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# The Italian Economic Decline

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# ABSTRACT

The economic growth of Italy in the last twenty years was one of the worst across OECD countries. When looking for some causes, it is found that for 21 countries in the period 1997-2011, the growth rate of per capita GDP is positively related to initial human capital (proxied by the growth rate of tertiary school enrolments) and the research and development expenditure. Moreover Italy has some other typical characteristics: high deficit, increasing labour cost, high tax wedge, lack of innovation and some other structural problems.

# Introduction

Italy had developed at brilliant rhythms since the Second World War to the early Seventies.
Since then a slowdown has prevailed, and this trend is brought out by all indicators: income, consumption, productivity and exports.
Compared to the past, but also in relation with other similar economies, the results are especially disappointing in the last twenty years.
The main objective of this study is to explain what causes different levels of per capita income in similar countries, and thus to provide an explanation of the recent Italian economic decline.
A vast literature uses cross-country regressions to search for empirical linkages between long-run average growth rates and a variety of economic policy, political, and institutional factors suggested by the theory, and this study focuses especially on the most important driven factors of economic growth of Italy and other twenty OECD countries. We will provide a comprehensive and critical overview of the impact of human capital, financial development, innovation and quality of institutions on economic performance of those highly developed countries.
Previous studies have focused largely on the convergence effect, which is the hypothesis that poorer economies' per capita incomes will tend to grow at faster rates than richer economies until eventually converge. Scholars in fact usually regress the economic development of the whole existing countries on many variables at the same time. The results are robust but they are wide and they are not representative of the situation of a single country.
Since the main objective of this study is to explain the recent Italian economic slowdown, we will focus particularly on countries that have had similar development trends and history, that share similar demographic and economic paths, so that it will be possible a comparison among them.
The results show that the development of human capital and innovation is more important than the quality of institutions and the financial development in influencing the per capita GDP, and it is the cause of the recent Italian slowdown.
The purpose in this thesis is threefold: the first chapter is an overview of the four major growth model paradigms that the economic growth literature has developed in the last century starting from the aurora of the theory of the classical economists (Smith 1776, Malthus 1798, Ricardo 1817, and Marx 1844). The chapter presents the neoclassical growth theory in which the growth rate is determined by the exogenous rate of technological progress (Ramsey 1928 and Solow 1956), and then the endogenous growth theory is which the growth rate is determined by both endogenous technological progress (Arrow 1962 and Romer 1986) and innovation (Schumpeter 1934, Frankel

1962, and Grossman and Helpman 1991). The chapter concludes with few recent empirical contribution on economic growth (Barro and Sala-i-Martin 1995, Grier 1997, Mauro 1995 and Barro and McCleary 2003).

The second chapter investigates which are the main determinants of economic growth of the twenty-one developed countries. We will review the literature about the variables that will enter the model: human capital, research and development, financial development and institutions, then we will show their different outcomes across countries and their relation with the growth rate, and we will show the results of the model.

The third chapter discusses the Italian situation reviewing the most crucial moments of the Italian economic history from the Second World War until now, and we will then focus on the main causes of the recent slowdown of the economy also in respect to the results of the regression model. In the end we compare the Italian evidences with other similar similar European countries, such as Germany, France and Spain.

This study does not pretend to give a comprehensive basis of economic development, because in this way it would become obsolete. We will do not touch interesting topics such as those related to the role of the social distribution of income in the determination of economic growth, or the relationship between development and international trade, issues which have also seen a great flowering of scientific contributions in the most recent period.

The aim of this thesis is not to present an overview, but a set of critical tools to measure the performance of Italy and few basic models also useful for further exploration.

# Chapter 1: Theories on Economic Growth

The issue of economic growth, or more generally, the economic development has played a crucial role since the aurora of the theory of the classical economists.

This first chapter is an overview of four major growth model paradigms that the economic growth literature has developed in the last century; in all models, the level of economic output depends on the stock of capital and labour and the state of technological progress. More accumulation of capital and labour will not in itself lead to a permanent increase of the growth rate, but technological progress is needed to offset diminishing returns to capital and labour.

In the first section we will review the classical paradigm, which states that free markets regulate themselves with the so called "invisible hand" (Smith, 1776), without requiring any external intervention.

The second section presents the neoclassical growth theory, in which technological progress is exogenous: higher investment increases the level of output but does not affect the growth rate, which is determined by the exogenous rate of technological progress.

In the third section in presented the endogenous paradigm, which endogenized technological progress by considering it part of capital accumulation (AK model) and innovation by linking it to product variety resulting from the research and development investments (Frankel, 1962 and Grossman and Helpman, 1991).

The Schumpeterian approach, for example, endogenizes innovation by linking it to firm turnover and "creative destruction" that lead to the obsolescence of old products and generate faster growth.

Finally last section presents few recent empirical models of economic growth.

## *1.1 Classical Theories*

Most of what historians have called classical economics was born in the latter part of 1700 and was consolidated in the early decades of the next century, when the great inventions were made. (Musu and Cazzavillan, 1997).

The father of classical economic theory is the Scottish economist and philosopher Adam Smith, who is considered the true founder of modern economics. In his "Wealth of Nations" (1776) he explains how the economic development is the origin of the wealth of nations and, in particular, how the dynamic of three factors is the determining source of the development: the knowledge progress, the specialization (or division of labour) and the size of the market. The knowledge

development leads to a need of greater specialization, which stimulates the trade between goods of different specializations and thus the development of the market; a larger market, finally gives incentives to develop new knowledge and its application.

In Smith's view the economic development is the result of a virtuous circle which works thanks to the free trade and the dynamic competition (Musu and Cazzavillan, 1997).

Other economists' contributions are more pessimistic about the economic development. The English economist Thomas Malthus (1798) in his first essay on population stresses that the exponential growth of population cannot work with the linear, and therefore necessarily slower, subsistence means offered by nature. Such a different progression would lead to an imbalance between limited available resources and an ever-increasing population growth: an increasing presence of humans beings in associated to proportionally less and less sufficient resources to feed them, and that leads to the impossibility to broaden the development to the whole humankind (Malthus, 1798).

Similarly, David Ricardo (1817) argues that the accumulation of capital would require the cultivation of lands gradually less efficient, thus it increases the income of the owners of the most efficient lands, while it reduces the return of the new capital employed on land less and less efficient; the resulting reduction of profits on capital investment will soon remove the incentive to invest and this will bring the whole system to a point of steady state.

Karl Marx comes to pessimistic conclusions regarding the final outcome of economic development: the development, driven by the profit-seeking capitalists will lead to an excessive capital intensity in the production processes which will lower the average rate of profit to weaken the entire capital accumulation process.

## *1.2 Neoclassical Growth Theory*

The first family of economic growth models which attempts to explain what causes different levels of per capita income in various countries is designed around the basic neoclassical growth model (Funke and Ruhwedel, 2001).

With the advent of the “marginal revolution” and the neoclassical economics, in fact, the interest of economic theory shifted from the analysis of the long run dynamic processes, that had characterized the classical economics, to the analysis of optimal use of given resources, available in limited quantities in different countries.

In the middle of the 20$^{th}$ century the most accredited theory of growth becomes the neoclassical one with the so called exogenous growth models.

It is a class of economic models which tries to explain long run economic growth by looking at the

influence of productivity, capital accumulation, population growth and technological progress.
Furthermore, in neoclassical theory the constraint of scarcity of resources is also applied to the problem of capital accumulation, which is perceived as a choice between present and future consumption, but instead of explaining why resources increase, it takes for granted that increment in the long run (Musu and Cazzavillan, 1997).
The origin of this theory took place in the research of Sir Roy F. Harrod and Evsey Domar, who independently developed respectively in 1939 and 1946 the basis for the later Harrod-Domar model. The model explains how the natural growth rate depends, in the absence of technological change, on the increase of the labour force, and how the warranted rate of growth depends on the saving and investing habits of households and firms, in an environment of fixed proportion, meaning that it is not possible to substitute labour for capital in production (Solow, 1956).
In 1956 the American economist Robert Solow extended the Harrod–Domar model adding labour as a factor of production and setting the capital-labour ratios not fixed any more.
Ten month later another economist from Australia named Trevor Swan published an article with a basic neoclassical model of economic growth.
The two theories put the basis for the neoclassical model, the also called the Solow-Swan model.
The basic building block of the model is an aggregate production function exhibiting diminishing returns of all resources and of capital as well : if the level of capital is high, then the productivity is low, while if the level of capital is low, then the productivity is high, the idea is that if you continue to equip people with more and more of the same capital goods without inventing new uses for the capital, then a point will be reached eventually where the extra capital goods become redundant (Aghion and Howitt, 1998).
In Solow's model the economy produces only one good, whose output is *Y*, through two productive factors: the capital stock *K* and the labour force *L*.
The aggregate production function can be written as $Y=F(K,L)$ , where *K* and *L* represents the durable physical inputs. This function express how much output *Y* can be produced, given the aggregate capital stock *K* and the labour force *L*, and *F* is an increasing and concave function with the first derivatives greater than zero and the second derivatives lower than zero:

$$F'(.)>0 \quad \text{and} \quad F''(.)<0$$

With constant return to scale, output and capital per person are $y \equiv Y|L$ and $k \equiv K|L$ , thus $y=f(k)$ . The last equation represents the production function in “intensive form” and it states that the pro capita production depends only on the capital-labour ratio (Musu and Cazzavillan, 1997).
Assuming that people save a constant fraction of their gross income *sY*, where $s \in [0,1]$ is the rate

of saving, that a constant fraction $\delta \in [0,1]$ of the capital stock disappears each year as a result of depreciation, and that the labour force *L* grows at an exponential rate *n*, then the accumulation of capital stock increases following the fundamental equation:

$$\dot{k} = sF(k) - (n+\delta)k$$ [7]

where *sF(k)* is the rate at which new capital accumulates and , and *(n+δ)k* is the amount of capital required to replace the depreciated capital and to support new workers.

The increase of capital stock, then, is determined by the amount of the capital already existing at that time.

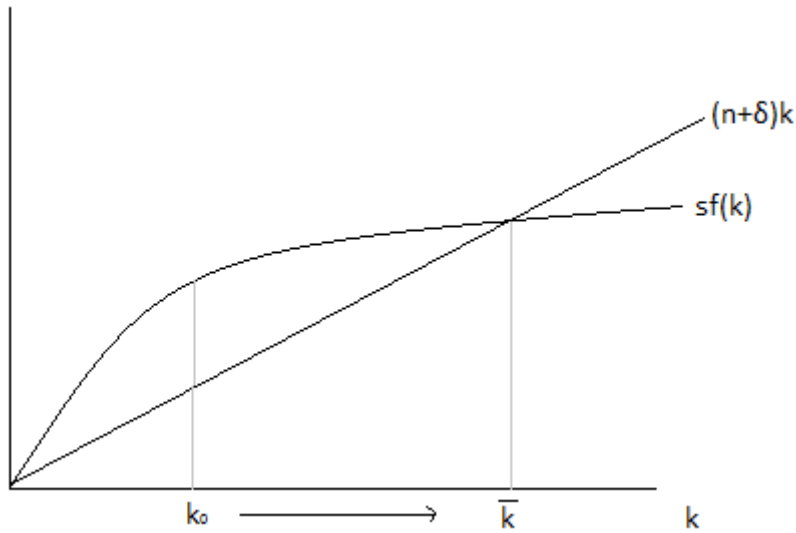



**Figure 1: How the market system leads the economy to a steady state**

As figure 1 shows, diminishing returns will impose an upper limit to capital per person; the saving schedule has a positive but diminishing slope, while the amount of capital required to replace the depreciated capital and to support new workers is a straight line through the origin with a slope equal to the sum of *n* and *δ*.

If saving is larger than what is required to replace the depreciated capital and to support new workers, then *k* can increase and vice versa.

Given any stock of capital $k_0$ the rate of the increase of the stock is the vertical distance between the two schedules; it will continue to crease monotonically and eventually a point will be reached where all of people's saving is needed to compensate for depreciation and population growth.

The system will converge in the long run to $\bar{k}$ , the capital stock at which the two schedules intersect. Thus $\bar{k}$ is a unique, stable, stationary state of the economy (Aghion and Howitt, 1998).

7 For mathematical details see Aghion and Howitt (1998).

Economically this can be explained because if $sf(k)>(\delta+n)k$ there is an excess supply of saving with respect to the investment required to endow new workers and reconstruct the worn out capital, at the initial capital-labour ratio; the rate of interest falls with respect to the real wage and firms find more convenient to substitute capital for labour and they increase the capital-labour ratio of their production processes. This allow to increase output, but, because of the declining marginal product of capital, the increment is lower and lower, that implies that also savings increase at a decreasing rate; on the other hand the investment required to endow new workers and to replace capital increases proportionally to the increase in the capital-labour ratio, until the system reaches in the long run the steady state, where all people's saving is needed to compensate for depreciation and population growth.

In this steady state equilibrium capital stock will increase at the rate of population *n* because

$$\frac{\dot{K}}{K}=s\,f\,\frac{(\bar{k})}{\bar{k}}-\delta=n$$ [8]

thus also the output will increase at the rate of population.

At the same time growth as measured by the rate of increase in output per- person will cease in the long run: all per capita variables are constant in the long run.

This feature of the model is clearly unrealistic (Barro and Sala-i-Martin, 2004).

It follows that the only way to explain the observed long-run growth in output per person is through technological change that continually offsets the dampening effect of diminishing returns, and that this productivity parameter grows at the constant exponential rate *g*.

Solow assumes hence that the output depends on capital *K*, the labour force *L* and the technical progress *A*, thus $Y=F(K,AL)$ where *AL* is defined as the units of effective labour

Assuming that population and labour force are constant and the labour efficiency grows at an exogenous constant rate *g*, then

$$\dot{\hat{k}}=sf(\hat{k})-(\delta+g)\hat{k}$$

where $\dot{k}$ is now *K/AL*, the capital per unit of effective labour.

The only difference between this model and the previous one is thus to raise the effective population growth rate from *n* to *n*+*g*.

As for the same reasons of before, the capital per effective labour *K/AL* will approach to a steady state, but in this case both capital and capital per unit of labour grow at the rate of technological progress

$\frac{\dot{\bar{K}}}{\bar{K}}=g\,,\frac{\dot{\bar{k}}}{\bar{k}}=g$ where $\bar{K}$ and $\bar{k}$ are the capital stock at the steady state.

8 For mathematical details see Aghion and Howitt (1998).

This is because as capital accumulates the tendency for output/capital ratio to fall because of diminishing returns to capital is continually offsets by technological progress. The economy comes to a steady state in which the two conflicting forces exactly offset each other and the output/capital ratio is constant. It follows that "the only way to explain the observed long run growth in output per person is through technological change that continually offsets the dampening effect of diminishing returns" (Aghion and Howitt, 1998).

In the long run thus the only sources of growth come from outside the economy and are identified by a demographic condition and the technology development, whose determinants are not explained.

Solow's model has very strong predictions that are empirically testable but it lacks micro foundations (saving is not determined exogenously) and since the rate of long-run growth is exogenous, it can only explain growth in the short run and its transaction to the rate of long-run growth.

After Solow, other economists tried to explain with different paths the output growth endogenizing some variables.

The Ramsey–Cass–Koopmans model usually just called Ramsey growth model is a neoclassical model of economic growth based primarily on the work of the economist and mathematician Frank P. Ramsey, with significant extensions by David Cass and Tjalling Koopmans. The Ramsey model differs from the Solow model because in Solow's savings are assumed to be a constant fraction of the income, exogenously given, while Ramsey believed that savings are endogenous, since they are the result of economic agents' allocative choice of postponing consumption from present to the future.

As a result, unlike in the Solow model, the saving rate may not be constant in approaching the long run steady state.

The evolution of the system is now represented by two dynamic equation: the first represents the evolution of capital per unit of efficient labour

$$\dot{\hat{k}} = k^{\alpha} - (g + \delta)\hat{k} - \hat{c}$$

where $c$ is consumption per workers and, as said before, it is endogenous; capital can increase after having subtracted from output what is required to replace the worn out capital and to sustain the technological progress at the existing capital per unit of efficient labour

The second one is the so called Euler Equation, which represents the evolution of consumption per unit of efficient labour

$$\frac{\dot{\hat{c}}}{\hat{c}} = \frac{(\alpha k^{\hat{\alpha}-1} - \delta - \rho - \Theta g)}{\Theta}$$

where $r$ is the rate of interest above households own capital, ρ the rate of discount of future utilities (rate of time preference) and θ is the elasticity of marginal utility.[9]

As in the model with a fixed saving rate, the capital stock will converge asymptotically to the stationary state and growth is sustainable in the long run only if there is technological progress; consumption, capital and output all grow at the exogenous rate $g$.

Moreover, according to Ramsey, the convergence to the equilibrium requires that the value of the initial consumption per capita $c_0$ is expected to lie on a "stable trajectory" and this can occur only if that particular value of $c_0$ is properly chosen. It is therefore the price system that provides the right signal to the choice of initial per capita consumption in order to achieve the steady state equilibrium: the initial price must be appropriate and the evolution of it must be granted along the transition, which is extremely difficult because is required a set of perfect and complete markets.

### *1.3 Endogenous Growth Theory*

We have seen so far that in neoclassical growth models, the long-run rate of growth is exogenously determined by the savings rate or the rate of technical progress. However, the savings rate and rate of technological progress remain unexplained.

The main critic of the neoclassical model is that it does not explain the differences in growth rates across countries because it takes the rate of technological progress as exogenous, which sounds distant to the reality since the growth of technology depends on economic decision at least as much as does capital accumulation (Aghion and Howitt, 1998). Furthermore, Cass and Koopmans proved that per capita growth rate of a country is inversely related to its starting level of income per person: there is thus a force that promotes convergence. This is inconsistent with the cross-country evidence, which indicated that per capita growth rates have a little correlation with the starting level of per capita product (Barro, 1991).

Moreover in the previous section we pointed out that in the neoclassical theory it is not possible to provide a satisfactory explanation about the determinants of a long-run economic growth and we have seen that it is not even possible to effectively affect it.

Starting from these considerations about the limits of the neoclassical model, in recent years some scholars have proposed new theoretical frameworks aimed to provide an endogenous explanation to the phenomenon of growth.

9 For mathematical details see Barro and Sala-i-Martin (2004).

The two main actors are households which are assumed to maximize utility subject to budget constraints and firms which maximize profits. In these kind of models decisive importance is given to the production of new technologies and human capital.

The first class of endogenous growth models recognize that the engine of economic development is the increasing level of knowledge due to the experience. At any time, the stock of knowledge available in the community plays the role of a public good, since the companies have free access on it.

In 1962 an American economist, Kenneth J. Arrow supposed that technology growth was a unintended consequence of the experience of producing new capital goods, an endogenous phenomenon called "learning by doing": it depends on industrial innovations made by profit-seeking firms on factors such as research and development and accumulation of human capital (Aghion and Howitt, 1998). The experience acquired by each worker is a positive externality since it increases the level of knowledge of any other worker and at the same time the level of knowledge of the entire community. This leads to an economic growth of the whole system.

The same year, the American economist Frankel introduced the "learning by doing" in a Solow model. He supposed that technological knowledge increases automatically with capital since it is itself a kind of capital good: it can be used in combination with other inputs to produce the final output, it can be stored over time, and it can be accumulated through R&D and other knowledge-creation activities. Frankel assumed that each firm has a production function of the Cobb-Douglas form $Y_j = \bar{A} K_j^{\alpha} L_j^{1-\alpha}$ where $\bar{A}$ is the level of technology given to each firm j while *K* and *L* are the firm's own employment of capital and labour.

Suppose all firms face the same technology and the same factor prices. With a constant exogenous saving rate, the capital accumulation equation is:

$$\dot{K} = s\,A\,K^{\alpha+n} - \delta\,K$$

To analyse the dynamic path of the economy there are three different scenarios, depending on the extent of knowledge externality:

1) $\alpha + n < 1$ the extent of knowledge spillover is not sufficient to counteract the decreasing returns to individual capital accumulation, thus with no population growth and exogenous technical progress the economy converges to the Solow stationary state.

2) $\alpha + n > 1$ learning externalities are so strong that aggregate economy experiences an explosive growth rate

3) $\alpha + n = 1$ then $Y = AK$ and $\frac{\dot{K}}{K} = sA - \delta$ [10] meaning that learning externalities exactly

10 For mathematical details see Aghion and Howitt (1998).

compensate decreasing returns to individual capital accumulation thus the growth rate of consumption and output per capita is positive and an increase in the saving rate will increase the output per capita growth rate permanently. There is then sustained growth of output per capita at a constant growth rate.

Romer (1986) developed a Ramsey version of the learning by doing model: he assumed a production function with externalities of the same sort as considered by Frankel and focused on the case in which population is constant so that the labour is normalized at one and the depreciation rate is zero.

Like Frankel's model, there are three different scenarios: the first two reach the same conclusion as Frankel's does, but when there are constant social returns to capital (the third case), then the economy will carry on a strictly positive but finite growth rate, in which diminishing private returns to capital are just offset by the external improvements in technology $\bar{A}$ that they bring out (Aghion and Howitt, 1998).

The long-run growth rate is completely determined by technology and preference parameters (marginal utility and rate of discount).

Individual firms when they take decision do not consider the positive effect on those on the other firms due to their contribution to increase the aggregate level of technology, but the public authority could stimulate growth just giving some R&D subsidies.

Growth then is endogenous because policies which embrace openness, competition, change and innovation will promote it and because the growth rate results from the optimizing decisions of private agents (households and entrepreneurs).

There is another implication: the long run growth rate implies a scale effect, that means the larger the economy is (measured by $L$), the higher is the amount of labour allocated to R&D and the higher is the long-run growth rate.

Apart from the pioneering studies of Frankel and Romer, other economists tried to explain growth with an endogenous rate of technological progress.

Kaldor (1957) introduced the “technical progress function” which abandoned the distinction between increases in productivity due to capital and those due to technological progress and he related the rate of output growth to the rate of investment.

Uzawa (1965) showed that a sustained growth could be achieved in the long run at an endogenous rate, interpreting $A$ as representing human capital per worker.

Nordhaus (1969) and Shell (1973) built the first growth model in which technological change occurred as a result of deliberate economic choices. They assumed that research was motivated by the prospect of monopoly rents.

Rebelo (1991) stated that in order to produce perpetual growth, there must be a factor or a combination of factors that can be accumulated indefinitely without diminishing returns.

The set up for growth can be as simple as a constant return to scale production function (the AK model) or more complicated engine with spillover effects increasing numbers of goods, qualities, etc.

Grossman and Helpman (1991) introduced endogenous technological change through increasing variety of inputs. The idea is that there are three sectors: a research sector which produces innovations, these innovations are transformed into intermediate goods and those goods, each embodying an innovation, are used to produce final goods.

From the product variety model, as it is called, the rate of growth seems to depend positively on the productivity of the research field, the size of the economy (our $L$), the weight of intermediates between the research and the final sectors, and the level of future consumption.

At the beginning of the 20th century Joseph Schumpeter has already reached similar conclusion but with an innovative approach.

He also assumes that there are three sectors: research, intermediate and final ones. Every time a new best quality variety is introduced as an input in the final sector there is an upgrading of quality and it replaced the old variety.

The endogenous rate of growth positively depends on expected productivity of research effort, on the jump in quality of the intermediate input due to innovation and on the size of the economy.

What Schumpeter does differently, is to leave the main paradigm of the economic theory stating that the general equilibrium can be reached only in condition of perfect competition.

Schumpeter gives to the model a strong stationary characteristic, commonly to the other economists of his time (Musu and Cazzavillan, 1997).

He reinterpreted the equilibrium of the system as a circular flow in which the economy and then the steady state are continuously reproduced and in which different agents easily learn to achieve the steady state if the environment in which they operate is always the same.

Schumpeter argues that economic change orbits around entrepreneurial activities, market power and the most crucial factor which is innovation.

In order to make the development possible, it is instead necessary that the circular flow is continuously disturbed by a new events that modified the environment and the learning process. In this context, the engine of economic development is the innovative entrepreneur, who introduces an innovation and breaks the routine, and at the same time gain a position of monopoly profit which is, on the other side, necessary to provide the incentive for firms to develop new products and processes. That profit is temporary because the innovation quickly spreads and it is soon be

competed away by rivals and imitators.

Schumpeter thus proves that innovation-originated market power can provide better results than the invisible hand and price competition (Musu and Cazzavillan, 1997).

This theory was recently reconsidered by the new theory of the economic development, which removed the link with the hypothesis of perfect competition proposing to include a theory of innovation in the growth theory.

The most recent models of growth have embraced the idea of imperfect competition and they are focused on the analysis of the connection between the introduction of technical progress and the research and development.

## *1.4 Empirical Contributions*

The endogenous growth theory embraces a diverse body of theoretical but also empirical work, in fact between the 1990s and 2000s appeared an intensive empirical literature aimed to test the growth theories.

Like Romer's pioneering paper (1986), most of the new literature has paid close attention to data and to the real world experience of countries worldwide. The empirical growth literature has evolved along different lines, such as cross-sectional studies, time-series studies and case studies, but the most fertile is still the first one (Barro and Sala-i-Martin, 1994).

For example many economists like Barro (1991), Sala-i-Martin (1991, 1992), King and Levine (1992), Alesina and Rodik (1994), Benhabib and Spiegel (1994) and others examined the determinants of long-run growth with statistical instruments based on empirical observations rather than on mathematically describable relationships.

The regression analysis, as it is called, is a statistical technique used to model and analyse some data that consist in a dependent variable and one or model independent variables. The dependent variable in the equation is a function or the independent variables plus an error term. Parameters are estimated to better describe data, and the most used method is the Ordinary Least Squares (OLS).

The standard approach in these studies is the following: calculate the average growth rate over time for each economy and then regress that average growth rate (the dependent variable) on a number of endogenous structural and policy variables, like the financial sector, political instability, human capital, etc. across countries (the independent variables) (Quah, 1993).

More specifically, based on a cross-country regression covering 98 countries over the period 1960-1985, Barro (1991) show that the average growth rate of GDP per capita is positively related to initial human capital, with life expectancy, with the investment to GDP ratio, and with terms of

trade, and it is negatively related with the initial level of real per capita GDP.

In the last two decades other cross country regressions demonstrated that a great number of different factors could influence growth such as inflation and public expenditure (Grier, 1997), corruption (Mauro 1995), participation of population in religious practices (Barro and McCleary, 2003), etc.

# Chapter 2: Determinants of Economic Growth

In the analysis we assume that the economic development is determined endogenously and we will try to investigate which are the main determinants of economic growth of twenty-one developed countries.

The first section reviews the literature about the elements of the model: human capital, research and development, financial development and the institutions.

The second section presents the variables that will enter in the model, their differences across countries and their relation with the growth rate.

The third section shows the empirical findings of the model.

## *2.1 Variables in the Literature*

### 2.1.1 Human capital

The importance of human capital in the economic development has been often underlined.

Literature on economic growth models explores directly the quantitative relationship between investments in education and the level and growth of per capita GDP; there are a large number of studies in both the classical and the endogenous growth theories that are still widely applied in many current empirical studies (Wilson and Briscoe, 2004).

In his pioneering contribution to the endogenous-growth literature, the American economist Lucas (1988) emphasizes human capital accumulation as an alternative source of sustained growth (Aghion and Howitt, 1998).

Lucas distinguishes between two main sources of human capital accumulation: education and learning by doing.

Lucas' approach, inspired by Beckers' (1964) theory of human capital, is based on the idea that it is the human capital formation itself that, by non-decreasing marginal returns, creates endogenous growth, so that differences in growth rates across countries are mainly caused by differences in the rates at which those countries accumulate human capital over time.

Lucas considered an economy populated by infinitely lived individuals who choose how to allocate their time between current production and skill acquisition (or schooling), where skill acquisition increases productivity in future periods. The assumption of human capital accumulation produces a positive growth rate in steady state that depends on the optimal allocation of individuals' time

between production and education (Aghion and Howitt, 1998).

The second approach primarily designed by Nelson and Phelps (1966) and recently revived by the Schumpeterian growth literature, describes growth as being driven by the stock of human capital, which in turn affects a country's ability to innovate or to catch up with more advanced countries. Differences in growth rates across countries are then first caused by differences in human capital stocks and thereby in those countries' abilities to generate technical progress.

In 1990 Romes stated that human capital is “the key input to the research sector, which generates the new products or ideas that underline technological progress”, meaning that countries with higher initial stock of human capital experience a more rapid rate of introduction of new goods in their economy and then tends to grow faster (Barro, 1991).

Becker, Murphy and Tamura (1990) assume that the rates of return on investments in human capital rise as the stock of human capital increases, until the stock becomes large, an effect that could increase due to the spillover benefits of human capital that Lucas (1988) underlines. In this context, the increase in the level of human capital per person tend to lead to higher rates of investment in human and physical capital, and, consequently, to higher per capita growth.

In 90th the American macro-economist Barro proposes a new approach: the empirical study, lately called “Barro regressions”. In his “Economic Growth in a Cross-section of Countries” (1991) Barro studied 98 countries over the period 1965-1985 showing that the average growth rate of GDP per capita is positively correlated with the educational attainment. He puts in relationship the annual average growth rate of per capita GDP with two main proxies for human capital, the 1960 values of school enrolment rates at the primary and secondary levels: the two variables measure the number of students enrolled in primary and secondary schools relative to the total population of the corresponding age group. The empirical results come from the regression show, one more time, that per capita growth is positively related to the two proxies for initial human capital, holding fixed the other variables in the model.

We can conclude that higher growth in human capital contributes to higher output growth, and higher stock of human capital increases the ability of a country to innovate or catch up with more advanced countries by imitation.

The type of education that matters for growth depends on the country’s state of technological development. The human capital variable presented in this study is related to tertiary education, whose investment should be more growth-enhancing for countries closer to the technology frontier, because it increases their ability to innovate, while primary and secondary education are likely to yield relatively more benefits among countries that are technology imitators (IMF Regional Economic Outlook: Europe, 2011).

### 2.1.2 Research and development

We have seen so far that the endogenous economic theory emphasises the accumulation of the research and development and human capital in explaining economic growth.

R&D is defined by UNESCO and OECD as follows:

*"Research and experimental development (R&D) comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications."*

(UNESCO 1978; OECD 1963)

Research and development, and innovation became important relatively soon in the endogenous growth theory with Frankel (1962), Romer (1986) and Rebelo (1991).

In models like Schumpeter's (1911) and Grossman and Helpman's (1991) technological progress shows up as an expansion of the number of varieties of products, and a change in this number has its basis in innovation R&D firms. Technology exists to produce a number of varieties of intermediate goods; an increasing number of varieties requires a technological advance, usually an invention that permits the production of the new kind of intermediate good. This advance requires purposive effort in the form of R&D (Barro and Sala-i-Martin, 2004).

Moreover the literature often uses R&D expenditure to explain some cross-country differences in per capita income and growth, which are driven by differences in the Total Factor Productivity, usually associated with technological progress (Samimi and Alerasoul, 2009).

Griffith (2000) modified Frankel's production function to model the idea that R&D matters for growth introducing a relationship between TFP (total factor productivity) and the R&D stock in this way:

$$Y_j = A(T) K_j^{\alpha} L_j^{1-\alpha}$$

This equation states that countries with a greater R&D stock have a higher level of total factor productivity; or, taking the first differences, countries with higher R&D investments experience faster TFP growth[11].

Research then is an essential factor in the innovation process, which raises productivity and increases economic growth.

Finally a large empirical literature tried to estimate the rate of return to R&D at the micro level, usually at firm and industry levels. In general, this literature finds that social rates of return to R&D are significantly above private rates. These rates of return both show how R&D is important for growth and provide one of the main justifications for government subsidies to R&D; "in order to achieve the optimal level of R&D investment, government policy should aim to bring private

11 For mathematical details see Barro and Sala-i-Martin (2004).

incentives in line with the social rate of return" (Griffith, 2000).

### 2.1.3 Financial development

Since the end of the 19th century, economists have quite different opinions regarding the importance of the financial system for economic growth (Levine and Zervos, 1996).

Walter Bagehot (1873) argues that the financial system has played a crucial role in starting industrialization in England by facilitating the mobilization of capital. Schumpeter (1912) argues that the services provided by financial intermediaries, "mobilizing savings, evaluating projects, risk management, manager, monitoring, and facilitating transactions", are strongly necessary for technological innovation and economic development, he states that well-functioning banks may stimulate technological innovation to identify and fund entrepreneurs with the best chances of successfully implementing innovative products and production processes (Levine, 1997).

Greenwood and Smith (1997) demonstrate that large stock markets can reduce the cost of mobilizing savings and thereby facilitate investment in the most productive technologies; Kyle (1984) shows that liquid stock markets can increase incentives to obtain information on companies to improve corporate governance, finally Obstfeld (1994) argues that international risk sharing through internationally integrated stock markets improves the distribution of resources and can accelerate the rate of economic growth.

In contrast, Devereux and Smith (1994) emphasize that greater risk sharing can actually lower saving rates and slow economic growth (Levine and Zervos, 1996). Shleifer and Summers' (1988) analysis suggests that stock market development could damage economic growth easing counterproductive corporate takeovers (Levine, 1997).

Furthermore some economists simply do not believe that the relationship between finance and growth is important, including few Nobel Prize winners, and Nobel Laureate Lucas (1988) argues that economists "badly over-stress" the role of financial factors in the economic development, while other economists often express their scepticism about the role of the financial system by ignoring it (Chandavarkar, 1992).

Although over these years studies reached several different conclusions, the preponderance of theoretical reasoning and empirical evidence suggests a positive, first-order relationship between financial development and economic growth (Levine, 1997).

Levine (1997) explains the relation between finance and growth with a simple theoretical approach: the costs of acquiring information and conduct transactions make incentives for the creation of financial markets and institutions: without information or transaction costs, a financial system

would be useless, since it spends resources in researching projects, scanning the manager, or establish mechanisms to ease risk management and facilitate transactions. Levine believes that financial systems hence serve a primary function: they facilitate the allocation of resources across space and time, in an uncertain environment.

Levine then points five basic financial systems' functions: they facilitate the trading, hedging, diversifying, and pooling of risk, they allocate resources, they monitor managers and exert corporate control, they mobilize savings, and finally they facilitate the exchange of goods and services.

These functions influence the rate of capital formation and accumulation through the saving rate, the reallocation of savings among different capital producing technologies, and they alter the rate of technological innovation. Concluding accumulation of capital, technology and innovation are also channels which affect the steady-state growth.

In related papers Levine provides an empirical analysis using the cross-country regressions to examine the association between financial development and economic growth.

The traditional practice (e.g., Goldsmith, 1969 and McKinnon, 1973) is to use the size of the formal financial intermediary sector relative to economic activity to measure financial sector development or “financial depth” (King and Levine, 1993).

Levine and Zervos (1996) constructed an index combining information on stock market size, liquidity, and international integration to produce an overall measure of stock market development, and they proved that financial development positively influences economic growth.

Levine then, with other two economists, Loayza and Beck, assesses the effect of financial intermediary development on economic growth with another cross-country study. The dependent variable is the growth rate of the real per capita GDP of 71 countries and the relative period between 1960 and 1995. In their model they use three indicators of financial intermediary development as poxies to measure the provision of financial services: liquid liabilities of the financial system (currency plus demand and interest-bearing liabilities of banks and non-bank financial intermediaries) divided by GDP, a ratio that measures the degree to which commercial banks versus the central bank allocate society’s savings and the value of credits by financial intermediaries to the private sector divided by GDP,supposing that higher levels of financial services mean greater financial intermediary development (Levine, Loayza and Beck, 1999).

The model shows that for a given set of other variables, these three measures are positive and statistically different from zero at the 1% level, indicating that the exogenous component of financial intermediary development strongly influence the long-run rates of per capita GDP growth.

The subsequent literature has been a large one, which we will not attempt to review here.

### 2.1.4 Institutions

A great number of economists, the so called "institutionalists" argue that economic institutions are the main cause of the differences in development between countries, since they affect the structure of economic incentives of the society (Acemoglu, Johnson, and Robinson 2001).

North (1981) gave a precise definition for the institutions: they are "the rules of the game in a society, or, more formally, are the humanly devised constraints that shape human interaction". He stressed the fact that formal institutions, and especially economic ones, are different in each country and this could lead in a different conduct of the economic system.

The debate about the impact that institutions may have on economic growth is still very much alive, and institutionalism is often included in economic analysis.

It is important to delineate the distinction between the formal and informal institutions: informal institutions are the set of values, traditions, social norms and conventions that have been handed down and strengthen in a cultural environment, while formal institution is a government organisation setted up for certain practical purposes, like the government itself, the system of laws, etc.

The most important problem, over the years, was to find an appropriate measure for the quality of institutions to be able to prove that they have a real effect on economic growth.

La Porta et al. (1997 and 1999) adopted for their studies the observable characteristics of formal institutions, such as the legal protection of creditors and shareholders.

Henisz (2000) analysed the government structure to determine policy changes.

Other scholars like Barro (1991), instead of studying the direct observation of the institutional characteristics, adopted some proxies in order to measure the quality of institutions, for example the frequency of coups and revolutions in a country, the size of the black market and the "contract-intense" which is the level of enforcement of contracts and rights (Clague et al. 1999).

Hall and Jones (1999) and Acemoglu, Johnson, and Robinson (2002), involved the feedback of experts gathered by special private companies to provide information to investors about the risks that may be incurred in the international market: the International Country Risk Guide is a collection of data related to the 80s and 90s and it covers issues such as nationalization, the quality of bureaucracy, corruption, efficiency of procedures, etc.

While early work on economic growth took for granted the existence of institutions that established clear and enforceable property rights, kept the costs of transacting business to a minimum, and reduced the threat of coercion, more recent works have shown that this is rarely the case. Indeed, current researches suggest that the capacity of national institutions in protecting property rights, reducing transaction costs, and preventing coercion may be decisive in determining whether

economic development takes place (Hirst, 1997).

## *2.2 Growth-enhancing Variables*

As we have seen so far, the literature is quite huge and exhaustive about human capital, research and development, finance and institutions in relation to the economic development, and when investigating the main causes of a country's economic growth it is always difficult to choose the correct path and the right variables.

This section presents the variables that will enter the model: starting from the graphical representation of them across countries, we will proceed with an analysis of them in relation with the economic growth.

The cross-country analysis uses a number of 21 OECD countries for which it was possible to collect data on the variables employed, and such that there is one observation per country.

The considered countries are: Australia, Austria, Belgium, Canada, Chile, Denmark, Finland, France, Germany, Greece, Israel, Italy, Japan, South Korea, Mexico, Netherlands, Norway, Portugal, Spain, Sweden and United Kingdom.

The choice of how many and which countries take into consideration is a consequence of the aim of this study, which is to analyse similar situations to understand what affects the economic growth of a developed country, and thus which are the main causes of the Italian economic decline.

### 2.2.1 Growth rate and initial per capita GDP

The dependent variable of the model is the growth rate of per capita GDP between 1997 and 2011, calculated as follows: $growth_{97-11} = \frac{(pcGDP_{2011} - pcGDP_{1997})}{pcGDP_{1997}} * 100$ .

Across the OECD area, countries have experienced a wide variation in per capita GDP growth over the last fifteen years: as Figure 2 shows, they have ranged from close to four in Italy and Japan to more than fifty percent in the South Korea (see Figure 2)[12].

12 The data are listed country-by-country in the Appendix, Table A1.

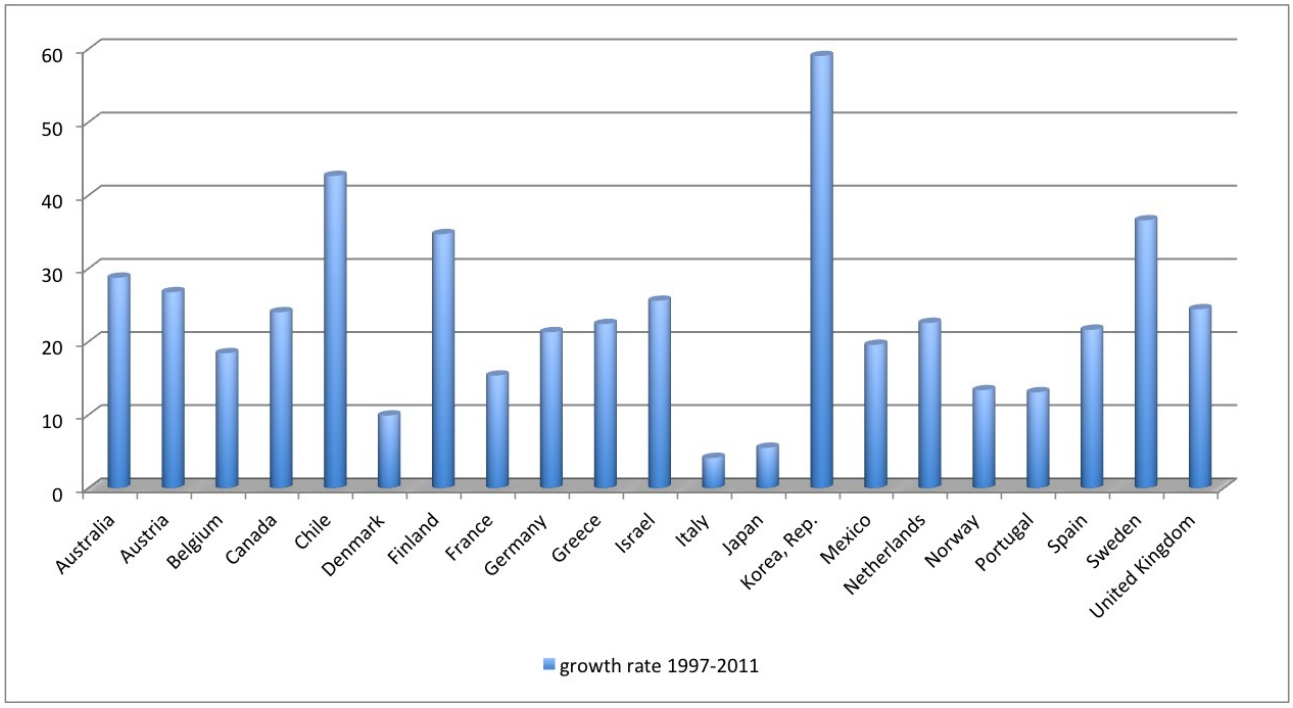



**Figure 2: Growth Rate of per Capita GDP (2000 US$), 1997-2011.**
Source: World Bank data.

Since 1960, South Korea has achieved an incredible record of growth and integration into the high-tech modern world economy (Tata, 2011). The two key factors that have driven this knowledge economy are an extremely competitive education system and a highly skilled and motivated workforce. Furthermore, in recent years, Korea's economy moved away from the centrally planned, government-directed investment model toward a more market-oriented one.

Even if this high growth rate is not surprising so much, someone may point out that there could be other explanations. The considered period of the analysis starts in 1997, the same year in which began the Asian Financial crisis: as the crisis spread, most of South-East Asia and Japan saw slumping currencies, devalued stock markets and other asset prices, and a precipitous rise in private debt, and South Korea, with Thailand and Indonesia was one of the most affected countries. In this scenario it is easily to think that a growth rate which has a very low starting value not due to structural causes leads to a very strong growth path only to come back to the same situation before the crisis.

Figure 2b shows that even if both South Korea and Japan had a record low in 1998, their growth rates of 1997 were not affected yet by the crisis, thus the variable does not depend on it.

The second highest growth rate comes from Chile.

Chile was the first and still the only one Latin America country which joined the OECD in 2010 and it is one of the fastest growing economies among its neighbourhoods.

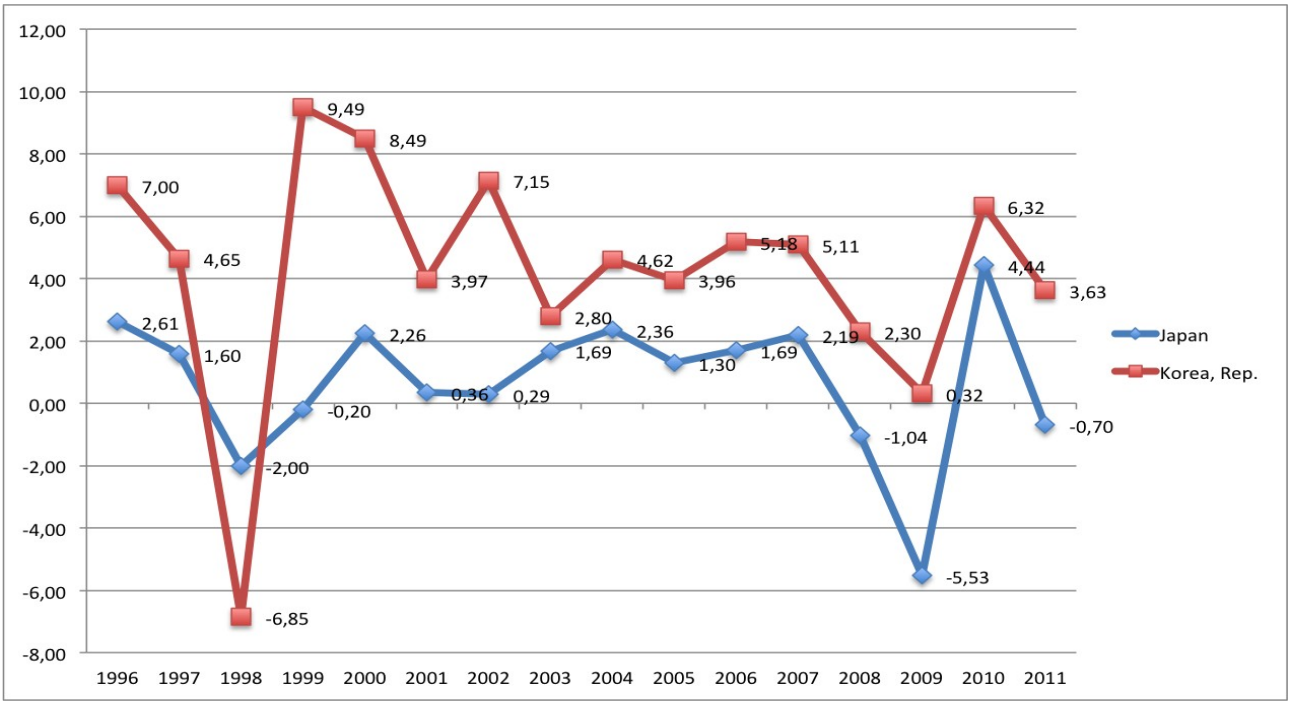



**Figure 2b: Annual Growth Rate of per Capita GDP of Japan and South Korea, 1996-2011.**
Source: World Bank data.

Economic growth in Chile since the mid 1980s has been remarkable for its high level and persistence: two decades ago it made the commitment to advance economic reform, proactive social investments, transparent public sector management and stable consensual governance.

During the past fifteen years, the country recorded an average annual per capita growth of 4.1% and per capita income increases of 43 percent between 1997 and 2011 (see Figure 1).

During this period Chile has consolidated its macroeconomic stability, in part through the adoption of a floating exchange rate and the definition of strict inflation targeting. In addition, a carefully calibrated fiscal policy has been essential to balance the expansion of social programs with fiscal discipline. Moreover, over the past decade, the number of students from the two lowest income levels has tripled.

Across the Europe the best results come from the Scandinavian countries, like Sweden (37%) and Finland (35%) where the per capita GDP is grown more than in the other European countries between 1997 and 2011. The welfare state in these countries develops efficient services: Sweden and Finland's entire populations have equal access to the universities and the public health care services. Both education and health care system are publicly-funded and, even if taxes are high, the government uses taxpayers' money well and efficiently. In this situation the inequalities are reduced as much as possible and the country is open to innovation.

Moreover, Baltic markets have been relatively quiet after the 2008 Global crisis and during the decline of stock markets worldwide in the last years. Between 2003 and 2008, according to The

Economist Statistics, the average annual growth rate of the Swedish GDP was 2.8%, and, even if it contracted by 5.3% in 2009, slightly worse than Germany (-5.1%) and Italy (5.2%), the year after Sweden had the highest growth rate across European countries (5,7%) against Germany (+3,6%) or Finland (+3,6%).

On the other side Italy performed worse than all the other countries with a growth rate of only four percent in 15 years.

The first independent variable included in the model is the is the starting value (1997) of per capita GDP; Figure 2c plots the simple relation between the variable and the growth rate.

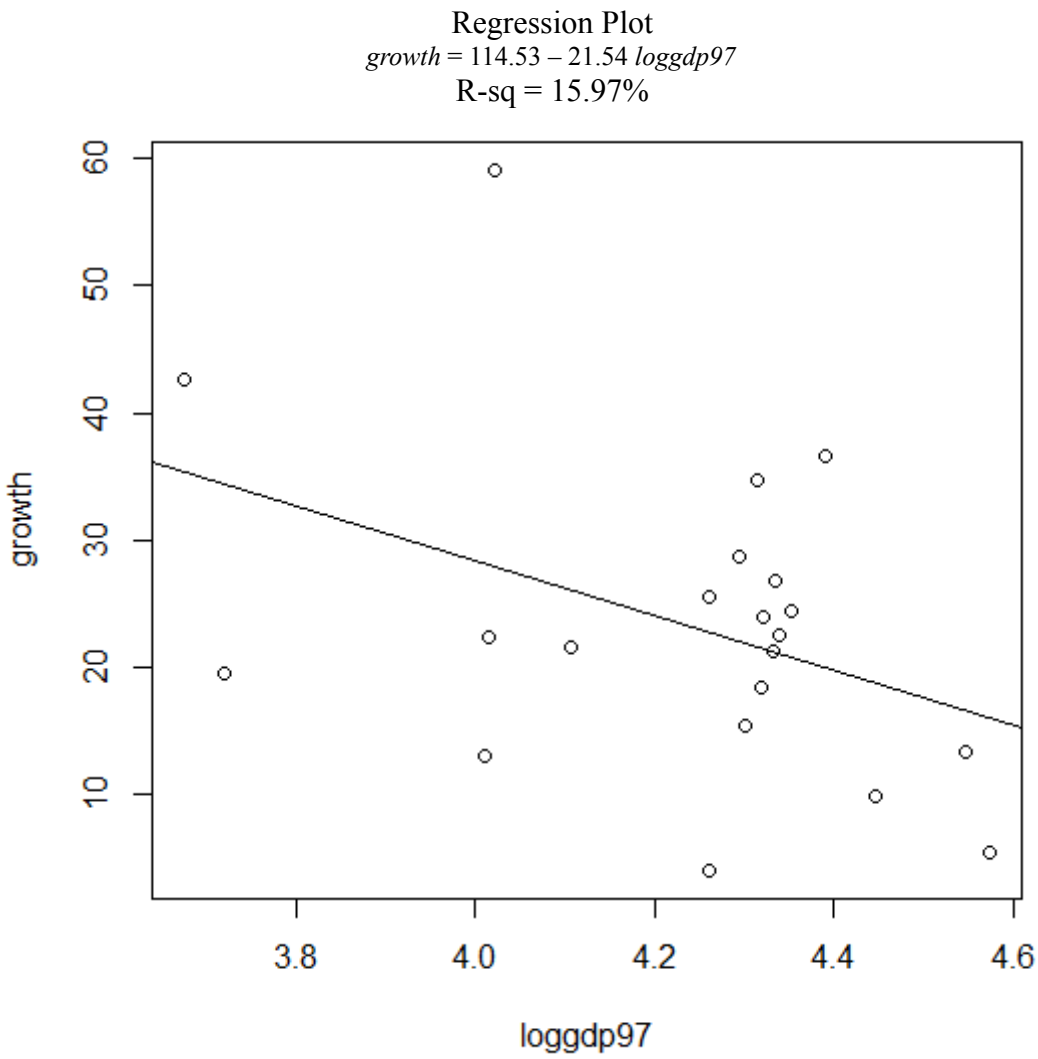



**Figure 2c: Scatter Plot of Growth Rate of per Capita GDP against the Initial per Capita GDP (simple relation).** These data are for 21 countries described in Table A1 of the Appendix. The log of per capita GDP in 1997 is on the horizontal axis, and the growth rate of per capita GDP from 1997 to 2011 is on the vertical.

As the Figure shows, the relation is negative but not statistically significant. This negative relationship is called β-convergence and it represents the tendency of poor countries to grow faster than richer ones, meaning that poor countries will eventually catch up with the others (Barro, 1991). R-sq = 15.97% indicating that about 16% of the variation in the growth rate can be explained by its initial level.

### 2.2.2 Human capital

The variable used as a proxy for the human capital is the tertiary school enrolment rates between 1980 and 1996. The variable, based on data from the World Bank, measures how is increased the number of students enrolled in universities or colleges as a proportion of the total population of the corresponding age group. Because of this definition it is possible for the value to exceed 100.

This way of proceeding is usually called 'growth accounting', because it emphasises the importance of measuring changes in the quality of labour, as indicated by improved qualifications and higher skills.

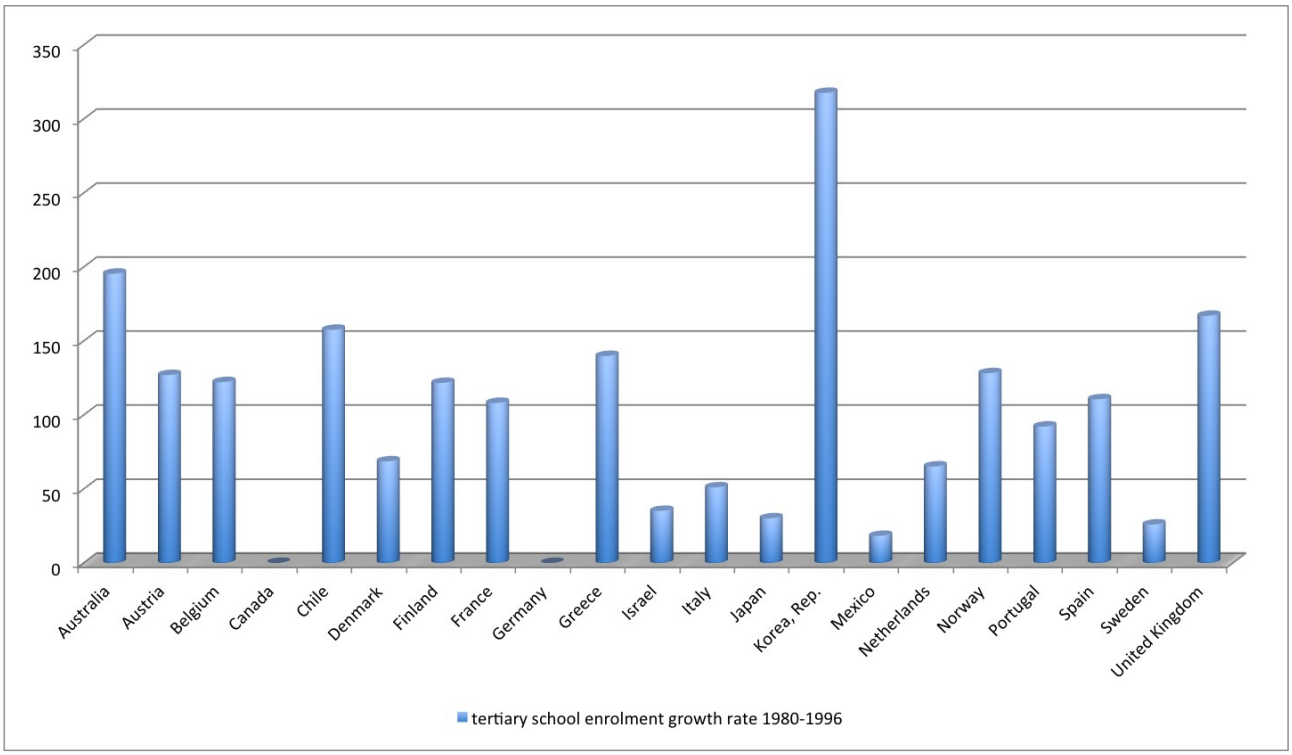



**Figure 3: Tertiary School Enrolment Growth Rate (% gross), 1980-1996.**
Source: World Bank data (two data are missing).

In the considered period of the model (1980-1996) the gross tertiary school enrolment of South Korea is more than quadrupled (Figure 3). This high number is in part justified by the very low

tertiary school enrolment rate at the beginning of the considered period.[13]

At the same time we have seen that South Korea is a country that derives its success from the economic ascent of the last ten years, a progress whose foundations are based in particular on excellence in education. The Korean education system is known for the highest standards of quality, that leads to a strong competition in the academic world, and later in the workplace (PISA 2009). However this high percentage is in part the reason of the subsequent high growth rate (see Figure 3b).

At the lower end of the enrolments spectrum we find Mexico, Sweden, Israel and Japan, followed by Italy. In these countries universities in 1996 attracted less than 50% more students than fifteen years before.

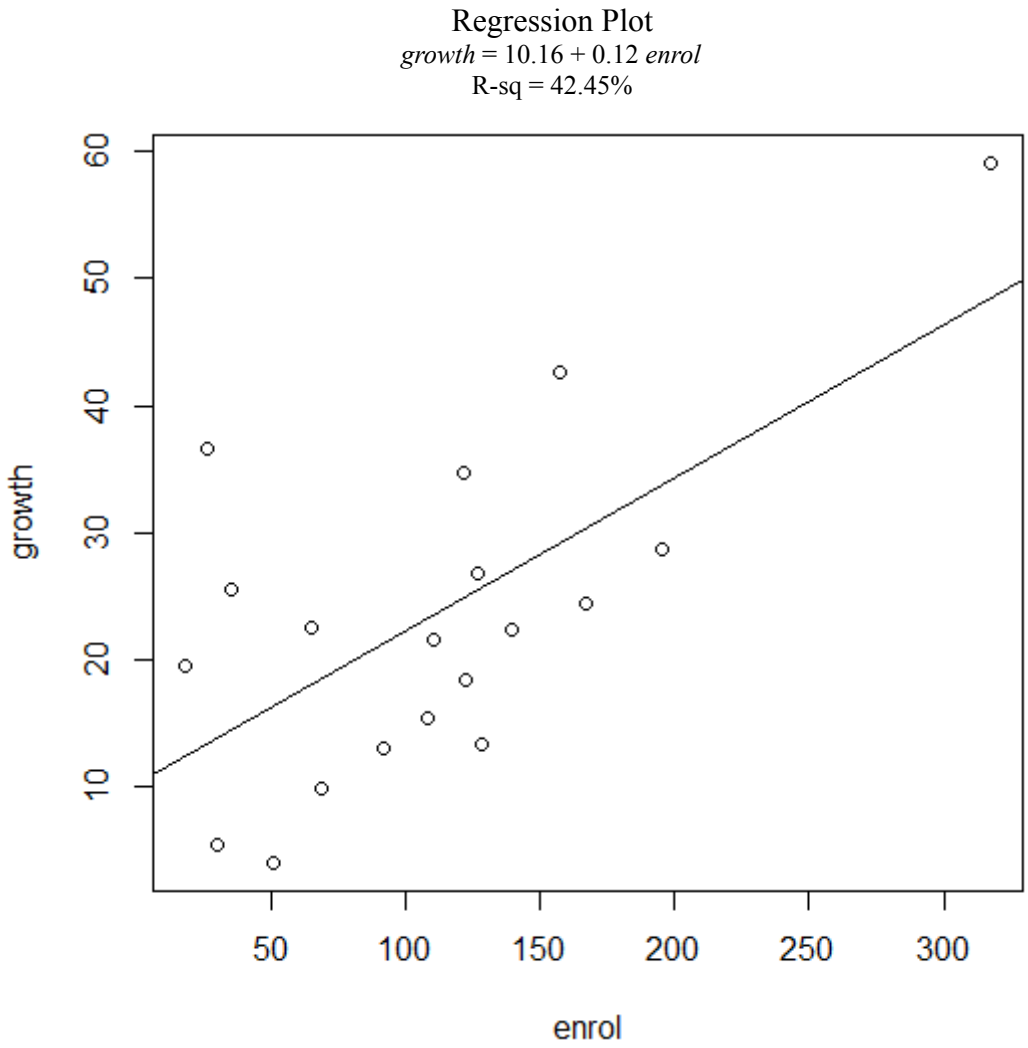



**Figure 3a: Scatter Plot of Growth Rate against Human Capital.** The scatter plot shows the partial relation between the growth rate of per capita GDP and the growth rate of tertiary school enrolments between 1980 and 1996.

13 The data are listed country-by-country in the Appendix, Table A2.

Figure 3a shows the simple relation between growth rate of per capita GDP and the tertiary school enrolment rates: the relation is positive hence the higher the value of enrolments the greater is the growth rate.

R-sq = 42.45% indicating that about 42% of the variation in the growth rate can be explained by human capital.

### 2.2.3 Research and development

Since we have underlined the importance of the R&D expenditure in the growth literature, it will enter the regression model as a percentage of GDP. Expenditures for research and development are current and capital expenditures (both public and private) on creative work undertaken systematically to increase knowledge; it covers basic research, applied research, and experimental development.

After the Second World War Sweden decided that knowledge and, in particular, scientific knowledge would be the lever for the economic, social and civil development of the country. The Government has acted accordingly and nowadays it is still doing it and Figure 3 shows that still in 1996 Sweden is investing in research and development about 3.4% of the GDP[14].

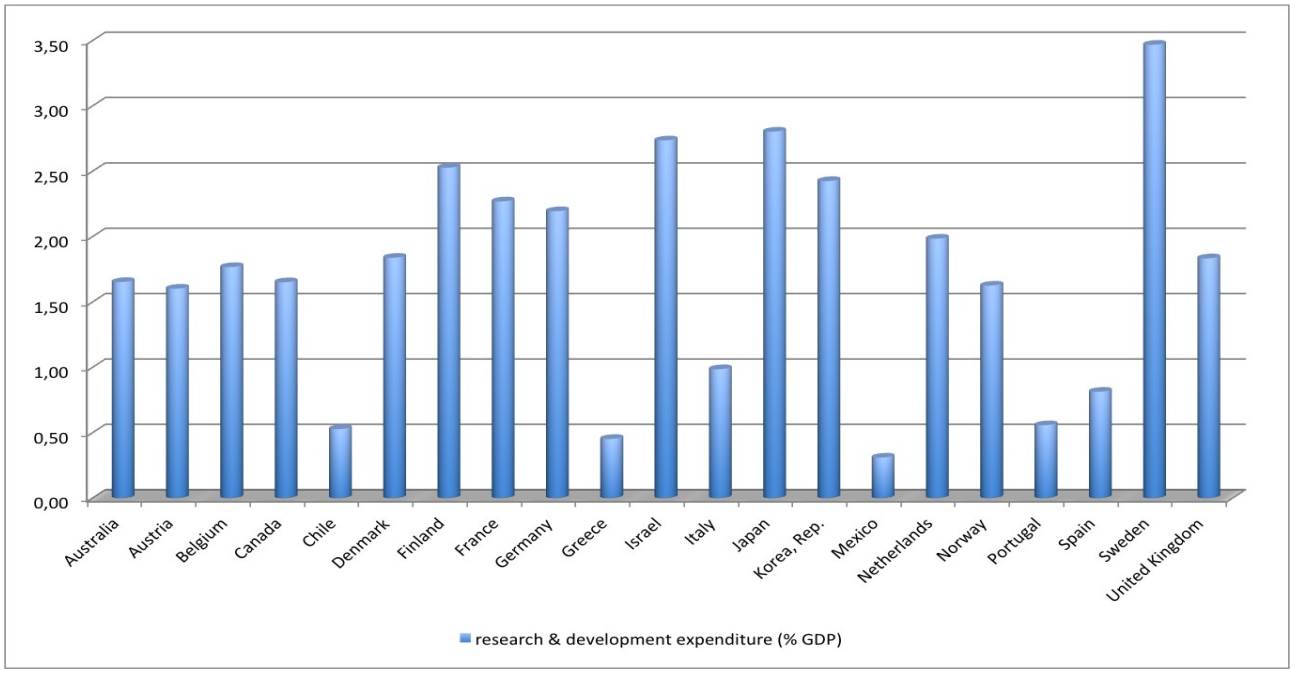



**Figure 4: R&D Public and Private Expenditure over GDP, 1996.**
Source: World Bank data.

Moreover in Sweden there is also a strong private R&D expenditure: investments are more frequently found within the enterprise group, both Swedish-owned firms and foreign-owned

14 The data are listed country-by-country in the Appendix, Table A2.

affiliates, and also from international joint ventures. Two of the main investors are Ericsson and Sony-Ericcson (Andersson and Ejermo, 2005).

Japan and Israel follow Sweden in R&D expenditure with about the 2.5% of spending over the GDP, almost one percent point less.

At the lower end of the R&D expenditure spectrum we find Mexico and Greeces. In Mexico the research and development expenditure is about 0.3% while in Greece it slightly exceeds 0.45%.

It is important to underline that inputs (R&D expenditures) and outputs, usually the number of patents, are not always "in line". For example in 1996 about the 28% of of the OECD's patents were from Germany (excluding those from United States), another 26% from Japan and only the 3% were from Sweden.

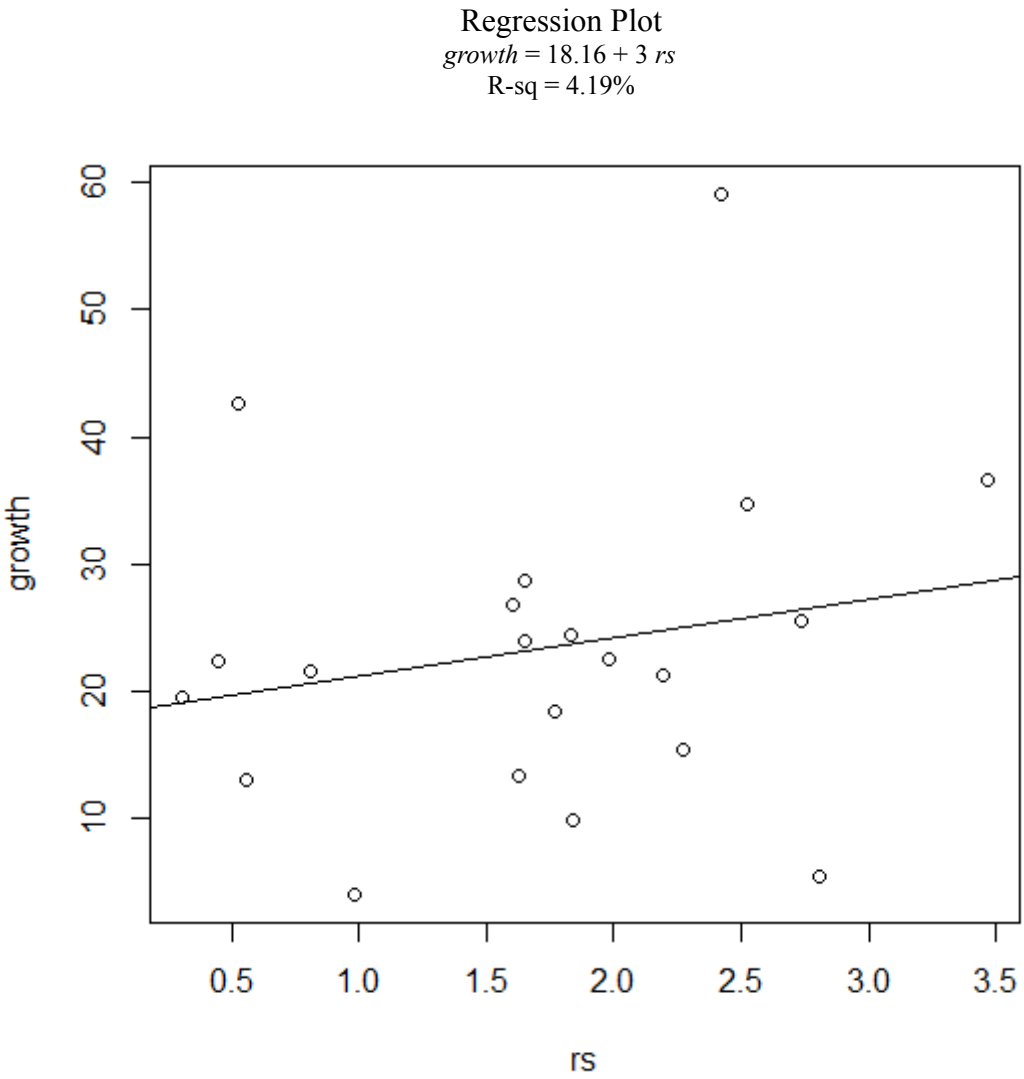



**Figure 4a: Scatter Plot of Growth Rate against R&D.** The diagram shows the partial relation between the growth rate of per capita GDP and the research and development expenditure in 1996 as a percentage of GDP.

Figure 4a shows the relationship between per capita growth rate and the research and development

expenditure in 1996 as a percentage of GDP.

The regression line is flat and even if there is a positive relation between R&D and the growth rate, the relationship is not statistically significant.

R-sq = 4.19% indicating that about 4% of the variation in the growth rate can be explained by research and development.

### 2.2.4 Financial development

We used then a set of four "financial variables" that should measure the differences in financial development across OECD countries.

The variables are from the IMF's International Financial Statistics, October 2008, and Standard and Poor's Emerging Market Database, and they are all relative to the 1996.

The first three measures are those used by Levine, Loayza and Beck (1999) already presented in the previous paragraph.

Liquid liabilities is the ratio of liquid liabilities of the financial system divided by GDP, a measure for the "financial depth" of a country, it represents the overall size of the financial intermediary sector (King and Levine 1993). Liquid liabilities consist of currency held outside the banking system plus demand and interest-bearing liabilities of banks and non-bank financial intermediaries.

It is defined as follow:

$$liquid = \frac{(liquid\ liabilities)}{GDP}$$

The other two financial variables are the deposit money bank, which equals the ratio of deposit money bank claims on domestic non financial real sector to the sum of deposit money bank and Central Bank claims on domestic non financial real sector:

$$deposit = \frac{(deposit\ money\ bank\ assets)}{[(deposit\ money + central)\ bank\ assets]}$$

It is a ratio that measures the degree to which commercial banks against the central bank allocate society's savings (Levine, Loayza and Beck, 1999).

Private credit then equals the value of credits by financial intermediaries to the private sector such as through loans, purchases of non-equity securities, and trade credits and other accounts receivable divided by GDP; it indicates the level of financial services, and therefore how great is the financial intermediary development in a country.

$$private = \frac{(private\ credit\ by\ deposit\ money\ bank)}{GDP}$$

A financial system that simply funnels credit to the government or state-owned enterprises may not be evaluating managers, selecting investment projects, pooling risk, and providing financial services

to the same degree as financial system that allocate credit to the private sector (Levine and Renelt, 1992).

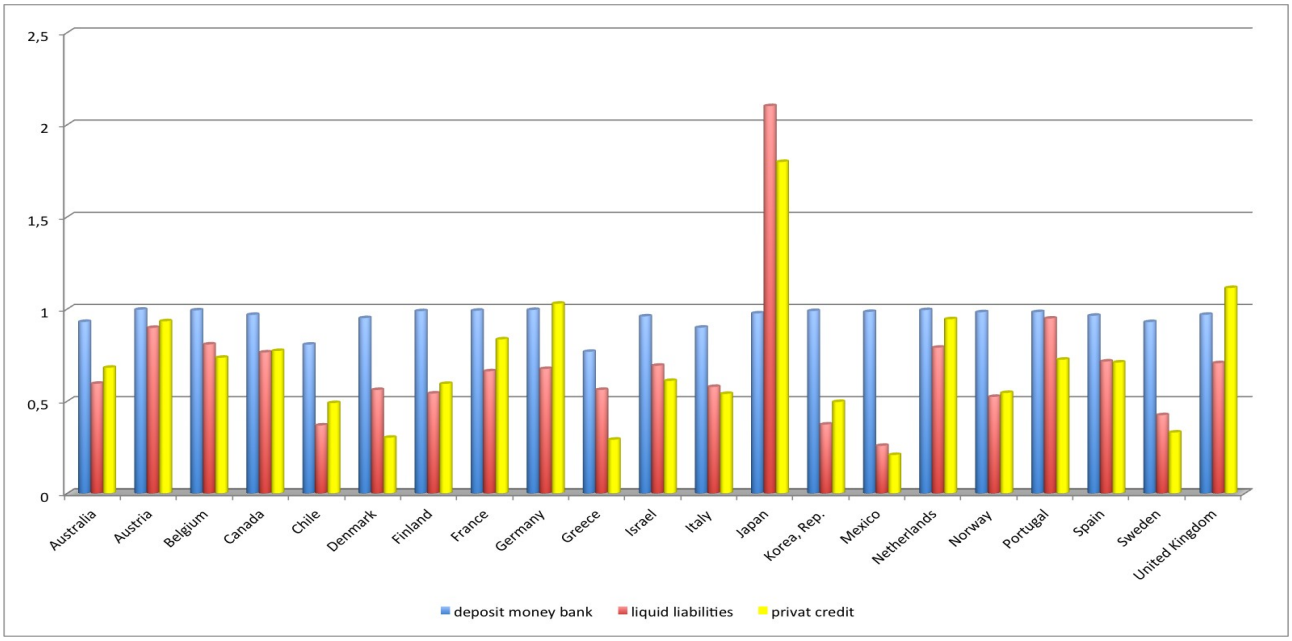



**Figure 5: Financial Development across Countries, 1996.**
Source: Levine data.

Figure 5 reports the first three variables by country[15].

It is notable that the deposit money bank variable does not change so much across countries, with a maximum of 0,99 in Austria and a minimum of 0,77 in Greece, and in fact it does not seem to affect the per capita GDP (Figure 5a).

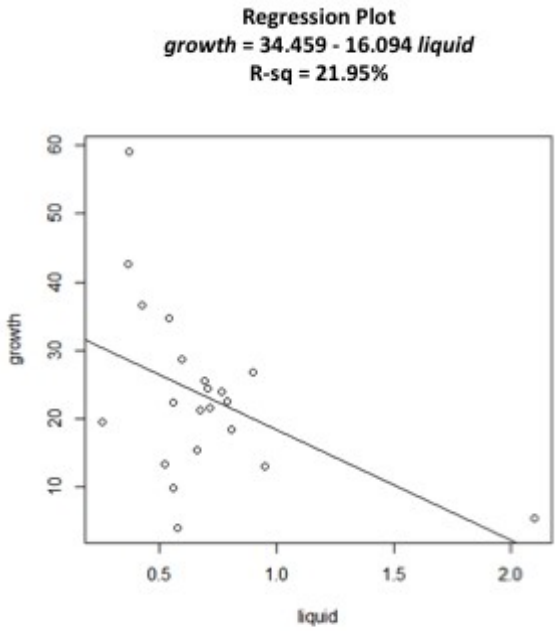



**Figure 5a: Scatter Plot of per Capita Growth against Liquid Liabilities**

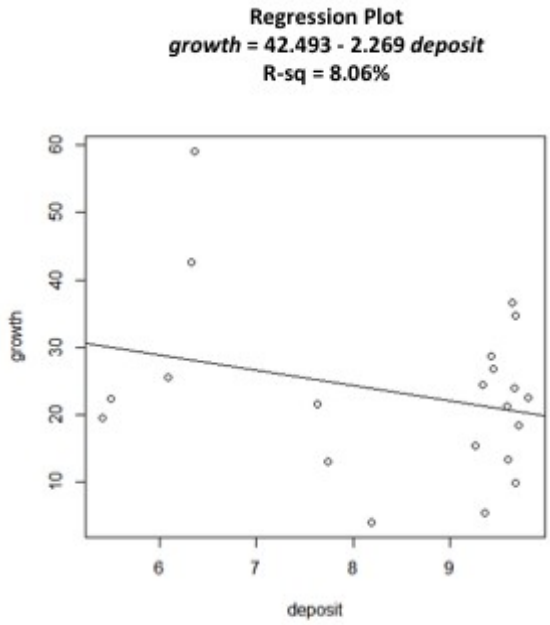



**Figure 5b: Scatter Plot of per Capita Growth against Deposit Money Bank**

15 The data are listed country-by-country in the Appendix, Table A3.

On the contrary, when considering liquid liabilities and private credit there is considerable variation across countries. For example, private credit is 21 percent of GDP in Mexico and less that 30 percent in Greece; it is greater than 110 percent of GDP in United Kingdom and even greater that 170 percent in Japan.

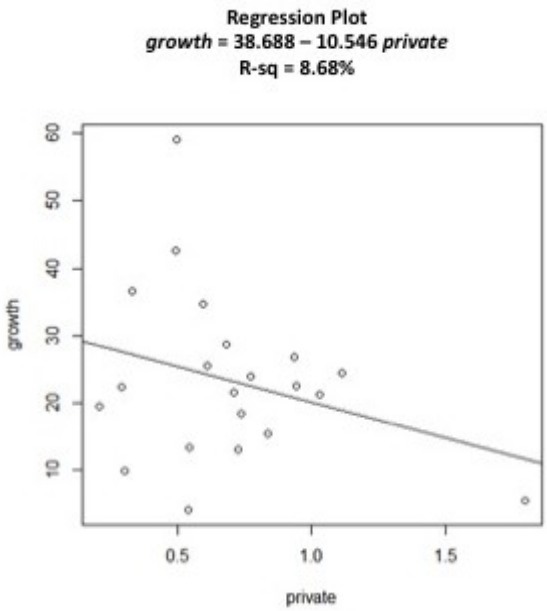



Figure 5c: Scatter Plot of per Capita Growth against Credit to Private Sector

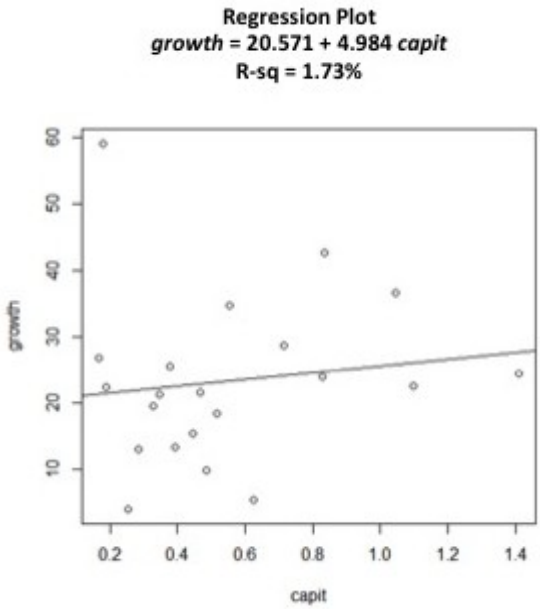



Figure 5d: Scatter Plot of per Capita Growth against Stock Market Capitalization

Japan has also a very high level of liquid liabilities, they are twice the real GDP, corresponding to the liquidity trap period, when the interest rate was almost zero and monetary policy was thus unable to stop the prolonged period of stagnation (Svensson, 2006).

The two variables deposit money bank and private credit do not seem to affect the per capita GDP (Figures 5b and 5c), while the simple relation between the growth rate of per capita GDP and the financial variable liquid liabilities is negative and statistically different from zero at the 5% level (Figure 5a), and about the 22% of the variation among countries in the growth rate can be explained by the level of liquid liabilities.

I used then another financial variable which is the stock market capitalization over the GDP. The variable measures the value of listed shares to GDP and it is another Levine's proxy for financial development. Listed domestic companies are the domestically incorporated companies listed on the country's stock exchanges at the end of the 1996. Listed companies do not include investment companies, mutual funds, or other collective investment vehicles.

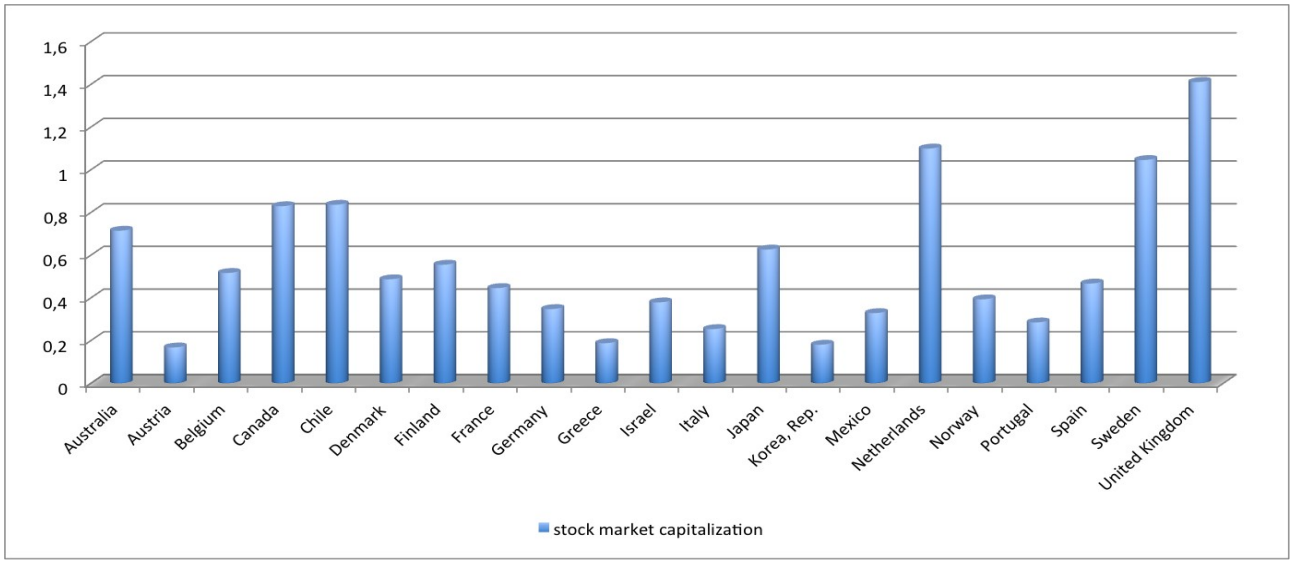



**Figure 6: Stock Market Capitalization across Countries, 1996.**
Source: Levine data.

Figure 6 shows that there is a considerable diversity in the degree of development and sophistication of financial markets within the OECD countries: in 1996, the starting date, the ratio between stock market capitalization and GDP ranged from 17% in Austria and 25% in Italy to 83% in Canada and Chile, and 141% in the United Kingdom[16].

While free capital mobility has been a reality in the European Union since the late 1980s, financial market segmentation has persisted due to different regulations and institutions across the EU (Guiso et al. 2004).

The situation was even worse for the other non-member countries like Canada, Chile, Mexico, and Israel, Japan and the Republic of Korea.

### 2.2.5 Quality of institutions

This set of institutional variables are typically controlled by policy-makers: we rely on four main poxies that have been used in the literature on country-level institutional determinants against growth.

The rule of law is a measure of the evaluation of the legal and order tradition in the country, it reflects the degree to which the citizens of a country are willing to accept the established institutions to make and implement laws and adjudicate disputes. The variable ranges from 1 (weak law and order tradition) to 6 (strong law and order tradition) and is published by the International Country Risk Guide (ICRG). I use the average of 1982-1995 values. It is the only institutional variable one outside the policy control.

16 The data are listed country-by-country in the Appendix, Table A3.

The creditors' rights protection is measured with an index developed by La Porta et al. (1998) which comprehends some features of the legal rules governing loan contracts. It ranges from 0 (little rights) to 4 (maximum rights).

Finally there are two indicators of judicial efficiency: the duration in weeks of trials and the cost of judicial proceedings as a percentage of GDP. These data are from the World Bank.

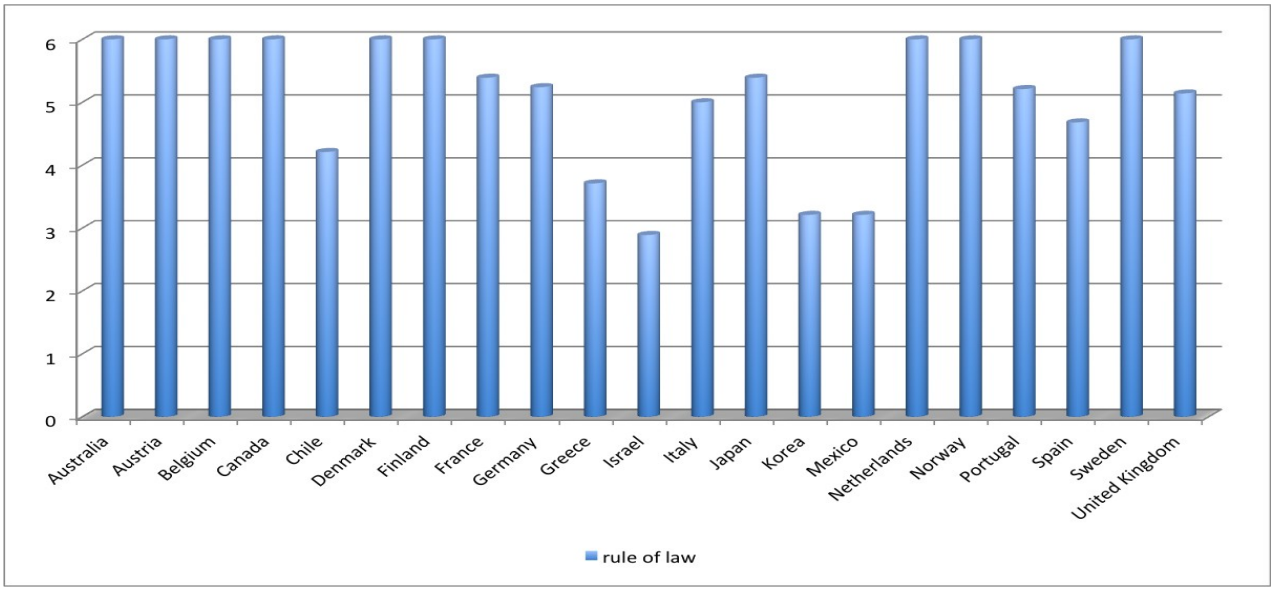



**Figure 7: Rule of Law Index, average 1982-1995.**
Source: International Country Risk Guide.

Figure 7 shows that European countries have the highest scores of "rule of law" across OECD countries. Except from Greece, they are all above the 4 score, meaning that they have quite strong law and order tradition[17]. Even if the recent OECD document "The global competitiveness Report 2008-2009" see the rule of law as a source for a nation to reach a more competitive position across countries, the simple relation between the index and the growth rate is not statistically significant (see Figure 7a).

On the contrary, the index of creditor rights varies across countries, with Israel and U.K. at the highest levels (see Figure 8) and the diversity is in part the result of some culture differences.

Stulz and Williamson (2001), for example, in one of their studies attempt to verify if and how religion and language affects the financial sphere, and in particular the investor and creditor rights. The results show a statistically significant and positive relation between the rights of creditors and religion, and, in particular, they are weaker in countries where the most followed religion is the Christian one, especially those countries who are Catholics.

This result could explain the very low level of French and Mexican indexes, since the most

17 The data are listed country-by-country in the Appendix, Table A4.

professed religion in these countries is the Catholicism, but it does not justify the high creditor rights' level in the United Kingdom, since it is a Christian country.

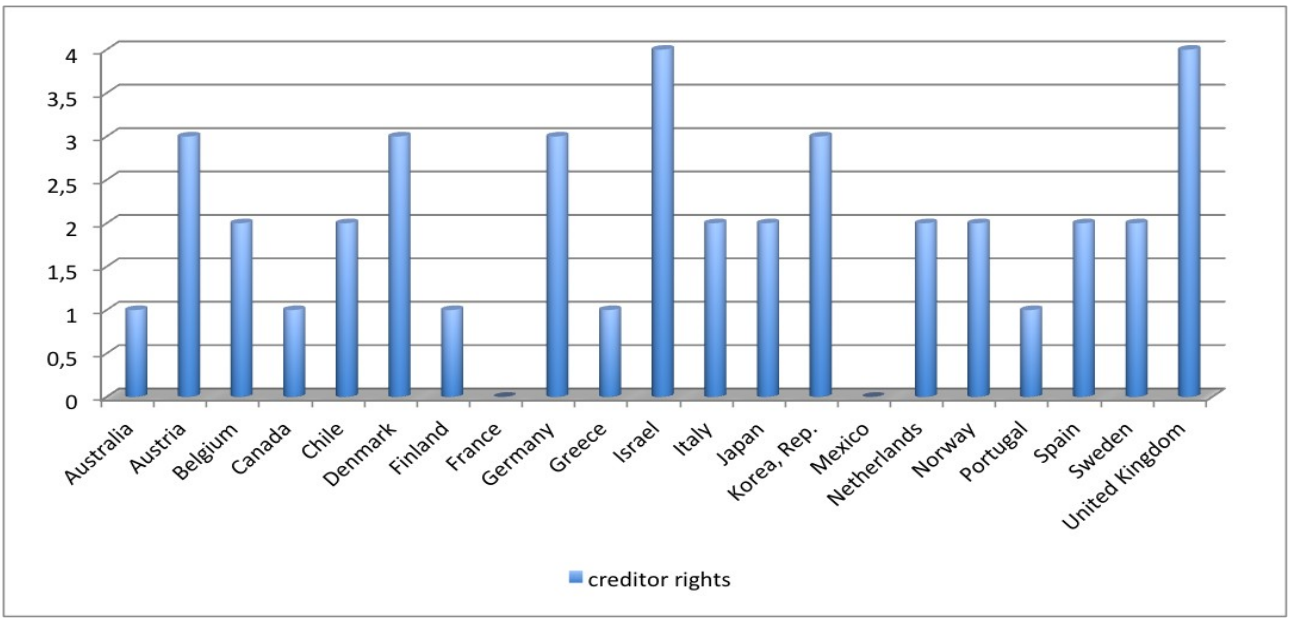



**Figure 8: Creditor Rights Index, average 1982-1995.**
Source: La Porta *et al.*

According to the "Global Credit Portal" by Standard&Poor's (2008), Israel has a "well-developed body of commercial law and an experienced and practical bar, judiciary, and financial service community. Its insolvency regime is, on the whole, creditor-friendly. Debt recoveries for secured creditors are strong, primarily due to creditors' ability to foreclose on collateral, even during liquidation proceedings."

Unsecured creditors have the ability to instigate liquidation proceedings on insolvent debtors and they are subject to a nine-month extendible stay during reorganization proceedings.

The duration in weeks of juridical trials and the cost of them are both variable across countries. The most efficient seem to be the Netherlands (9 months), followed by Japan and then South Korea and Denmark (see Figure 9).

At the lower end at the judicial efficiency spectrum we find Italy, where processes last more than 600 weeks, about 12 years. This is an historical problem and even if nowadays the Government acts to solve it, the time spending in civil and criminal procedures is still too high.

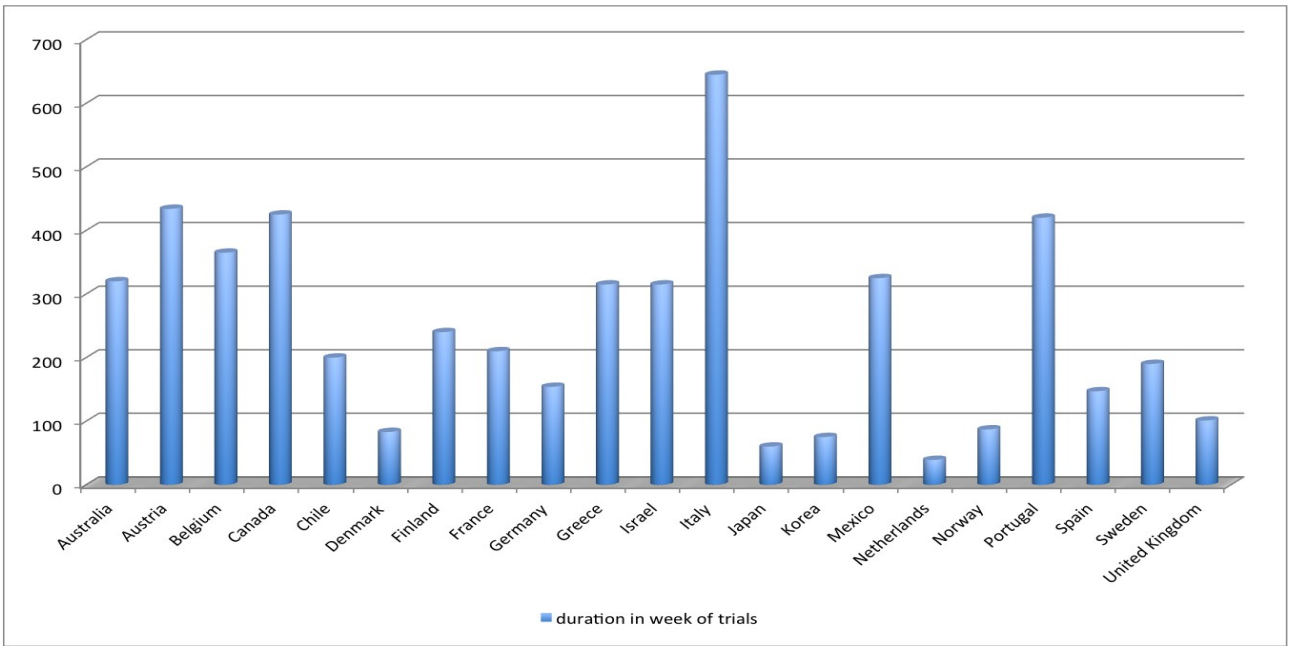



**Figure 9: Duration in Weeks of Trials.**
Source: World Bank data.

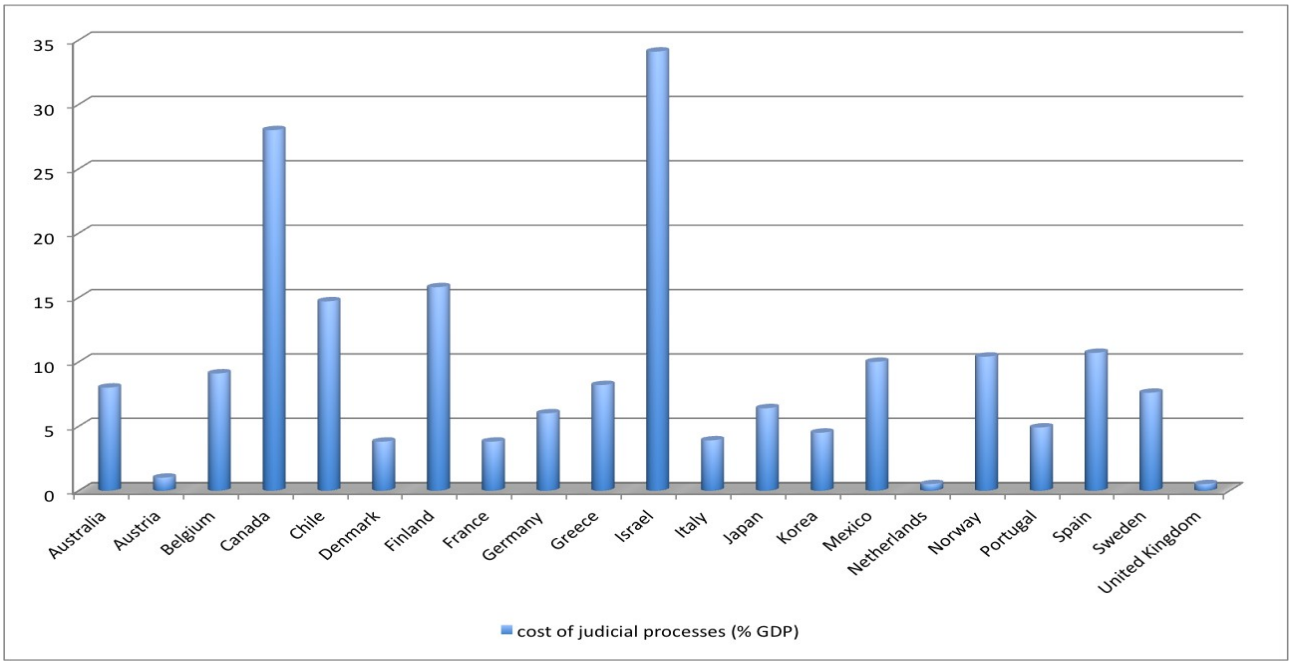



**Figure 10: Cost of Justice (% GDP).**
Source: World Bank data.

According to an Eurispes study (2007), the main causes of this long time spending in civil and criminal procedures are some simple logistical and organizational dysfunctions, for example the 69.7 percent of the processes did not end with a judgement, it is postponed to another hearing due to legal impediment of the accused (2%) and of the defender (3.3%), the absence of the judge (9.2%). The 13.4 percent of the processes has been postponed due to the lack or irregular notification of the

respondent or the summoned witnesses, who, for the 28.9 percent do not appear at the hearing. Finally Figure 10 shows the percentage of money spent on judicial proceedings as a percentage of GDP. The most efficient remain the Netherlands and United Kingdom (0.5%), while in Israel they spend about the 35% in justice.

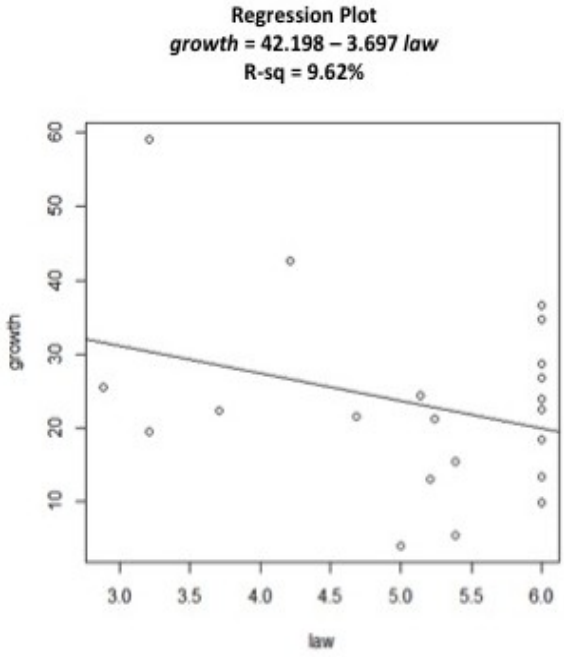



Figure 7a: Scatter Plot of per Capita Growth against Rule of Law Index.

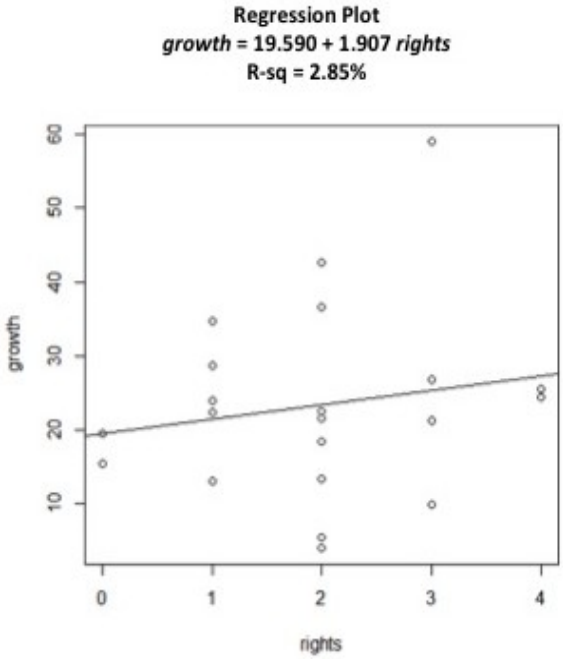



Figure 8a: Scatter Plot of per Capita Growth against Creditor Rights Index.

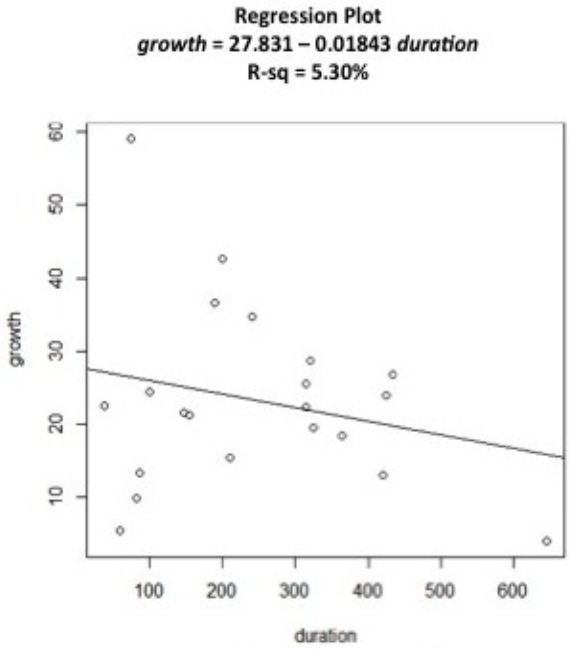



Figure 9a: Scatter Plot of per Capita Growth against Duration in Weeks of Trials.

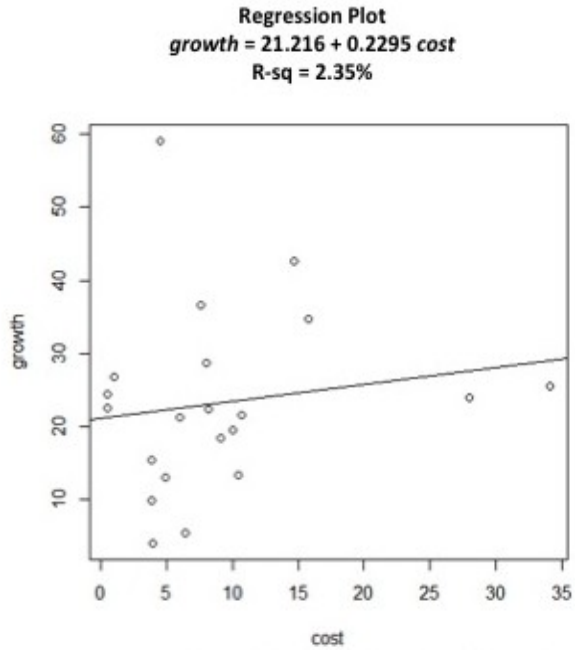



Figure 10a: Scatter Plot of per Capita Growth against Cost of Justice (% GDP).

The regression plots of these four institutional proxies are presented above. It is easy to understand that they do not have a trend, regression lines are quite flat and points in the scatter do not seem to have a real path

We finally analyse the effect of another institutional index, which is a general institutional quality index developed by Sachs and Warner (1997) that is an average of 5 sub-indexes, including the rule of law index, the bureaucratic quality index (it measures the autonomy from political pressure and the strength and expertise to govern without drastic changes in policy or interruptions in government services), the corruption in government index (illegal payments such bribes connected

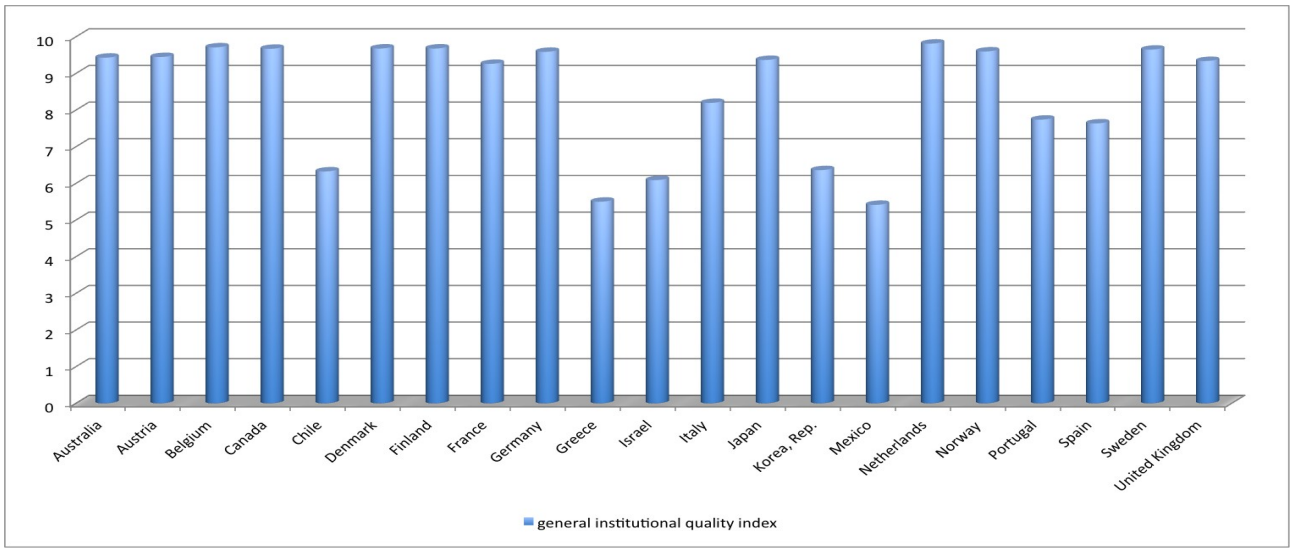



**Figure 11: General Institution Quality Index.**
Source: Sachs and Warner data.

with import and export licenses, exchange controls, tax assessments, police protection, or loans), the risk of expropriation index and the government repudiation of contracts index (the risk of a modification in a contract taking the form of a repudiation, postponement or scaling down). Data refer to 1980.

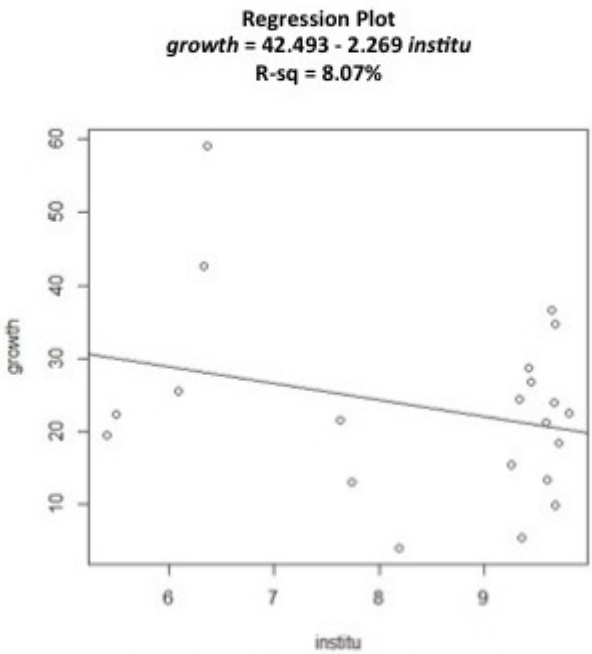



**Figure 11a: Scatter Plot of per Capita Growth against General Institution Quality Index.**

Again, the variable presents very low variance across countries (see Figure 11), and, as the scatter plot shows (Figure 11a) there is not a strong relation between growth rate and the institution quality index, and, the same as for the other institutional proxies, points do not seem to have a real path.

## *2.3 Empirical Findings*

We have seen so far that some variables seem to have an important effect on economic development and in this section we will show the relative empirical results.

There does not exist an agreed theoretical framework to lead an empirical work on growth, and existing model do not completely specify the variables that should held constant while conducting statistical inference on the relationship between growth and the other explanatory variables. A common feature of most cross-country growth regressions in that variables of interest are entered linearly, so the models will use equation of the form:

$$Y = \beta_i X + u$$

where Y is the growth rate of per capita GDP while X is the set of interested variables.

The cross section used a number of 21 OECD countries for which it was possible to assemble data on the variables employed[18].

The data are from the World Bank, IMF's International Financial Statistics, Sachs and Warner dataset, Standard and Poor's Emerging Market Database and few other sources.

The first basic regression takes the form:

$$growth_i = \alpha + \beta_1 loggdp97 + \varepsilon_i$$

The log of starting value (1997) of per capita GDP is used to capture the convergence effect; even if we have seen that the simple relation between growth rates and initial levels of per capita GDP is negative, Table I shows that the relation is not statistically significant (see Table I).

**Table I**

Coefficients:

| | Estimate | Std. Error | Pr(>\|t\|) |
|---|---|---|---|
| (Intercept) | 114,53 | 48,06 | 0.0278 * |
| loggdp97 | -21,54 | 11,33 | 0.0726 · |

Residual standard error: 11.87 on 19 degrees of freedom
Multiple R-squared: 0.1597, Adjusted R-squared: 0.1155
F-statistic: 3.612 on 1 and 19 DF, p-value: 0.07264

We start then to include more variables, and the regression now takes the form:

$$growth_i = \alpha + \beta_1 loggdp97 + \beta_2 enrol + \beta_3 rs + \varepsilon_i$$

Table II shows regressions for growth rate of real per capita GDP between 1997 and 2011.

18 Countries are listed in the Appendix, Table A1.

The proxy for human capital is the growth rate of tertiary school enrolment rates between 1980 and 1996.

Previous studies have focused largely on primary and secondary education (Barro, 1991), but investment in tertiary education is more growth-enhancing for countries closer to the technology frontier such the twenty-one that we are considering, because it increases their ability to innovate, while primary and secondary education are likely to yield relatively more benefits among countries that are technology imitators. Moreover we are assuming that economic growth relative to a certain period of time is affected by some recent changes in the quality of labour by improving qualifications and higher skills workers.

For the same reason the considered period is not random: tertiary education is the educational level following the completion of a school providing a secondary education, it includes undergraduate and postgraduate education.

The other explanatory variable used in the regression model is the research and development public and private expenditure as a percent of GDP in 1996.

Table II shows that when the other independent variables are held constant, there is a strong relation between growth rate and initial level of GDP per capita. The estimated coefficient is significantly negative for log(GDP). For a given starting value of per capita GDP, growth in tertiary enrolment rates and R&D expenditure over GDP have a positive effect on the growth rate and they are statistically different from zero at the 1% level (Table II). Moreover, given the R&D and human capital variables, subsequent growth is substantially negatively related to initial level of per capita GDP.

**Table II**

Coefficients:

| | Estimate | Std. Error | Pr(>\|t\|) |
|---|---|---|---|
| (Intercept) | 185,43142 | 29,00372 | 1.21e-05 *** |
| loggdp97 | -45,75857 | 7,24105 | 1.38e-05 *** |
| enrol | 0,09973 | 0,01830 | 6.70e-05 *** |
| rs | 12,02567 | 1,93581 | 1.66e-05 *** |

Residual standard error: 5.437 on 15 degrees of freedom
(2 observations deleted due to missingness)
Multiple R-squared: 0.8605, Adjusted R-squared: 0.8326
F-statistic: 30.85 on 3 and 15 DF, p-value: 1.164e-06

Results indicates that per capita growth is positively related to the proxy for human capital and the research and development spending, holding fixed the initial level of per capita GDP. The estimated coefficients of tertiary school enrolments and R&D expenditure are individually significantly different from zero, with *t*-values of 5.450 and 6.212 respectively.

Increases in initial GDP per capita that are accompanied by the increase in human capital per person and R&D expenditure are not systematically related to subsequent growth, but increases in initial GDP per capita with human capital and R&D held fixed are strongly negatively related to subsequent growth. Similarly, ceteris paribus, increases in human capital or R&D are strongly positively related to subsequent growth.

The adjusted R-squared is close to 1 meaning that goodness of fit of the model is confirmed.

The F ratio is 30.85 and significant at p = 1.164e-06. This provides evidence of existence of a linear relationship between the response growth rate and the three explanatory variables initial per capita GDP, tertiary school enrolments and R&D expenditure.

### 2.3.1 Robustness checks

When investigating on the relation between financial development and economic growth, the regression takes the form:

$$growth_i = \alpha + \beta_1 loggdp97 + \beta_2 enrol + \beta_3 rs + \beta_4 finance + \varepsilon_i$$

where *finance* is a set of the four Levine's proxies for financial development presented in the last section.

We are not including them in the model at the same time because the observations are only twenty-one and, even if there are no generally agreed methods for relating the number of observations versus the number of independent variables, a widely quoted rule states you need 10 or more observations per independent variable.

The four financial variable are liquid liabilities of the financial system divided by GDP, the ratio of deposit money bank claims on domestic non financial real sector to the sum of deposit money bank and Central Bank claims on domestic non financial real sector, the value of credits by financial intermediaries to the private sector and finally the stock market capitalization over the GDP.

Despite of what happen in the simple relation between growth and liquid liabilities, in which the relation is positive and significant (see the previous section) in the general model, when the other independent variables are held constant, the p-value of liquid liabilities is 0,121 meaning that the variable is not statistically significant any more (see Table IIIa).

**Table IIIa**

Coefficients:

| | Estimate | Std. Error | Pr(>\|t\|) |
|---|---|---|---|
| (Intercept) | 170,36701 | 28,96021 | 3.99e-05 *** |
| loggdp97 | -40,95529 | 7,45431 | 7.90e-05 *** |
| enrol | 0,09364 | 0,01773 | 0.000116 *** |
| rs | 11,79553 | 1,83927 | 1.62e-05 *** |
| liquid | -6,05041 | 3,67378 | 0,121829 |

Residual standard error: 5.151 on 14 degrees of freedom
(2 observations deleted due to missingness)
Multiple R-squared: 0.8832, Adjusted R-squared: 0.8498
F-statistic: 26.46 on 4 and 14 DF, p-value: 2.135e-06

The same happens with the other two financial variables (see Table IIIb and IIIc):

**Table IIIb**

Coefficients:

| | Estimate | Std. Error | Pr(>\|t\|) |
|---|---|---|---|
| (Intercept) | 203,68926 | 37,24454 | 8,27e-05 *** |
| loggdp97 | -52,32520 | 11,02938 | 0,000314 *** |
| enrol | 0,09821 | 0,01862 | 0,000118 *** |
| rs | 12,19490 | 1,97127 | 2,37e-05 *** |
| deposit | 1,12486 | 1,41161 | 0,43883 |

Residual standard error: 5.505 on 14 degrees of freedom
(2 observations deleted due to missingness)
Multiple R-squared: 0.8666, Adjusted R-squared: 0.8285
F-statistic: 22.73 on 4 and 14 DF, p-value: 5.318e-06

**Table IIIc**

Coefficients:

| | Estimate | Std. Error | Pr(>\|t\|) |
|---|---|---|---|
| (Intercept) | 172,45319 | 29,78449 | 4,68e-05 *** |
| loggdp97 | -41,83833 | 7,61089 | 7,86e-05 *** |
| enrol | 0,10046 | 0,01781 | 0,000118 *** |
| rs | 12,00273 | 1,88324 | 1,73e-05 *** |
| deposit | -5,34676 | 3,93066 | 0,19500 |

Residual standard error: 5.289 on 14 degrees of freedom
(2 observations deleted due to missingness)
Multiple R-squared: 0.8768, Adjusted R-squared: 0.8416
F-statistic: 24.91 on 4 and 14 DF, p-value: 3.073e-06

The last variable used is the capitalization of stock market, and as happened with the other, the variable is not statistically significant (see Table IIId).

**Table IIId**

Coefficients:

| | Estimate | Std. Error | Pr(>\|t\|) |
|---|---|---|---|
| (Intercept) | 183,69606 | 28,95660 | 1.82e-05 *** |
| loggdp97 | -45,71021 | 7,21761 | 1.85e-05 *** |
| enrol | 0,10091 | 0,01827 | 7.52e-05 *** |
| rs | 11,51759 | 1,98948 | 4.69e-05 *** |
| capit96 | 4,14398 | 3,95431 | 0,312000 |

Residual standard error: 5.419 on 14 degrees of freedom
(2 observations deleted due to missingness)
Multiple R-squared: 0.8707, Adjusted R-squared: 0.8337
F-statistic: 23.56 on 4 and 14 DF, p-value: 4.293e-06

We can conclude that in the cross-section analysis financial development is not an important factor to explain the diversity in growth of similar developed countries.

Finally we have tried to show some relations between the quality of institutions and economic growth.

The third regression takes now the form:

$$growth_i = \alpha + \beta_1 loggdp97 + \beta_2 enrol + \beta_3 rs + \beta_5 institution + \varepsilon_i$$

where *institution* is the a of quality variables: the rule of law, a measure on the evaluation of the

legal and order tradition in the country, it ranges from 1 (weak law and order tradition) to 10 (strong law and order tradition) and is published by the International Country Risk Guide (ICRG); the creditors' rights protection is measured by an index developed by La Porta et al. (1998); there are then two indicators of judicial efficiency: duration in weeks of trials and the cost of justice as a percentage of GDP. These judicial efficiency's data are from the World Bank.

The institutional indexes will not enter the model together because they tend to be highly correlated. Table IVa shows the results of the regression model:

$$growth_i = \alpha + \beta_1 loggdp97 + \beta_2 enrol + \beta_3 rs + \beta_5 law + \varepsilon_i$$

while Tables IVb, IVc and IVd show the results for the other institutional variables.

**Table IVa**

Coefficients:

| | Estimate | Std. Error | Pr(>\|t\|) |
|---|---|---|---|
| (Intercept) | 209,05478 | 33,77025 | 2,35e-05 *** |
| loggdp97 | -54,17014 | 9,62674 | 6,24e-05 *** |
| enrol | 0,09880 | 0,01792 | 7,64e-05 *** |
| rs | 12,81768 | 1,99112 | 1,55e-05 *** |
| law | 2,11255 | 1,63671 | 0,21800 |

Residual standard error: 5.32 on 14 degrees of freedom
(2 observations deleted due to missingness)
Multiple R-squared: 0.8754, Adjusted R-squared: 0.8397
F-statistic: 24.58 on 4 and 14 DF, p-value: 3.331e-06

**Table IVb**

Coefficients:

| | Estimate | Std. Error | Pr(>\|t\|) |
|---|---|---|---|
| (Intercept) | 189,25314 | 29,22683 | 1,46e-05 *** |
| loggdp97 | -46,99828 | 7,33860 | 1,64e-05 *** |
| enrol | 0,09555 | 0,01875 | 0,000163 *** |
| rs | 11,67967 | 1,96434 | 3,57e-05 *** |
| rights | 1,26360 | 1,24934 | 0,32898 |

Residual standard error: 5.433 on 14 degrees of freedom
(2 observations deleted due to missingness)
Multiple R-squared: 0.87, Adjusted R-squared: 0.8329
F-statistic: 23.43 on 4 and 14 DF, p-value: 4.443e-06

**Table IVc**

Coefficients:

| | Estimate | Std. Error | Pr(>\|t\|) |
|---|---|---|---|
| (Intercept) | 186,96079 | 30,23371 | 2,38e-05 *** |
| loggdp97 | -45,81045 | 7,46592 | 2,58e-05 *** |
| enrol | 0,09817 | 0,01941 | 0,000175 *** |
| rs | 11,80390 | 2,09912 | 6,28e-05 *** |
| duration | -0,00317 | 0,00932 | 0,739 |

Residual standard error: 5.605 on 14 degrees of freedom
(2 observations deleted due to missingness)
Multiple R-squared: 0.8617, Adjusted R-squared: 0.8222
F-statistic: 21.8 on 4 and 14 DF, p-value: 6.814e-06

**Table IVd**

Coefficients:

| | Estimate | Std. Error | Pr(>\|t\|) |
|---|---|---|---|
| (Intercept) | 181,31456 | 33,58059 | 9,37e-05 *** |
| loggdp97 | -44,84145 | 8,20680 | 8,34e-05 *** |
| enrol | 0,10129 | 0,01975 | 0,000153 *** |
| rs | 11,80666 | 2,15592 | 8,16e-05 *** |
| cost | 0,05316 | 0,19629 | 0,79046600 |

Residual standard error: 5.613 on 14 degrees of freedom
(2 observations deleted due to missingness)
Multiple R-squared: 0.8613, Adjusted R-squared: 0.8216
F-statistic: 21.73 on 4 and 14 DF, p-value: 6.957e-06

As happened with financial variables, the institutional proxies are not statistically significant.

Results do not change when we use the general institutional quality index developed by Sachs and Warner (1997).

Table IVe shows the results.

None of the institutional variables is statistically significant.

The explanation of this could be related to the similarity of the considered countries.

**Table IVe**

Coefficients:

| | Estimate | Std. Error | Pr(>\|t\|) |
|---|---|---|---|
| (Intercept) | 203,68926 | 37,24454 | 8,27e-05 *** |
| loggdp97 | -52,32520 | 11,02938 | 0,000314 *** |
| enrol | 0,09821 | 0,01862 | 0,000118 *** |
| rs | 12,19490 | 1,97127 | 2,37e-05 *** |
| institu | 1,12486 | 1,41161 | 0,43883 |

Residual standard error: 5.505 on 14 degrees of freedom
(2 observations deleted due to missingness)
Multiple R-squared: 0.8666, Adjusted R-squared: 0.8285
F-statistic: 22.73 on 4 and 14 DF, p-value: 5.318e-06

Another explanation is given by Glaeser et al. (2004), who estimated the impact of the average years of schooling between 1960 and 2000, and the constraints of the executive power (a proxy for the quality of institutions) in the same period, having as dependent variable the per capita income in 2000.

The purpose of the study was to verify which one between human capital and institutions was the key variable in economic growth: the results show that the variable for years of schooling is statistically significant, while the other institutional variable is not. In a second regression model the authors regress the variable for human capital on the institutional proxy and then the reverse and, surprisingly, the result shows that an initial level of education significantly increases the quality of institutions in the following five years.

This would demonstrate the fact that human capital affects both institutions and economic growth directly.

We eventually try to build a model which includes all the variables. Table V shows the results.

Conclusions are straight-forward: the growth rate of per capita GDP seems to be positively influenced by human capital and R&D expenditure, while the other variables about financial development and the quality of institutions are not statistically significant. In particular, the equation of the model is now: $growth_i = 185{,}43 - 45{,}76\, loggdp97 + 0{,}1\, enrol + 12{,}03\, rs$ .

The estimated coefficients imply than holding the other variables fixed, an additional percent point of the growth rate of tertiary school enrolments raises the growth rate on impact by 0.1% per year, and an additional percent point on the R&D expenditure raises the growth rate by 12%.

**Table V**

Coefficients:

| | Estimate | Std. Error | Pr(>\|t\|) |
|---|---|---|---|
| (Intercept) | 201,63380 | 46,71257 | 0,00500 ** |
| loggdp97 | -51,12355 | 14,57527 | 0,01271 * |
| enrol | 0,09807 | 0,02485 | 0,00757 ** |
| rs | 13,75442 | 1,97127 | 0,00154 ** |
| liquid | 1,76809 | 11,24358 | 0,88020 |
| deposit | -7,91859 | 5,15711 | 0,17557 |
| private | -2,99068 | 6,281195 | 0,65082 |
| capit | 2,59494 | 5,94263 | 0,67763 |
| law | 12,80681 | 6,00110 | 0,07678 |
| rights | 2,57764 | 1,45183 | 0,12617 |
| cost | 0,06933 | 0,24151 | 0,78371 |
| duration | -0,00239 | 0,00979 | 0,81527 |
| institu | NA | NA | NA |

Residual standard error: 5.048 on 6 degrees of freedom
(3 observations deleted due to missingness)
Multiple R-squared: 0.9502, Adjusted R-squared: 0.8588
F-statistic: 10.4 on 11 and 6 DF, p-value: 0.004665

# Chapter 3: The Slowdown of Italian Economy

In this third chapter we will discuss the recent slowdown of the Italian economy.

Italy had have strong and deep changes over the last three decades of the last century, and it has especially accentuated the trend towards a post-industrial structure: the share of industry in GDP reduced from 34% of the total output to 25% in 2011, while tertiary sector has increased its weight from 60% in 1971 to 73% in 2011, finally agriculture has become gradually a marginal activity (from 6% in 1971 to 2% in 2011)[19].

In order to understand the recent path of the economy, the first part reviews the most crucial moments of our economic history in which there were carried out some of the strategic choices of economic policy that have characterized the economic, political and social development of our country; we then present the recent trends of the economy.

The second part focuses on the main causes of the recent slowdown of the economy with a particular focus on the results of the regression model: we show how in the last fifteen years human capital and research and development have changed in Italy and we compare the Italian evidences with other similar similar European countries, such as Germany, France and Spain.

## *3.1 From the Second World War to Recent Years*

### 3.1.1 The reconstruction period and the "economic miracle"

After the Second World War were made some strategic choices of economic policy that allowed the beginning of cycles and phases that have characterized the entire economic and political development of Italy.

At the end of the conflict there was what it is usually called "reconstruction period". In those years were taken decisions that would have been critical to the economic development of the future generations. Italy was facing problems in the reconstruction of production facilities destroyed by war, it had an always higher inflation and the bottleneck of the balance of payments prevented the purchase of essential commodities.

Furthermore it had an historical structural unemployment, which carried with it the need to improve the industrial development, to find solutions to backwardness of agriculture and to mitigate regional imbalances (Graziani, 2000).

The inflationary situation resulted from the scarcity of the goods and from the collapse of industrial

19 Data are from CIA World Factbook.

and agricultural production but it has its origin already during the years of Fascism when a significant scarcity of goods was accompanied by the monetary emissions of the Amlire (the Allied Military currency), which determined objectively the presence of inflationary factors.

There were also inflationary behaviours on the part of the Italian monetary authorities. There was in fact the abolition of forced placement of government securities and monetary financing of the public deficit (Cotula, 2000).

Moreover the condition of domestic monetary nature of inflation concerned the absence of Bank credit restrictions to private, in fact when banks were left free to grant loans there was an increase of the mass of liquid in circulation, which did not correspond to a similar quantity of goods.

The price indices that between 1938 and 1943 were doubled, increased further the following year, continuing a rapid growth in 1945, after the short break of 1946, inflation increased rapidly in 1947. At the end of that year a stabilization manoeuvre stopped the growth of prices.

It was also important the problem of balance of payments. The country was locked in a vicious circle: to pay for imports, exports had to be developed, and it was necessary to reconstitute the production capacity by importing machinery and raw materials.

As long-term problems there were the modernization of production, the structural unemployment and the poverty of the South.

The other important strategic choice of great value was the trade liberalization of goods and services and, hence, the integration of the Italian economy in an international context. The choice between open and planned economy developed an intense debate between liberals and the left parties, who favoured a regime of economic planning. Later on, with the success of the liberal orientation, there was a dismantling of existing controls and Italy became one of the European countries that mostly pushed for trade integration and monetary union.

The choice of a rapid and accelerated liberalization was therefore a strategic choice that allowed in the future the development of the country.

In 1947 in fact it was made effective the result of the General Agreement on Tariff and Trade (GATT), which allows to reduce the rates of duty in order to facilitate and increase the international trade. Given the complexity of the problem, there was not an immediate success to be expected.

The rapid economic development that took place between 1956 and 1962, the so called “Economic Miracle”, was marked by deeply contradictory elements, and it appears as a double-sided development: in those years in fact, the Italian economy was simultaneously able to achieve three objectives which were incompatible in most cases: very high productive investment, the monetary stability and the equilibrium in the balance of payments (Ricci, 2012).

### 3.1.2 Structural Instability and Oil Shocks

When eventually ended the phase of the intense postwar development and the economic miracle that lasted until the middle of 60s, the following decades were characterized by a strong macroeconomic instability as well as structural changes within the firms system, especially in their territorial distribution, and the problem of inflation occurred again.

The first significant arrest of the growth process was in 1964 and the next one in 1969, both due to an increasing number of problems between the labour union and the entrepreneurs, and a significant wage increases (Faini and Sapir, 2005)

Inflation in particular rose again and it increased the cost of imports (essential for the Italian production).

When in 1971 the U.S. President Nixon ended the Bretton Woods system declaring the inconvertibility of the dollar in gold, the global monetary system adopted flexible exchange rates; with the consequent open up to foreign markets and international competition, and the adhesion of Italy in 1979 to the European Monetary System (EMS) introduced an element of discipline in fiscal policy.

A more virtuous public finance was established only after the currency crisis of 1992 and especially after the difficult path of convergence to the parameters of the Treaty of Maastricht, which ended with the entry of Italy into the European single currency.

The instability of Italian economy between the 1970 and 1980 was in part surely driven by external factors.

After the end of the international monetary system of fixed exchange rates that had sustained economic growth for twenty five years, there were the two oil shocks of 1974 and 1979 which leaded to a price inflation and a deflation of the quantity produced.

Figure 12 shows the evolution of the Italian GDP (in 2000 €) since 1960. The years 1970 to 1975 correspond to the first oil crisis, as well as the years 1979 to 1982 marked a result of the recession the second oil crisis.

The oil crisis of the period between 1973 an 1976 disrupts the Italian economic situation: the dependence of our economy on hydrocarbons reveals its cost and danger.

After the first oil crisis, all the major industrialized countries implemented policies of diversification of energy sources to reduce the dependence on foreign oil and Italy, as the greatest dependence of all industrialized countries, started launching a series of energy plans providing ambitious nuclear programs.

Moreover, the crisis in Italy was particularly difficult because the effects of the international crisis were added up to a structural weaknesses of the economy, like the technological backwardness, the

inefficiency of the tax system, the deficit in the balance of payments, the weakness of the lira, and some inefficiencies in public administration.

The Bank of Italy adopted then a deflationary monetary policy, increasing the discount rate and causing a recession: the GDP decreased and there was an increase of the interest rate on government bonds.

The frequent use of the "Cassa Integrazione", the spending growth for pension and the high tax evasion led to a growing budget deficit, which was a new problem for the difficult Italian economy.

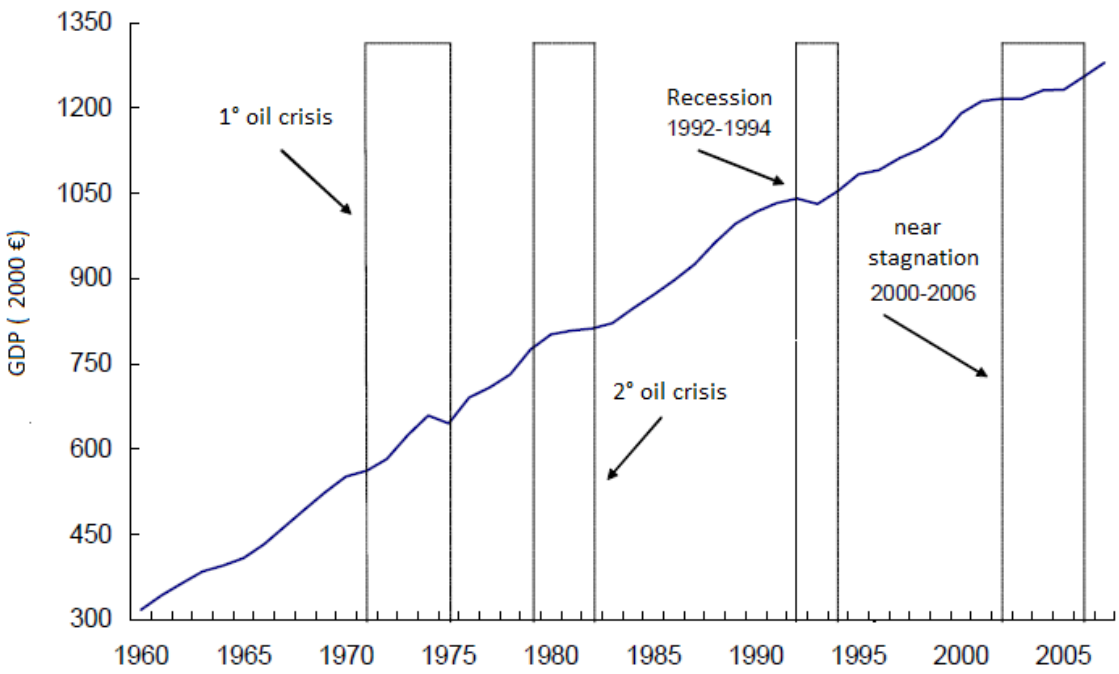



**Figure 12: Italian Real GDP between 1960-2007.**
Source: Travaglini, 2008.

The exchange rate is used to help the Italian economy to devaluate the lira and thus to gain a competitive advantage on trades in respect to the other countries.

### 3.1.3 Political Instability

The instability of Italian economy between the 1970 and 1980 was surely driven by external factors but also by political and institutional ones.

During those years also the political order was having ups and downs: between 1969 and 1980 thirteen different governments have followed.

In 1970 there was the establishment of the ordinary statute regions that have contributed to the

growth of public spending since then, and the Workers' Statute approved in 1970 tightened the labour input, especially in larger companies.

The elections of 1976 initiated the so called “government of national solidarity” formed by the political alliance between the DC (a centre-left party) chaired by Andreotti and the PCI, the Communist Party chaired by Berlinguer.

At the end of the 1978, after two years, the national solidarity was in crisis, and it was replaced by a new unstable governments of the centre-left.

With the end of the politics of national solidarity, there was also less dialogue between employers and trade union movements and after several violent clashes. the tense situation ended with the defeat of the union.

Those were also the years of terrorism of two different types: the “black terrorism”, the fascist's one, which made a series of attacks like Piazza Fontana, Piazza della Loggia, the bomb on the train Italicus at the Bologna train station in 1980; and the “red terrorism” developed in the mid 70s by the “Brigate Rosse” aimed to hit the governing class to start a revolutionary movement through kidnappings, injuries, assaults and murders.

In the early '80s the economy was still in serious crisis, but since 1984 there was an intense recovery that let to think of a second economic boom. The major causes of the recovery were the healthy state of the world, largely driven by the fall in oil prices, and a new domestic availability for entrepreneurs to invest.

From one side big companies did great restructuring and they launched new products in the market, which helped the Italian economy to be competitive in international markets, but, on the other side, the uncontrolled growth of the budget deficit, the inefficiency of services and the stagnation of scientific research restrained the economic boom.

Moreover, in the 80s the full affirmation of a culture stability was difficult to reach also because of the permanent uncertainty of the political and institutional settings, the crisis of political parties and their difficulties to settle in the society (D'Antonio and Scarlato, 2004).

Despite the effort to accelerate the convergence of the Italian economy with the other European economies (in 1990 the lira enters in EMS's “currency snake” in which the maximum exchange rate fluctuations allowed were 2.25% around parity in bilateral exchange rates with other member countries), the competitiveness of Italian products reduced again.

In September 1992 lira suffered for a serious speculative attack led to a devaluation of 30% of the lira and in draining of the reserves of the Bank of Italy, which was forced to burn 48 billion dollars in a vain attempt to stem the speculative attack. The crisis also led to the exit of Italy from the European Monetary System. The only good consequence was that between 1992 and 1995 the

economy regained the lost competitiveness on the other foreign markets.
In 1997 Italy came back into the EMS to participate to the European single currency and it comes in 1998 to the establishment of the parity between lira and Euro. The policy makers start to apply some manoeuvres to restrict the public spending, they start to privatize and liberalize some public services and there were the first waves of immigrants.

### 3.1.4 Recent Trends

The brief summary of the main events that have troubled the Italian economy over four decades, from the 50's to mid 90's, shows how the path to the economic stability was tiring and tortuous since it had also to deal with obstacles of institutional nature (the weak political structure and the alternation of governments in charge), with obstacles of a social nature (the dynamics of wages and labour costs) and financial nature (the high deficit of the public debt).
Even if, as we have seen so far, the economy had its ups and downs, for much of the post war period, per capita GDP in Italy has been growing faster than in many OECD countries, but as from some time in the 1990s this catch-up ceased, and Italy's relative position has been slipping.
Compared to the past, but also to the other European economies the results are even worse and quite disappointing in the two decades followed the currency crisis of 1992 (Ciocca, 2004).
Furthermore, after a decade of low but stable growth (between 1998 and 2008) Italy has experienced its deepest recession of the last half century following the financial and economic global crisis of 2008, and in our country the recession was deeper and the recovery so far has been weak: it have had a strong negative impact on the basically all sectors of the economy, in line with other major exporting countries (OECD Economic Surveys: Italy, 2011).
The economy after crisis has been recovering only slowly: the 2009's output was adversely affected by the decrease in fixed investments (-2.5 percentage points), penalized by the reduction of domestic and foreign demand, the credit crunch and the deterioration in expectations. The government reacted with the application of a tax exemption for investments in machinery and equipment and it had the desired effect.
The economic development of the external environment has been the main driver of the economy into and out of the recession: usually trade's path follows the trend of the GDP, however the decline in exports was almost four times more marked than the decline of GDP, much higher than any forecast (Ministero dell'Economia e delle Finanze, 2010).

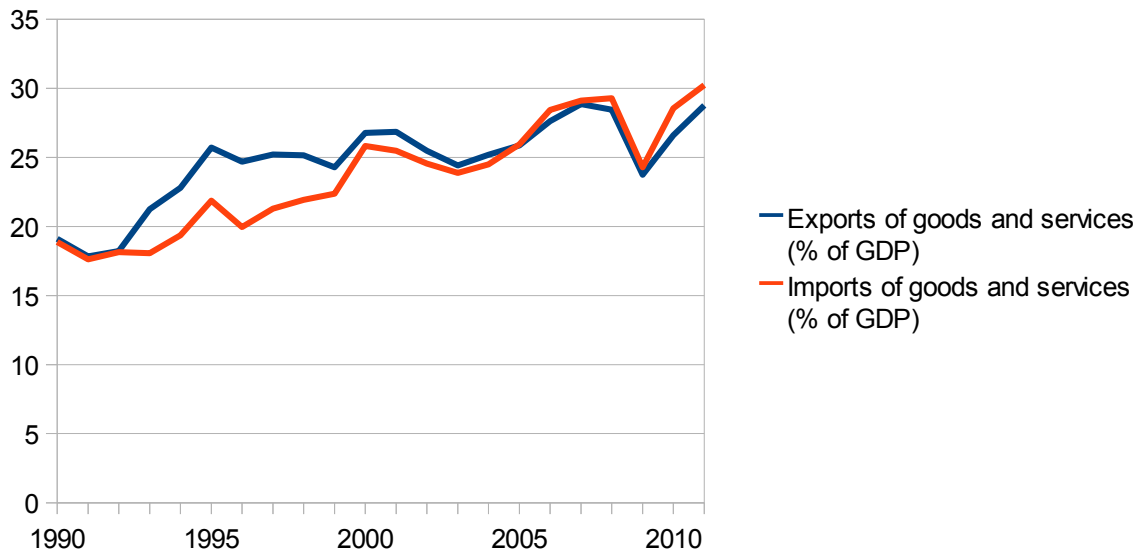



**Figure 13: Import and Export of Goods and Services (% of GDP) in Italy, 1990-2011.**
Source: World Bank data.

From the first quarter of 2008 to the second quarter of 2009 exports and imports collapsed by 19,1% and 14,5% respectively; since then, while exports have recovered sharply, imports have risen even more (see Figure 13)[20], unlike what happened to other exporting countries such as Germany, probably indicating that Italian recovery "may have been hampered by structural factors such as the relative deterioration in labour costs and less penetration of the major emerging markets" (OECD Economic Surveys: Italy, 2011).

Spending decisions of households have been adversely affected by the weakness of the labour market and by a reduction in the financial wealth, even if the demand of vehicles has registered a small increase, benefiting from government incentives.

The slowdown in product (GDP) per capita, compared to the previous decade, is derived by low labour productivity, resulted more from a slower growth in total factors' productivity, (weakened by a not adequate technical progress and organization) rather than the capital intensity (D'Antonio and Scarlato, 2004).

Many possible explanations for low productivity growth have been advanced and between others, the 2011 OECD Economic Survey pointed out these main factors:

- the industrial and export structure
- the nature of the Italian family firms
- low educational attainment and inadequacies in tertiary education

20 The data are listed country-by-country in the Appendix, Table B1.

- the lack of innovation and R&D activity
- the integration of large numbers of immigrants
- the regulatory barriers to entrepreneurship

Despite the extraordinarily weak development of labour productivity, nominal contractual wages and salaries set by collective agreements have increased steadily; the government supports this trend and firms benefits from the tax relief for night work, overtime and productivity bonuses, basically all the productivity-related wage increases.

The public deficit is still really high and it keeps growing[21]. Figure 14 shows that Italian debt is twice the Spanish one and much higher that the French and German debts.

Private consumption in Italy deteriorated comparatively less than the other GDP components and thus the households savings dropped to a historic low in 2009. In the past decade the propensity of savings in fact has dropped: it was around 16% of income in early 2008, and it is further reduced to 12 per cent in 2011 (Vice Director General of Bank of Italy A.M. Tarantola, April 2012).

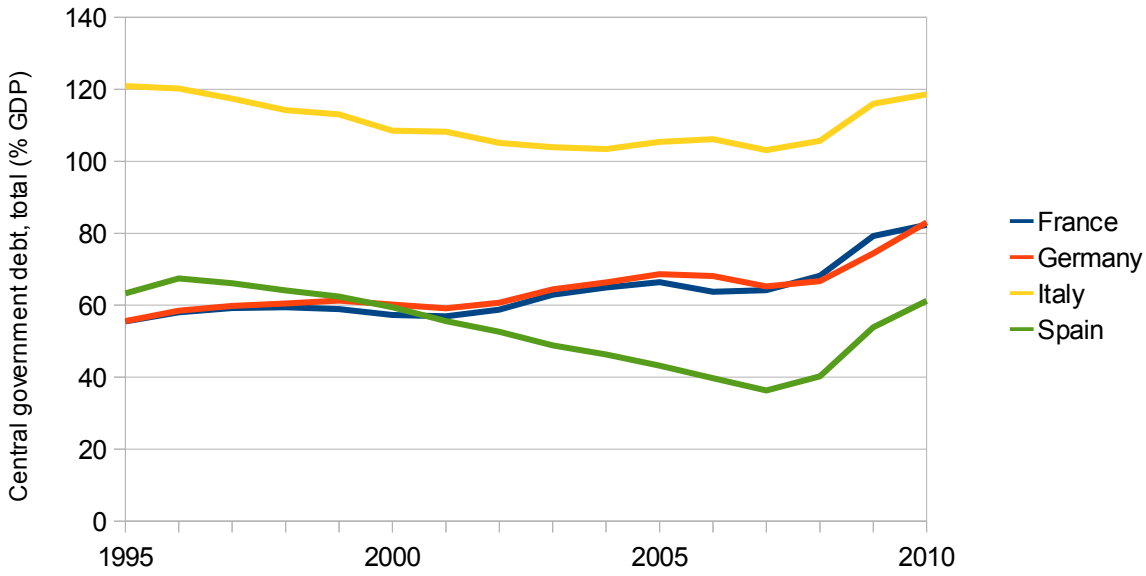



**Figure 14: Central Government Gross Debt (% of GDP), 1995-2010.**
Source: Eurostat

In the period 2008-10 the share of indebted households has decreased from 24 to 21 percent. This decrement was due not only to a lower demand for loans, but also by a greater selectivity in granting funding from financial intermediaries, which was reflected in an increase in the proportion of households that have not received the whole or a part of the credit requested (Tarantola, 2010).

21 The data are listed country-by-country in the Appendix, Table B2.

In this way the banking system escaped the financial crisis comparatively unhurt (OECD Economic Surveys: Italy, 2011).

## *3.2 The Main Causes of the Decline*

The result of the underlined historical and recent structural constraints, and several interconnected and often endogenous factors explain why Italy's growth performance lags by international comparison.

Despite the progress made in reducing state control and barriers to entrepreneurship from the second half of the nineties, Italy is still one of the OECD countries with the highest regulation in different sectors of the economy. While in the early Nineties employment has been on an increasing trend, the subsequent decline in the rate of GDP growth was mostly driven by inefficient expenditures, low quality of institutions, and the slowdown in productivity, which in turn, was caused by a lack of capacity for innovation (Pammolli, Cambini and Giannaccari, 2007).

### 3.2.1 Public administration inefficiencies, tax evasion and corruption

Inefficient public expenditure and a complex tax system obstruct fiscal consolidation and growth. Italy scores poorly in terms of quality and efficiency of public expenditure, and it stands out among countries with the highest tax burden and lowest tax compliance (European Commission Innovation Union Scoreboard, 2009).

An efficient and effective public administration is the key factor to support a country's competitiveness: human and financial resources well-allocated by the government, in fact, contributes to improve the health of the public finances and at the same time frees up resources for the economic development.

Italy is characterized by a high level of public spending: in 2009 the outputs of government exceeded the 50% of GDP, an increase of about 3 points compared to 2008 and it is 2-3 points higher than its main European competitors. Moreover the problem of the "quantity" of public administration expenditure is aggravated by its poor "quality"; among the main causes for the imbalance between quantity and quality of spending, in fact, there is the high weight of personnel costs, the weak effectiveness of administration, the fact that it is difficult to evaluate the performance, it depends on political objectives and thus on the government in charge, and it is difficult to attract high professional level of workers.

To these negative factors we have to add the non-application of fiscal federalism that would allow

significant savings in resources since public administrators would be more careful in the management of public finances. In a federalism country, in fact, an increase in the tax burden without an adequate return in facilities may adversely affect the elections (Unionecamere del Veneto and Consiglio Regionale del Veneto, 2008).

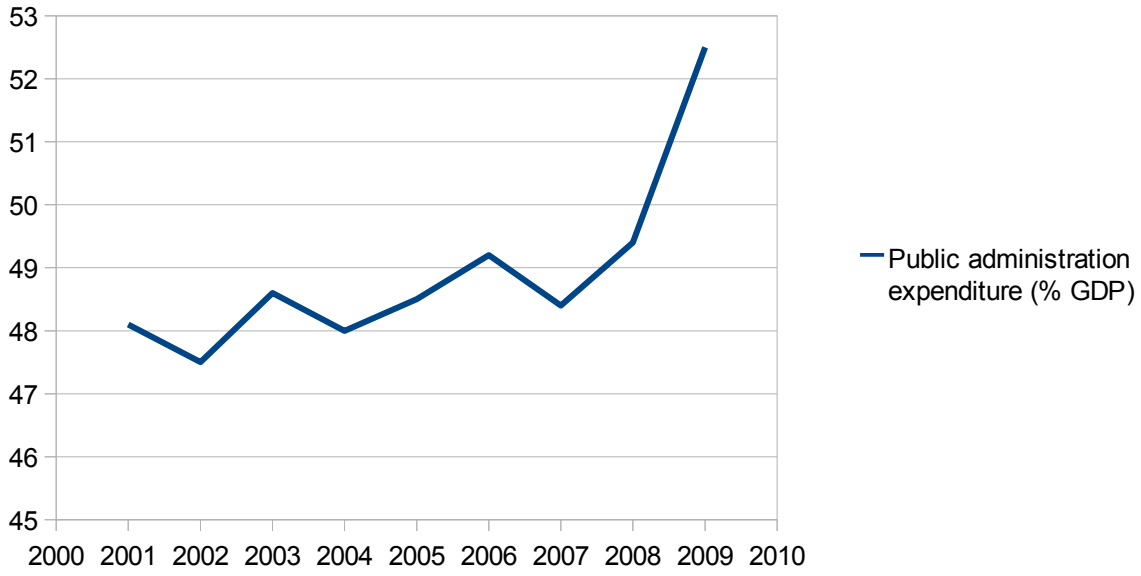



**Figure 15: Public Administration Expenditure (% GDP), 2001-2009.**
Source: Istat[22].

Overall, progress on improving public expenditure has been limited, although some measures have been taken to improve the budget classification, institutionalize spending reviews, and reorganize public administration.

Finally, the tax system is unduly complex and prone to abuse (IMF Regional Economic Outlook: Europe, 2011). The evasion is one of the largest and most serious problems of the Italian economy. It causes the unequal distribution of the tax burden, it limits the ability to reduce the debt relative to GDP and to attract FDI into the country and it is responsible of the alteration of the competitiveness' conditions. “Tax evasion war” requires the government to increase and continually improve the system of controls necessary to tackle evasion, and thus it employs resources that could be used to encourage and develop other public and social services.

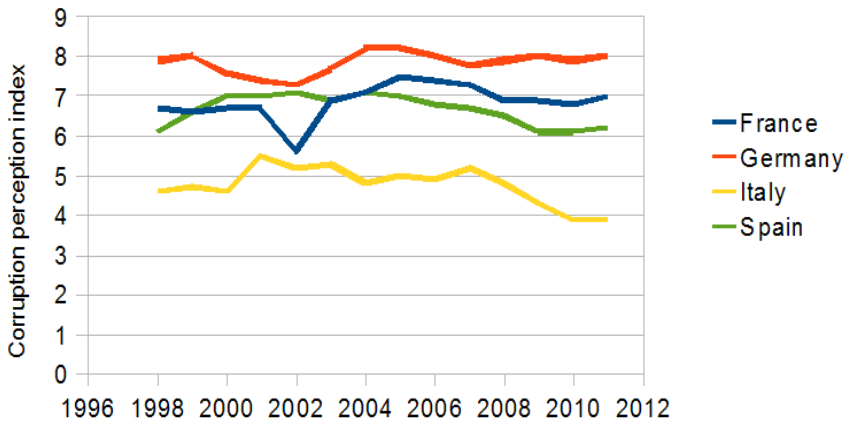
Italy and Greece scored the lowest among Euro-area countries in a global corruption ranking as their inability to tackle graft and tax evasion exacerbated the debt crisis (Bloomberg data, 2011).

Lawlessness and corruption are phenomena still significantly present in Italy and the dimensions are

22 The data are listed in the Appendix, Table B3.

great. It is enough to look at the Corruption Perceptions Index developed by Transparency International and which ranks countries/territories based on how corrupt their public sector is perceived to be.

**Figure 16 : Corruption perception index, 1998-2011.**




In the 2011 survey Italy was ranked at the 69th place, with a score of 3.9 (A country/territory's score indicates the perceived level of public sector corruption on a scale of 0 - 10, where 0 means that a country is perceived as highly corrupt and 10 means that a country is perceived as very clean). Italy is at the same level of Ghana, and it results more corrupted than Saudi Arabia, Malaysia and Costa Rica. Moreover it is getting worse every year: between 2001 and 2011 Italian score lost more than 1.5 points (See figure 16)[23].

The value of corruption in Italy is of around 60 billion Euro per year (Corte dei Conti, 2012).

### 3.2.2 Low labour productivity and participation

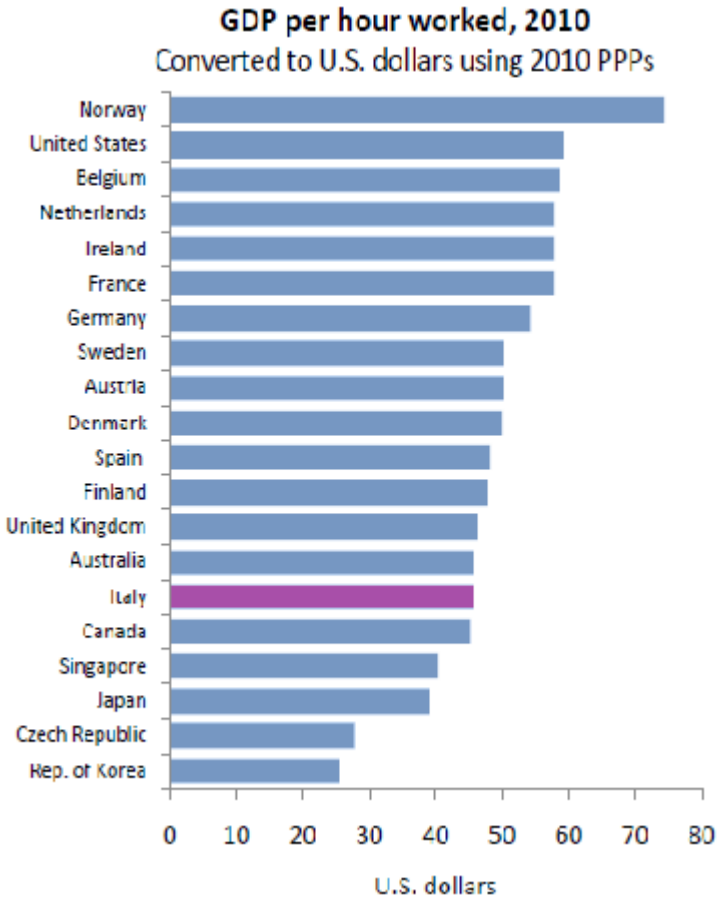
Labour productivity is low and falling. The slowdown results from a slower growth in total factor productivity due to a weak technical progress rather than a slower growth of capital intensity. In the last ten years, the productivity per hour worked in Italy increased overall by 1,4 per cent, much lower than the EU's average (11,4%) and the Germany's (13,6%). In the last twenty years the labour cost per unit of product is grown by 35% more than what happened in Germany, meaning that with the same cost of labour the value of an Italian product is one-third lower that the German product's value (Bureau of Labor Statistics, 2011).

Limited labour market reforms and the centralisation of wage bargaining have not prevented real wage growth from exceeding the modest productivity gains, causing unit labour costs to increase.

Real wages in all sectors are low and cannot fall more, and the ability to adjust them proportionally with productivity is strictly constrained (IMF Regional Economic Outlook: Europe, 2011). Moreover, firms are unable to compete with low-cost producers in the global market and this has

23 The data are listed in the Appendix, Table B4.

contributed to fall the growth of productivity.




Italy has a very low employment rate but it has, together with Spain, the strongest immigration rate; low-skill immigrant workers have partly offset the negative impact of low labour participation and a rapidly ageing society but at the same time it may also have contributed to a decrease in average productivity (IMF Regional Economic Outlook: Europe, 2011).

Labour participation in Italy is low due to a lack of participation of women and over 60, and the high youth unemployment. For instance, the labour participation of women is constrained by the lack of a family policy and formal child care structures: the rate of female labour participation in Italy is 38% while it is over 50% in the other similar countries (Germany, Spain and France with 53%, 52% and 51% of women participation respectively). In addition, old age participation is reduced by a pension system that until recently favoured early retirement.

Usually, demand for labour is negatively affected by the skill mismatches between what the education system produces and the labour market demands, a high tax wedge, particularly for low-skilled workers, the lack of competition in the product market and a very complex rules system resulted from some labour market reforms protecting insiders with permanent contracts, damaging part-time and younger workers, and subsequently encouraging the brain drain.

### 3.2.3 Regulation and innovation

Regulations at the regional and local levels reduce further the flexibility of domestic markets. In some sectors, such as commercial distribution, pharmaceuticals, and the transport sectors, regional and even municipal regulations add further complexity (IMF Regional Economic Outlook: Europe, 2011). An excess regulation compresses the economic growth by acting on innovation, the development of human capital and the efficient allocation of resources, and this situation negatively

influences the trend in productivity. (Nicoletti and Scarpetta 2003, 2005).
Liberalization introduces competitive mechanisms that push off the less efficient firms from the market, encouraging the reallocation of production factors into firms with higher productivity. Moreover, the liberalization leads to an increase of the productivity of existing businesses, as it introduces incentives for the efficient use of factors (Pammolli, Cambini and Giannaccari, 2007).
Finally, competition in the public sector would reduce information asymmetries that hinder the evaluation and comparison of the managers performances. In addition, in areas where the price elasticity of demand is high, competition forces companies to cut operational costs and since the risk of failure is higher in sectors open to competition, managers have greater incentives to increase efforts.
In Italy nowadays innovation is low, especially in the small and medium firms (IMF Regional Economic Outlook: Europe, 2011).
The quick changing in market conditions and the increasingly pressing competition in international markets, forces small and medium firms to develop strategies of continuous innovation, necessary in order to emerge over time and ensure their competitive position.
The higher the quality and the innovative products and services business, the greater the ability to accommodate international challenges and improve growth prospects.
The main causes of this low investment is that until 2006 bankruptcy law was very severe and entrepreneurs have been exposed to risky criminal proceedings, even putting their personal wealth at risk. The stock market is under-utilized and the venture capital market is developing only slowly. This is partly due to a still new market of institutional investors, a regulation which weakly encourage investment in the SMEs and a poor corporate governance practices, despite
adopted regulations that follow OECD best-corporate governance practices (OECD Economic Surveys: Italy, 2009). Indeed, Italy, mostly in the north part of the country, is characterized by widespread family ownership structures, where the owner holds most of the control and power and he limits the effective rights of minority shareholders.

### 3.2.4 Quality of institutions

Civil justice remains inefficient (OECD Economic Surveys: Italy, 2009): there is a backwardness of the system and procedures, which are slow and long, there exist strong regional imbalances and the average duration of trials is longer than in the other countries. Inefficiencies in our justice system create situations of deep inequalities between directly involved citizens, and represent an obstacle to the development of our economy for the deterrent effect on foreign investors, who are reluctant to

invest in countries where it is difficult to argue their case in a reasonable time (Antonucci et al. 2011). This represents another bottleneck limiting firms from growing beyond the threshold below which family control is still an effective organizational form for enforcing contracts (IMF Regional Economic Outlook: Europe, 2011).

### 3.2.5 Education

The total public spending on education is lower in Italy than in other countries such as France, United Kingdom and Spain (see Figure 17)[24].

The data reported by World Bank considers all levels of public spending, local, regional and national, and includes not only educational institutions but also other institutions that guarantee the functioning of the national education system: ministries and departments of public education, services , research, etc., and subsidies for private entities (students/households and other privates entities).

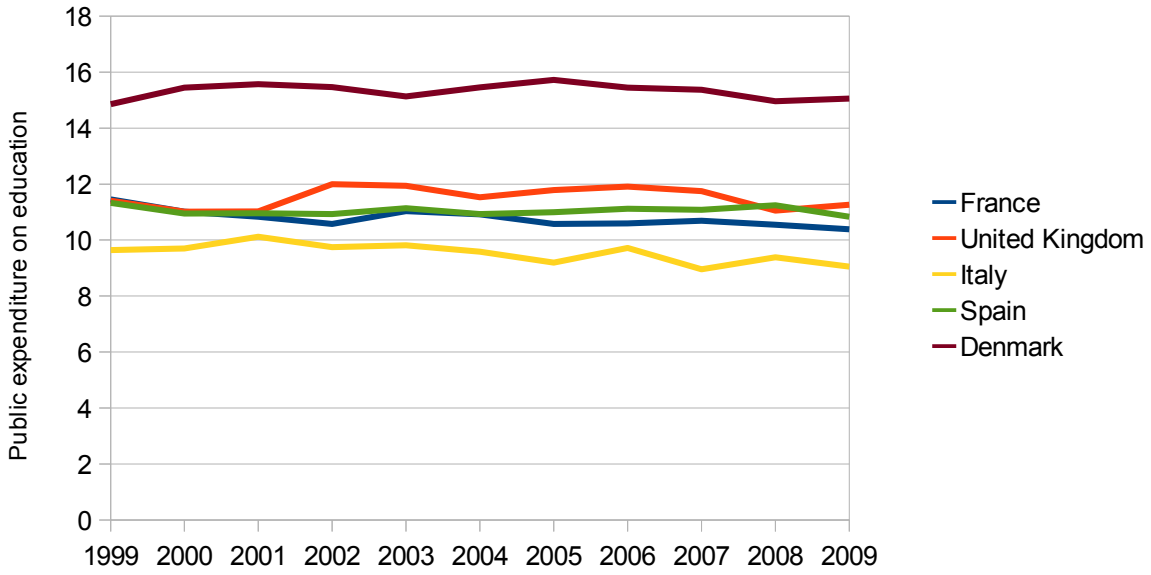



**Figure 17: Public Expenditure on Education, total (% of government expenditure), 1999-2009.**
Source: World Bank data.

Furthermore attainments in education in Italy are low (OECD Economic Surveys: Italy, 2009, 2011). The results of 2009 PISA tests showed a deterioration of the already not great Italian education system, and Italy is ranked among the five worst OECD performers (see Figure 18)[25]. At the national level only the results of North-East high schools are at the European average (PISA,

24 The data are listed in the Appendix, Table B5.
25 The data are listed in the Appendix, Table B6.

2009).

The proportion of the labour force with a tertiary degree in Italy is 17%, one half the OECD average. Drop-out rates are high with only 45 percent of students entering tertiary education actually completing their studies, well below the 65 percent OECD average.

Moreover less than 30 percent of university's students graduates on time and the average number of years to complete a 3 year degree is 4.7 (OECD Economic Surveys: Italy, 2011).

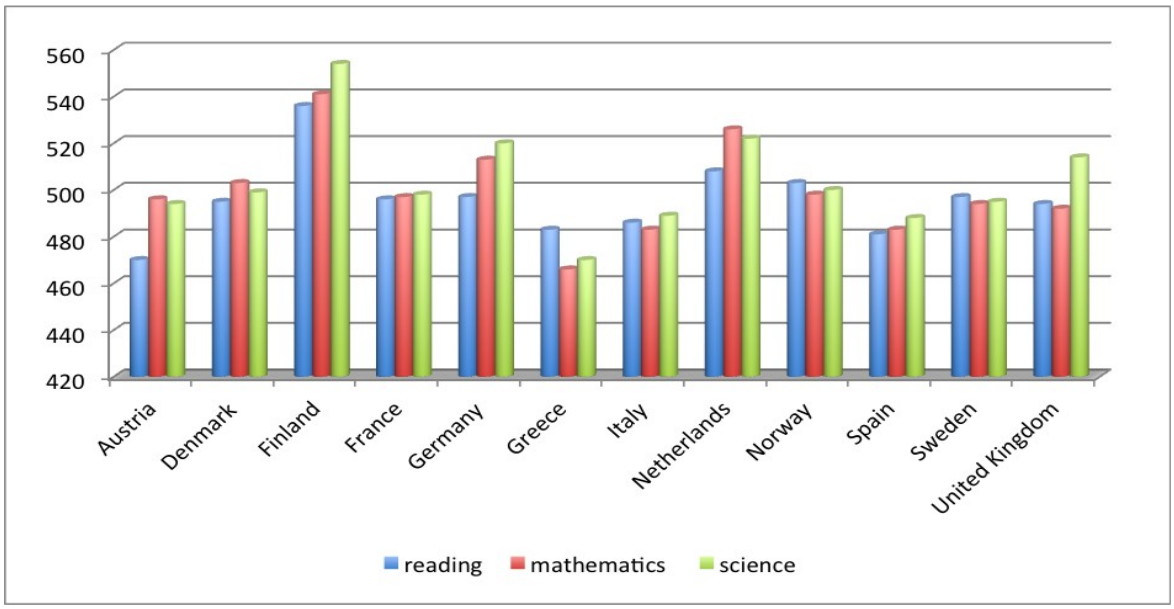



**Figure 18: PISA Tests Results on Reading, Mathematics and Science Scales.**
Source: PISA, 2009.

### 3.2.6 Evidences from the model

We have seen that the results of the regression model show that human capital and research and development are important to determine the economic development of a country.

When we talk about the enrolment rates in primary and secondary education between similar European countries there is not so much difference: education is compulsory between the ages of 6 to 15 in Greece, between 6 to 16 ages in France, England and Spain, and between 6 and 18 ages in Germany and Italy.

At the same time tertiary education varies a lot across countries. We have seen that tertiary school enrolment rates are increased less in Italy than in other economies: the first-year students fell by 15% over the past eight years, with a drop-out rates of 23% during the first year and 30% including the second year. Less than 30 percent of university's students graduates on time and the average number of years to complete a 3 year degree is 4.7 (OECD Economic Surveys: Italy, 2011).

As a matter of fact Figure 19 shows that the proportion of the labour force with a tertiary degree in

Italy is one half the shares of other similar countries such as Germany, France and Spain[26].

The university system offers a number of courses significantly higher than international standards and, even if the proliferation of programs in recent years has been caused by the introduction of the two-level system agreed under the Bologna process, it was also the result of local politicians' interests that have led to a spread of decentralized universities (Regini, 2009). This would not be a problem if the education system as a whole results effective and efficient.

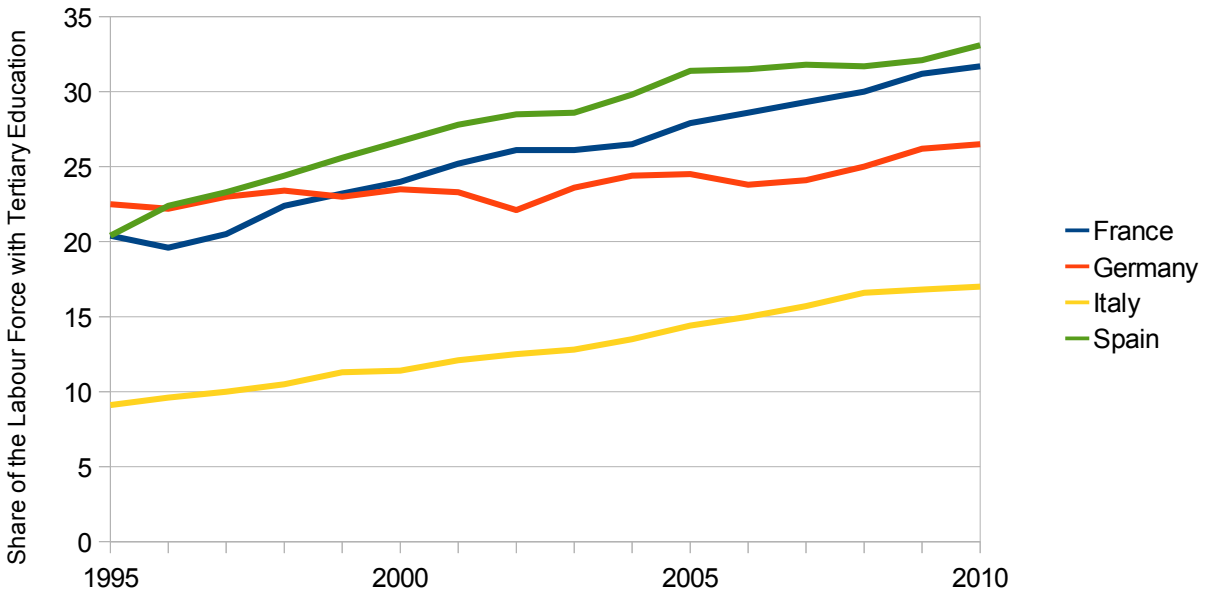



**Figure 19: Share of Labour Force with Tertiary Education (% Total Population).**
Source: World Bank data.

Since the mission of universities is mainly the formation of human capital and scientific research, it is on these two results that their efficiency should be measured.

Available information suggests that the quality of Italian higher education outcomes is low by international standard (OECD Economic Surveys: Italy, 2011); the recent polemics points out the low rate of graduates among the population and the very low completion rate, which are indicators of low productivity. Moreover it is disappointing the bad positions of Italian universities in the major international rankings, since none of them ranks Italian universities at the top.

According to the Shanghai ranking, in 2012 the highest ranked Italian university is the University of Pisa, between the 100th and the 150th place, with thirteen English, eight German and six French universities performing better than that. The "Academic Ranking of World Universities", as it is called, uses six objective indicators to rank world universities, including the number of alumni and staff winning Nobel Prizes and Fields Medals, number of highly cited researchers, number of

26 The data are listed country-by-country in the Appendix, Table B7.

articles published in journals or indexed in some Citation Index, and per capita performance with respect to the size of an institution.

The Times Higher Education's 2011-2012 World Universities Ranking, which is based on thirteen separate performance indicators covering all of the core missions of a world class university such as teaching, research, knowledge transfer and international outlook, does not even show any Italian universities at the top 200 institutions. The best ranked Italian college is the University of Bologna, at the 226th place, with twelve German, five French and three Spain universities performing better than that.

Another indicator of the efficiency of education system is the employment rate of graduates and their marginal benefits of studying more years.

Italian employment rates vary considerably according to the level of educational attainment. Across the European Union-27 the rate of those who had completed a tertiary education was 83.9 % in 2010, much higher than the rate (53.8 %) for those who had attained a primary or lower secondary education. Italian rates are 78,3 % for tertiary education and 50,4% for the primary or lower secondary education, the lowest percentages across its neighbourhoods (see Figure 20)[27]. The employment rate of a person with an upper secondary or post-secondary non-tertiary education is also lower than the European average (72,6 % and 73.1 % respectively).

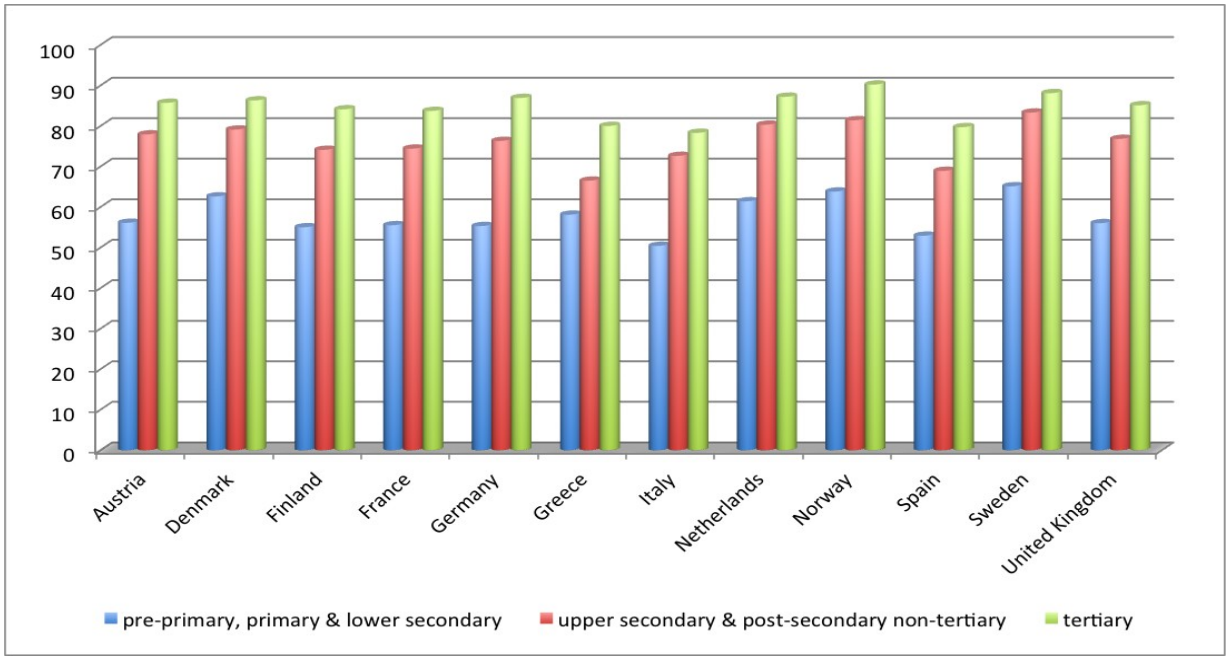



**Figure 20: Employment Rate by Highest Level of Education (% of population), Age Group 25-64, 2010.**
Source: Eurostat.

27 The data are listed in the Appendix, Table B8.

On the other hand a significant number of firms tend to find the qualification of new graduates insufficient, since they often need to provide initial training to compensate the initial lack of abilities and competences. At the same time the hiring demand of the business sector is highly concentrated towards low educational levels, resulting in a excess supply of tertiary graduates.

The problem results from a combination of both limited regional mobility and a universities' approach which is very much theoretical and rarely technical (OECD Economic Surveys: Italy, 2011).

Skills mismatch, in fact, seems to be one of main challenge faced by our economy: workers are not well-matched with their current jobs. Some are over-skilled for their current jobs, meaning that they could handle more complex tasks and their skills are underutilized, while others are under-skilled for their current jobs and they lack the abilities normally needed for their position. In Italy the number of jobs that require a skilled worker exceeds the number of people with tertiary education by 2.3 times (Eurostat, 2007).

There are then other few issues: Italian higher education system does not perform very well in retaining Italian students and most of the brain drain is permanent; some people claim that part of the responsibility of this situation lies with the lack of financial support and appropriate incentives to research (Becker, Ichino, Peri, 2003).

This exodus costs to Italy more than 1.2 billion of dollars a year, this is the money value generated by the 243 patents that the 50 best Italian brains have registered abroad (I-COM, 2012).

On the other hand Italian higher education and research is not attractive either for foreign students and researchers, partly because of the language and the absence of university residences (Regini, 2009).

This low performance of universities is partly explained by the fact that they are generally not allowed to select students or they can do it only in some kind of curricula; they are not free in defining the programs and hiring faculty, they are poorly governed with inadequate funding, and they lack accountability (OECD Economic Surveys: Italy, 2011).

Universities should compete with each other, they should have greater autonomy and the small and inefficient ones should close. This competitive system, then, should be accompanied by an environment that encourage meritocracy.

As a result of these many shortcomings, Italian universities often have a low contribution to human capital formation in general, thereby reducing labour utilization, and worse, contribute little to R&D expenditure, hindering innovation (IMF Regional Economic Outlook: Europe, 2011).

Italian universities, provide a modest contribution to the overall innovation, but even if Italy is the seventh largest world producer of scientific publications, Italy's overall innovation performance is

well below the international average and this makes Italy a moderate innovator (see Figures 21 and 22)[28].

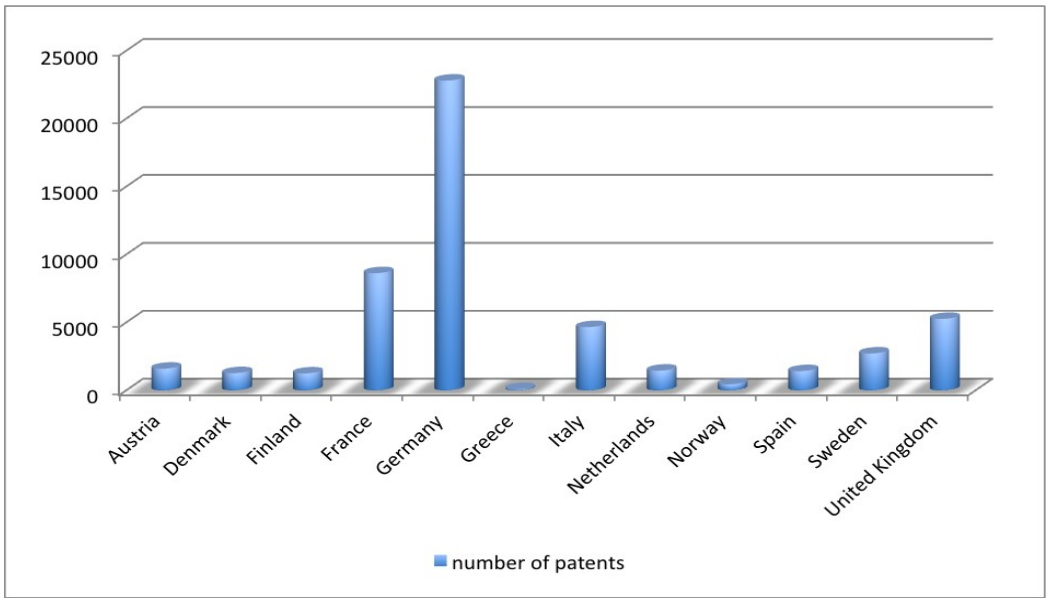



**Figure 21: Patent Applications to the EPO for the Investor Country of Residence, 2008.**
Source: OECD statistics.

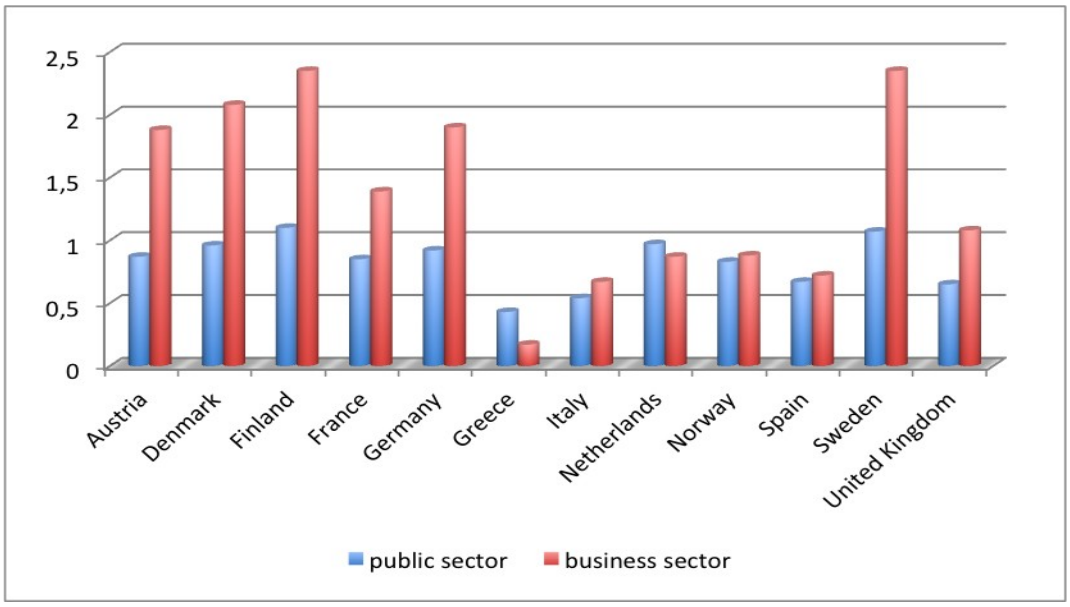



**Figure 22: R&D Expenditure in the Public and Business Sectors (% GDP), 2011.**
Source: Eurostat.

The percentage of Italian GDP devolved to the research in the public sector is only 0.54% and 0.67% in the business one, that are, across developed European countries better only than Greek ones (European Commission Innovation Union Scoreboard, 2011).

In 2009 (last data available) Italian companies have carried out R&D for a total cost of 10238

28 The data are listed in the Appendix, Table B9.

millions (53.3% of the total), universities of 5812 millions (30.3%), public institutions for 2525 millions (13.1%) and, finally, private no-profit institutions has contributed to the total by 634 millions (3.3%) (see Figure 23).

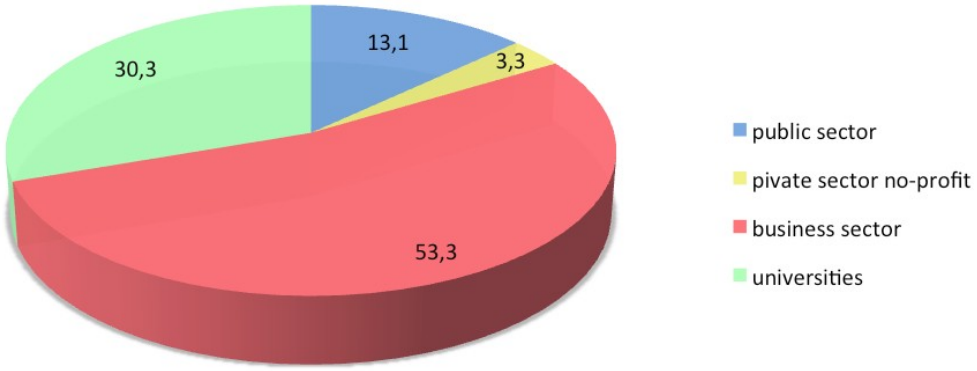



**Figure 23: R&D expenditures by sector, 2009.**
Source: Istat.

The Summary Innovation index, developed by the European Commission, measures the aggregate national innovation performance: in Italy is well below the European average (0.441) that makes our country a "moderate innovator" unlike Germany, United Kingdom and France that reached 0.700, 0.620 and 0.558 respectively (see Figure 24).

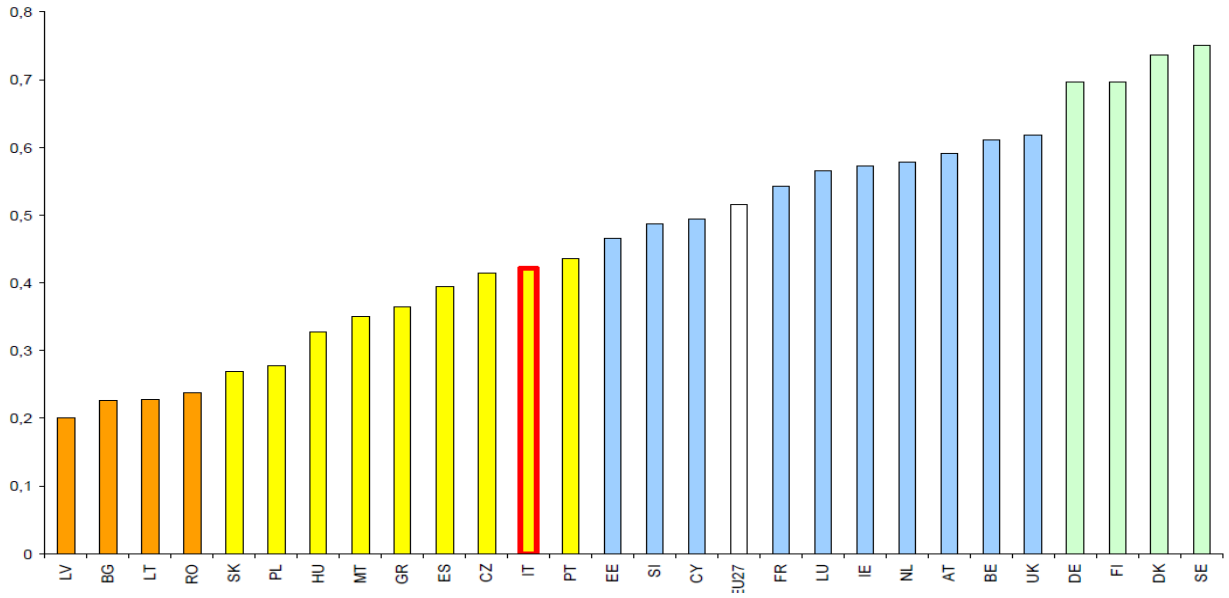



**Figure 24: Summary Innovation Index EU-27 Member States, 2010.**
Source: European Commission Innovation Union Scoreboard.

In 2010, spending on R&D *intra-muros* supported by enterprises, public institutions, no-profit institutions and universities amounted of a total of 19.5 billions of Euro, and the expenditure on

R&D as a percentage of GDP was equal to 1.26%. Compared to 2009, there was an increase in spending by 1.7% in nominal terms and an increase of 1.1% in real terms (Istat, 2011).

The Italian economic sectors that invest more in R&D activities are the manufacture of computers, electronic and optical products, motor vehicles, trailers and other transports, and machinery and mechanical equipment.

Probably because of these low investments, the number of researchers in R&D is well below the OECD average: in 2008 Italy had 1614 researchers per million people while Germany and France employed more than 3600 researchers (World Bank, 2012).

Recently the government is acting to reverse the dramatic trend of university and R&D performances. In the last two years some universities reforms have followed, with the aim of improving the efficiency of education system. It is needed to increase the timely completion of graduate studies and reducing the drop-out and it could be done with a better initial selection, introducing scholarships and real incentives for early and on-time graduations.

As a matter of fact the financial support to tertiary students increased, comprehending discounts and subsidies for "Honors Students", and other funding was allocated to universities on the basis of teaching and research performance (OECD Economic Surveys: Italy, 2011).

The government also increased the English-taught courses to enhance the competitiveness of the Italian university even abroad.

On the research and development side, the "Decreto Sviluppo" approved in August 2012 brings with it many new features, including those related to the so called bonus for research and development, also known by R&D tax credit.

The resources allocated by the Government amounts to about 25 millions for this year and they will rise to 50 million in the next year. The aim of the decree is to give a tax credit to enterprises which recruit R&D personnel, more specifically, the credit will be of the amount of 35% of the cost of the recruitment of permanent staff with specific requirements.

# Conclusions

The aim of this study was to explain what causes different levels of per capita income in similar highly developed countries, and thus to provide an explanation of the recent Italian slowdown; to make the comparison possible we have focused particularly on countries that have had similar development trends and history, and share similar paths.

The results have shown that the development of human capital and innovation are more important than the quality of institutions and the financial development in influencing the economic growth.

We have proved, in fact, that the relation between the growth rate of per capita GDP and many proxies of financial development and quality of institutions is not statistically significant, probably because the overall effect of these variables is similar in the considered countries.

On the other hand model's results have shown that the proxy for human capital, and the research and development expenditure are positively related to the economic growth, hence the low level of both variables in Italy is an important reason for its economic decline.

Italian higher education does not appear internationally competitive and could perform better: the attainment in education is lower than in the other European countries as well as the share of labour force with tertiary education; no Italian universities are placed in the top 100 according to two world university ranking system, with a consequent crucial brain drain and the strong difficulties in attracting foreign students. The number of drop outs during the three-years degree is high and the average number of years to complete a degree is higher than in all other European countries.

The under performance of tertiary education hampers the labour market as shown by the low employment rate of tertiary degree holders, due to the fact that there is a crucial skill mismatch between what the education system produces and what the labour market demands, and also because a significant number of firms tend to find the qualification of new graduates insufficient.

Moreover universities provide only a modest contribution to the overall innovation performance, which results well below the international average and this makes Italy a moderate innovator. The number of patents in Italy is much lower than the number of patents in similar countries like Germany and France, and the percentage of Italian GDP devolved to the research in the public sector is well below the Germany's and France's ones.

Italy needs many structural changes to stop its economic decline.

Even if recently the Government is acting to reverse this trends, it is important to improve human capital formation in the high level education system trough a combination of better performance information, it would be useful to implement a more performance-focused management and to

increase the accountability in order to improve the efficiency of the system. A rationalisation of the supply of academic courses could help make better use of limited resources and to exploit the different comparative advantages of each university. It is needed to increase the timely completion of graduate studies and reducing the drop-out and it could be done with a better initial selection, introducing scholarships and real incentives for early and on-time graduations. It would be useful to grant universities more autonomy and flexibility.

It is needed to improve the research and development results, in order to make Italy more competitive in the international market. It would be useful then to spread the innovation into the economy increasing the cooperation between universities and public research centres, and also between universities and firms.

# Appendix

**Table A1.** Initial (1997) and Final (2011) per Capita GDP (2000 US$), Growth Rate and Logarithm of the Initial per Capita GDP.

| Country | gdp1997 | gdp2011 | growth | loggdp97 |
|---|---|---|---|---|
| Australia | 19692,3047 | 25350,9625 | 28,7354 | 4,2943 |
| Austria | 21638,4083 | 27427,6415 | 26,7544 | 4,3352 |
| Belgium | 20887,5819 | 24733,9259 | 18,4145 | 4,3199 |
| Canada | 20911,1121 | 25933,2883 | 24,0168 | 4,3204 |
| Chile | 4734,5641 | 6753,6048 | 42,6447 | 3,6753 |
| Denmark | 27923,9165 | 30687,4547 | 9,8967 | 4,4460 |
| Finland | 20614,9129 | 27765,6264 | 34,6871 | 4,3142 |
| France | 19952,9059 | 23016,8478 | 15,3559 | 4,3000 |
| Germany | 21502,7214 | 26080,5209 | 21,2894 | 4,3325 |
| Greece | 10337,4533 | 12653,4412 | 22,4039 | 4,0144 |
| Israel | 18202,4963 | 22859,6759 | 25,5854 | 4,2601 |
| Italy | 18190,6711 | 18935,0526 | 4,0921 | 4,2598 |
| Japan | 37518,5809 | 39578,0744 | 5,4893 | 4,5742 |
| Korea, Rep. | 10491,0818 | 16684,2128 | 59,0323 | 4,0208 |
| Mexico | 5244,2897 | 6269,8967 | 19,5566 | 3,7197 |
| Netherlands | 21814,3043 | 26734,6800 | 22,5557 | 4,3387 |
| Norway | 35316,7508 | 40034,8506 | 13,3594 | 4,5480 |
| Portugal | 10222,9615 | 11558,9454 | 13,0685 | 4,0096 |
| Spain | 12754,6317 | 15511,9280 | 21,6180 | 4,1057 |
| Sweden | 24536,8146 | 33513,0242 | 36,5826 | 4,3898 |
| United Kingdom | 22529,4597 | 28032,7916 | 24,4273 | 4,3528 |

**Gdp1997** is the per capita GDP (2000 US$) of 1997.

**Gdp2011** is the per capita GDP (2000 US$) of 2011.

**Growth** is the growth rate of per capita GDP between 1997 and 2011.

**Loggdp97** id the logarithm of the 1997 per capita GDP (2000 US$).

**Table A2**. Initial (1980) and Final (1996) tertiary school enrolment rates (% gross), growth rate and R&D public and private expenditure over GDP, 1996 (source: World Bank).

| Country | enrol1980 | enrol1996 | enrol | R&D |
|---|---|---|---|---|
| Australia | 25,0649 | 74,0495 | 195,4313 | 1,6526 |
| Austria | 21,0599 | 47,7894 | 126,9217 | 1,6018 |
| Belgium | 25,0354 | 55,6230 | 122,1778 | 1,7668 |
| Canada | NA | 88,7614 | NA | 1,6509 |
| Chile | 11,8795 | 30,5874 | 157,4798 | 0,5276 |
| Denmark | 28,3325 | 47,7668 | 68,5935 | 1,8380 |
| Finland | 31,7834 | 70,4369 | 121,6150 | 2,5273 |
| France | 24,9124 | 51,8548 | 108,1485 | 2,2693 |
| Germany | NA | 46,0512 | NA | 2,1943 |
| Greece | 16,8055 | 40,3036 | 139,8235 | 0,4521 |
| Israel | 30,4825 | 41,1942 | 35,1406 | 2,7358 |
| Italy | 27,4471 | 41,4600 | 51,0544 | 0,9856 |
| Japan | 30,8738 | 40,1700 | 30,1100 | 2,8029 |
| Korea, Rep. | 12,8330 | 53,5856 | 317,5602 | 2,4249 |
| Mexico | 12,9511 | 15,3151 | 18,2529 | 0,3094 |
| Netherlands | 29,0802 | 48,0244 | 65,1446 | 1,9841 |
| Norway | 25,4666 | 58,1161 | 128,2050 | 1,6251 |
| Portugal | 18,2386 | 35,0378 | 92,1073 | 0,5570 |
| Spain | 22,9399 | 48,3080 | 110,5855 | 0,8130 |
| Sweden | 36,5285 | 45,9909 | 25,9040 | 3,4675 |
| United Kingdom | 18,6012 | 49,6624 | 166,9853 | 1,8339 |

**Enrol1980** is the tertiary school enrolment rate (% gross) in 1980.

**Enrol1996** is the tertiary school enrolment rate (% gross) in 1996.

**Enrol** is the growth rate of tertiary school enrolment rates between 1980 and 1996.

**R&D** is the public and private research and development expenditure as a percentage of GDP. The considered year is the 1996.

**Table A3**. Four Variables for Financial Development: Deposit Money Bank, Liquid Liabilities, Private Credit and Stock Market Capitalization, 1996 (source: Levine database).

| Country | deposit | liquid | private | capit |
|---|---|---|---|---|
| Australia | 0,9302 | 0,5946 | 0,6816 | 0,7143 |
| Austria | 0,9967 | 0,8978 | 0,9338 | 0,1675 |
| Belgium | 0,9929 | 0,8079 | 0,7357 | 0,5164 |
| Canada | 0,9685 | 0,7645 | 0,7726 | 0,8290 |
| Chile | 0,8070 | 0,3683 | 0,4900 | 0,8359 |
| Denmark | 0,9507 | 0,5610 | 0,3019 | 0,4866 |
| Finland | 0,9886 | 0,5418 | 0,5940 | 0,5549 |
| France | 0,9908 | 0,6623 | 0,8353 | 0,4456 |
| Germany | 0,9953 | 0,6751 | 1,0291 | 0,3472 |
| Greece | 0,7681 | 0,5614 | 0,2911 | 0,1873 |
| Israel | 0,9603 | 0,6925 | 0,6101 | 0,3786 |
| Italy | 0,8990 | 0,5776 | 0,5395 | 0,2534 |
| Japan | 0,9763 | 2,1012 | 1,7982 | 0,6261 |
| Korea, Rep. | 0,9895 | 0,3732 | 0,4959 | 0,1805 |
| Mexico | 0,9846 | 0,2578 | 0,2081 | 0,3284 |
| Netherlands | 0,9943 | 0,7904 | 0,9448 | 1,0993 |
| Norway | 0,9826 | 0,5235 | 0,5449 | 0,3928 |
| Portugal | 0,9834 | 0,9484 | 0,7252 | 0,2846 |
| Spain | 0,9637 | 0,7154 | 0,7100 | 0,4669 |
| Sweden | 0,9293 | 0,4241 | 0,3301 | 1,0455 |
| United Kingdom | 0,9689 | 0,7062 | 1,1143 | 1,4111 |

**Liquid** is the ratio of liquid liabilities of the financial system divided by GDP, a measure for the "financial depth" of a country, it represents the overall size of the financial intermediary sector (King and Levine 1993). Liquid liabilities consist of currency held outside the banking system plus demand and interest-bearing liabilities of banks and non-bank financial intermediaries.

It is defined as follow: $liquid = \frac{(liquid\ liabilities)}{GDP}$

**Deposit** is the ratio of deposit money bank claims on domestic non financial real sector to the sum of deposit money bank and Central Bank claims on domestic non financial real sector; it measures the degree to which commercial banks against the central bank allocate society's savings.

It is defined as follow: $deposit = \frac{(deposit\ money\ bank\ assets)}{[(deposit\ money + central)\ bank\ assets]}$

**Private** is the value of credits by financial intermediaries to the private sector such as through loans, purchases of non-equity securities, and trade credits and other accounts receivable divided by GDP; it indicates the level of financial services, and therefore how great is the financial intermediary development in a country.

It is defined as follow: $private = \frac{(private\ credit\ by\ deposit\ money\ bank)}{GDP}$

**Capit** is is the stock market capitalization over the GDP; it measures the value of listed shares to GDP and it is another Levine's proxy for financial development.

It is defined as follow: $capit = \frac{(stock\ market\ capitalization)}{GDP}$

**Table A4.** Five Variables for the Quality of Institutions: rule of law, creditors' right, duration and cost of judicial proceedings (sources International Country Risk Guide and La Porta *et al*).

| Country | law | rights | duration | cost | institu |
|---|---|---|---|---|---|
| Australia | 6 | 1 | 320 | 8 | 9,42968 |
| Austria | 6 | 3 | 434 | 1 | 9,44791 |
| Belgium | 6 | 2 | 365 | 9,1 | 9,71093 |
| Canada | 6 | 1 | 425 | 28 | 9,67187 |
| Chile | 4,21 | 2 | 200 | 14,7 | 6,32552 |
| Denmark | 6 | 3 | 83 | 3,8 | 9,67968 |
| Finland | 6 | 1 | 240 | 15,8 | 9,67968 |
| France | 5,39 | 0 | 210 | 3,8 | 9,26041 |
| Germany | 5,24 | 3 | 154 | 6 | 9,58854 |
| Greece | 3,71 | 1 | 315 | 8,2 | 5,5 |
| Israel | 2,89 | 4 | 315 | 34,1 | 6,08854 |
| Italy | 5 | 2 | 645 | 3,9 | 8,19531 |
| Japan | 5,39 | 2 | 60 | 6,4 | 9,36718 |
| Korea, Rep. | 3,21 | 3 | 75 | 4,5 | 6,36093 |
| Mexico | 3,21 | 0 | 325 | 10 | 5,41406 |
| Netherlands | 6 | 2 | 39 | 0,5 | 9,8125 |
| Norway | 6 | 2 | 87 | 10,4 | 9,59895 |
| Portugal | 5,21 | 1 | 420 | 4,9 | 7,73854 |
| Spain | 4,68 | 2 | 147 | 10,7 | 7,63541 |
| Sweden | 6 | 2 | 190 | 7,6 | 9,64843 |
| United Kingdom | 5,14 | 4 | 101 | 0,5 | 9,33854 |

**Law** is a measure on the evaluation of the legal and order tradition in the country, it reflects the degree to which the citizens of a country are willing to accept the established institutions to make and implement laws and adjudicate disputes. The variable ranges from 1 (weak law and order tradition) to 6 (strong law and order tradition).

**Rights** measures the creditors' rights protection, and it is an index developed by La Porta et al. (1998) which comprehends some features of the legal rules governing loan contracts. It ranges from 0 (little rights) to 4 (maximum rights).

**Duration** is the duration in weeks of trials.

**Cost** is the total cost of judicial proceedings as a percentage of GDP.

**Institu** is a general institutional quality index developed by Sachs and Warner (1997) that is an average of 5 sub-indexes, including the rule of law index, the bureaucratic quality index (it measures the autonomy from political pressure and the strength and expertise to govern without drastic changes in policy or interruptions in government services), the corruption in government index (illegal payments such bribes connected with import and export licenses, exchange controls, tax assessments, police protection, or loans), the risk of expropriation index and the government repudiation of contracts index (the risk of a modification in a contract taking the form of a repudiation, postponement or scaling down).

**Table B1**. Import and Export of Goods and Services (% of GDP) in Italy, 1990-2011 (source: World Bank).

| | **exports** | **imports** |
|---|---|---|
| 1990 | 19,109 | 18,881 |
| 1991 | 17,836 | 17,613 |
| 1992 | 18,217 | 18,149 |
| 1993 | 21,260 | 18,072 |
| 1994 | 22,795 | 19,346 |
| 1995 | 25,714 | 21,874 |
| 1996 | 24,681 | 19,961 |
| 1997 | 25,208 | 21,285 |
| 1998 | 25,154 | 21,931 |
| 1999 | 24,280 | 22,361 |
| 2000 | 26,769 | 25,815 |
| 2001 | 26,858 | 25,475 |
| 2002 | 25,482 | 24,545 |
| 2003 | 24,415 | 23,875 |
| 2004 | 25,190 | 24,488 |
| 2005 | 25,873 | 25,934 |
| 2006 | 27,620 | 28,435 |
| 2007 | 28,851 | 29,102 |
| 2008 | 28,456 | 29,288 |
| 2009 | 23,747 | 24,278 |
| 2010 | 26,606 | 28,550 |
| 2011 | 28,760 | 30,232 |

**Table B2**. General Government Gross Debt (% of GDP), 1995-2010 (source: Eurostat).

| | France | Germany | Italy | Spain |
|---|---|---|---|---|
| 1995 | 55,5 | 55,6 | 120,9 | 63,3 |
| 1996 | 58 | 58,5 | 120,2 | 67,4 |
| 1997 | 59,2 | 59,8 | 117,4 | 66,1 |
| 1998 | 59,4 | 60,5 | 114,2 | 64,1 |
| 1999 | 58,9 | 61,3 | 113 | 62,4 |
| 2000 | 57,3 | 60,2 | 108,5 | 59,4 |
| 2001 | 56,9 | 59,1 | 108,2 | 55,6 |
| 2002 | 58,8 | 60,7 | 105,1 | 52,6 |
| 2003 | 62,9 | 64,4 | 103,9 | 48,8 |
| 2004 | 64,9 | 66,3 | 103,4 | 46,3 |
| 2005 | 66,4 | 68,6 | 105,4 | 43,2 |
| 2006 | 63,7 | 68,1 | 106,1 | 39,7 |
| 2007 | 64,2 | 65,2 | 103,1 | 36,3 |
| 2008 | 68,2 | 66,7 | 105,7 | 40,2 |
| 2009 | 79,2 | 74,4 | 116 | 53,9 |
| 2010 | 82,3 | 83 | 118,6 | 61,2 |
| 2011 | 85,8 | 81,2 | 120,1 | 68,5 |

**Table B3**. Italian Public Administration Expenditure (% GDP), 2001-2009 (source: Istat).

| | PA expenditure |
|---|---|
| 2001 | 48,1 |
| 2002 | 47,5 |
| 2003 | 48,6 |
| 2004 | 48 |
| 2005 | 48,5 |
| 2006 | 49,2 |
| 2007 | 48,4 |
| 2008 | 49,4 |
| 2009 | 52,5 |

**Table B4**. Corruption Perception Index, 1998-2011 (source: Transparency International). A country/territory's score indicates the perceived level of public sector corruption on a scale of 0 - 10, where 0 means that a country is perceived as highly corrupt and 10 means that a country is perceived as very clean.

| | France | Germany | Italy | Spain |
|---|---|---|---|---|
| 1998 | 6,7 | 7,9 | 4,6 | 6,1 |
| 1999 | 6,6 | 8 | 4,7 | 6,6 |
| 2000 | 6,7 | 7,6 | 4,6 | 7 |
| 2001 | 6,7 | 7,4 | 5,5 | 7 |
| 2002 | 5,6 | 7,3 | 5,2 | 7,1 |
| 2003 | 6,9 | 7,7 | 5,3 | 6,9 |
| 2004 | 7,1 | 8,2 | 4,8 | 7,1 |
| 2005 | 7,5 | 8,2 | 5 | 7 |
| 2006 | 7,4 | 8 | 4,9 | 6,8 |
| 2007 | 7,3 | 7,8 | 5,2 | 6,7 |
| 2008 | 6,9 | 7,9 | 4,8 | 6,5 |
| 2009 | 6,9 | 8 | 4,3 | 6,1 |
| 2010 | 6,8 | 7,9 | 3,9 | 6,1 |
| 2011 | 7 | 8 | 3,9 | 6,2 |

**Table B5**. Public Expenditure on Education, total (% of Government Expenditure), 1999-2009 (source: World Bank).

| | France | UK | Italy | Spain | Denmark |
|---|---|---|---|---|---|
| 1999 | 11,45007 | 11,4034 | 9,64071 | 11,33003 | 14,85059 |
| 2000 | 11,00965 | 11,01158 | 9,69426 | 10,94734 | 15,4464 |
| 2001 | 10,83757 | 11,02754 | 10,1232 | 10,95881 | 15,56824 |
| 2002 | 10,57918 | 11,99855 | 9,75162 | 10,92775 | 15,46336 |
| 2003 | 11,03003 | 11,93781 | 9,81697 | 11,13681 | 15,12901 |
| 2004 | 10,92049 | 11,53052 | 9,58705 | 10,92739 | 15,45412 |
| 2005 | 10,57627 | 11,78244 | 9,19718 | 11,00015 | 15,72063 |
| 2006 | 10,59287 | 11,90883 | 9,71347 | 11,11692 | 15,44943 |
| 2007 | 10,68869 | 11,74805 | 8,95874 | 11,08514 | 15,37399 |
| 2008 | 10,54874 | 11,05205 | 9,38276 | 11,24178 | 14,95653 |
| 2009 | 10,38059 | 11,26112 | 9,05413 | 10,8353 | 15,0523 |

**Table B6**. PISA Tests Results on Reading, Mathematics and Science Scales, 2009 (source: PISA, 2009).

| Country | reading | mathematics | science |
|---|---|---|---|
| Austria | 470 | 496 | 494 |
| Denmark | 495 | 503 | 499 |
| Finland | 536 | 541 | 554 |
| France | 496 | 497 | 498 |
| Germany | 497 | 513 | 520 |
| Greece | 483 | 466 | 470 |
| Italy | 486 | 483 | 489 |
| Netherlands | 508 | 526 | 522 |
| Norway | 503 | 498 | 500 |
| Spain | 481 | 483 | 488 |
| Sweden | 497 | 494 | 495 |
| United Kingdom | 494 | 492 | 514 |

**Table B7.** Share of Labour Force with Tertiary Education, 1995-2010 (source: World Bank).

| | France | Germany | Greece | Italy | Spain | Denmark |
|---|---|---|---|---|---|---|
| 1995 | 20,4 | 22,5 | 16,5 | 9,1 | 20,4 | 25,5 |
| 1996 | 19,6 | 22,2 | 17,3 | 9,6 | 22,4 | 26,3 |
| 1997 | 20,5 | 23,0 | 17,7 | 10,0 | 23,3 | 23,9 |
| 1998 | 22,4 | 23,4 | 18,6 | 10,5 | 24,4 | 24,1 |
| 1999 | 23,2 | 23,0 | 18,9 | 11,3 | 25,6 | 24,8 |
| 2000 | 24,0 | 23,5 | 19,0 | 11,4 | 26,7 | 24,0 |
| 2001 | 25,2 | 23,3 | 19,3 | 12,1 | 27,8 | 27,0 |
| 2002 | 26,1 | 22,1 | 20,2 | 12,5 | 28,5 | 28,0 |
| 2003 | 26,1 | 23,6 | 20,8 | 12,8 | 28,6 | 30,5 |
| 2004 | 26,5 | 24,4 | 23,2 | 13,5 | 29,8 | 30,7 |
| 2005 | 27,9 | 24,5 | 23,2 | 14,4 | 31,4 | 31,8 |
| 2006 | 28,6 | 23,8 | 24,6 | 15,0 | 31,5 | 32,6 |
| 2007 | 29,3 | 24,1 | 25,1 | 15,7 | 31,8 | 29,5 |
| 2008 | 30,0 | 25,0 | 25,8 | 16,6 | 31,7 | 29,3 |
| 2009 | 31,2 | 26,2 | 25,8 | 16,8 | 32,1 | 31,1 |
| 2010 | 31,7 | 26,5 | 26,8 | 17,0 | 33,1 | 30,8 |

**Table B8.** Employment Rate by Highest Level of Education (% of population), Age Group 25-64, 2010 (source: Eurostat).

| | primary | secondary | tertiary |
|---|---|---|---|
| Austria | 56,1 | 77,9 | 85,7 |
| Denmark | 62,6 | 79,1 | 86,3 |
| Finland | 55 | 74,1 | 84,1 |
| France | 55,5 | 74,4 | 83,7 |
| Germany | 55,3 | 76,3 | 86,9 |
| Greece | 58,1 | 66,5 | 80 |
| Italy | 50,4 | 72,6 | 78,3 |
| Netherlands | 61,4 | 80,3 | 87,2 |
| Norway | 63,8 | 81,4 | 90,2 |
| Spain | 52,9 | 68,9 | 79,7 |
| Sweden | 65,1 | 83,3 | 88,1 |
| United Kingdom | 56 | 76,8 | 85,1 |

**Table B9.** Patent Applications to the EPO for the Investor Country of Residence, 2008 (source: OECD statistics) and R&D Expenditure in the Public and Business Sectors (% GDP), 2011 (source: Eurostat).

| Country | patents | R&D public | R&D business |
|---|---|---|---|
| Austria | 1589,4 | 0,87 | 1,88 |
| Denmark | 1263,5 | 0,96 | 2,08 |
| Finland | 1240,7 | 1,1 | 2,35 |
| France | 8620,6 | 0,85 | 1,39 |
| Germany | 22797 | 0,92 | 1,9 |
| Greece | 90,8 | 0,43 | 0,17 |
| Italy | 4651,9 | 0,54 | 0,67 |
| Netherlands | 1444,8 | 0,97 | 0,87 |
| Norway | 440,5 | 0,83 | 0,88 |
| Spain | 1411,6 | 0,67 | 0,72 |
| Sweden | 2710,7 | 1,07 | 2,35 |
| United Kingdom | 5252,8 | 0,65 | 1,08 |

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