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**The impact of regulation on economic growth: comparative analysis across countries and sectors**

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Master in Economics

Supervisor:

Professor Sofia de Sousa Vale, Assistant Professor, ISCTE Business School,  
Economics Department

October 2020

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Economics Department and Political Economics Department

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# O impacto do crescimento económico na Regulação: análise comparativa entre países e setores

Diogo Palpista Bárbara

## Resumo

Esta investigação pretende compreender a relação entre a regulação e o crescimento económico, estimando o impacto do comportamento das instituições, da regulação de mercado e de sectores das utilidades no crescimento económico. Para isto recorreu-se ao método de “fixed-effects” e Arellano and Bond em dois estágios, com uma amostra de 28 países da OCDE no período de 1998-2017. A análise também é realizada para subgrupos, tais como países não europeus, países do sul e este europeus e países “core” europeus. Os resultados sugerem que o comportamento das instituições e a regulação de mercado estão relacionados positivamente com o crescimento económico. Quando se divide por grupos de países, a capacidade das instituições prevalece nos países não europeus. Enquanto que nos países europeu a regulação de mercado prevalece. A nível de sectores, a regulação dos transportes e financeira está relacionada positivamente com o crescimento económico. Na divisão da amostra os resultados dispersão pelos diferentes grupos de países. Considerando estes resultados os decisores devem ter em conta a importância da regulação e da capacidade das instituições para moldarem a economia.

Palavras-Chave: crescimento económico, regulação, instituições, políticas governamentais

Códigos JEL: L51, O43



# The impact of regulation on economic growth: comparative analysis across countries and sectors

Diogo Palpista Bárbara

## **Abstract**

This research intends to understand the relationship between regulation and economic growth, estimating the impact of the institutions' behaviors, market regulation and of the utilities' sectors on economic growth. With this objective, it was applied both fixed-effects and the two-step Arellano and Bond methodologies on a sample of 28 OECD countries between 1998-2017. The analysis is extended to subgroups, such as non-European countries, South and East European countries and the core European countries. The results suggest that the behavior of institutions and the market regulation are positively correlated with economic growth. When divided into groups of countries, the capacity of these institutions prevails in the non-European countries. While in the European countries the market regulation is the one which prevails. At the sectors level, the transport regulation and the financial regulation is positively related with economic growth. In the sample division the results are disperse through the different groups. Once regarded these results, the policymakers should take into account the importance of regulation and institutions capacity to shape the economy.

Keywords: economic growth, regulation, institutions, government policy

JEL codes: L51, O43





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## List of Abbreviations:

**CC-** *Control of Corruption*

**Comun-** Communication

**GC-** *Government final consumption percentage of GDP*

**GCF-** *Gross Capital Formation percentage of GDP*

**GDP-** Gross Domestic Product

**GE-** *Government effectiveness*

**gGDPpc-** Growth of Gross Domestic Product per capita

**GMM-** Generalized Methods of Moments

**H-** *Human Capital Index*

**IGDP-** *Initial GDP per Capita*

**INF-** *Inflation*

**L. gGDPpc-** Growth of Gross Domestic Product per capita one periods lag

**L2. gGDPpc-** Growth of Gross Domestic Product per capita two periods lag

**Max-** Maximum

**Min-** Minimum

**OECD-** Organization for Economic Cooperation and Development

**PMR-** *Product Market Regulation*

**PPP-** Purchasing power parity

**R&D-** Research and Development

**RQ-** Regulatory Quality

**Sd-** Standard Deviation

**WDI-** World Bank Development Indicators

## 1. Introduction

Economic growth is one of the most determinant factors in economics, and even other factors such as income, social and environmental problems revolve around growth. It is a foregone conclusion that growth influences decisions in businesses, in public policy and financial markets. However, the most obvious influence of economic growth is on our future decisions, since countries with positive GDP (Gross Domestic Product) growth rates are more capable of improving society's welfare, as well as, their economic structure. Economic growth has a silver lining: prosperity, wealth, better living conditions and more and improved jobs. However, it is not all a bed of roses, since with economic growth there may come more inequality between poor countries and rich countries, environmental damage, and the creation of new inequalities which may appear through economic networks.

Regulation may be one way to mitigate these negative externalities, but can it contribute to growth? The role of regulatory institutions leads to a more conscientious growth, maybe they can be seen as Smith's *invisible hand* or as a tool to solve economic problems such as natural monopolies, unbundling, etc. In this, regulation can have a positive contribution to growth, as it can to society. Furthermore, the regulation's behavior can prevent the consumer from being harmed economically, in the sense that it tries that companies, which have a dominant position in the market, or are monopolies, do not practice unaffordable prices. Hence, there is an indirect income redistribution since consumers do not have to spend as much of their income in these goods. Additionally, through the fight of the dominant position in the market, regulators are promoting competition, aiding in the creation of space for new companies to emerge.

On one hand, authors as Djankov, McLiesh and Ramalho (2005) and Acikgoz et. al (2016) preconize the importance of regulation at the enterprise's level, and how it can affect the growth dynamic of the companies, creating a systemic ballast in the economy. The proposed regulatory forms are closer from nowadays trajectory in some economies: deregulation.

On the other hand, Jalilian, Kirkpatrick and Parker (2007) and Koeniger and Silberberger (2016) put in evidence the role of institutions and its contributions to regulatory policies. These authors believe that the most efficient institutions contribute to a more adequate and effective regulatory policy.

It is crucial to understand the links between economic growth and regulation. Despite there being uncountable variables, which have an impact on growth, most of the times this influence

is disregarded. This research explores this relation and contributes with relevant work in this area, unraveling new paths, bringing new theoretical and empirical contributions.

This dissertation's prime contribution is an impact evaluation of regulation, both at a business level, as of the institutions' quality level. From this arises the research question: Does Regulation have an Impact on economic Growth? The intended contribute to the literature is given through new data and variables, regarding institutions, the regulation of the product and utilities' market, observing the differences at the sectorial level, and by group of countries.

Results show that market regulation and institutions behavior can be accountable to economic growth in the entire sample. At the sector level financial and transport regulation are related with economic growth.

The structure followed has six sections. In section 2 it is presented the literature review, section 3 demonstrates the empirical analysis, where it is described the data, methodology and the analysis of the empirical evidence. In chapter 4 the results are presented and discussed, while in the chapter 5 is discussed the robustness of the models under study and in section 6 it is presented the conclusion of this dissertation.

## **2. Literature Review**

The relationship between Regulation and Economic Growth has been debated throughout the century (appendix A1). The range of this relation is particularly broad.

Firstly, it is paramount to clarify the concepts concerning regulation and economic growth. Generally, regulation can be seen as a mechanism to develop competition and rule the markets structures, this because the markets are imperfect, and information is asymmetric. Stigler (1971) provides us with a fundamental element to understand the regulation concept, "*The potential uses of public resources and powers to improve the economic status of economic groups*". This idea puts in evidence the initiation of regulation policies which were guided by government intervention to persecute the "*public interest*" and reduce the ways of being "*Captured*" by interest groups to maximize their profits (Posner, 1973).

Actually, these concepts are the basis of economic regulation, however, other authors are more concrete or complex when they bring to debate this question. Joskow (2007) considers that the prime motive to regulate is the existence of a "*natural monopoly*", indicating that this economic characteristic leads to several economic problems such as "*excessive prices,*

*production inefficiencies, costly duplication of facilities, poor service quality*". Coyle (2018), in the forum, argued with three judgements, "*market-creating and market-growing*", this is, to create the same economic standards in one market, "*enable competition*", to give the opportunity to have more and efficient companies in the market, and the "protection of consumer", the regulators try to diminish the externalities in the economy.

The prospective of Baldwin and Lodge (2010) brings forward a new statement, the regulatory state. This is a new way to do economic policy, through substituting the welfare state by the regulatory state, where the decision-makers should primer macroeconomic stabilization, market stability and provision welfare. Many countries are concentrated on the intakes control of utilities (telecommunication, water, gas, electricity), however, the state could also be captured by the interest groups (Stiglitz, 1998). For this, the solution is privatization. Independent regulatory bodies must protect the "public interest" using methods such as control of costs, price cap or efficiency incentives. For Kirkpatrick and Parker (2007), institutions such as that are extremely important in economic development, wealth creation and help build markets with fewer imperfections and more economic incentives.

On another turn, economic growth can be defined as an increase in production and services in a determined period and country. The way to measure it is by using GDP or more precisely GDP per capita. GDP give us a big picture about the state of the economy and enables policy makers and central banks to judge when an economy is in recession or in a boom. GDP represents the accumulation of wealth and production. Furthermore, GDP per capita is an important element to measure the standard of living and well-being. Typically, countries with higher annual GDP per capita are more prone to produce and consume goods and services. Since these goods and services are closer to these consumers, and the richness per capita is higher, they are more inclined to buy them, thus, these consumers obtain goods and services more valuable, especially in knowledge. Although this explanation seems elementary, economists want to deepen the explanation and debate around economic growth and its determinants. Durlauf and Quah (1999) suggest three reasons to better develop the study of growth across countries. Firstly, they refer that it is beneficial to understand the different patterns of growth and its sources. This because these differences lead to different welfare and different aggregate growth rates. Secondly, the authors assume that better knowledge about economic growth is important to analyze new policies, the implications to the economies as

well as for intellectual economic purposes, as the third reason to better develop the study of growth across countries.

These different economic patterns referred to before lead to the discussion on convergence. For Barro (1996), the countries which have a lower GDP per capita grow faster. Through assuming that the initial capital is different and that the rest of the economies "*were intrinsically the same*", the economies would reach absolute convergence. However, economies can differ in various aspects such as education, kinds of political regime technology, among others. In this case, we have conditional convergence. It is crucial to refer that in the long-run economies should tend to a steady-state.

The traditional growth models of authors such as Solow, Mankiw, Romer and Weil attribute to capital accumulation, labor or population growth the main explanation for growth and technological progress is seen as a secondary explanation.

According to them, technological progress is something exogenous to the model, in the sense that the model does not explain it. This is often considered as a modelling deficiency (Barro,1996). In the short-run this question is a non-question because capital and labor contribute to the increase in production, which does not happen in the long-run. In the long-run the determinant element of the growth rate of GDP is technology "that comes outside of the model" (Barro,1996: 6), so economies can grow for centuries, at the same growth rate if there are no shocks to the economy.

Hall and Jones (1999) built a theory to explain why some countries produced more than others. They argued that the fundamental element to create differences in capital accumulation and productivity across the countries is the "*social infrastructure*". By Social Infrastructure "*we mean the institutions and government policies that determine the economic environment within which individuals accumulate skills, and firms accumulate capital and produce output*"(Hall and Jones,1999:84). A better "*social infrastructure*" conduces to better inputs and productivity, thus to a more efficient economic performance. The authors suggest that the effect in production is not only direct but also indirect, such as the creation of new ideas and technology. Although Hall and Jones used the Solow model as a basis, they believe that the "*social infrastructure*" is endogenous. The results of the author confirmed the theory that countries with higher "*social infrastructure*", higher the level of output per worker.



Other authors as Paul Romer, Lucas or Ramsey, treat technology as endogenous. Romer (1994) classified it in this way: "*This work distinguishes itself from neoclassical growth by emphasizing that economic growth is an endogenous outcome of an economic system, not the result of forces that impinge from outside*" (Romer, 1994: 3). The concept of "*technological advance*" involves ideas and what people do (Barro, 1998 and Romer, 1994). Endogenous growth model introduces imperfect market competitions, where there can exist more than one firm, as we can prove with Romer's (1994: 14) quote: "*the technology is endogenously provided as a side effect of private investment decisions. From the point of view of the users of technology, it is still treated as a pure public good, just as it is in the neoclassical model. As a result, firms can be treated as price takers and an equilibrium with many firms can exist*". In these models, it is possible to have long term growth without new ideas, however, it depends on what governments do, the role of taxations and regulation of international trade (Barro, 1996).

Djankov, McLiesh and Ramalho (2005) "*go further*" and underline that regulation of business activities is the main determinant of economic growth. For the authors, this kind of policies with strong and efficient institutions lead to richer countries. Their paper puts in evidence the consistent and positive correlation between growth and the business regulation index of the World Bank. To have better growth policies, decision-makers should consider more business-friendly measures.

According to Loayza, Oviedo and Servén (2005) regulation is associated with a lower level of growth. However, there can be another take on this matter, economies with better quality institutions mitigate the negative role of regulation and the effect can become positive. Then the authors conclude that institutional environment have a play role in the relationship between growth and regulation. These authors evidence another curious element to the debate, with too much regulation the informal sector tends to increase and harm economic growth.

Koeniger and Silberberger (2016) share the opinion that good or bad regulation has different effects on growth and their behavior affects trade, development and economic integration. One more time, the role and design of institutions are linked with economic growth and can contribute to it as we can prove "*Especiallly in countries, in which the political institutions are nonextractive and there is sufficient centralization, regulatory reforms can be a major source of 23 economic growth*"(2016:22). In terms of econometric results, they explain that regulatory quality and government effectiveness are positively correlated with growth and

their impact on GDP is large. Countries with the worst regulatory quality have more benefits when this indicator improves than the others, and this makes sense because it is easier to develop a bad condition than a good condition. With this we may think of regulation as a variable with decreasing returns to scale.

Jalilian, Kirkpatrick and Parker (2007) state that regulation should act when it exists market failures, the outcomes of regulation by government or regulatory bodies affect production, and consequently economic growth. The authors test the direct and indirect effect of regulation quality on economic growth. The correlation between the explanatory variables (government effectiveness and regulatory quality) and GDP per capita growth rate is positive, this is expected as seen in other papers. These results are also expected, the regulatory quality and governance have an impact on growth, and "*better governance contributes to more rapid economic growth*". However, still, there is a gap in the literature regarding how different industrial sectors respond in different ways of regulation.

In literature it is evidenced that both regulations and institutions are determinants of economic growth. For this reason, the next two sections will be important to understand this better.

## **2.1. Institutions-Growth**

This segment has a vast literature in economic journals. Authors try to understand the behavior of institutions on economic growth, especially the government role. They examine the reforms preponderance and effectiveness on economic development.

As it was discussed previously, institutions can have a crucial involvement in economic growth. Loayza et al. (2005) conclude that institutional environments are essential, while Koeniger and Silberberger (2016) argue about the effects of bad or good decisions by institutions.

D'Agostino et al. (2016) studied the links between government spending and corruption and how this affects growth. The authors explain that the government budget is supported by income tax and their efficient allocation allows spending it, however, corruption can distort this purpose. To understand these implications on economic growth they built an econometric model (data panel) to observe the empirical results. The results confirm the expectation that corruption affects negatively economic growth. Nevertheless, when we observe institutional

proxies' variables (such as government regulation and political stability) they have a positive behavior and help to mitigate the effects of corruption on growth.

Cooray (2009) debated on the relationship between governance and economic growth. He argues that good governance of institutions, more precisely government, is a fundamental factor to explain economic growth and countries with better governance have faster economic growth. Another significant conclusion concerns an item of government expenditure, more efficient institutions of governance make the government expenditure more effective, which could lead to an improvement in economic growth.

According to Seldadyo et al. (2007) the impact among governance and economic growth is not so obvious, and they consider the concept of governance extremely broad. For this reason, they constructed a proxy index of governance with the variables: "*democratic accountability, government stability, bureaucracy quality, corruption, and rule of law*". In the model other variables like school and investment are represented. The results confirm that school has a positive impact on growth as well as investment. The index built by the author is significant and positive and it contributes to the growth.

Works in this category converge to the same node. What is crucial is the type of role of the institutions. Not only the quality of economic institutions such as regulatory bodies is of the utmost importance, but also the quality of government, education and social services. The political regime allied with corruption can harm institutions.

Amin and Djankov (2014) study how economic reforms respond to different political regimes reforms. For the authors, most reforms were done when countries became democratic, however, democracy could be an obstacle to do new reforms. They argue that "*Democratic regimes could lead to more reforms if reforms create more winners than losers*". At the same time this can be the reason to create an obstacle because the politicians want to be elected. Furthermore, they affirm that there is a link between democracy and economic reforms. The change of regime leads to more economic reforms. The main results indicate that democracy is "*associated with regulatory reforms*" (significant and positively) and elections do not affect reforms. Economic institutions have a proclivity to reforms and better government behavior helps better reforms. Then, they conclude that more democracy rights contribute to more regulatory reforms, government efficiency and economic growth.

This question affects growth and it is not consensual in literature. For instance, Acemoglu et al. (2014) considers that it exists a positive effect of democracy on growth, whereas Freun and Jaud (2014) argue that the change of regime does not have a clear effect on growth. It is essential to understand that corruption can harm institutions and the economy, then we must fight for an instrument that will effectively combat it.

## **2.2. Economic Freedom, Sectorial Regulation and growth**

The range of this point is the regulatory theory. Papers from this section bring up topics such as deregulation, models, practices of regulation and sectorial regulation. Moreover, most of them relate the grade of freedom in the economy growth. For them, this is a desirable process to understand the quality of institutions, namely regulatory institutions.

Koedjik and Kremers (1996) present deregulation and freedom as a measure of the quality of regulation. Countries with a higher degree of freedom are better regulated than the opposite. They argue that rigid regulation distorts and affect negatively the market. For them, government regulation implies fewer market dynamics as an obstacle to productivity growth.

Zielenkiewicz (2012) is in line with the previous authors, he has doubts about the optimal level of government intervention. He defends that economic freedom could be important to respond to the instability in the economy. Their results confirm that "*the higher level of economic freedom is accompanied by a lower instability of GDP growth rate*". Additionally, there is another crucial result, the variables' proxies to the quality of institutions (corruption freedom, property rights and monetary freedom) are significant to the "welfare states' economies", high quality in institutions more prepared the economy to instability.

The paper of Acikgoz et. al (2016) studies the relationship between economic freedom and growth. For them, economic freedom is an indicator to observe the influence of governments on business. Their hypothesis is if "*ceteris paribus more economic freedom is associated with higher levels of economic growth*". The results confirm that it exists a relationship among economic freedom and growth, especially in free countries. The authors give a suggestion to decision makers: "In most free countries policy makers, are encouraged to focus on increasing business freedom for higher economic growth rates."

Próchniak and Witkowski (2014) state that regulating institutions are determinants of macroeconomic performance. The authors argue that the problem is to measure institutions. To examine the regulatory environment, they use an index of economic freedom of the Fraser

Institute. The results are interesting, economic freedom is significant to explain growth, but its direction is not clear, rich countries could be harm and lower-income countries benefited. Although, when tested only for a group of countries, for example the European Union, the impact is positive. They conclude that "*It means that regulations are very important factors of economic growth of the EU countries and reforms of the regulatory environment should be the priority for policy-makers in the European Union*" (2014:173).

Now, it is relevant to analyze the effect of sectorial regulation. Nagaj (2016) did an analysis on how the changes in the regulation of the electricity sector stimulated economic development. He compares two periods, in one of them there was a strong regulation and in the other there was market liberalization. The author began to try to understand if the prices grows faster than GDP or not. With a strong regulation GDP increases more than prices, with less regulation the prices grow more than GDP. However, the investment increases more with the liberalization and the environment is better protected with liberalization. The effect of market liberalization on economic growth is not clear and it seems to be more negative than positive.

Lorente and Herranz (2016) state that the "*economic growth is compatible with environmental improvements*". The authors study the links between air pollution and economic growth and found the pattern of Kuznets curve. Furthermore, the involvement of environmental regulation can accelerate changes in contaminations. According to them, more important than economic growth for reducing pollution is technological changes and R&D stimulated by environmental regulation. Once again, regulation seems to be a crucial factor to improve the environment.

Another important sector to observe is the financial sector, Copelovitch et al. (2015) considers that the goal of financial regulation is "*making the financial sector more efficient*" but for regulation to be effective it needs transparency. Transparency has another effect, it attracts investors. They give the example of Germany, the attraction of investors is in line with transparency. Neanidis (2019) puts in evidence banking regulatory supervision, which reduces the negative impact of the volatilities in economic growth and diminishes the systemic risks.

Kalyvas and Mamatzakis (2014) provide an analysis of financial specific regulations on banks efficiency. The authors built an econometric model to understand the behavior of different variables. Regulation quality, rule of law, financial freedom and financial

development (ratio of financial institutions' assets to GDP, ratio of liquid liabilities to GDP, and ratio of deposits to GDP) contribute positively on banks' efficiency.

Costa-Campi et. al (2018) analysis the electricity regulation and its relationship with economic growth. Although, the authors give several notes on the improvement of competitiveness in all market. They put in evidence four hypothesis to understand this relationship, in my point of view this hypothesis can be valid to other utilities. The first hypothesis they call "the growth hypothesis" it "is based on the idea that energy, together with labor and capital, is the main driver of economic growth". The second, "the conservation hypothesis", explores the other side, the increase in real GDP causes an increase in energy consumption. The third theory, "the neutrality hypothesis" energy consumption does not have an impact in growth. The last, "the feedback hypothesis" energy and economic growth are complementary on of the other. In this case, regulatory efficient policies have a great contribution to real GDP. Their results support the "growth hypothesis", regulators should make efficient and independent policies and minimizing the effect on the price to contribute with a better impact on GDP. These policies affecting macroeconomic performance, job creation, demand and environmental, then they also create an indirect impact on GDP growth.

### **3. Empirical analysis**

#### **3.1. Data**

This paper studies the impact of regulation on economic growth for 28 OECD countries, between 1998 and 2017. The data set comprises annual data derived from The World Bank and OECD. The sample includes Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Rep., Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States.

The dependent variable is the growth rate of real GDP per capita (gGDPpc). It is used the variable "*Growth Rate of GDP per capita*" collected by the World Bank and available in the World Bank Development Indicators (WDI). This variable consists of the annual percentage growth rate of GDP per capita on constant US dollars. The GDP was calculated at purchasers' prices and divided by the midyear population.

The independent variables are divided into two groups: the explanatory variables, which are proxies of regulation, and the control variables, which are the other determinants of economic growth, as described in the theoretical economic growth literature.

It is important to understand the reason for studying several variables to explain the behavior of regulation. This explanation can be separated into three parts. First, as it was aforementioned, institutions play a vital role in economic growth and regulatory institutions do it as well. Then is relevant to capture the relationship between institutions behavior and growth. The second part is studying the behavior of regulation policy in economic growth. Finally, the third one is the research of the implication in different sectors.

### **3.1.1. Explanatory Variables**

- *Regulatory Quality (RQ)*: This variable consists of an estimation of the government's abilities to formulate and implement policies, as well as, regulations that promote the development of the private sector. The estimate is an aggregate score with a range between -2.5 and 2.5 and with a standard normal distribution. It is relevant to capture the impact of the quality of regulations, precisely their efficiency, efficacy and abilities. It is expected a positive sign corroborated by D'Agostino et al. (2016) and Jalilian, Kirkpatrick and Parker (2007). This variable was taken from the World Bank database.

- *Government effectiveness (GE)*: This variable is also estimated as an aggregate score with a range between -2.5 and 2.5 with a standard normal distribution. Government effectiveness captures the quality of public services, civil services, independence from political pressures, credibility and quality of formulation and implementation of policies. This variable is relevant to understand better the dichotomy between institutions and growth. Not only regulatory institutions, but also the institutions that shape the economy. As it is observed in the literature review, institutions played an important role in economic growth, as their good use does. It is expected a positive contribution of GE to economic growth. This variable was taken from the World Bank database.

- *Control of Corruption (CC)*: This variable is also an estimated aggregate score with a range between -2.5 and 2.5 with a standard normal distribution. This captures how public power is captured by private interests and elites. Corruption diverts money to the informal economy and hinders growth. This variable wants to capture this

performance and how institutions deal with it. The expected sign in the model is negative. This variable was taken from the World Bank database.

- *Product Market Regulation (PMR)*: This is an aggregate indicator that measures the regulatory barriers to competition compiled by OECD. The range varies between 6 and 0, the closest to zero more competition-friendly regulation is. This variable has been used when the authors explain the barriers to business as Kremers and Koejick (1996). The expected sign is positive.

- *Sector Product Market Regulation (Energy, Comun, Transport)*: This variable is equivalent to the measure of product market regulation but is estimated at the level of individual sectors. The sectors that will be studied are Energy (electricity and natural gas), Communications (postal and e-communications), and Transport (road, air, rail). With this individual sector variable, it is possible to study the implications of regulation on growth in each sector. These variables respond to regulatory issue, such as verticalization and unbundling. These gives a great range about the possible implications on growth. The expected sign is positive. This variable was taken from the OECD database.

- *Banking Credit Regulation (Financial)*: This variable is a proxy for financial regulation. As in (Sinha, 2011), Bank Credit Regulation gives approximated results about the tendencies of financial regulation. This is the ratio of capital requirement to its assets held. This capital is defined by central banks, usually, it is one of the most emblematic policies taken by central banks to face bank solvency problems. It is relevant to refer that the ratio of regulatory capital is associated with the risk of each bank. It is expected a positive sign. As indicate by Neanidis (2019) and Kalyvas and Mamatzakis (2014) an active financial regulation gives more trust to investors and consumers. This variable was taken from the World Bank financial database.

### **3.1.2. Control Variables:**

- *Initial GDP per Capita (IGDP)*: In economic growth, the convergence issue is an important determinant for growth. Normally, the countries with the lowest initial GDP per capita have strong economic growth. To capture this, this variable is relevant. This variable was taken from the World Bank database, it is measured in constant 2011 US dollars and the GDP per capita based on purchasing power parity (PPP). Following the literature, we expect to find a negative sign.



- *Human Capital Index (H)*: The Human Capital Index is based on years of schooling each year and country. This index is built by the Penn World Table 9 and is based on Barro and Lee dataset. This index is significant to understand the behavior of labor-capital in economic growth. It is expected a positive contribution.

- *Inflation (INF)*: Annual inflation is captured by the GDP deflator, and is measured in percentage. The GDP implicit deflator measures the changes in the prices of goods and services for the whole economy. At the same time, inflation can be seen as a proxy of “macroeconomic stability” (Neanidis, 2019). The expected contribution of inflation to economic growth is ambiguous. If macroeconomic stability is not a very important issue, inflation could have a positive contribution to economic growth by decreases on interest rate the capital accumulation increase. However, in this type of study, it is frequent to find inflation negatively contributing to GDP economic growth (see e.g. Parker et.al, 2007, and Neanidis, 2019). This variable was taken from the WDI database.

- *Trade-in percentage of GDP (Trade)*: Trade is the sum of exports and imports in the percentage of GDP. This variable was taken from the WDI database. Trade is usually seen as having a positive contribution to economic growth. Trade and globalization have been important factors in economic development and economic growth. Market firms, production and product factors are more mobile. It is also relevant capture the relationship between trade and regulation, an inefficient regulation could be impact on transaction costs.

- *Government final consumption % of GDP (GC)*: This is the sum of almost all government consumption expenditure of goods and services, excluding military expenditure in the percentage of GDP. This variable was taken from the WDI database. It is expected that government consumption has a negative contribution to economic growth. As explained by Sadeghi et. at 2013, when governments raise the amount of their consumption, private consumption, and investment decrease (crowding-out effect). Affecting negatively economic growth because this consumption is done by the increases of debt or taxes.

- *Gross Capital Formation % of GDP (GCF)*: This variable consists of the sum of the fixed assets like hospitals, schools, roads, machinery and plants, the inventories stock of firms, military expenditures, and net acquisitions of valuables. This variable

was taken from the World Bank database. It is expected a positive contribution to economic growth.

Table 1 entails the descriptive statistics of the variables afore introduced. It is possible to understand the number of observations, the mean, the standard deviation and their interval, hence being possible to see the variance of each variable.

*Table 3.1.2.1. Summary Statistics*

|           | count | mean     | sd       | min       | max      |
|-----------|-------|----------|----------|-----------|----------|
| gGDPpc    | 560   | 1.690518 | 2.769159 | -8.997955 | 23.98551 |
| IGDP      | 560   | 30686.29 | 10031.35 | 13324.04  | 55816.56 |
| H         | 560   | 3.2069   | .3818381 | 1.938314  | 3.757822 |
| INF       | 560   | 3.004837 | 7.642065 | -5.21392  | 143.6925 |
| Trade     | 560   | 79.97338 | 37.75702 | 18.34896  | 226.0414 |
| GC        | 560   | 19.11978 | 3.87692  | 8.543129  | 27.935   |
| GCF       | 560   | 23.34664 | 3.953508 | 10.21701  | 37.41433 |
| CC        | 560   | 1.367363 | .8199505 | -.927987  | 2.469991 |
| GE        | 560   | 1.358327 | .5998139 | -.2648129 | 2.353998 |
| RQ        | 560   | 1.268069 | .4816651 | .0351406  | 2.098008 |
| PMR       | 556   | 1.668874 | .4293127 | .8391534  | 3.282279 |
| Energy    | 555   | 2.865726 | 1.254559 | 0         | 6        |
| Comun     | 555   | 2.071542 | .9458318 | 0         | 5.40625  |
| Transport | 555   | 2.410498 | 1.024128 | 0         | 5.666667 |
| Financial | 540   | 14.19164 | 3.559376 | 7         | 30.9     |

### 3.2. Empirical methodology

We want to estimate the following equation:

$$gGDPpc_{it} = \beta_0 + \beta_1 Regulation_{it} + \beta_2 X_{it} + \varepsilon_{it} \quad (1)$$

Where  $gGDPpc_{it}$  = annual growth rate,  $Regulation_{it}$  = explicative variables,  $X_{it}$  = set of control variables,  $\varepsilon_{it}$  = error term,  $i = 1, \dots, N$  countries and  $t = 1, \dots, T$  years.

To observe the impact of regulation on economic growth we apply panel data econometric methods. Panel data has several relevant benefits for works that study economic growth models.

Baltagi (2005), pointed some of these advantages as “*Controlling for individual heterogeneity*”, in panel data assumes the  $N$  (eg: countries or firms) as heterogenous. “*Panel data give more informative data, more variability, less collinearity among the variables, more degrees of freedom and more efficiency*” (2005: 5) and “*Macro panel data on the other hand have a longer time series and unlike the problem of nonstandard distributions typical of unit roots tests in time-series analysis*” (2005: 7).

First, it is important to refer that all variables will be studied for stationarity. Some authors as Maddala et. al (2000) and Phillips and Moon (2000) argue that the variables used in economic growth model have a strong probability to being nonstationary, however, the presence of unit roots depends on the group of countries that will be studied.

In the case of this research, the number of countries ( $N$ ) is 28 and the number of years ( $T$ ) is 20, then  $N$  is larger than  $T$ . To study the stationarity, it will be performed Fisher-type tests (first generation). This method is specific to an unbalanced panel data set. For this test, the null hypothesis is “*All panels contain unit roots*” and the alternative is “*At least one panel is stationary*”. The Fisher test is computed with five lags because, usually, economic growth depends on past values. Levin et. al (2002) suggest that it is important to removed cross-section means, to mitigating cross-sectional dependence. The test does not contain the time trend tendency, only when the variables are non-stationary should this be performed. The results appointed that there is only one non-stationary variable the *Human Capital Index (H)*. This result confirms the results present in the literature. When the first difference is computed the variable becomes stationary.

Secondly, to perform the panel data model it is computed three common panel methods. The *pooled model*, assuming homogeneity and a common constant variable, the *Fixed-effect model* and *Random-effect model*.

*Fixed-effect model* is indicated to study the impact in variables that vary in time and a specific set of  $N$  as it is the case of this research (OECD countries). With this method it is assumed that the individual characteristics of the predictor may or may not impact the outcomes. Other assumption, as it was referred before, is the invariant individual characteristics, which cannot be correlated with other individual characteristics (Baltagi, 2005).

*Random-effect model* is indicated to study large and random  $N$ . With this method it is assumed that individual characteristics are randomly drawn (Baltagi, 2005). The invariant time

characteristics can be included in the sample because the entity's error term is not correlated with the predictor (Kohler and Kreuter, 2009).

As this research has an invariant time variable (Initial GDP per capita) and the result of the Hausman test in all models indicate that the fixed effects are better (more consistent). It is, therefore, appropriate to test the models with GMM (*generalized methods of moments*). GMM proposed by Arellano and Bond is opportune to verify the dynamic effects, because of endogeneity bias. The GMM allows us to understand better the adjustment dynamics in the economy. As we referred before, the economic growth, usually, depends on its past time variables. "*This dynamic panel data regression described in and is characterized by two sources of persistence over time*" (Baltagi, 2005: 135). These two sources are the autocorrelation, due to lagged values, and the heterogeneity between the individuals (Baltagi, 2005). The dynamic panel data computed it is of Arellano-Bond's two step type. This hypothesis is suitable since the overidentifying restrictions are valid (Sargan test) and there is not autocorrelation (Abond test).

For all the methods it will be performed a regression with all variables of interest, secondly, the variables which are not statistically significant will be taken out of the model, to achieve the final model regression. Furthermore, the significant model will be applied to the proxies of sector regulation to understand the impact which each specific sector being regulated causes on economic growth.

Finally, since the impacts could depend on the type of countries being analyzed, the 28 countries were organized in three more homogeneity sub-groups, to give robustness to the model: the non-European Union countries, the core European countries, and the South and East European countries.

### **3.3. Empirical Evidence**

As observed in the literature review the relationship between regulation, institutions and growth has been under debate throughout the years. To further improve this discussion, it is pertinent to add some empirical data. The database used is the average values of the countries studied. There has been plotted a figure with a real growth rate GDP per capita for each of the three variables in discussion on this research Regulation Quality (Figure 3.1), Product Market Regulation (Figure 3.2) and Government Effectiveness (Figure 3.3), so as to better understand the relationship between them.

In Figure 3.1 it is displayed a weak negative correlation of -0.1018 (see Table 2) between growth rate GDP per capita and regulation quality. This result is pertinent to the research, but this aspect and the reasons behind the graph will be explored later. In Figure 3.2 it is possible to observe a weak positive correlation of 0.3327 between gGDPpc and PMR, entailing that an increase in regulation should lead to an increase of the growth rate of GDP. Figure 3.3 denotes a weak positive correlation of 0.2796 between gGDPpc and GE, meaning that with an expected increase in the capacity of institutions, the GDP per capita should increase.

Figure 3.1.2.1: GDP per capita and Regulatory Quality



Figure 3.1.2.2: GDP per capita and Product Market Regulation

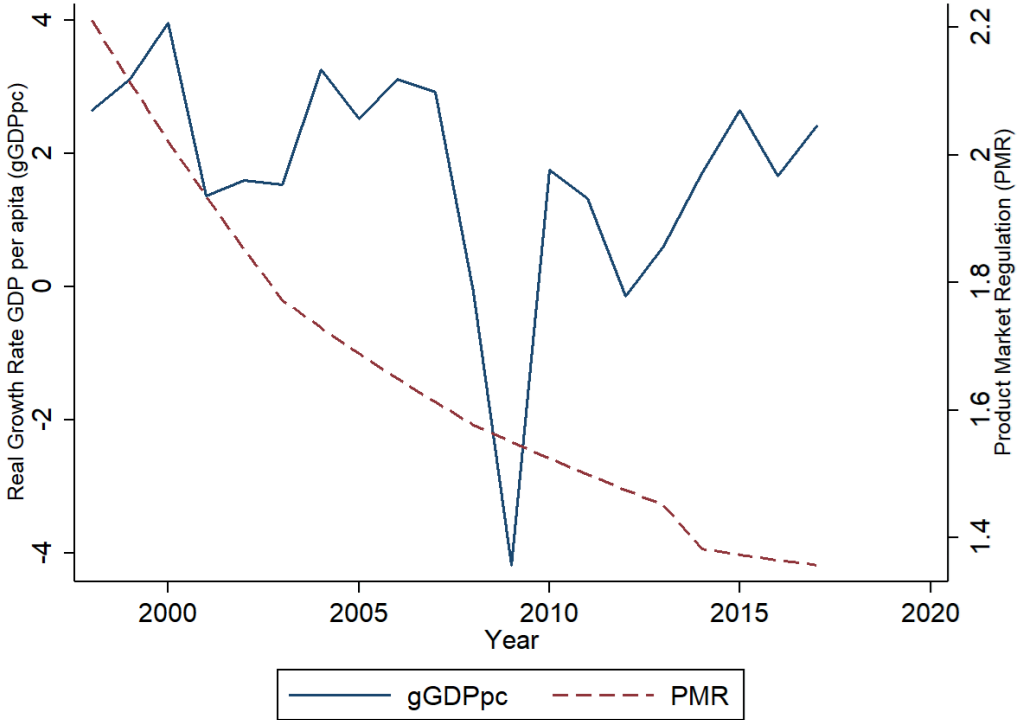


Figure 3.1.2.3: GDP per capita and Government Effectiveness

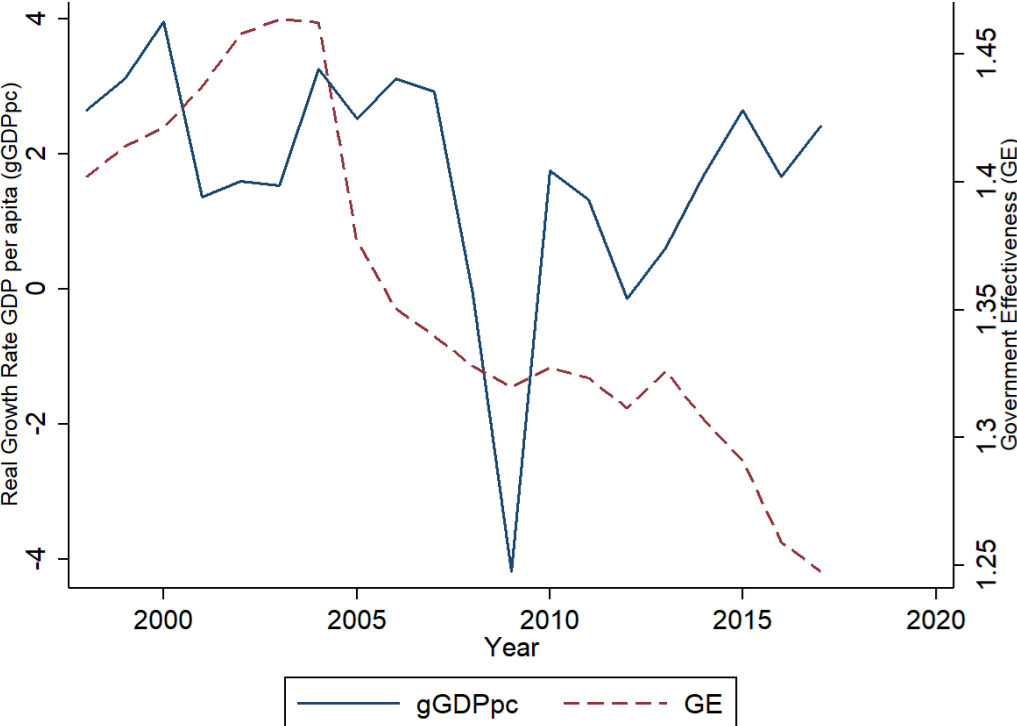


Table 3.1.2.2: Correlation Matrix

|     | (1)      |          |       |
|-----|----------|----------|-------|
|     | gGDPpc   |          |       |
|     | rho      | p        | count |
| RQ  | -.101787 | .6693744 | 20    |
| PMR | .3327167 | .1517542 | 20    |
| GE  | .2795604 | .2325895 | 20    |

#### 4. Empirical Results and Discussion

This section provides the results of the econometric estimations and the discussion regarding the main topic of this research: the impact of regulation on economic growth.

##### 4.1. Results

As it was explained in the methodology chapter, in order to have a wide and deep analysis of results, the empirical study starts by estimating the three methods of panel data.

Table 4.1: Results from Pooled Estimates

|                             | (1)                  | (2)                  | (3)                  | (4)               |
|-----------------------------|----------------------|----------------------|----------------------|-------------------|
|                             | gGDPpc               | gGDPpc               | gGDPpc               | gGDPpc            |
| Initial GDP                 | -2.009***<br>(-4.19) | -1.818***<br>(-4.09) | -1.148***<br>(-2.75) | -0.545<br>(-1.51) |
| Control of<br>Corruption    | 0.856***<br>(3.89)   |                      |                      |                   |
| Government<br>Effectiveness |                      | 0.946***<br>(3.40)   |                      |                   |
| Regulation<br>Quality       |                      |                      | 0.622*<br>(1.92)     |                   |

|                              |                      |                      |                      |                      |
|------------------------------|----------------------|----------------------|----------------------|----------------------|
| Product Market<br>Regulation |                      |                      |                      | 0.427<br>(1.30)      |
| Human Capital                | 65.96*<br>(1.81)     |                      | 62.10*<br>(1.67)     |                      |
| Trade                        | 0.757***<br>(3.12)   | 0.702***<br>(2.93)   | 0.726***<br>(2.92)   | 0.870***<br>(3.51)   |
| Government<br>Consumption    | -0.145***<br>(-4.38) | -0.122***<br>(-3.81) | -0.116***<br>(-3.59) | -0.0790**<br>(-2.46) |
| Investment                   | 0.193***<br>(6.74)   | 0.184***<br>(6.38)   | 0.201***<br>(6.93)   | 0.201***<br>(6.91)   |
| Constant                     | 15.82***<br>(3.06)   | 14.11***<br>(2.97)   | 6.752<br>(1.49)      | -0.332<br>(-0.08)    |
| Observations                 | 532                  | 560                  | 532                  | 556                  |

*t* statistics in parentheses \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.010$

Table 4.1 shows the results of the first set of regressions, which was computed individually for each of the explanatory variables due to multicollinearity problems. It starts with a more complete model that includes all of the control variables in the model for each of the explanatory variables, after the variables that yield insignificant were removed until it was reached the parsimonious models (Table 4.1). The final pooled models suggest that the Control of Corruption is significant and positive. The positive effect on economic growth was not expected, since, according to the literature, the sign tends to be negative because governments deviate finds that could be applied in the economy in order to control corruption, harming growth. The positive effect could have been reached due to the group of countries included in this research. The countries included are developed and have strong structure to fight corruption, which may mean that there is little to no corruption due to these measures. The variables Government Effectiveness and Regulation Quality are significant and positive as



expected. This put in evidence the relevance of institutions and their behavior in accordance with economic growth. The Product Market Regulation is insignificant. In terms of growth determinants, it should be highlighted that Human Capital is not significant in the two final models. The other control variables are significant and have their expected signs.

*Table 4.2: Results from Random-Effects Estimations*

|                              | (1)                  | (2)                  | (3)                  | (4)                  |
|------------------------------|----------------------|----------------------|----------------------|----------------------|
|                              | gGDPpc               | gGDPpc               | gGDPpc               | gGDPpc               |
| Initial GDP                  | -1.991***<br>(-3.36) | -1.902***<br>(-3.22) | -0.920*<br>(-1.79)   | -0.276<br>(-0.58)    |
| Control of<br>Corruption     | 0.834***<br>(3.07)   |                      |                      |                      |
| Government<br>Effectiveness  |                      | 1.163***<br>(3.29)   |                      |                      |
| Regulation<br>Quality        |                      |                      | 0.359<br>(0.94)      |                      |
| Product Market<br>Regulation |                      |                      |                      | 0.594<br>(1.61)      |
| Trade                        | 0.822***<br>(2.77)   | 0.828***<br>(2.61)   | 0.842***<br>(2.74)   | 1.085***<br>(3.27)   |
| Government<br>Consumption    | -2.933***<br>(-4.20) | -3.159***<br>(-4.37) | -2.477***<br>(-3.57) | -2.331***<br>(-3.15) |
| Investment                   | 4.758***             | 4.812***             | 5.120***             | 5.104***             |

|              |                 |                 |                   |                    |
|--------------|-----------------|-----------------|-------------------|--------------------|
|              | (6.82)          | (6.77)          | (7.20)            | (7.05)             |
| Constant     | 11.15<br>(1.54) | 10.27<br>(1.45) | -1.715<br>(-0.27) | -10.29*<br>(-1.72) |
| Observations | 560             | 560             | 560               | 556                |

*t* statistics in parentheses \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.010$

Table 4.2 presents the results of the regressions with random effects. The outcomes follow the same logic presented above. The random effects model implies that the control of corruption is significant and has a positive effect, which was afore discussed. The government effectiveness has a positive effect on economic growth, as expected. The regulation quality and product market regulation are not significant. The results for the determinants of growth revealed that inflation and human capital are not significant, because of that they are not included in the final models. The other control variables have the expected signs and are significant.

*Table 4.3: Results from Fixed Effects Estimates*

|                              | (1)<br>gGDPpc     | (2)<br>gGDPpc      | (3)<br>gGDPpc     | (4)<br>gGDPpc |
|------------------------------|-------------------|--------------------|-------------------|---------------|
| Control of<br>Corruption     | -0.478<br>(-0.67) |                    |                   |               |
| Government<br>Effectiveness  |                   | 1.769***<br>(2.83) |                   |               |
| Regulation<br>Quality        |                   |                    | -1.036<br>(-1.45) |               |
| Product Market<br>Regulation |                   |                    |                   | 1.547***      |

|                           |                       |                       |                       |                      |
|---------------------------|-----------------------|-----------------------|-----------------------|----------------------|
|                           |                       |                       |                       | (2.87)               |
| Inflation                 | -0.458***<br>(-3.43)  | -0.448***<br>(-3.39)  | -0.457***<br>(-3.44)  | -0.545***<br>(-4.01) |
| Trade                     | 3.067***<br>(3.48)    | 3.661***<br>(4.24)    | 3.058***<br>(3.56)    | 5.461***<br>(4.73)   |
| Government<br>Consumption | -17.53***<br>(-10.49) | -16.79***<br>(-10.13) | -17.01***<br>(-10.15) | -15.89***<br>(-9.08) |
| Investment                | 7.843***<br>(8.33)    | 7.299***<br>(8.33)    | 8.131***<br>(8.60)    | 7.452***<br>(8.53)   |
| Constant                  | 16.40**<br>(2.28)     | 10.33<br>(1.43)       | 14.65**<br>(2.07)     | -0.685<br>(-0.08)    |
| Observations              | 504                   | 504                   | 504                   | 500                  |

*t* statistics in parentheses \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.010$

Table 4.3 puts forward the results of the fixed effects' regressions. As explained in the previous chapter, the results of Hausman test indicate that fixed effect are more efficient. Then, it is compulsory to focus and pay attention to these results. Column (1), (2), (3), (4) are considered the final model for each of the explicative variable. Through the analyses of the behavior of the determinants of growth it is observable that only human capital (dLH) is an insignificant variable in the model, thus being left out of the final model, the remaining determinants of growth are significant. Inflation has a negative effect on growth, meaning that an increase in inflation leads to a decrease in economic growth. Trade and Investment have a significant coefficient and contribute positively to the GDP's growth. Public Consumption is negatively related with economic growth. These three results are in line with the literature review.

The growth rate of GDP per capita (gGDPpc) is significantly affected by two of the explanatory variables. On one hand, Product Market Regulation and Government Effectiveness

have a positive impact. While, on the other hand, Control of Corruption and Regulation Quality are insignificant.

*Table 4.4: Results from Sectors Estimates*

|                           | (1)<br>gGDPpc        | (2)<br>gGDPpc        |
|---------------------------|----------------------|----------------------|
| Government Effectiveness  | 1.043<br>(1.61)      | 2.094***<br>(3.12)   |
| Energy                    | 0.321<br>(1.35)      |                      |
| Communication             | -0.543**<br>(-2.18)  |                      |
| Transport                 | 0.929***<br>(3.73)   |                      |
| Product Market Regulation |                      | 1.406**<br>(2.55)    |
| Financial                 |                      | 0.124***<br>(3.33)   |
| Inflation                 | -0.513***<br>(-3.82) | -0.488***<br>(-3.46) |
| Trade                     | 4.975***<br>(4.44)   | 4.606***<br>(3.79)   |
| Government Consumption    | -16.82***<br>(-9.66) | -16.19***<br>(-9.06) |
| Investment                | 6.749***             | 7.352***             |

|              |                 |                   |
|--------------|-----------------|-------------------|
|              | (7.65)          | (8.30)            |
| Constant     | 5.436<br>(0.62) | -0.209<br>(-0.02) |
| Observations | 499             | 481               |

*t* statistics in parentheses \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.010$

This research also has the objective to perceive the implications on economic growth of specific forms of regulation in different sectors. After the finding of the significant model, the sector variables were introduced. Table 4.4 presents the model results. Energy, Communication and Transport were kept in a unique model, because for these variables it is not expectable for there to be multicollinearity, since they were constructed in the same methodological form and are representative of network industries' sectors. The Product Market Regulation variable was taken from the model because of the possible collinearity between the sector variables, since there is a ponderation for the sectors in this variable. The findings brought about that Transport's regulation are significant and positive, which is in line with what was expected since it was the first sector to implement regulation in the World. The Transport's market is perfectly adapted and stable. Communication is significant and negative, this sector reacts severely to more regulation, which is likely because the market in this sector has been changed at a cruising speed, with the adaptation being still in course. The fact that a century ago most part of the communication was held via post, and nowadays there are numerous ways one can be in touch with another, makes for this regulation to be arduous. The regulator has to be in constant change, as the communication's technologies are. The Energy sector (Energy) is shown to be insignificant for the growth rate of GDP per capita in the countries under analysis.

Table 6 presents the model results when it is introduced the proxy variable to control for the financial sector. In this case it is possible to keep PMR in the model for there is no problem of collinearity. The outcome indicates a significant and positive impact of financial regulation on economic growth. This result confirms the argument indicated by Neanidis (2019) and Kalyvas and Mamatzakis (2014), regulation can give a sign to the investors and families generating more trust in the markets.

Table 4.5: Results from GMM Estimates

|                           | (1)                   | (2)                  | (3)                  |
|---------------------------|-----------------------|----------------------|----------------------|
|                           | gGDPpc                | gGDPpc               | gGDPpc               |
| L.gGDPpc                  | -0.341***<br>(-5.20)  | -0.285***<br>(-4.65) | -0.379***<br>(-5.19) |
| L2.gGDPpc                 | -0.312***<br>(-11.55) | -0.316***<br>(-9.18) | -0.346***<br>(-8.14) |
| Government Effectiveness  | -1.047<br>(-0.43)     | 2.427<br>(0.77)      | -0.111<br>(-0.07)    |
| Product Market Regulation | 5.183**<br>(2.11)     |                      | 2.801<br>(1.06)      |
| Energy                    |                       | -0.915<br>(-0.39)    |                      |
| Communication             |                       | -0.563<br>(-0.40)    |                      |
| Transport                 |                       | 2.565***<br>(2.89)   |                      |
| Financial                 |                       |                      | 0.0709<br>(1.48)     |
| Initial GDP               | 6.272**<br>(2.03)     | 10.78***<br>(2.77)   | 8.775*<br>(1.83)     |
| Inflation                 | -0.719***<br>(-6.86)  | -0.626***<br>(-5.02) | -0.668***<br>(-5.18) |

|                           |                      |                      |                      |
|---------------------------|----------------------|----------------------|----------------------|
| Trade                     | 2.793<br>(1.09)      | 3.350<br>(1.30)      | 2.682<br>(1.08)      |
| Government<br>Consumption | -40.40***<br>(-5.58) | -51.27***<br>(-4.64) | -46.63***<br>(-4.12) |
| Investment                | 12.61***<br>(4.22)   | 7.725<br>(1.46)      | 11.23***<br>(2.94)   |
| Constant                  | 0<br>(.)             | 0<br>(.)             | 0<br>(.)             |
| Observations              | 350                  | 349                  | 337                  |

*t* statistics in parentheses \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.010$

With the GMM estimations it is possible to take into account an invariant-time variable, in this case initial GDP per capita, which is important to estimate, as explained in the Methodology chapter and as it is possible to observe in the above table. Table 4.5 presents the results of the regression. It can be confirmed that the initial GDP per capita is significant. However, the sign was not the expected. In this model the sign is positive, which means that a greater initial GDP per capita leads to a greater growth rate of the GDP per capita. Regarding the determinants of growth only Trade reveals to be insignificant. Inflation and Government Consumption remain significant and negative and Investment continues to be positive and significant.

The independent variables have different results. Government Effectiveness now is not significant in the model. This can portrait that the impact of this variable over time may not be very persistent, *i.e.*, the impact may be immediate, and it will not be continuous through time. With respect to Product Market Regulation, the variable is significant, and it affects positively economic growth. The conclusion is similar to that given previously (in fixed-effect analysis). Furthermore, it reinforces the idea that the impact on markets persists over time, because this regulation must be carefully, effective, efficacy and efficient.

When the sectors variables are introduced the results also differ from fixed-effects model. The regulation of Transport sector affects positively economic growth. Energy, Communication and Financial regulation are insignificant.

*Table 4.6: Summary of Results*

| <b>Variables</b>          | <b>Fixed-Effect</b> | <b>GMM</b>      |
|---------------------------|---------------------|-----------------|
| Initial GDP               | Not included        | Significant (+) |
| Inflation                 | Significant (-)     | Significant (-) |
| Trade                     | Significant (+)     | Insignificant   |
| Government Consumption    | Significant (-)     | Significant (-) |
| Investment                | Significant (+)     | Significant (+) |
| Control of Corruption     | Insignificant       | Not Included    |
| Government Effectiveness  | Significant (+)     | Insignificant   |
| Regulation Quality        | Insignificant       | Not included    |
| Product Market Regulation | Significant (+)     | Significant (+) |
| Energy                    | Insignificant       | Insignificant   |
| Communication             | Significant (-)     | Insignificant   |
| Transport                 | Significant (+)     | Significant (+) |
| Financial                 | Significant (+)     | Insignificant   |

Table 4.6 shows which control and explicative variables are (positively or negatively) significant and insignificant for each model. Therefore, it gives a summary of both models and a means of comparison between them, where the GMM model is dynamic and can be considered a proxy for the persistence of the variables over time.

#### **4.2. Main Results Discussion**

The conceptual framework of the theoretical and empirical literature regarding economic growth and regulation, presented in Section 2, are paramount to discuss the results afore presented. The Product Market Regulation results indicates that market deregulation affects negatively the market and an increase level of regulation can lead to a greater economic growth. For the purpose of this results' analysis it is paramount to reveal that deregulation promotes supervision and monitorization, where the regulator has a more passive than active behavior towards the market. In this case, there may occur an elimination of the governmental power in certain sectors and the impulse of more competition. Contrary to restrictive regulation, where



the regulator establishes measures that will have a direct impact on the market functioning, instantaneously. For instance, in the utilities' sectors, deregulation leads to the reduction of the decision of regulators regarding prices or tariffs, if or when a regulatory response is needed, it is given later (*ex post* observation), and it may happen that it negatively affects the market. Other hypothesis is that the deregulated market allows for a market concentration and cartelization.

The Government Effectiveness results reveal that institutions have a positive effect on the economy, that is, institutions with more independence from political pressures, better quality of policies, and more credibility shape the development of the economy more effectively. Cooray (2009) and Koeniger Silberberger (2016) consider the good behavior of institutions the predominant driver of economic growth.

As it was explained in the previous chapter some authors consider that Regulation Quality has a positive effect, however it was not the case in this research, where the value yield was insignificant. The key to understand this difference can be the countries sample. The research of D'Agostino et al. (2016) and Parker et al. (2007) study more than 100 countries including emerging countries. This thesis only studies OECD countries, all of them have a higher level of development (OECD and World Bank consider Turkey as an economic with higher/medium level of development despite its social and political problems). Furthermore, at a certain level, Regulation Quality scrutinizes about different perspectives, such as consumers rights, regarding more than the economic development. In fact, in underdeveloped countries there is a need for structural reforms and economic impulse, whereas in developed countries the path of regulation quality has already been done. In these cases, for developed countries regulation is already part of the system, being a scrutinized reality and a recognized necessity.

As Di Agostini et al (2016) explained, corruption harms economic growth, and the deviation of funds to control corruption instead of its application in the development of the economy is harmful and affects negatively economic growth. However, in this research the control of corruption (CC) demonstrated to be insignificant in the model. The explanation for this, can be also the group of countries selected in this research. Institutions are well prepared to deal with the problem of corruption, there are mechanisms set into place. Additionally, it can also be the fact that in these countries most part of the corruption being held is caused by "white collar workers", being a matter of exchanged influences of interest groups. Although morally and legally reprovved, this may not imply a significant effect on the economy as a whole,

contrary to the impact that the transfer of some economic activities to the informal sector of the economy.

Throughout the recent years, monetary policy around the world, primarily in the monetary zones of the studied countries, trailed inflation control as a tool of macroeconomic stabilization, thus giving some explanation for its insignificance. Additionally, an unstable inflation contributes negatively to economic growth, then this sign was expected. (Parker et.al, 2007, and Neanidis, 2019).

Furthermore, it is relevant to analyze the initial GDP per capita, which could only be computed through the GMM model. The positive significance of the initial GDP per capita to explain the GDP per capita growth rate collides with the convergence theory. A possible reason for this occurrence can be the time period under study which includes a long and hard recession. The countries with a stronger and more developed economy reacted vigorously, having a domestic market more responsive.

**5. Robustness**

To gain more homogeneity and evaluate how the results differ from the previous outcomes, our sample was divided into three groups: Non-European countries, the Core European countries and the South and East European countries. One can admit these robustness’ tests since the afore conclusions could derive from a generalization of the observations, testing for smaller groups of countries, hence, less observations, may reinforce the conclusions or refute them.

**5.1. Robustness with Fixed Effects**

Table 5.1 presents the fixed-effects’ results for the different groups of countries. The models presented in the following table are the ones the explicative variables yield a significant p-value (lower than 0.1), the other models estimated are presented in the appendix B1.

*Table 5.1: Results from Robustness with Fixed Effects Estimates*

|                          | Non-EU<br>gGDPpc      | South and East<br>gGDPpc | Core EU<br>gGDPpc | Core EU<br>gGDPpc |
|--------------------------|-----------------------|--------------------------|-------------------|-------------------|
| Government effectiveness | 3.377**<br><br>(2.50) |                          |                   |                   |

|                           |           |           |           |           |
|---------------------------|-----------|-----------|-----------|-----------|
| Regulation Quality        |           |           | -2.489**  |           |
|                           |           |           | (-2.55)   |           |
| Product Market Regulation |           | 2.436**   |           | 3.056***  |
|                           |           | (2.14)    |           | (3.58)    |
| Inflation                 | -0.687*** | -0.267    | -0.302    | -0.337*   |
|                           | (-2.68)   | (-0.91)   | (-1.49)   | (-1.71)   |
| Trade                     | 4.695***  | 5.947**   | 3.162**   | 8.367***  |
|                           | (2.80)    | (2.03)    | (2.42)    | (4.47)    |
| Government consumption    | -14.84*** | -21.75*** | -18.46*** | -14.35*** |
|                           | (-4.75)   | (-5.13)   | (-6.09)   | (-4.72)   |
| Investment                | 7.822***  | 4.278**   | 7.258***  | 6.634***  |
|                           | (4.86)    | (2.52)    | (3.06)    | (2.87)    |
| Constant                  | -4.789    | 22.22     | 25.09*    | -16.79    |
|                           | (-0.46)   | (0.88)    | (1.80)    | (-1.01)   |
| Observations              | 162       | 144       | 139       | 139       |

*t* statistics in parentheses \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.010$

Most results corroborated the conclusions presented in the previously section. However, there is an interesting result for two of the statistically significant explanatory variables. Government effectiveness is positive and significant in the Non-European countries. When regarding product market regulation one can conclude that it is positive and significant in the groups of South and East European countries and Core European countries. This result is in line with the economic structure of these blocks. In the European countries there is a concern with sectoral regulation and common regulatory directives for various sectors, while in the Non-

European countries the government decisions and their capacity have more impact in the economy.

Other important outcome is the results of the Core European countries with respect to the regulation quality (RQ). It is the only group of countries for which this variable is statistically significant and is displayed with a negative sign. This means that an increase in regulation quality is related with a decrease in economic growth. A possible explanation for this result is the concern with other types of regulation policies, in this group of countries, such as environmental concerns, service's quality or asymmetric information problems. An increase in the quality of regulatory policies, sometimes leads to an increase of the sectorial companies' requirements, which may constraint their competitiveness, hence decrease their gross value added.

Regarding the determinants of growth, they are all significant and corroborate the previous findings, although inflation is insignificant to the South and East European countries, whereas for the Core European countries their result is ambiguous, in the first model it is insignificant and in the second it is significant.

## 5.2. Sector Fixed Effect

Table 5.2 comes in the sequence of the previous models, for each group of countries. In these models it was included the sector variables, so that it can be understood which sectors may have related with economic growth.

*Table 5.2: Results from Robustness with Sector Fixed Effects Estimates*

|                      | Non-EU             | Non-EU             | South and East    | South and East  | Core EU           | Core EU           |
|----------------------|--------------------|--------------------|-------------------|-----------------|-------------------|-------------------|
|                      | gGDPpc             | gGDPpc             | gGDPpc            | gGDPpc          | gGDPpc            | gGDPpc            |
| Gover. Effectiveness | 4.187***<br>(2.96) | 5.256***<br>(3.73) | -1.284<br>(-0.86) | 0.391<br>(0.31) | -0.402<br>(-0.39) | -0.517<br>(-0.46) |
| Energy               | -0.893*<br>(-1.68) |                    | 0.290<br>(0.48)   |                 | 0.648<br>(1.49)   |                   |
| Communication        | 0.0527             |                    | -0.837            |                 | -0.455            |                   |

|                              |           |           |           |           |           |           |
|------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
|                              | (0.12)    |           | (-1.26)   |           | (-0.93)   |           |
| Transport                    | 0.542     |           | 1.351**   |           | 1.845***  |           |
|                              | (1.16)    |           | (2.26)    |           | (2.80)    |           |
| Product Market<br>Regulation |           | -0.545    |           | 2.259*    |           | 3.129***  |
|                              |           | (-0.43)   |           | (1.89)    |           | (3.58)    |
| Financial                    |           | 0.235***  |           | 0.104     |           | -0.0477   |
|                              |           | (3.72)    |           | (0.89)    |           | (-0.67)   |
| Inflation                    | -0.599**  | -0.508**  | -0.109    | -0.238    | -0.325*   | -0.388*   |
|                              | (-2.27)   | (-1.99)   | (-0.37)   | (-0.80)   | (-1.67)   | (-1.80)   |
| Trade                        | 4.168**   | 2.681     | 3.044     | 5.281*    | 8.902***  | 8.887***  |
|                              | (2.21)    | (1.48)    | (1.09)    | (1.73)    | (4.68)    | (4.04)    |
| Government<br>Consump.       | -17.34*** | -17.46*** | -22.75*** | -20.26*** | -12.44*** | -14.36*** |
|                              | (-4.96)   | (-4.69)   | (-5.39)   | (-4.38)   | (-3.44)   | (-4.50)   |
| Investment                   | 6.756***  | 8.088***  | 3.647**   | 4.882***  | 8.791***  | 6.371***  |
|                              | (3.91)    | (4.58)    | (2.06)    | (2.66)    | (3.50)    | (2.69)    |
| Constant                     | 8.153     | 4.683     | 42.21*    | 17.45     | -30.88    | -16.85    |
|                              | (0.56)    | (0.28)    | (1.83)    | (0.67)    | (-1.53)   | (-0.90)   |
| Observations                 | 158       | 158       | 143       | 144       | 139       | 139       |

*t* statistics in parentheses \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.010$

The outcome for Transport regulation indicates that in the two blocks of European countries (South and East and Core), this variable is positive and significant. Energy regulation is the only significant sector variable in the Non-European countries and their sign is negative. The

result of the Communication sector is insignificant in all groups of countries, which is interesting because in the outcomes presented before communication was significant with the complete sample. This may mean that the result of the complete sample is a distortion of the reality, once it is not relevant for any of the homogeneous groups. The regulation of financial sector in these estimations is only significant for economic growth in the Non-EU countries.

The conclusion resulting from the fixed-effect estimates is that the model in different countries describes the fact that economic growth per capita is affected in the majority by Product Market Regulation and Transport Regulation, similarly to the results of the model with all countries.

### 5.3. Robustness GMM

The following table 5.3 presents the GMM results for each group of countries.

*Table 5.3: Results from Robustness with GMM Estimates*

|                             | Non-EU<br>gGDPpc     | South and East<br>gGDPpc | Core EU<br>gGDPpc    |
|-----------------------------|----------------------|--------------------------|----------------------|
| L.gGDPpc                    | -0.263***<br>(-3.86) | 0.107<br>(1.35)          | -0.274***<br>(-4.11) |
| L2.gGDPpc                   | -0.186***<br>(-3.33) | -0.0546<br>(-0.82)       | -0.375***<br>(-6.74) |
| Government<br>Consumption   | -27.47***<br>(-5.41) | -16.01***<br>(-3.15)     | -25.69***<br>(-8.20) |
| Investment                  | 10.17***<br>(5.83)   | 11.83***<br>(7.05)       | 9.809***<br>(4.46)   |
| Government<br>Effectiveness | 2.330<br>(1.43)      | -0.369<br>(-0.39)        | 0.293<br>(0.34)      |
| Product Market              | -2.760               | 3.357***                 | 2.126**              |

|              |           |           |          |
|--------------|-----------|-----------|----------|
| Regulation   |           |           |          |
|              | (-1.61)   | (3.42)    | (2.57)   |
| Initial GDP  | 3.698*    | -2.006    | 0.844    |
|              | (1.73)    | (-0.76)   | (0.57)   |
| Inflation    | -0.813*** | -0.712*** | -0.0515  |
|              | (-3.08)   | (-3.73)   | (-0.30)  |
| Trade        | 2.792     | 6.123**   | 8.577*** |
|              | (1.34)    | (2.26)    | (5.00)   |
| Constant     | 0         | 0         | 0        |
|              | (.)       | (.)       | (.)      |
| Observations | 122       | 112       | 118      |

*t* statistics in parentheses \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.010$

When regarding the two observable explanatory variables one can state that in the two group blocks of European countries the behavior of these variables is similar. Product Market Regulation is positive and significant for the two groups and Government Effectiveness is insignificant for the same group of countries, which may demonstrate a common response concerning regulation within Europe. Whereas in the Non-European countries, both the Product Market Regulation and the Government Effectiveness are insignificant.

In what concerns the other control variables it is observed that the public consumption is statistically significant and negative, and Investment is statistically significant and positive for the three samples of countries, which corroborates the previous results with the aggregate sample of countries. Additionally, the initial GDP per capita is only significant and positive in the Non-European countries cluster. For the Non-European countries and the South and East countries Inflation is significant to explain economic growth. Trade is significant and positive in the Core European countries and in the South and East European countries, which is aligned with the economic reality of these countries, with more advantageous interconnected commerce due to the European Single Market.

#### 5.4. Sector GMM

The following table 12 present the outcomes at the sector level with GMM methods.

Table 5.4: Results from Robustness with Sector GMM Estimates

|                              | Non-EU               | Non-EU               | South and            | South and           | Core EU              | Core EU              |
|------------------------------|----------------------|----------------------|----------------------|---------------------|----------------------|----------------------|
|                              | gGDPpc               | gGDPpc               | East                 | East                | gGDPpc               | gGDPpc               |
|                              |                      |                      | gGDPpc               | gGDPpc              |                      |                      |
| L.gGDPpc                     | -0.264***<br>(-3.79) | -0.249***<br>(-3.60) | 0.0941<br>(1.15)     | 0.123<br>(1.52)     | -0.337***<br>(-5.12) | -0.272***<br>(-4.05) |
| L2.gGDPpc                    | -0.190***<br>(-3.33) | -0.179***<br>(-3.15) | -0.0780<br>(-1.10)   | -0.0426<br>(-0.62)  | -0.387***<br>(-7.24) | -0.374***<br>(-6.61) |
| Government<br>Effectiveness  | 2.770<br>(1.61)      | 4.191**<br>(2.34)    | -1.450<br>(-1.32)    | -0.0332<br>(-0.04)  | -0.404<br>(-0.47)    | 0.336<br>(0.36)      |
| Energy                       | -1.021*<br>(-1.86)   |                      | 1.192*<br>(1.71)     |                     | 0.442<br>(1.01)      |                      |
| Communication                | -0.310<br>(-0.56)    |                      | -1.623***<br>(-2.87) |                     | -0.520<br>(-1.17)    |                      |
| Transport                    | 0.885<br>(1.35)      |                      | 1.501***<br>(3.01)   |                     | 2.479***<br>(4.67)   |                      |
| Product Market<br>Regulation |                      | -2.138<br>(-1.22)    |                      | 4.229***<br>(4.07)  |                      | 2.136**<br>(2.56)    |
| Financial                    |                      | 0.195***<br>(2.68)   |                      | 0.370***<br>(3.21)  |                      | -0.00567<br>(-0.11)  |
| Initial GDP                  | 2.716<br>(1.51)      | 2.025<br>(0.90)      | -1.360<br>(-0.47)    | -7.053**<br>(-2.30) | -0.235<br>(-0.14)    | 0.703<br>(0.47)      |
| Inflation                    | -0.683**             | -0.595**             | -0.492**             | -0.684***           | -0.0869              | -0.0603              |



|                           |           |           |          |          |           |           |
|---------------------------|-----------|-----------|----------|----------|-----------|-----------|
|                           | (-2.53)   | (-2.13)   | (-2.47)  | (-3.51)  | (-0.51)   | (-0.33)   |
| Trade                     | 2.958     | 1.785     | 3.450    | 8.354*** | 10.56***  | 8.710***  |
|                           | (1.46)    | (0.84)    | (1.34)   | (2.96)   | (6.35)    | (4.56)    |
| Government<br>Consumption | -25.18*** | -23.75*** | -13.00** | -6.916   | -26.04*** | -25.35*** |
|                           | (-5.30)   | (-4.47)   | (-2.18)  | (-1.19)  | (-7.53)   | (-8.07)   |
| Investment                | 9.995***  | 11.47***  | 11.43*** | 14.07*** | 10.77***  | 9.757***  |
|                           | (5.69)    | (6.28)    | (6.50)   | (7.60)   | (4.71)    | (4.37)    |
| Constant                  | 0         | 0         | 0        | 0        | 0         | 0         |
|                           | (.)       | (.)       | (.)      | (.)      | (.)       | (.)       |
| Observations              | 122       | 122       | 110      | 112      | 118       | 118       |

*t* statistics in parentheses \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.010$

The final table of results presents the estimates for the effect that the regulated sectors may have on economic growth within different groups of countries. Transport Regulation is positively significant in the two blocks of European countries. This sector is extremely consistent in time and form in European regulatory terms, hence, being a predictable result. Communication regulation is negatively significant for South and East countries, whereas in the estimates with the aggregate sample it was insignificant. When looking closely to the Energy sector regulation it is possible to state that it is negatively significant to explain its effect on economic growth in the Non-European countries and in the South and East countries it is positively significant. This result is contrary to the aggregate sample results, where the regulation of the Energy Sector was insignificant. Financial Regulation is positive and significant in the Non-European countries and in the South and East European countries.

## 6. Conclusion

The purpose of this study is testing the impact of regulation on economic growth. In this sense, it demonstrates the impact of the evolution of the institutions and of the regulated market in the economic growth. Another important contribute is the analysis at sector's levels, which are the various regulated utilities market, through seeking to find its importance to explain the changes

in economic growth. Additionally, the sample of countries used is later divided into three groups of countries, to find the robustness of the model. The question intended to be answered is if regulation has an impact on economic growth of the countries under analysis.

To answer this question, it was studied 28 OECD countries between 1998 and 2019. A panel data analysis was conducted, considering three estimation methods: pooled effects, fixed-effects and random effects. This analysis has a time-invariant variable (economic growth) that cannot be analyzed in the most efficient method (fixed-effects), so it was appropriate to test the estimated models with a GMM method.

The results of the fixed-effects model indicated that the proxies of institutions (government effectiveness) and market regulation (product market regulation) have an impact on economic growth. Institutions and market regulation are related with economic growth, since institutions' capacity and market regulation will influence consumers' behavior, as well as, companies' behavior, which will impact the GDP, therefore, economic growth. Hence, policy makers and decision makers should consider the institutions capacity and credibility when making decisions. Furthermore, the path followed in the Western countries to deregulate their markets may not be appropriate to all economies. In a second stage, the variables that stand for regulation were replaced by variables that represent specific sectors regulation. The results showed that the transport and financial regulation seem to be positively related with economic growth, while communication regulation is negatively related with growth.

In a third stage, this work analyzed the same model applying the GMM methodology. The market regulation is positively related with economic growth and the initial GDP per capita (the invariant variable) is significant but contrary to the convergence theory, which may be due to the time and the countries under study. When the sector variables were introduced only the transport regulation showed an impact on economic growth.

Finally, the robustness tests focused in the division of the sample into three more homogeneous groups: non-European countries, South and East European countries and core European countries. At the fixed-effect level the product market regulation is significant in the European countries, while the government effectiveness is significant in the non-European. Additionally, it was found evidence of the significance of regulation quality in the core European countries in economic growth. The robustness's tests were repeated but with the sector variables, and in this case the results obtained diverge from the results obtained with the entire sample. The evidence revealed that the regulation of the communication sector is not

significant to the growth of GDP per capita for any of the group of countries, which is contrary to what was found for the entire sample. The transport regulation is related with growth in the European countries. Whereas, the financial sector only has a significant impact in economic growth in non-European countries. At the GMM level, the product market regulation is significant to explain the changes in the growth rate of GDP of the European countries. Regarding the sector variables, it was found that all of them are significant to explain economic growth in the south and east European countries. Regarding transport regulation, in the GMM method, it is only significant to economic growth in the European countries. To non-European countries energy and financial regulation are significant to explain growth.

This research suggests that market regulation factors have an impact on economic growth. When the institutions behavior is studied it is possible to conclude that it is related with growth. Also, the credibility and capacity to implement policies is relevant to GDP per capita growth rate, at least to some countries. This entails that the work to be developed in the regulatory policies cannot simply be liberalization and/or deregulation, at least in developed countries. Economic regulation only exists because there are market failures, the worsening of these failures can have a controvert effect in growth, in the consumers and in their income available. For there to be an increase in competition, one can not only deregulate. There is the need to create solid and clear market basis, otherwise dominant positions or unjustified lack of competition can continue to exist. Furthermore, it is relevant to understand that a country which its primary goal is to increase economic growth should not only seek to regulate the market. Regulation is one of the policies that must be developed in the economic process, however, there are other policies that may be more significative to increase GDP per capita growth in the short run. Moreover, institutions effectiveness is crucial for economic growth. There is the need, in the decision markers spectrum, to assume the importance that institutions entail, comprehending the relevance of transparent and independent institutions to ensure confidence, in markets, in law and in society in general. In this way, institutions should be well monitored. It should also be made available space for institutions to grow and for new institutions to be created, so as to establish with success their role.

This study as several limitations. Firstly, it is important to denote that the data of the explicative variables starts 1998, which limits the temporal space of the analysis. Additionally, the Product Market Regulation variables, and the sectorial variables of regulation only exists for the OECD countries, which limits this study in the countries under study. When considering the countries being studied, there is also another question that arises. The countries being used

are developed countries, in OECD's eyes, thus, their economic growth should be converging, and/or almost reaching, the steady-state, in accordance with economic growth theory. This may be difficult for this research, especially when considered with the timeline limitation. Finally, it would be interesting to test different functional forms. It may be that when using some variables interaction, other results would arise. For example, when making the interaction of the Government Effectiveness variable with the Control Corruption variable, it could show the impact of corruption with the effectiveness of institutions in economic growth.

In terms of future research, there are possible extensions for this study. One of them would be to explore the impact at sectors level individually, exploring the most important characteristics of each sector and its importance to explain economic phenomena. Another interesting development would be to use the synthetic control method in the European Regulatory Reform, so as to understand its impact on each European country's economy. A different approach would be to analyze the impact of Regulation, not only on the economy, but also on the service's quality, consumer rights, industrial structures, etc.

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## 8. Appendix

A 8.1: Table of Literature Review

| Authors and Year                                     | Periods   | Countries  | Econometric Approach                   | Dependent Variables  | Independent Variables  | Type of relationship findings   |
|--|-----------|--|--|--|--|---|
| Norman V. Loayza; Ana María Oviedo; Luis Servén-2005 | 1990-2003 | 72-75 Countries, more precisely 22 developed and 53 developing countries | OLS                                    | -Average annual growth rate of GDP per capita<br>- Informal sector output (% of GDP) | -Regulation index<br>-Governance index   | -Negative relation between regulation and GDP<br>-Regulation has a positive relation with informal sector   |
| Giorgio di Agostini, J Paul Dunne, Luce Peroni -2016 | 1996-2010 | 106 countries over the world   | Dynamic panel Data with GMM estimators | The growth rate of GDP   | -Political Stability<br>-Regulation quality<br>-control of corruption<br>-trade openness<br>-investment<br>-Military spending<br>WBI (all of them) | The results appoint to a positive effect of governance indicators on growth. On the other hand, corruption and military investment harm economic growth |

|  |           |  |   |   |   |   |
|--|-----------|--|---|---|---|---|
| Harry Seldadyo;<br>Emmanuel Padu<br>Nugroho; Jakob<br>de Haan - 2007 | 1984-2004 | ICRG data, which<br>monitors 140<br>countries,<br>developed,<br>emerging and<br>frontier markets | Panel Data  | Average growth<br>Rate of GDP per<br>capita | -Income<br>-School enrolment<br>rate<br>-Investment per<br>GDP<br>-Investment Price<br>-Governance  | The effect of<br>governance on<br>economic growth<br>is always positive,<br>regardless of the<br>sample, but bigger<br>in poorly<br>governed<br>countries   |
| Jens Koeniger;<br>Magdalene<br>Silberberger -<br>2016                | 1970-2009 | 106 countries, 80<br>of them are<br>developing<br>countries                                      | Panel Data:<br>-Pooled OLS and<br>fixed effects<br>estimation<br>-GMM<br>estimation | GDP per capita                              | -Investment Share<br>-Population<br>Growth<br>-Education<br>-Trade Share<br>-Regulatory<br>Component<br>(Regulatory<br>Quality)<br>-Bureaucratic<br>Quality<br>-Democracy<br>-Autocracy | Regulatory<br>Quality and Trade<br>Share are<br>positively<br>correlated with<br>GD's growth<br>rates. Democracy<br>is positively<br>corelated, but<br>insignificant and<br>Autocracy is<br>negatively<br>correlated and<br>significant.<br>Concludes that<br>Economic<br>Institutions have a<br>bigger impact on<br>income growth<br>rates than political<br>institutions. |
| Arusha V.Cooray<br>- 2009  | 1996-2003 | 71 countries,<br>developed,  | Cross section<br>data:  | Rate of GDP from<br>1996 to 2003            | -Initial GDP<br>-Private Capital  | Implies that an<br>increase in public   |

|  |           |                           |   |                               |   |  |
|--|-----------|---------------------------|---|-------------------------------|---|--|
|  |           | developing and transition | -OLS estimation<br>-GMM Estimation<br>-SUR Estimation |                               | -Human Capital<br>-Govt. Exp/GDP<br>-Credit/GDP<br>-Governance Dummy<br>-Public Investment<br>-Public Consumption<br>Health<br>-Education | spending and good governance can improve growth outcomes. It also observes convergence among income groups. Improving the efficacy of public capital can lead to improved growth.  |
| M.T. Costa-Campi; J. García-Quevedo; E. Trujillo-Baute – F2018 | 2007-2013 | 22 European countries     | Dynamic Panel data with GMM, Arellano-Bond method     | -Electricity consumption      | -Economic growth (GDP)<br>-RES-E promotion costs<br>-Network costs-industrial<br>-Energy costs<br>-Intensive energy sectors               | The effect of regulatory costs on electricity consumption is negative. An increase in the regulated cost leads to a decrease in electricity consumption and to a reduction of GDP. |
|  |           |                           |   | -Economic growth              | -Employment<br>-Capital<br>-Productivity Trend<br>-Electricity consumption  |  |
| Kyriakos C. Neanidis - 2019                                    | 1973-2013 | 156 developing economies  | Cross-country data:<br>-OLS<br>-dynamic system-GMM,   | Growth rate of GDP per capita | -Capital flows<br>-Banking supervision<br>-Initial GDP per capita   | It is observed that regulatory policies mitigate the negative growth effects of  |

|  |                                 |                    |   |  |  |  |
|--|---------------------------------|--------------------|---|--|--|--|
|  |                                 |                    | Arellano and Bover and Blundell and Bond  |  | -Education<br>-Population growth rate<br>-Investment<br>-Trade<br>-Government Consumption<br>-Inflation<br>-Institutions<br>-Private credit  | unstable capital flows.  |
| Mariusz Próchniak;<br>Bartosz Witkowski - 2014 | 1970-2010, in 10-year intervals | 111 countries      | Overlapping Panel Data with Bayesian model averaging method applied to Blundell and Bon's GMM | GDP per capita Growth rate at PPP (2005 constant prices) | -Government consumption expenditure<br>-Investment<br>-Openness<br>-Average total years of schooling<br>-Population with tertiary education<br>-Inflation<br>-Life expectancy<br>-Fertility rate<br>-Population Growth<br>-Population ages 15-64 | Economic freedom is positively and nonlinearly correlated with economic growth. It shows world economies convergence and that the higher the increase of economic freedom, the more rapid economic growth is, however, the increase is not proportional. |
| Malgorzata Zielenkiewicz - 2012                | 2007-2011                       | European Countries | Pearson's and Spearman's correlation  | -Level of GDP per Capita<br>-Stability                   | -Business Freedom<br>-Trade Freedom  | The results confirm that higher level of economic  |

|   |                  |                          |  |   |   |  |
|---|------------------|--------------------------|--|---|---|--|
|   |                  |                          |  |   | <ul style="list-style-type: none"> <li>-Monetary Freedom</li> <li>-Government spending</li> <li>-Fiscal Freedom</li> <li>-Property Rights</li> <li>-Investment Freedom</li> <li>-Financial Freedom</li> <li>-Freedom from corruption</li> <li>-Labor Freedom</li> </ul> | <p>freedom is accompanied by lower instability of GDP. Economic freedom seems to be highly important to reach a high level of GDP. There is, however, a negative correlation between Fiscal Policy and the level of GDP, as well as, of Government Spending with the level of GDP.</p> |
| <p>Daniel Lorente;<br/>Agustín Álvarez-Herranz - 2016</p> | <p>1990-2012</p> | <p>17 OECD Countries</p> | <ul style="list-style-type: none"> <li>-OLS</li> <li>-EGLS (Cross-section weights)</li> <li>-Two-Stage least squares (TSLS)</li> </ul> | <p>-GHGpc (Greenhouse gas emissions per capita)</p> | <ul style="list-style-type: none"> <li>-GDP per capita</li> <li>- Proportion of renewable energy resources</li> <li>-Public budget on energy research</li> </ul>  | <p>It suggests that the implementation of regulatory policies in the field of renewable energy and the increase in public budget on energy RD&amp;D positively affects the correction of</p>   |

|  |           |  |   |  |  |   |
|--|-----------|--|---|--|--|---|
|  |           |  |   |  |  | GHG emission levels-  |
| Kees Koedijk;<br>Jeroen Kremers -<br>1996                  | 1981-1993 | 10 countries:<br>Ireland, United Kingdom,<br>Denmark,<br>Belgium, Portugal.<br>Spain,<br>Netherlands,<br>Germany, France,<br>Italy, Greece | Cross-country regression  | Real output growth market sector in % per capita | -Overall market regulation<br>-Product market regulation<br>-Labor market regulation | Product market regulation is the variable that counts the most when it comes to explaining economic growth, although labor market regulation seems to be relevant too.  |
|  |           |  |   | Productivity growth                              | -Total factor productivity<br>-Labor productivity<br>-Capital productivity           |   |
| Bernur Acikgoz;<br>Athony Amoah;<br>Mine Yilmazer-<br>2016 | 1993-2011 | Tree-country group:<br>1. Mostly free (24)<br>2. Moderately free (38)<br>3. Mostly un-free countries (43)                                  | Panel data: Panel Unit Root Test;<br>Pedroni Residual Cointegration Test;<br>Unrestricted Cointegration Rank Test: Kao Residual Cointegration Test; DOLS and FMOLS Long-Run Estimates | GDP per capita                                   | -Labor<br>-GCF<br>-Fiscal freedom<br>-Business freedom                               | For un-free countries: Capital formation is positively correlated with economic growth, with a small magnitude. With this, the authors conclude that spending on capital formation does not affect this countries growth rate. For moderately free: It suggests |

|                                    |               |           |                               |                             |   |  |
|------------------------------------|---------------|-----------|-------------------------------|-----------------------------|---|--|
|                                    |               |           |                               |                             |   | that Business freedom is not relevant, which might be explained by the inefficiency in enforcement of government regulations.<br>For free countries: Both Fiscal and Business freedom have a positive impact on GDP per capita, The business Index has a higher impact on economic growth than Fiscal Index. |
| Mohammad Amin; Simeon Djankov-2014 | 144 countries | 2003-2013 | Cross-country OLS regressions | Number of Reforms Democracy | -Election<br>-GDP per capita<br>-Latitude<br>-Rule of Law<br>- Europe and Central Asia<br>-East Asia and Pacific<br>-Latin America and Caribbean<br>-Middle east and North Africa | The Rule of law is positively correlated with the number reform democracies, which suggests that broader economic institution may lead to the quality of democracy.  |

|                  |  |           |     |                                       |   |  |
|------------------|--|-----------|-----|---------------------------------------|---|--|
|                  |  |           |     |                                       | <ul style="list-style-type: none"> <li>-North America</li> <li>-South Asia</li> <li>-Sub-Saharan Africa (SSA)</li> <li>-English legal origin</li> <li>-French legal origin</li> <li>-German legal origin</li> <li>-Scandinavian legal origin</li> <li>-Socialist legal origin</li> <li>-Muslim</li> <li>-Catholic</li> <li>-Protestant</li> <li>-All other religions</li> </ul> |  |
| Rafal Nagaj-2016 | EU Member States and Poland separately | 2000-2014 | OLS | Changes in GDP (economic growth rate) | <ul style="list-style-type: none"> <li>-Change in electricity prices for households</li> <li>-Change in electricity prices for industrial consumers</li> </ul>  | The paper suggests that the liberalization of electricity prices has led to an increase in prices for the industry. It is observed that prices households are negatively correlated with economic growth, but this |



|   |       |           |  |  |   |  |
|---|-------|-----------|--|--|---|--|
|   |       |           |  |  |   | coefficient is insignificant. However, regarding industrial consumers this correlation is significant and even significantly correlated.   |
| Antonios Nikolaos Kalyvas; Emmanuel Mamatzakis - 2014 | EU-27 | 2004-2010 | Stochastic frontier model<br>Maximum Likelihood Method | EFF (the cost efficiency scores) assuming common frontier across the EU 27 | <ul style="list-style-type: none"> <li>-Regulatory Environment</li> <li>-Financial Regulation</li> <li>-Overall regulatory quality indicator</li> <li>-Legal rights of creditors</li> <li>-Credit information depth</li> <li>-Public credit registry coverage</li> <li>-Private credit registry coverage</li> <li>-Number of tax payments per year</li> <li>-Time dedicated at the firm level in order to handle taxation regulation</li> </ul> | It is observable that regulation has a negative effect on bank efficiency. On the other hand, labor regulation has a positive impact on bank efficiency. The authors found that the effect of the business regulation is many times influenced by institutional quality, measured by the rule of law and the control of corruption. The quality of institutions such |

|  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|
|  |  |  |  |  | <ul style="list-style-type: none"> <li>-Profit tax</li> <li>-Contracts time</li> <li>-Contracts cost</li> <li>-Contract procedures</li> <li>-Extent of disclosure</li> <li>-Extent of director liability</li> <li>-Ease of shareholder</li> <li>-Insolvency time</li> <li>-Insolvency cost</li> <li>-Insolvency recovery rate</li> <li>-Minimum wage</li> <li>-Severance payment</li> <li>-Notice period for worker dismissal</li> <li>-GDP per capita</li> <li>-GDP growth</li> <li>-Inflation</li> <li>-Financial Freedom</li> <li>-Control of Corruption</li> </ul> | <p>as the rule of law and control of corruption does matter in terms of the impact of business regulation on bank performance.</p> |
|--|--|--|--|--|--|--|

B 8.2: Table of Robustness Fixed Effects Estimations

|                           | Non-EU<br>gGDPpc   | Non-EU<br>gGDPpc     | Non-EU<br>gGDPpc     | Non-EU<br>gGDPpc     | South<br>and East<br>gGDPpc | South<br>and East<br>gGDPpc | South<br>and East<br>gGDPpc | South<br>and East<br>gGDPpc | Core<br>gGDPpc    | Core<br>gGDPpc    | Core<br>gGDPpc      | Core<br>gGDPpc     |
|---------------------------|--------------------|----------------------|----------------------|----------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-------------------|-------------------|---------------------|--------------------|
| Control of corruption     | -1.451<br>(-1.07)  |                      |                      |                      | -1.364<br>(-1.06)           |                             |                             |                             | -0.291<br>(-0.26) |                   |                     |                    |
| Government effectiveness  |                    | 3.377**<br>(2.50)    |                      |                      |                             | 0.726<br>(0.61)             |                             |                             |                   | 0.409<br>(0.38)   |                     |                    |
| Regulation quality        |                    |                      | 0.983<br>(0.68)      |                      |                             |                             | -1.161<br>(-0.73)           |                             |                   |                   | -2.489**<br>(-2.55) |                    |
| Product market regulation |                    |                      |                      | -0.920<br>(-0.71)    |                             |                             |                             | 2.436**<br>(2.14)           |                   |                   |                     | 3.056***<br>(3.58) |
| Inflation                 | -0.736*<br>(-2.81) | -0.687***<br>(-2.68) | -0.714***<br>(-2.73) | -0.729***<br>(-2.73) | -0.129<br>(-0.45)           | -0.147<br>(-0.51)           | -0.101<br>(-0.34)           | -0.267<br>(-0.91)           | -0.318<br>(-1.53) | -0.320<br>(-1.54) | -0.302<br>(-1.49)   | -0.337*<br>(-1.71) |
| Trade                     | 3.709*<br>(2.10)   | 4.695***<br>(2.80)   | 4.698**<br>(2.58)    | 3.818**<br>(2.01)    | 0.663<br>(0.35)             | 1.250<br>(0.66)             | 1.383<br>(0.72)             | 5.947**<br>(2.03)           | 3.371**<br>(2.43) | 3.790**<br>(2.40) | 3.162**<br>(2.42)   | 8.367***<br>(4.47) |

|            |         |           |           |           |          |           |           |           |         |           |           |           |
|------------|---------|-----------|-----------|-----------|----------|-----------|-----------|-----------|---------|-----------|-----------|-----------|
| Gover.     | -       | -14.84*** | -14.05*** | -14.98*** | -        | -24.70*** | -24.70*** | -21.75*** | -       | -16.90*** | -18.46*** | -14.35*** |
| Consum     | 12.95*  |           |           |           | 26.55*** |           |           |           | 17.37** |           |           |           |
|            | (-4.17) | (-4.75)   | (-4.17)   | (-3.93)   | (-6.56)  | (-5.99)   | (-6.08)   | (-5.13)   | (-5.64) | (-5.22)   | (-6.09)   | (-4.72)   |
| Investmen  | 9.854*  | 7.822***  | 8.811***  | 8.830***  | 5.922*** | 5.165***  | 5.810***  | 4.278**   | 6.914** | 6.929***  | 7.258***  | 6.634***  |
| t          |         |           |           |           |          |           |           |           | *       |           |           |           |
|            | (6.17)  | (4.86)    | (5.19)    | (5.28)    | (3.25)   | (3.09)    | (3.04)    | (2.52)    | (2.79)  | (2.82)    | (3.06)    | (2.87)    |
| Constant   | -6.206  | -4.789    | -6.820    | 2.072     | 59.90*** | 52.61**   | 51.87**   | 22.22     | 18.87   | 14.33     | 25.09*    | -16.79    |
|            | (-0.58) | (-0.46)   | (-0.64)   | (0.12)    | (2.99)   | (2.54)    | (2.51)    | (0.88)    | (1.31)  | (0.84)    | (1.80)    | (-1.01)   |
| Observatio | 162     | 162       | 162       | 158       | 144      | 144       | 144       | 144       | 139     | 139       | 139       | 139       |
| ns         |         |           |           |           |          |           |           |           |         |           |           |           |

*t* statistics in parentheses

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.010$