in social welfare (Bhagwati, 1958 and 1968). This static analysis may present only a partial picture, given that international trade may affect growth, as well (Gandolfo, 1998).

Using **dynamic and endogenous growth models**, pioneered by Lucas (1988) and Romer (1986) which differ from **neoclassical growth** (and trade) models, **technological progress** is endogenous because investment in R&D, which advances technology, is driven by the **market incentives**. In a seminal work, Rivera-Batiz and Romer (1991) develop a model involving trade in goods, in knowledge or both. They demonstrate that trade liberalization would allow the exploitation of increasing returns to scale and the expansion of the market yields to a permanent increase in the growth rates. In a similar framework, Grossman and Helpman (1991) develop a model of the **product cycle** in which the North trade with the South of the world. Because of trade, growth accelerates in both regions. Trading with the less developed South, the developed North frees up resources that can be invested in R&D activities, while the South takes advantages from North technology through imports. Similarly, Ben-David and Loewy (1998) built a model in which trade liberalisation results in the **diffusion of knowledge** and **economic growth** and where the **degree of knowledge transfer** is dependent on the level of **human capital**.

Not all trade models predict that poor countries may benefit from trading with the rich ones. Immediately after the Second War World, Singer (1950) and Myrdal (1956) raised several arguments to promote **protectionist** measures for developing countries, such as the **infant industry** argument, declines in terms of trade and export pessimism. More recently, Galor and Mountford (2003) indicate that international trade is a major factor for the present **divergence** between developed and developing countries. Similar results can be found also in Young (1991) and Stokey (1991).

The issue of **income convergence** or **divergence** is not new. Initially, the debate seemed to be confined to **exogenous growth models** – such as those à la Solow (1956) – which predict convergence, vs. **endogenous growth models** à la Lucas (1988) and Romer (1986) in which divergence is a possible outcome. In these models, international trade amplifies the differences in factor endowments and technical progress between rich and poor countries, thus generating diverging income patterns (Baldwin et al., 2001). However, very recently it has been demonstrated that also in an endogenous growth framework convergence may arise because of either international trade (Walz, 1998) or the interaction between human capital and technological progress (Eicher, 1999).

The **empirical literature** reflects the uncertainties highlighted by the theoretical models, both **static and dynamic**, as indicated by Rodriguez and Rodrik (2001) in their critical survey on the topic. The major problem that scholars encounter in dealing with the empirics of the relationship between trade and growth is the likelihood of a **two way causality**. While it is reasonable to suppose that trade may affect income level and/or growth rates, it is equally reasonable to expect that the level of income and its growth rates may affect trade. This endogeneity problem can be tackled by instrumenting trade shares. Several papers suggest solutions to this problem (Hallak and Levinsohn, 2004; Frankel and Romer, 1999; Frankel and Rose, 2002), and the results indicate that trade significantly affects income level.

The recent literature indicates that focusing solely on **factor accumulation**, as suggested by traditional growth theory is not sufficient because such models can not explain why some countries utilize their resources more effectively than others. Three hypotheses seem promising in answering this questions and these are (Rassekh, 2004): 1) **integration** into the world economy and, thus, international trade (Frankel and Romer, 1999); 2) **geography** (resource endowments (Landes, 1998; Sachs, 2003); 3) **political and economic institutions** (North, 1990; Acemoglu et al., 2001).

Dollar and Kraay (2003) find that both trade and institutions matter for growth in the long-run; however, the impact of the former is larger than that of the latter in the short-run. Rodrik et al. (2002) and Esterly and Levine (2003), however found that institutions matter most, while Sachs (2003) demonstrates that the impact of geography on growth is independent from that of the institutions. This new field of research on the relative contribution of **trade, geography and institutions** to economic growth constitutes the most recent and the most promising line of research in this field (Rassekh, 2004).

Mixed empirical results also characterize the relationship between **trade and income convergence/divergence**. Sachs and Warner (1995), Ben-David (1996) and Rassekh (1992) find that international trade leads to income convergence, mainly among countries that are major trade partners. However, Slaughter (2001) finds no significant links between trade and convergence.

This inconclusiveness – which mirrors that of the theoretical models – might be due to different estimation methodologies, time spans and countries included in the analysis. Thus, we need to identify a **common framework**, which provides **robust comparisons** across countries of the different aspects of this **complex relationship**, while controlling for **country-specific** effects.

Despite the inconclusiveness, the theoretical literature and empirical findings have contributed our understanding of the interrelations between trade and growth. What however is not clear, it is how policy makers should use these findings in order to formulate **trade and domestic economic policies** that raise growth and induce industrialization.

In order to offer a positive contribution in solving the large debate on trade and growth, this project will analyse on a **comparative** basis the relation between **trade and economic growth** in different **emerging regions** (e.g. Brazil, China, Eastern Europe and South East Asia).

This will allow us to identify the main stylized facts on this complex relationship. Once these facts are identified, we will try to estimate in a common framework their effects on **world patterns of trade and income**. The results from this analysis will allow us drawing **policy conclusions**, in particular for the EU.

5. INNOVATION CAPACITY AND INNOVATION POLICY

Although **R&D investments** are undertaken widely, the process of **international innovation** tends to be **concentrated** in a relatively small though growing number of countries. Within nations, innovation tends to be dominated by geographically concentrated **clusters of firms** supported by **local institutions**. For example, more than three-quarteres of all bio-pharmaceutical patents have their origin in a handful of regional clusters in the US. In the context of increased globalization and the telecommunication revolution, regions have emerged as important units of economic activity. Innovation activity is less associated with footloose multinational corporations and more associated with **high-tech innovative regional clusters** such as Sillicon Valley, Research Triangle and Route 122 (Audretsch, 2003).

R&D productivity of firms at a given location is shaped by local policies, local institutions, and other local circumstances. Innovation output depends on the interaction between private – sector and public sector policies and investments. This constellation of factors is termed **national innovative capacity**, or the degree to which a nation offers a favourable environment for **global innovation** (Porter and Stern, 2003).

A major **policy objective** of innovation policy must be to contribute to the **learning capability of firms**, **knowledge institutions** and **people** and to promote innovation and adaptation. Innovation policy includes human resource development, new forms of firm organization, network formation, new role for knowledge intensive business services and for universities. Due to the various types of **Regional Innovative Systems** (RIS) which research has shown to exist (Cooke et al. 2000, 2004; Asheim and Isaksen 2002), each RIS would require a differentiated innovation policy. (Tödtling and Trippl 2005).

The Innovative Systems approach has identified additional types of **market failure**, which justify **public intervention**. (Lundvall and Borrás 1999, 2005; OECD 1999; Smith 2000; Edquist 2002; Lundvall 2002). Mismatching between the elements of an innovation system can lead to a lack of communication and networking and institutional rigidities. Governments should address these "systemic failures which block the functioning of innovation systems [and] hinder the flow of knowledge and technology" (OECD 1999, p.63) ".

Lundvall and Borràs (1999), emphasize three types of trade-offs or dilemmas to outline policy concerns from an **evolutionary perspective**. There is an **exploitation-exploration dilemma** (pursuit of too narrow trajectories and neglect of radically new innovations), an **integration-flexibility-dilemma** (lack of innovation networks, problems of too strong ties) and diversity-harmonising dilemma (necessity of both diversity and standardisation)."

The work discussed here provides a sound basis to justify **policy intervention in innovation systems** and offers implications for the scope, objectives and methods of innovation policy.

Do **public expenditures on knowledge creation and dissemination** matter? This question has intrigued many policy-workers and researchers. They often refer to Silicon Valley types of development, to North-Carolina, to Finland, to Taiwan or Singapore, where research has created on avalanche of **spinoffs** in the form of **innovations, new start-ups, licenses and patents**, and so forth.

It is undoubtedly true that such regions with a research-benign climate tend to grow faster than others (Acs 2002, Bertuglia et al. 2000, Suarez-Villa 2000). Clearly, public expenditures in science and technology are not the only critical success factors for **accelerated economic development**. Other factors, such as the development of timely niche markets (e.g., ICT, biotechnology) are important as well. For example, Roller and Waverman (2001) demonstrate that there is a significant positive causal link between **telecommunications infrastructure** and **economic growth** for 21 OECD countries over 20 years. Responsive governments may see it as their task to orient their R&D expenditures towards promising new market niches.

This message is also reflected in the new growth theory which stipulates that public policy is not only driven by demand stimuli, but also by **endogenously determined factors** such as **infrastructure, education, innovation** and the like (see Romer 1986, Nijkamp and Poot 1997, and Acs et al. 2003). Several explanatory paradigms have been put in place in recent years, with a view to the identification of **success regions** or **sectors** that might be further stimulated by **public policy**. Some of these paradigms are the **new economic geography** (Fujita et al. 1999), the **endogenous growth theory** (Aghion and Howitt 1998), and the **new economics of innovation** (Acs 2002). The diversity in all these explanatory frameworks has however, one element in common, namely, the importance of **knowledge availability and access**. Knowledge creation and diffusion is to a large extent a mission of **academic research and education** institutions (universities, research laboratories, colleges, high schools etc.), so that governments are not a neutral actors in this context. The size and direction of public expenditures on science and education may exert a decisive impact on the prosperity and well-being of nations or regions.

The positive link between human capital and growth raises the issue of **policy interventions and the financing of education**. Interventions are justified if social returns exceed private ones. This is the case Benhabib and Spiegel (1994) due to the positive social externality on technological progress. A number of studies fail to find any evidence of excessive social returns (Topel 1999; Acemoglu and Angrist 1999) which is contrary to Benhabib and Spiegel (1994). An attempt to reconcile both studies suggests that **education matters only for technological catch-up**, but **not for frontier innovations**. Hanushek and Kimko (2000) demonstrate the importance of the **quality of human capital**. At the same time they find no evidence that public spending on schooling resources influences performance differences of students.

Understanding **the relationship between public and private R&D investment** is important in formulating government policy, which seeks to maximise innovative activity and growth. **Public R&D subsidies** are provided on the basis that some form of market failure has resulted in private underinvestment in R&D. Public R&D investment is supposed to complement private investment.

However, empirical research provides evidence that it can act as a substitute (i.e. crowding out private financed R&D). (Lach 2000, David, Hall and Toole 1999) put forward the following principal reasons for the **substitution effect of R&D subsidies on private R&D expenditures** are: (i) subsidizing of projects that firms would undertake even in the absence of subsidies, (ii) firms adjust their portfolio of R&D projects by closing or slowing-down non-subsidized projects, (iii) increased prices of R&D inputs due to increased demand arising from R&D subsidies.

David, Hall and Toole (1999) survey the body of available econometric evidence and find that of 19 studies at the firm level 9 report substitution, however, this is mostly to the USA: of 12 studies based on US data ,7 report susbstitution, while of 7 studies on other countries' data, only 2 report substitution. Complementarity is thus much stronger in the case of non-US studies and vice versa in the case of US studies. These results point to the methodological problems which influence the results of econometric studies.

According to Liebenstein (1978) **the supply of entrepreneurship** depends on alternative opportunities available to potential entrepreneurs, as well as on the value society places on entrepreneurship as an activity. Van Praag (1996) supports this idea by stating that both willingness and opportunity are essential in order to start as an entrepreneur. Opportunity depends on starting capital, entrepreneurial ability and the (economic) environment. Baumol (1990) further finds that **institutional arrangements** or other social phenomena affect the quantity of entrepreneurial effort. This was already stipulated by Liebenstein (1978), who believed that **innovative entrepreneurship** can be supported by the **government creation of institutions which foster savings, capital accumulation, and the allocation of capital to users**. The government only creates the seedbed conditions for successful entrepreneurial performance, by means of investments in R&D, education, training and knowledge centres, and so on (Nijkamp 2001). More effective policies are necessary to better encourage and stimulate entrepreneurial activities with growth potential.

The question whether **public sector expenditures** – in general or for specific policy domains – enhance or retard economic development has been the subject of heated debates in the past, with an interesting mix of **scientific and policy arguments**. In a recent study Nijkamp and Poot (2004) try to avoid various traps in this debate by presenting the results of 123 empirical and officially published studies on (categories of) public expenditures and economic growth for a great variety of countries and for different time periods. **Meta-analysis** is deployed in their study to test the **robustness** of the evidence regarding the effect of **fiscal policy** on **economic growth**. Five fiscal policy areas are distinguished and analysed in their large sample of studies: general government consumption, tax rates, education expenditure, defence and public infrastructure. Based on an extensive data set, several meta-analytical methods were applied, including descriptive statistics, contingency table analysis and rough set analysis. Clearly, the outcomes of each individual study are dependent on various research design parameters, such as the type and quality of data, the model specification and the statistical-econometric techniques used in the study. In addition, the level of scientific quality of the publication channel of any particular study is taken into consideration. On balance, the empirical evidence for a convincingly **positive impact** of conventional fiscal measures and instruments on long-run economic growth is in many cases not strong. But the meta-analysis clearly pinpoints two categories of fiscal expenditure that in general have a positive effect, namely, **expenditures for education and research** and for **infrastructure**.

Their conclusion is clear: public expenditures do matter. More precisely: Europe will not be able to reach the Barcelona and Lisbon ambitions, if public expenditures on R&D are not significantly increased. On top of it, private R&D expenditures are equally critical.

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