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The impact of institutions on economic growth across OECD

Inês Isabel Arede Fidalgo de Almeida

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Supervised by

Óscar Afonso, PhD

Natércia Fortuna, PhD

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Abstract: The study of the impact of institutions on economic growth is now widely researched, and the relationship between these two variables has shown to be positive. However, empirical research on institutions has been mostly done for global data sets and developing countries, been lacking in the case of developed countries.

Hence, we propose to analyze for the case of OECD countries how the existent institutions impact economic growth in the medium and long-run. Regarding the methodology, a panel data analysis considering the impact of institutional quality on growth will be estimated. While having data for potential GDP *per capita* between 1995 and 2021, the calculation of the 15-year average of potential growth only allows us to cover a reduced period, more precisely the span of [1995, 2006]. Besides institutional quality, we also consider other relevant determinants of potential growth such as the initial level of GDP *per capita*, public debt, and structural variables typically referred to in economic growth theory. Our estimation results show a positive impact of institutions on subsequent economic growth: an increase in 1 point in institutional quality leads to an estimated increase of 16.88 percentage points in potential GDP *per capita* growth, in the case of high-debt countries. With this, we notice a particular relevance of institutions in countries with high levels of debt.

Our findings support the importance of institutions for growth in developed countries for the medium and long-run. This implies necessary attention to the institutional tissue of societies since improvements in the institutional quality can subsequently improve economic growth.

JEL codes: C23; O10; O43.

Keywords: economic growth; institutions; panel data.

Resumo: O estudo do impacto das instituições no crescimento económico tem vindo a ganhar crescente interesse e o impacto das mesmas no crescimento económico tem-se mostrado positivo. Contudo, a investigação empírica tem sido feita essencialmente para amostras globais ou para amostras que analisam países em desenvolvimento, sendo diminuta no caso dos países desenvolvidos.

Consecutivamente, nesta dissertação pretende-se analisar para o caso dos países da OCDE, de que forma as instituições existentes influenciam o crescimento económico de médio e longo-prazo desses mesmos países. Relativamente à metodologia, com análise de dados em painel, estimar-se-á um modelo que contempla o impacto da qualidade das instituições. Apesar de possuirmos data para o produto potencial *per capita* desde 1995 até 2021, o cálculo da média do produto potencial a 15 anos apenas nos permite cobrir um período reduzido, mais precisamente para [1995, 2006]. Para além da qualidade institucional também serão considerados outros determinantes relevantes do crescimento potencial como o nível inicial do Produto interno bruto *per capita*, Dívida pública e variáveis estruturais usualmente referidas na teoria económica. Os resultados da estimação indicam um impacto positivo das instituições no crescimento económico subsequente: um aumento de 1 unidade na qualidade institucional leva a um aumento estimado de 16.88 pontos percentuais no crescimento do PIB *per capita* potencial, no caso de países com níveis de dívida elevados. Com estes resultados, notamos, em especial, a relevância das instituições no caso particular de países com níveis de dívida elevados.

Os resultados obtidos apoiam a importância das instituições para o crescimento económicos de países desenvolvidos no médio e longo-prazo. Tal facto requer atenção ao tecido institucional das sociedades, já que, melhorias na qualidade das instituições conduz a melhorias no crescimento económico.

Códigos JEL: C23; O10; O43.

Palavras-chave: crescimento económico; instituições; dados em painel.

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List of abbreviations

GDP – Gross Domestic Product

OECD - Organization for Economic Co-operation and Development

OLS – Ordinary Least Squares

PPP- Purchasing Power Parity

R&D – Research and Development

TFP – Total Factor Productivity

WGI – Worldwide Governance Indicators

1. Introduction

For a long time, the explanation for economic growth relied mainly on factors like the augmentation of physical and human capital and technical progress. However, such variables could not explain economic growth completely which led to the search of other determinants that could do so.

In such pursuit, evidence has been increasingly pointing towards institutions as a strong determinant of economic growth and a positive correlation between these two variables has been shown (Valeriani & Peluso, 2011). Hence, to understand economic growth one must also understand the institutional environment in which governments operate.

Even though the importance of institutions is acknowledged and extensively used in growth and cross-country income level studies, there still lacks a common sense of what they are and how can they be classified. The literature concerning institutions and its effects is vast, being however quite heterogeneous with a broad range of definitions and measures used. One typical way to categorize institutions is resultant of the institutional framework coming from North (1991), creating a division between formal and informal. Within these, there can be a further distinction between economic, political, and cultural institutions (Kuncic, 2012; Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1999). Consequently, there still some need to clarify among all these types of institutions which ones matter the most for economic growth.

Evidence shows that the relevance of institutions differs according to the context where they are, namely, the level of development of the country. With that, economic institutions appear to be more relevant for low-developed countries (Glaeser, Porta, Lopez-de-Silanes, & Shleifer, 2004), whereas political ones benefit developed countries the most. The main finding when comparing differences in overall economic institutions is that advanced country institutions have become more market-friendly in the 1980s and 1990s, reducing institutional differences among them (Freeman, 2002). With that, some similarities in institutional quality are expected among a group of countries such as OECD.

Initially, empirical studies considering the impact of institutions focused on developing countries to find how weak institutional quality impacted output. The results indicated that in the presence of poor institutions, redistributive activities are more likely to happen than productive ones, which limit investment and, subsequently, economic growth

(Ali, 2003). Likewise, in the case of natural resources, when property rights are poorly defined, powerful interest groups typically pursue unproductive activities, expropriating rents (Tornell & Lane, 1999), leaving developing countries with low chances to grow and develop. Aware of what institutions are lacking or still requiring improvements in developing countries, it is important to understand if the same institutions are relevant when analyzing developed countries.

With much of the literature studying the impact of institutional differences in economic growth being done for global samples or developing countries, there is a lack of such studies in the case of developed ones (Eicher & Röhn, 2007). As far as we can tell, one exception is the paper by Masuch, Moshammer, and Pierluigi (2016), who consider the group of European countries to study the impact of institutions on economic growth, using the Worldwide Governance Indicators as a proxy for institutional quality. Since this study only covers a reduced sample of developed countries, there is still the need to expand the research done so we can obtain robust conclusions about what institutions matter for this level of development.

Given the aforementioned reasons, there seems to exist a gap in the literature measuring the effect of institutions on economic growth in the case of developed countries. If institutions can be a determinant factor in economic growth, not only in developing countries but also in developed ones, it is important to acknowledge and improve them. Due to that reason, we propose to investigate, for the case of OECD, what are the relevant institutions and how much they impact economic growth among other variables. It is of interest to understand if this set of countries that are expected to be homogeneous and displaying high-quality institutions, still have disparities and how that affects economic growth.

More precisely, our investigation questions are: What is the impact of institutions on economic growth across OECD countries? And how relevant are institutions for developed countries?

Regarding the methodology, we use panel data and estimate the model using Two-Stage Least Squares (2-SLS) to account for the endogeneity of the institutional variable. To verify how initial conditions impact subsequent economic growth, our dependent variable will measure the average of GDP *per capita* (GDPpc) potential growth, for 3, 5, 10, and 15-years. Using data from 1995 to 2021 for potential GDPpc, the calculation of the average for 15-years leaves us with a drastically reduced sample, namely from 1995 to 2006.

Subsequently, two models are estimated: a baseline, considering the variables institutions, the initial level of GDPpc, and public debt; and a Final model to which we add structural variables, typically referred to in economic growth literature. In this present research, the focus will be on formal institutions and within that, on economic ones, using as a proxy the Worldwide Governance Indicators, that enter our growth regression as an institutional quality variable.

The findings of the dissertation support the idea that institutions matter for medium and long-run economic growth in developed countries with institutions being statistically significant and positive in its impact. Moreover, when taking into account other relevant macroeconomic variables, institutions keep their significance and sign revealing their importance to explain subsequent economic growth.

After this brief introduction, the dissertation will be structured as follows: in Section 2 the literature review will be presented, starting with the determinants of growth. Then, institutions will be analyzed with subsections concerning its definition, the categories that can be made, its relationship with economic growth, and the concerns about institutional measures. In Section 3, we will discuss the data and methodology used and, in Section 4 we present the empirical model and discussion of the results. Finally, in Section 5, the main conclusions are presented along with some limitations of the present dissertation and ideas for future investigation.

2. Literature review

Economic growth is a major concern in all world economies, being one of the most important indicators of economic development. Therefore, it is important to address its causes and its obstacles. Several causes have been pointed out in the empirical literature such as production structure, capital accumulation, labor, technological change, human capital, geography, natural resources, and institutions (Ali, 2003). In this present dissertation, our focus will be on institutions and their impact on economic growth.

Since the 80s, the endogenous growth theory proposes a novelty regarding the modeling of economic growth. Technological knowledge, human capital, and institutions are frequently introduced in the aggregate production function as a productive factor, alongside labor and physical capital, although with quite different characteristics. Technological-knowledge, for example, is non-rival and usually only partially exclusive good (Romer, 1990). Due to these characteristics of the (impure) public goods, R&D activities dedicated to the production of new productive factors, generate positive externalities (spillovers) over the rest of the economy, which increases the efficiency of production and boosts growth. As a result, in the set of production factors (labor, physical capital, human capital, technological knowledge), the aggregate production function presents increasing returns to scale, leading to *per capita* output growth in the dynamic equilibrium of the economy.

Empirical evidence suggests that technological-knowledge (Romer, 1990) and human-capital (Lucas, 1988) accumulation is not a sufficient condition for sustained economic growth. Institutions are identified by some authors as the mechanism that facilitates or enhances the occurrence of positive externalities resulting from technological-knowledge and human-capital accumulation. Thus, it becomes relevant to investigate how such institutions can contribute to the global process of economic growth, which is the motivation of this dissertation.

2.1. Economic growth and its determinants

As stated above, research done on economic growth using a production function approach usually considers as inputs physical and human capital, labor, and technology. Modern growth theory appeared with Solow (1956), who showed that the engine of economic growth was the accumulation of physical capital. In the long-run, positive economic growth would only be achieved if there was exogenous technical progress. Consequently, in

the neoclassical model, technological progress was kept exogenous, despite its big importance for long-run growth (Petrakos, Arvanitidis, & Pavleas, 2007). As Solow's model was not following the empirical evidence, there was the need to make changes that could bring it closer to reality. The neoclassical theory was then revisited in the 80s, in the scope of the endogenous model.

Consequently, at the end of the 80s, Romer (1990) explained that technological progress was the result of R&D activities. Hence, endogenous growth models tried to explain technological progress endogenously, considering that the accumulation of technological knowledge, arising from R&D activities, would induce self-maintained economic growth (Petrakos et al., 2007). In parallel to the improvement of physical capital (technical progress with R&D), Lucas (1988) modeled the improvement of the quality of work, namely, the human capital. Investment in human capital (e.g., higher expenditures on education and training) might even play a more persistent role in the growth process than physical capital as told by Bassanini, Scarpetta, and Hemmings (2001). Thus, education may not only contribute to "embodied" improvements via increases in the skills of the workforce, but also a contribution via R&D activities (Bassanini et al., 2001). In education there are externalities to investment, i.e., social returns are higher than private returns, making the government's intervention particularly important.

Lucas (1988) focused on the accumulation of human capital as the driving force of growth whereas Romer (1990) emphasized technical progress as the force driving economic growth.

As explained before, for both neoclassical and endogenous growth models, investment is the most important determinant of economic growth (Petrakos et al., 2007). Human capital refers to education and training and it is the main source of growth in several endogenous growth models. Lastly, R&D activities and innovation are important determinants for economic growth increasing productivity (Petrakos et al., 2007). However, there is little knowledge of what drives these determinants and, hence, economic growth remains unexplained (Bloch & Tang, 2004).

As a result, the early focus on theoretical models that generate self-sustaining growth and endogenous technological advance has been increasingly replaced with attempts to show the diversity of experience with economic growth.

Over the past years, academic literature has contributed to a better understanding of the determinants of long-run economic growth. In addition to the "primary" influences

already referred of capital accumulation and skills embodied in human capital, evidence has confirmed the importance for of trade openness, of the level and structure of taxation and government expenditure, of R&D activity, of well-developed financial markets, of economically-friendly institutions or cultural traits. The main findings are that many of these factors are conducive to low inflation, having a significant positive impact on long-run GDPpc levels (Bouis, Duval, & Murtin, 2011; OECD, 2003). Focusing on R&D and tertiary education, these determinants are considered especially relevant for the economic growth of developed countries (Lee & Kim, 2009).

As the traditional theories could not explain the fundamental causes of economic growth, the search for correlates of growth has gone beyond economic variables (such as physical and human capital) to examine "deeper" or "fundamental" determinants of economic performance. Deep determinants allow us to explain differences in the proximate determinants (Knowles & Weatherston, 2006). As Acemoglu, Johnson, and Robinson (2004) refer to, innovation and factor accumulation are growth itself but not the cause of it; hence, they are proximate causes of growth.

As a result, there has been a switch from the variables existent in the neoclassical growth model to the deep determinants, which are described next:

- Geography: relates to the advantages and disadvantages posed by a country's physical location. Geography determines climate, population growth, natural resource endowments, food productivity, disease burden and public health, and transport costs (Bloch & Tang, 2004). It also influences agricultural productivity and the quality of human resources (Rodrik & Subramanian, 2003). The evidence on geography's impact on economic growth has been heterogeneous, telling us there might be other determinants holding a better explanation of long-run economic growth (Bloch & Tang, 2004). Geography is the only one of these deep determinants that can be treated as exogenous.
- Integration (trade): relates to market size and the benefits and costs of participating in international trade; trade can impact economic development directly and indirectly. Directly via absolute or comparative advantage but also indirectly through increased efficiency with increasing scale economies, higher competitiveness with foreign firms, and technology transfers (Bloch & Tang, 2004). This variable co-evolves with economic performance, making it endogenous (Dani Rodrik, 2003).

- Institutions: refers to the quality of formal and informal socio-political arrangements – ranging from the legal system to broader political institutions - that play an important role in promoting or hindering economic performance. Institutions have been acknowledged for a long time as an important factor in economic development but only recently they have been examined consistently, gaining more emphasis as a determinant of economic growth (Petrakos et al., 2007). The importance of institutions lays not only on the direct impact they have on growth but also on its impact on the other determinants of growth such as investment, physical and human capital, and technical changes, creating a chain effect. Hence, the "proximate" determinants would not have any impact on economic performance if the institutional set up would not be well-developed (Easterly, 2002). That tells us that the usual engines of growth are boosted in the presence of certain characteristics, such as good institutions. Similarly to trade, institutions are considered to be endogenous to income levels (Dani Rodrik, 2003).

These three fundamental determinants are significantly correlated with per-capita income. However, once institutions are controlled for, measures of geography have weak direct effects on incomes and trade is almost always insignificant (Bloch & Tang, 2004).

As stated before, institutions have received increasing attention in the growth literature as it has become clear that property rights, appropriate regulatory structures, the quality and independence of the judiciary, and bureaucratic capacity could not be taken for granted in many settings and that they were of utmost importance to initiating and sustaining economic growth (Dani Rodrik, 2003).

In light of this, some questions arise: What type of institutions exist? Which institutions demand priority? What are the specific institutional forms that are required? Do these differ across countries according to the level of development, historical trajectory, and initial conditions?

In the next section, we intend to find the answer to such questions.

2.2. Institutions

2.2.1. A Brief contextualization

A key source of influence for the New Institutional Economics was Ronald Coase's contributions. In his work entitled "The Problem of Social Cost", Coase (1960) examined "how the problem of externalities can be solved via bargaining without any government

intervention provided the transaction costs are zero" (Lloyd and Lee, 2018, p.2). This article highlights the importance of defining and enforcing property rights, an aspect that continues to dominate studies attempting to link institutions and economic growth. Later, in the 1970s and 1980s, Oliver Williamson extended the ideas of Coase (Williamson, 1975), concerning the role of property rights, transaction costs, and contracts at the firm level (Ménard & Shirley, 2014). The work of Douglass North (1973, 1990) has also been of major importance to the renewed interest in institutions. North's contributions have been to analyze institutions to a more macro level - linking institutions to economic growth and development, emphasizing the role of government. Lloyd and Lee (2018) identify four major approaches to today's institutional literature that branched from the work of Coase, Williamson, and North. Next, these four approaches are presented briefly.

The first approach focuses on legal institutions and their relationship with development, pointing to the importance of Legal origins and traditions with authors like Rafael La Porta, Florencio Lopez-de-Silanes, Andrei Shleifer, and Robert Vishny (Porta et al., 1999).

The second approach emphasizes the role of political institutions in influencing economic policies. A key finding of this literature is that electoral rules and legislative regimes affect public policy outcomes such as government spending. Persson and Tabellini (2003) are key contributors to this strand.

The third approach turns to culture as a determinant of growth, in which traditions and customs are transmitted across generations over the long run. Within this approach, culture can be measured, for instance, by trust and respect for others, which is done by Tabellini.

The last approach focuses on the work of Acemoglu, Robinson, and their co-authors (e.g., Acemoglu, Johnson, & Robinson, 2001), which links the impact of past institutions with long-run economic performance. Within this approach, two strands can be identified. The first is an empirical one, focusing on the relation between initial institutions and long-run economic performance (Acemoglu et. al., 2001). Flachaire, Garcia-Penalosa, and Konte (2014) also find that more rooted institutions such as political ones set the stage for economic institutions and other variables that, ultimately, affect growth. Hence, political institutions are considered one of the deep determinants of economic growth. The second strand, a more theoretical one, shows how politics affect economic growth, concerning the conflict between elite groups and the rest of the society.

2.2.2. Definition

Even though the importance of institutions is acknowledged and extensively used in growth and cross-country income level studies, there still lacks a common sense of what institutions are and how can they be classified.

One can think of institutions in the common sense of the word, as organizations with designated members (Lloyd & Lee, 2018), who are bound by a common purpose and want to achieve certain objectives (North, 1994). These organizations can be economic (firms, trade unions), political (governments, political parties), social (sportive clubs), and educational (schools, universities) (North, 1994). However, organizations are only a small part of what institutions can be.

When defining institutions and discussing their importance in explaining cross-country differences in the level of income *per capita*, it is typical in the deep determinants literature to cite North's (1990, p.3) definition of institutions as being "the rules of the game in a society or, more formally, (they) are the humanly devised constraints that shape human interaction". These rules are the institutions, the individuals and the firms are the players and the game would be any social interaction.

From this relevant definition from North, we can highlight some important features of institutions: they are set by individuals, having an intentional side, differently from other causes like for instance, geography; they set "constraints" on individuals; and they shape human action through incentives (Acemoglu & Robinson, 2010). A keyword in these and other institutions' definitions is constraints. But there is another essential aspect of institutions: the constraints need to be reasonably permanent or durable. Indeed, transitory constraints would not necessarily bind the agent's behavior and may be changed by those who do not like them (Glaeser et al., 2004; Knowles & Weatherston, 2006).

Institutions range from costumes and conventions well embedded in a determined society and its individuals, broadly called informal institutions; to formal rules like rule of law and property rights, typically enforced by governments, that allow regularity and expected action for individuals.

Although North distinguished between formal and informal institutions and even argued that informal institutions may be the more important of the two, the empirical proxies used in the deep-determinants literature focus almost exclusively on formal institutions. This could be because formal institutions are easier to measure than informal ones, with more available data and hence easier measurability (Knowles & Weatherston,

2006). Knowles and Weatherston (2006) also show this, stating that when it comes to measuring institutions, the protection of property rights and the rule of law (formal institutions) tend to feature prominently; however, norms, conventions, and trust (informal institutions) do not. Despite its difficulty of being measured, informal institutions are found to be just as an important determinant of income levels as formal institutions are, as Knowles and Weatherston (2006) try to show.

While the relationship between economic institutions and economic outcomes has been established empirically for developing countries and global data sets, it has seldom been analyzed for the countries that represent the gold standards of institutions today. Due to that, Eicher and Leukert (2009) show that when analyzing developed countries is necessary to choose relevant and representative instruments of the institutions existent in such countries.

Comparing some institutional measures for OECD and non-OECD countries, Freeman (2002) finds that the OECD economies form a reasonably well-defined cluster when talking about economic freedom but they also score the maximum in the sub-indices that measure property rights and legal structure.

Consequently, we will verify the relevant institutions for OECD and see how much they can explain subsequent economic growth.

Henceforth, the different categories of institutions will be presented.

2.2.3. Categories

The division between formal and informal institutions is largely found in the institutional economics' literature, which comes as a result of the institutional framework coming from North (1991). Alongside with other authors, Valeriani and Peluso (2011) also use this division. The dialectic of this branch examines whether informal institutions are preferable to formal ones or vice versa.

Generally, formal institutions can be described as the written laws and regulations, and mechanisms in which economic agents operate (Pasimeni & Pasimeni, 2016) and they encompass the economic, political, and regulatory rules that facilitate interactions between individuals. More specifically, they can be the constitutional rules, the legislation, the courts, the police, as well as regulatory agencies that interpret and enforce those rules.

The most commonly referred formal institutions on literature are property rights, rule of law, and transparent legal systems. These institutions matter greatly for how the

economy evolves since, as it was stated before, they promote order and stability while drawing incentives on agents. In the case of the protection of property rights, it is positively related to innovation, with the reinvestment of profits and with the size of companies (Fuentelsaz, González, & Maicas, 2019), all linked with better economic performance. On the opposite, if formal institutions are weak, entrepreneurship is discouraged limiting the opportunities of economic agents (Fuentelsaz et al., 2019). As a consequence, sound formal institutions are important to create incentives for entrepreneurship and to make an economy grow.

When we are talking about formal institutions, the concept of good governance appears frequently associated with it (Pasimeni & Pasimeni, 2016). This happens because good governance is maintained through institutions, more specifically, through formal ones (Parto, 2005). Good governance is consequently a result of good institutions such as property rights, effective bureaucracy, and rule of law which are, as referred before, typical elements of formal institutions. Since governance is an outcome of institutions, when measuring formal ones, one can reach for indicators that proxy the former. Consequently, the World Bank developed a composite indicator, the Worldwide Governance Indicators which includes six indicators measuring the quality of governance (Kraay, Kaufmann, & Mastruzzi, 2010). In parallel with the greater focus on institutional factors as explanatory variables of economic growth, the use of WGI is growing on the literature, showing that they can perform robustly on the institutional analysis of the process of economic growth and development (Pasimeni & Pasimeni, 2016).

Notwithstanding the relevance of formal institutions, they do not exist by themselves. They depend and interact with informal ones (North, 1991).

Informal institutions are the unwritten laws, this is, the norms that arise naturally and unconsciously between individuals and are typically transmitted through culture (Fuentelsaz et al., 2019). Similarly, Dobler (2011) sees informal institutions as beliefs, values, norms, convictions, morals, and codes of conduct that can be more generally described as culture. Culture restricts human behavior since individuals belonging to a certain culture share the same values and habits. Informal institutions are also the stickiest since people do not easily give up their convictions, beliefs, or origins - that is, their identity. Hence, informal institutions are hard to change since they define a society's culture, shape their worldview, and create a feeling of affiliation. In informal institutions, transactions occur between two parts belonging to the same group, based on linguistic, ethnic, and cultural bonds and

contracts are personal and implicit. When a contract is broken, other members of the group may punish the one who broke the deal relying on social sanctions (Valeriani & Peluso, 2011).

Informal institutions influence economic development because they also draw incentives into societies. If societies differ concerning their cultural characteristics, aggregated behavior will vary and affect economic outcomes differently, since different cultural groups share different values and worldviews. These differences lead to different strategies on an individual level but also collectively.

The fact that empirical literature refers, and measures more often formal institutions than informal ones is due to data availability, since a country's informal institutions, namely the value system is difficult to measure. Consequently, despite the accepted importance of informal institutions for economic outcomes, they are rarely applied in empirical studies measuring the impact of institutions on economic growth (Knowles & Weatherston, 2006; Woodruff, 2006). However, that does not mean that informal institutions are irrelevant or unnecessary for economic growth: the empirical results of Knowles and Weatherston (2006) suggest that in some specifications they are important in explaining cross-country income differences, more so than formal institutions.

Due to the already mentioned difficulties in finding proxies that could be suitable for this panel data approach the impact of informal institutions on economic growth will not be analyzed in this paper.

Within formal and informal institutions there can be a further distinction between economic, political, and cultural (Kuncic, 2012; Porta et al., 1999). Each of the categories provides different explanations for institutions being what they are: in the case of economic theories it is the social efficiency needs; redistribution towards powerful groups in the case of political theories, and social beliefs in the case of cultural theories.

Focusing on political and economic institutions, Flachaire et al. (2014) show that the differences between these two types of institutions exist not only conceptually but also in their evolution and how they impact economic growth across countries. They show that for the majority, political institutions have remained stable while economic ones have increased its quality. Considering their impact on incomes, the hypothesis that the authors propose is that economic institutions have a direct impact on economic growth, similar to structural variables such as education or investment in human and physical capital, whereas

political institutions have an indirect effect, being more rooted, determining, for instance, the growth regime in which a country finds itself such as autocracy or democracy.

The idea is that economic institutions impact economic growth directly, but they are influenced by political ones. And so, to understand economic institutions and how they impact economic growth we have to dig deeper and look into political institutions.

Political institutions determine the constraints and incentives of agents in the political realm, determining who holds the political power in a society (Acemoglu et al., 2004). The distribution of resources is a political decision that is inherently conflictual since people who have the political power will try to distribute resources in their favor; quite often, the best choice for the group in power is not the best choice for society. The equilibrium structure of economic institutions will, therefore, be determined by who has the power to make decisions (Acemoglu et al., 2004): those who are in power shape policies and institutions to keep their control and amass resources (Porta et al., 1999). Hence, political institutions determine the distribution of de jure political power, which in turn assigns the power to alter economic institutions.

Political institutions are social choices, being rather persistent in time. Such persistence over time is introduced by those holding political power who benefit from it since the longer they stay in control the most they can profit (Eicher & Leukert, 2009). For political institutions to change is necessary to have a large change in the distribution of political power: that can happen with a shock that creates an imbalance in the existing power leading to a revolution. That shock can be either a change in the international environment or a change in technology (Acemoglu et al., 2004).

Due to their slow-changing character, political institutions appear to be not so relevant for the short-run performance, but that result is most likely to change for the long-run (Flachaire et al., 2014).

Since political institutions are slow-moving and their impact on output is negligible, they perform well as an instrument for institutions (Eicher & Röhn, 2007; Eicher & Leukert, 2009). Flachaire et al. (2014) also point to that idea, stating that political institutions belong to the set of deep determinants of economic growth, while economic ones belong to the proximate determinants. That means that political institutions set the stage for economic ones, and consequently the former can be used as instruments which is known as the hierarchy of institutions' hypotheses (Acemoglu et al., 2004). The idea behind this hypothesis is that political institutions are behind economic institutions, being the

latter the ones that directly impact the output. In search of instruments that control for endogeneity of economic institutions in both global and the OECD samples, Eicher and Leukert (2009) turn to political institutions, an approach also used by Masuch et al. (2016).

Within the political theories of institutions, Legal origins can proxy the quality of governance concerning how interventionist the governments are and how large the size of government is. Legal origins can be viewed as indicators of the relative power of the State relative to the property owners, reflecting how much the State controls economic life (Porta et al., 1999). Additionally, they reflect aspects of present institutional quality that are a result of civil legal tradition, taking into account deeper political and legal differences that economic institutions do not capture (Masuch et al., 2016). With Legal origins, one can also test the hypothesis of the hierarchy of institutions, already referred before (Acemoglu et al., 2004). Hence, political institutions are used as an instrument for economic ones, drawing attention to deeper-country characteristics.

Similarly to political institutions, economic institutions can be determined by history or chance but mainly they are a human choice: which economic institutions arise depends on who has the political power to create or block them. Different economic institutions will lead to different distributions of gains and since in a society there are different preferences, conflicts of interests are likely to arise. The set of economic institutions and hence, the distribution of economic gains will be decided by the group who holds the political power (Acemoglu et al., 2004). Distinct economic institutions will lead to different economic performances and different distribution of outcomes, appearing quite relevant in determining differences in income across countries (Acemoglu et al., 2004; Acemoglu & Robinson, 2010). Consequently, economic institutions help to allocate resources most efficiently and determine who receives the profits.

Economic institutions are particularly important for economic outcomes since they shape and structure the economic incentives for society: they influence what technology exists, the investment made in physical and human capital, and the organization of production (Acemoglu & Robinson, 2010). Moreover, economic institutions, which can also be called market-creating institutions (D. Rodrik, Subramanian, & Trebbi, 2004) create the incentives to accumulate and participate in the marketplace, and allow individuals to have control over their economic returns, making possible for complex economic interactions to take place (Das & Quirk, 2016).

Good economic institutions are those that "provide security property rights and equal access to economic resources to a broad cross-section of society" with property rights allowing for investment both in physical and human capital (Acemoglu et al., 2004, p. 9). Thus, to attain good economic institutions is needed that property rights are enjoyed by the majority of the population and not only by a restricted group, such as elite groups.

A big part of recent institutionalists center their analysis on economic institutions, and more precisely on the concepts of property rights and rule of law (Lloyd & Lee, 2018). While protection of property rights and enforcement of contracts are two largely referred characteristics of economic institutions some other relevant ones can be named, such as benign regulation and modest taxation, and uncorrupt bureaucracy (Porta et al., 1999).

Comparing some institutional measures for OECD and non-OECD countries, Freeman (2002) finds that the OECD economies form a well-defined cluster where economic freedom is noticeably higher than for all the other groups of countries. OECD economies also score the maximum in the sub-indices that measure property rights and legal structure. Consequently, OECD countries are expected to have a similar and high level of institutional quality. Likewise, when ranking such group considering their institutional quality (using the Institutional Climate Index), Ochel and Osterkamp (2007) highlight characteristics that high-ranking countries share: law and order are enforced, property rights are protected, corruption is prevented and there is an investment in human capital with a considerable portion of GDP spent on public education. However, when comparing the ranking of institutional quality, the authors notice that comparison might be misleading since the institutional setting is not uniform across countries, even when they all belong to OECD. So high-quality institutions can be defined in several terms and countries can perform well in some areas but not in others.

As seen before, institutions can be categorized in different ways and different definitions lead to different measures. Besides that, one must take into account the level of development of the country analyzed, since economic and political institutions have different impacts on economic growth between developed and developing countries.

2.2.4. The link between institutions and economic growth

For some time the main determinants of economic growth considered were augmentation of capital and labor, technical progress as well as the interplay between these factors, as referred previously in Section 2.1. It was the seminal work of Douglas North and Robert

Thomas (1973) that challenged this view and laid the foundation for institutional economics (Ochel & Osterkamp, 2007). Since then, the statement "institutions matter" has received strong empirical support, making it no longer doubtful that institutions do indeed matter for economic growth and development.

North's framework in conjunction with the neoclassical growth model helped to clarify the channels through which institutional quality might influence growth. The channel that is most referred on literature is the investment one which affects growth indirectly (Dawson, 1998). In this case, good institutions meaning secure property rights allow individuals to be secure in their investment, without the fear that their profits will be expropriated by other individuals or by the state, increasing the level of investment. On the opposite weak institutions, leading to bribes and higher transaction costs, create barriers to investment, decreasing its levels.

Also pointing to this direction is Aron (2000) who suggests that the quality of institutions has a robust and significant indirect relationship to growth via its effects on the volume of investment. Thus, better-performing institutions may increase growth by increasing the volume of investment. Knack and Keefer (1995) share the same idea, finding the quality of institutions to be crucial for growth and investment, operationalized by the security of property rights and the level of contract enforcement. Alesina, Hems, and Chinnock (1998) also demonstrate that institutional quality is important for growth, using measures of property rights, rule of law, absence of corruption, and bureaucratic efficiency.

Besides the widely referred investment channel, there are some other important ones through which institutions operate.

Institutional quality has been shown to improve investment in R&D within a country and also across countries' investments with capital inflows (Clarke, 2001). Dawson (1998) shows that institutions can also directly affect economic growth through total factor productivity. In this case, institutions affect the aggregate production function, and consequently the level of productivity of the economy. Using economic freedom as a proxy for institutions, the author finds that growth is affected both directly (through productive efficiency) and indirectly (through investment).

Institutions can likewise affect growth through trade openness, and this relation is shown to be relevant not only for developing countries but also, for developed ones (Sachs & Warner, 1997). Economic openness allows for a more dynamic environment, increasing the demand for better institutions and greater diffusion of knowledge (Alonso, 2011).

Moreover, institutional quality can explain integration in international trade and there is evidence that better institutions allow countries to capture larger import shares in more industrially complex industries (Pasimeni & Pasimeni, 2016). Institutional quality is also associated with lower volatility of macroeconomic policies (Acemoglu, Johnson, Robinson, & Thaicharoen, 2003), leading to higher economic growth.

Consequently, it is now recognized that institutions and politics are central in the process of economic growth because they affect the incentives to accumulate, innovate, and accommodate change (Dellepiane-Avellaneda, 2010). Hence, economic literature has agreed to assign a fundamental role of institutions for encouraging growth and facilitate economic transitions and social reforms (Valeriani & Peluso, 2011). And even though economic literature has constantly dedicated attention to the correlation between institutions, there is still no possibility to find a general consensus about which and how many institutions do influence economic growth. As a result, there is still an on-going debate about what those institutions are exactly (Bruinshoofd, 2016). Assured that institutions matter we have now to ascertain which institutions matter and in which context they matter (Das & Quirk, 2016).

As said by Aron (2000), the structure of both formal and informal rules and the nature of their enforcement are what defines the incentives and wealth-maximizing opportunities of the agents in society (both individuals and organizations). The institutional framework affects growth because it is essential to the amount spent on both the costs of the transaction and the costs of transformation: transaction costs can be higher when property rights or the rule of law are not reliable while transformation costs are raised if inefficient and inexpensive technology is used. When there are few formal institutions or when these are poorly defined, economic activities are restricted to interpersonal exchanges. This does not allow a high degree of formality and, hence, firms and agents cannot engage in complex, long-run, and multiple-contract exchanges, since there is no effective enforcement in the case of weak institutions. A basic structure of property rights that encourages long-run contracting appears essential for the creation of capital markets and economic growth (Aron, 2000).

In a world of imperfect information, institutions allow to decrease transaction costs and increase security and stability and under these conditions, individuals maximize their utility. If we know that the other individual adheres to the rules one incurs in less risk in doing business.

When trying to explain income differences across countries, the literature focuses mostly on formal institutions mainly due to more data availability and hence easier measurability. To measure those formal institutions there are different proposals, ranging from individual indicators to composed ones. Usually, within the formal institutions, the protection of property rights and the rule of law are two typical measures.

Knowles and Weatherston (2006) show this, stating that when it comes to measuring institutions, the protection of property rights and the rule of law (formal institutions) tend to feature prominently; however, norms, conventions, and trust do not. That happens due to the wider availability of data and more indicators for the case of formal institutions.

Notwithstanding its difficulty of being measured, informal institutions (which are a similar concept to culture and social capital) are found to be just as an important determinant of income levels as formal institutions are, as the authors try to show (Knowles & Weatherston, 2006). The promotion of social capital strengthening informal institutions may positively influence growth both directly and indirectly. On the paper by Knack and Keefer (1995), they find that trust and civic norms are positively associated with growth and claim a causal role, singly and together.

In the search of the institutions which conduce to growth, Dani Rodrik (2004) finds well-defined property rights, civil liberties, political representation, reliable legal systems, and a prevalent rule of law which enables productive activities as causes. Knack and Keefer (1995) use property rights enforcement. Porta et al. (1999) show how government performance namely secure property rights, enforcement of contracts, low taxation, and high quality of bureaucracy have a strong positive association with *per capita* income. Nugroho, Pasay, Damayanti, and Panennungi (2019) refer that the growth of knowledge stock and technological progress happens once good institutions are settled in and higher economic performance is achieved when organizations are engaged in productive activities.

The protection of property rights is typically associated with the group of "good institutions" making it relevant for almost every level of economic development that one might be analyzing. However, the typically called good institutions which also include sound money and open trade do not always do the trick for countries to grow economically. While it can seem wise to "take" the good institutions who typically deliver good economic results from developed countries to developing ones, evidence shows that it can be damaging. Good institutions can be acquired but doing so often requires experimentation and attention to local conditions. Dani Rodrik (2003) suggests that for

institutions to work there is not only one solution. To do a successful institutional reform in developing countries, political leaders must look into transitional institutions, that is, institutions that can differ from the so-called best practice institutions, but that deliver the best results for such countries. Transitional institutions can have the virtue of being more suited to the realities on the ground of both economic efficiency and political feasibility.

Hence, Dani Rodrik (2003) shows that conditions can be quite country-specific and that the choices made by local political leaders matter. It is naïve to think that institutions are invariant to initial conditions, to the period, or other aspects of the country's specific characteristics (Dani Rodrik, 2003). Local variation, cultural characteristics, costumes, and traditions matter for the success of formal institutions. An approach to institutional reform that ignores the role of local variation and institutional innovation is at best inadequate, and at worse harmful.

The idea that different institutions are appropriate in different circumstances is also emphasized in Djankov et al. (2003) in which, using a trade-off between dictatorship and disorders, it is shown that certain institutions might be appropriate for a certain environment, even if it is not the benchmark of perfect institutions. In this case, evidence suggests that the characteristics and duration of political regimes are important in determining whether countries have well-enforced and well-defined property rights, demonstrating a possible link between political stability and investment and implying that inefficient political institutions may result in weak property rights and thus discourage economic growth. Consequently, institutions that are appropriate in developed countries might not be for less developed economies. One size does not fit all for sure!

Solid institutions are recognized as a need requirement for sustained long-run economic growth (Dani Rodrik, 2004). However, to get economic growth started, small institutional changes can get the job done. Growth can be stimulated with minimal institutional changes and hence, to instigate economic growth it is not required to have an extensive set of institutional reform, which is rather encouraging for policymaking (Dani Rodrik, 2004). In light of that, we need to recognize the different goals an economy wants to achieve, between stimulating economic growth or sustaining it, as in this last one, solid institutions are an important requirement. For instance, the process of transition from a low-income equilibrium to a state of rapid growth is different from the process of re-ignite growth in a middle-income country. As Dani Rodrik (2003) reveals, at low-levels of income it may be easier to achieve high growth with reasonable institutions whereas, in the case of

middle-income countries, the institutional requirements to re-ignite growth are more demanding.

Consequently, in the institutional analyses, the characteristics of the countries have to be taken into account since the level of economic development matters for subsequent growth-enhancing institutions.

The analysis of institutions as a key element of good governance was initially applied to the study of developing countries with such an analysis showing how weak institutions negatively impact economic growth. However, institutions have also been found relevant for developed countries. What institutions matter for developed countries and which ones matter for developing ones?

Economic institutions are particularly relevant for poor countries since they allow to provide the basic needs for individuals. Bjørnskov, Dreher, and Fischer (2010) show that economic-judicial institutions in low-income countries are more relevant to reach happiness than political ones. Some evidence on the relevance of economic institutions for economic growth present China, Mauritius and, Botswana as cases of success and show that institutions creating market-oriented incentives, protecting property rights, and allowing political stability, lead to good economic performance (Dani Rodrik, 2003).

Only when institutions ensuring property rights and providing economic opportunities are settled, political institutions will be relevant for the well-being of society. This idea is also shown by Barro (1996a) who states that the welfare of poor nations would be improved if they imported the economic systems of developed countries, such as free markets and property rights, rather than their political systems. Political systems will then typically develop after reasonable standards of living had been attained. Das and Quirk (2016) also illustrate this idea, showing how the context is important to know which institutions matter, defending that in the case of lower-income countries, market-creating institutions are more important than market-legitimizing ones (political institutions).

On the paper written by Glaeser et al. (2004), it is shown that economic institutions are crucial for poor countries, whereas political institutions are not: often poor countries start with dictatorships, in which good policies, typically pursued by dictators allow the country to escape poverty. Those countries can subsequently improve their political institutions once economic growth takes place: only when property rights and free markets are assured, providing economic opportunities to individuals, the political systems will

develop. Therefore, for low-income countries, economic institutions are more relevant than political ones.

Eicher and Leukert (2009) show that the impact of economic institutions on income in OECD countries is about one-third of the effect that the same institutions have in non-OECD countries, indicating that economic institutions are more relevant and more impactful on developing countries than on developed ones. Summing up, the authors find a larger impact of economic institutions in determining output for developing countries when comparing OECD with the former (Eicher & Leukert, 2009).

For developed countries where economic institutions are already attained and well established, it is the political institutions that seem to matter for differences in the well-being of the population. However, considering both developing and developed countries, evidence indicates that economic institutions have in general, a higher impact on economic growth than political ones: Flachaire et al. (2014) show that the correlation between the former and growth is 0,29 while for the latter is only 0,19.

Lee and Kim (2009) also support the idea that different institutions matter for different levels of economic development. In the case of developed countries, institutions as proxied by Constraints on the executive, are found to be non-significant, despite having a positive coefficient. This result can occur since institutions are only proxied by one variable which does not reflect the complete institutional setting of developed countries. When using the Rule of law as a proxy for institutions, it already appears significant for higher-income countries; however, the magnitude of the impact is even bigger for low-income countries. Thus, the authors defend that the proxies typically used for institutions such as Constraints on government and Rule of law might be more relevant for the early stages of economic development than for developed countries.

Flachaire et al. (2014) conclude that political and economic institutions can be substitutes in the growth process. Countries with weak political institutions have lower average growth rates but a high return to economic institutions. Differently, countries with stronger political institutions tend to exhibit high growth rates and a low return to improvements in economic institutions. Hence, economies with weak democracies but with good economic institutions can attain fast growth, as it happened in East-Asian economies.

Concerning empirical studies, developing countries often display weak quality institutions which might lead to inefficiencies in its economies and more specifically, slow

growth. In a weak institutional environment, developing political and economic organizations may be considered a sunk cost: it is more likely that the attempt to improve the institutions would perpetuate and entrench the weak institutional environment (Aron, 2000).

The existence of poor institutions can as well lead to appropriating behavior by powerful groups such as rent-seeking, low innovation, investment in unproductive activities, and low investment if property rights are inexistent. As stated by Aron (2000) weak institutions reduce the efficiency of investment, affecting growth. Another author presenting this effect is Ali (2003): when poor institutions exist, individuals engage in redistributive activities rather than in economic ones and invest less in human capital which ultimately limits the possibility of sustained economic growth. It is also pointed by Nugroho et al. (2019) how in developing countries, the existing institutions prioritize distributive activities instead of productive ones: good institutions must be innovative and growth-oriented so that economic growth can take place.

A specific case of the detrimental effect of weak institutions on economic growth is in the presence of natural resources. The link between institutions and natural resources can be of three types as Mehlum, Moene, and Torvik (2006) refer: the quality of institutions can be hurt by resource abundance leading to inferior political governance or even civil war, institutions can have a neutral role or resources can interact with the quality of institutions. In this last case, good institutions attract entrepreneurs into productive activities while in the scenario of weak institutions entrepreneurs are drawn into rent appropriation. Natural resource rents can make rent-seeking activities and corruption more attractive (Murshed, 2004). Hence, whether the rents from the resources result in competition among the elites or in stimulating the productive activities depends on the quality of institutions (Mehlum et al., 2006). Due to weak property rights and weak law enforcement, natural resources are more a curse than a blessing to the countries that own them.

As seen in this section, for institutions there is no such thing as one fits all: a homogenous type of institutions that produces the same effects in different contexts and countries does not exist. Hence, different behaviors and ideologies may create different results among the same economic system (Valeriani & Peluso, 2011). It is necessary to acknowledge the need for different factors when analyzing countries with different income levels (Lee & Kim, 2009).

Exploring the causal link between institutions and economic growth has proved particularly difficult and big steps still have to be made on the empirical side of the institutional economics' field. Despite the efforts, the existing research strategy does not establish this link, due to both conceptual problems in measuring institutions and the limitations of econometric techniques (Glaeser et al., 2004). More precisely, the econometrics studies on institutions and growth are still fighting with issues concerning causality, endogeneity, omitted variable biases, poor specification, and most importantly, difficulties in measurement (Vaal & Ebben, 2011). These issues concerning institutional measurement will be presented in the next section along with some solutions.

2.2.5. Concerns about institutional measures

A difficulty present in most of the institutional literature relates not only to the complexity in defining it but also because institutions are not directly measurable; this implies the need to find indicators that can be used as proxies for the variables of interest (Eicher & Röhn, 2007). Alonso and Garcimartín (2013) refer that despite existing several institutional quality indicators, their characteristics and quality levels differ greatly, making it hard to reach a consensus. The authors also present some concrete shortcomings of the existent institutional quality indicators: they can be biased, not distinguish between institutions and policies, aggregate incorrectly composite indicators, data for the indicators not being homogenous across countries and, finally changes in the samples can make it difficult to make comparisons between countries. Therefore, it is important to take these into account when choosing institutional quality indicators.

It is largely mentioned in institutional literature that there is at least, a correlation between institutional variables and growth. However, the correlation between institutional variables and growth while suggesting a relationship does not tell us the direction of causality: causality can run in both directions, from good institutions to economic growth or from improved growth to good institutions (Aron, 2000). Despite existing several ways to overcome that problem, causality remains an issue in growth regressions (Dellepiane-Avellaneda, 2010). If one analyses institutions over time (although they change slowly) that provides means of controlling for reverse causality, relating initial levels of the institutions to subsequent growth rates (Dawson, 1998). Masuch et al. (2016) introduce the institutional

variable as an initial condition to explain the subsequent income *per capita* growth. This increases the chances of causation, from good institutions to subsequent economic growth.

In their empirical analysis, Chong and Calderon (2000) found that there is both causality and reverse causality when considering institutions and economic growth; the authors found that it was economic growth that was causing higher institutional quality, and that improvement in the quality of institutions in developed countries is marginal when compared to developing countries. In the case of the latter, institutional quality is a strong predictor of subsequent economic growth, proving the causality from institutions to economic growth (Chong & Calderon, 2000). Hence, for developed countries, one might expect to find a marginal impact of institutions on economic growth, since they are already established. The issue of reverse causality can be addressed using instrumental variables as it is done by Glaeser et al. (2004). The author uses as instruments log settler mortality which is also done by Acemoglu et al. (2001), and log of population density.

Another difficulty among institutional literature concerns its endogeneity to income levels, making it hard to disentangle if it is good institutions that lead to economic growth or the other way around (Dani Rodrik, 2004). Saying that institutions are endogenous means that they are collective choices, determined by society or at least, by part of it (Acemoglu et al., 2004). One possible way to reduce endogeneity problems is to measure institutional quality at the beginning of the period on which the research is concentrating. For example, if growth is averaged over 10-years, the institutional variables should be measured before or at the beginning of the decade (Aron, 2000). This solution is also presented by Masuch et al. (2016) who measure and insert the institutional variable in their equation at time t to explain the subsequent 15-year average GDPpc growth.

An alternative solution to endogeneity is to find a valid instrument for economic institutions so that the impact of these on the output is not contaminated by endogeneity bias (Eicher & Leukert, 2009). Some candidates for instruments of economic institutions are related to the notion of the historical influence of Western Europe: the impact that the colonizers had in the past institutions which by turn influenced present institutions. This issue is addressed in Acemoglu et al. (2001), who show that different types of colonization policies resulted in different institutions: extractive states led to weaker institutions whereas "Neo-Europes" resulted in good institutions. In the places where colonizers could not settle due to high mortality rates, their main goal was to extract as many resources as possible, setting up "extractive states", that did not provide protection against

expropriation risk nor checks against the government, leading ultimately to bad institutions. By contrast, in places where the settlement was favorable to the colonizers, they tried to mimic the institutional set up existent in European countries, with enforced rule of law and incentives to investment, resulting in the "Neo-Europes", that in the long run led to better institutions (Acemoglu et al., 2001). So, to estimate the impact of institutions on economic performance the authors use the feasibility of European settlement as a source of exogenous variation: mortality rates faced by the settlers are found to be exogenous and hence, a good instrument to measure the effect of institutions on income. Another instrument referred to in the literature, concerning the importance of historical circumstances is Legal origins (Porta et al., 1999) which are divided into, French civil law, Common law, Scandinavian law, German civil law, and Socialist law. These traditions spread throughout the world during colonization and conquest, influencing the institutions that exist today. As Legal origins were introduced in countries through conquest or colonization, they are considered exogenous variables and hence, a good instrument to use (Porta, Lopez-de-Silanes, & Shleifer, 2008). With Legal origins, we test the hypothesis of the hierarchy of institutions, which provides sufficiently strong instruments, and hence the use of political institutions as instruments is shown to be reliable (Eicher & Leukert, 2009). Knack and Keefer (1995) use an index of ethnic divisions as an instrument for institutional efficiency while also measuring their institutional variable at the beginning of the period (Chong & Calderon, 2000).

Another problem when investigating institutional quality can stem from pooling together developed and developing countries. More specifically is problematic to consider the same institutional variables across countries with different income levels: for instance, using the same determinants for developed and developing countries. The analysis of developed countries requires specific determinants of economic performance, which might not be considered in developing countries due to unavailable data (Eicher & Röhn, 2007). Likewise, Eicher and Leukert (2009) also refers that the set of institutions used for developing countries or in global samples might not be adequate for developed countries and so they try to find a set of institutions that matter for both advanced and developing countries. The impact of institutions is most likely to differ among these groups of countries since economies with a smaller level of development will be most affected by institutions providing basic needs such as food, health care, shelter, and education, this is, economic institutions. Political institutions become more relevant once basic material

needs are overcome by the majority of the population. Hence, Bjørnskov et al. (2010) find that for low-income countries, economic-judicial institutions are the most effective ones to reach economic development whereas in middle and high-income countries it is the effect of political institutions that matter.

For advanced economies, which constitute a smaller group when compared to developing economies, there is also the issue of a limited-time series which leads to challenges in inference, providing little degrees of freedom against which to test hypotheses (Freeman, 2002).

When measuring institutions, it is preferred to base the indicators on publicly available data, due to objectivity and replication ends (Bruinshoofd, 2016). Two important notes are made by Bruinshoofd (2016) regarding institutional quality: the first is that institutional quality should be constructed as a variable that is independent of economic growth; second, institutional quality consists of a broad range of factors, some of which are hard to measure. These authors construct institutional quality based on seven variables, available from the World Bank website, being the six World Governance Indicators plus the Ease of Doing Business indicator (which relates to the environment conducive to business operation). Masuch et al. (2016) also rely on the WGI indicators to proxy their institutional quality variable. Consequently, WGI appear as a typically used measure to proxy institutional quality.

Despite their frequent use, the WGI are not excluded from critics. Dellepiane-Avellaneda (2010) presents some short-comings of this indicator, for instance, relying on surveys that embed perceptual and policy biases and not having a good historical root to account for deeper characteristics of the institutional setting. The widely-used WGI indicators governance indicators which are perception-based show to be, on one hand, too volatile to reflect permanent features of the institutions and on the other, to rise with *per capita* income which can raise issues on causality (Glaeser et al., 2004).

Another problem with measuring institutions is that often, the indicators used to proxy institutions are perception-based, measuring institutional outcomes or performances instead of measuring the constraints (Dellepiane-Avellaneda, 2010). Consequently, the results suggest that the current measurement strategies have conceptual flaws and that researchers would do better focussing on actual laws, rules, and compliance procedures that could be manipulated by a policymaker to assess what works best in reality (Glaeser et al., 2004). Descriptions of the features of political and economic institutions such as the

presence or absence of constitutional rights say nothing about how well such institutions perform. In contrast, measures of the quality of formal and informal institutions indicate how effectively the existing institutional rules or norms are implemented (Aron, 2000). The performance or quality measures include property rights, civil freedom as respect for contracts.

Aware of the shortcomings that the measurement of institutions implies, on the methodology section we will attempt to overcome them.

3. Data Analysis and Methodology

3.1. Description of the data

3.1.1. Sample and sources

The literature review allowed us to verify that institutions are an important factor to account for when we are considering economic growth. Consequently, a quantitative analysis will allow us to measure the impact that such institutions can have on economic growth alongside other relevant determinants.

As seen in Section 2.2.3., institutions are a broad concept that has to be narrowed and contextualized: institutions are quite country-specific and dependent on the level of development that a country has (Dani Rodrik, 2003). Hence, one possible way to narrow such a study can be, for instance, the choice of the countries one wants to analyze.

The present dissertation will investigate for the case of developed countries, more specifically the OECD countries how much institutions matter, focusing on institutional quality as an explanatory variable of subsequent economic growth. The sample used will concern the 36 countries of the OECD for the period of [1995, 2006]. For the dependent variable, potential GDPpc, data is available from 1995 to 2021 whereas for the independent variables is from 1996 to 2018. Despite these time-frames, when calculating the average of GDPpc potential growth for 15-years our sample is reduced, only contemplating the period of [1995, 2006]. Consequently, that will be the time-frame that we will use to analyze all the variables and then, to estimate our model[1]. For the dependent variable, the series comprise the period between 1995 and 2006, and for the independent variables' one the period used is from 1996 to 2006.

The data is retrieved from the World Bank and OECD.

3.1.2. Description of the variables

The variables' choice takes into account the relevant literature as well as the goals of this thesis. Next, for a better understanding of the scope of our study, we describe the dependent and independent variables used.

- Potential GDP *per capita*

The dependent variable measures the average of potential gross domestic product *per capita* (GDPpc) growth. Potential output is defined as the highest level of output that can be

[1] The complete series for each variable is presented in the Appendix.

achieved in an economy in the medium to long-run without generating excess inflation (Arsov & Watson, 2019). Several factors affect the level of potential output and its growth rate, namely the institutional framework and structural economic policies (European Central Bank, 2011). Long-run potential output assumes that all factors of production are allocated to their most productive uses (World Bank Group, 2018).

The use of potential GDP is used to verify how initial conditions in variables such as institutions and debt, impact subsequent economic growth in the long-run, allowing for a better analysis of the long-run impact. The estimation will be performed using 3, 5, 10, and 15-year averages of GDP per capita potential growth to verify how different time-frames influence estimation results.

The value of the volume of potential GDP, in dollars, at constant 2010 purchasing power parities (PPP) is obtained from the OECD database[2], using the data from 1995 to 2021, in which the value for 2021 is forecasted. Subsequently, to obtain the average of the fifteen years, we add for each starting year the subsequent 15-years of potential GDP per capita values and then divide it by 15. Similarly, we got potential GDPpc growth for 3, 5, and 10 years. The 3-year potential GDPpc allows us to predict economic growth further in time, with the last year predicted being 2018. For 5, 10 and 15-years average the last year of data one can obtain is respectively, 2016, 2011, and 2006. The result of the four series is depicted in Figure 1.

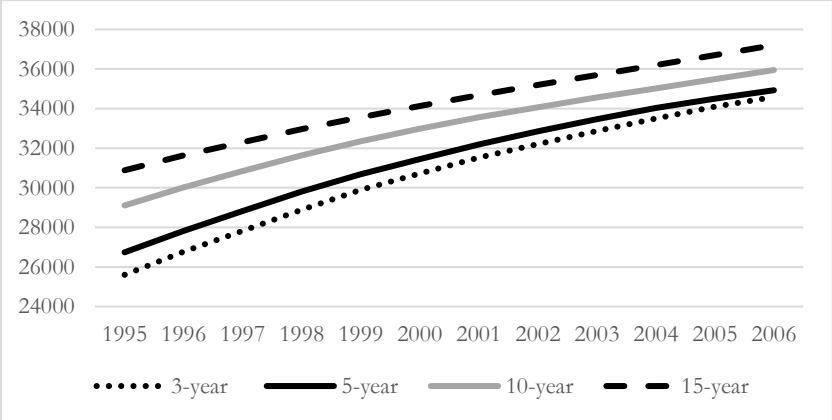

Figure 1 - Evolution of the different year averages for potential GDPpc for OECD

Figure 1 shows an increasing tendency for the different growth spans of potential GDPpc with the highest values in the case of the 15-year potential GDPpc. As we intend

[2] https://stats.oecd.org/index.aspx, last accessed in April 2020.

to compare the four different year averages, we restrict the sample from 1995 to 2006 to all of them.

- GDP per capita

GDP per capita at constant 2015 prices (in dollars) in PPP is used to measure the initial level of GDP per capita. The neoclassical model predicts a negative relationship between the initial level of GDP and economic growth (Barro, 1996b). This variable is included in the model to measure the catching-up effect, meaning that countries with initial low levels of GDP per capita are expected to have higher subsequent economic growth rates. The data for GDP per capita is available at the OECD database[3] and the resultant series appears in Figure 2.

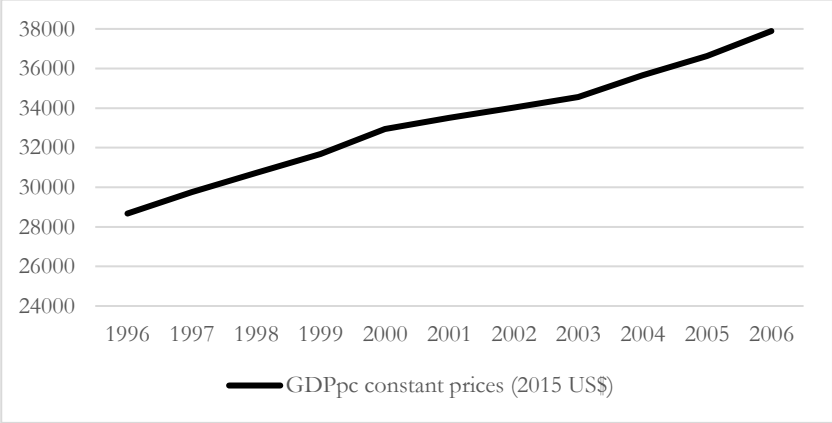

Figure 2 - Evolution of GDPpc for OECD

GDP per capita shows an increasing trend from 1996 to 2006. OECD can be considered a "convergence club" since the member countries share the same practices in several fields, leading to similar policies and outcomes reducing differences in output levels. However, evidence shows that, for OECD, there has been a convergence in growth rates rather than convergence in levels of GDP per capita which appear to be weak (Vanston, 2006).

- Institutions

For the institutional variable, we will use an aggregate measure of institutional quality from the Worldwide Governance Indicators (WGI) database. This database, developed by Kaufmann, Kraay, and Mastruzzi for the World Bank comprises six governance indicators: Corruption, Government effectiveness, Political stability and absence of violence, Regulatory quality, Rule of law and Voice and accountability which definitions are

[3] https://stats.oecd.org/Index.aspx?DataSetCode=PDB_LV#, last accessed in April 2020.

presented in Table 1. A further division can be made, splitting the six indicators into two groups, one considering the quality of a country's democratic process with Voice and accountability and Political stability and absence of violence indicators; and the other group capturing the quality of economic and administrative institutions with the remaining indicators (Helliwell, Huang, Grover, & Wang, 2014). The WGI is available for over 200 countries, updated annually, and it is based on several variables capturing governance perceptions obtained from non-governmental organizations and public and private survey respondents (Kraay et al., 2010). The estimate for each indicator follows a standard normal random variable, i.e. standardized to mean zero and unitary standard deviation, ranging between -2.5 and 2.5, with higher scores meaning better institutional outcomes (Apaza, 2009). The choice of this aggregate measure is based not only on its proven accuracy and free availability but also on the fact of being a complete indicator with several institutional measures frequently referred to in the literature (Fuentelsaz et al., 2019; Thomas, 2010). Pasimeni and Pasimeni (2016) also recognize WGI as an excellent source to operationalize an institutional analysis concerning the process of economic development and growth.

Despite the advantages referred, WGI is also associated with some criticism namely due to being a perception-based indicator, measuring policies instead of constraints, and adverse selection in sampling (Pasimeni & Pasimeni, 2016).

Table 1 - Definition of the Worldwide Governance Indicators

WGI indicator	Definition
Control of corruption (CC)	The extent to which public power is exercised for private gain, as well as "capture" of the state by elites and private interests.
Government effectiveness (GE)	The quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.
Political stability and absence of violence (PV)	Perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including political violence or terrorism.
Regulatory quality (RQ)	The ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.
Rule of law (RL)	The extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, the police, and the courts, as well as the likelihood of crime and violence.
Voice and accountability (VA)	The extent to which a country's citizens can participate in selecting their government, as well as freedom of expression, freedom of association, and free media.

For each one of the 6 WGI's indicator, we apply a 3-year centered moved average to include as much data as possible, since, until 2002, the data is only available on a biannual base (data is missing for the years of 1997, 1999, and 2001), obtaining our data from 1998 onwards. Subsequently, to construct the WGI series, we made an average of the 6 indicators for OECD countries, and its evolution can be found in Figure 3.

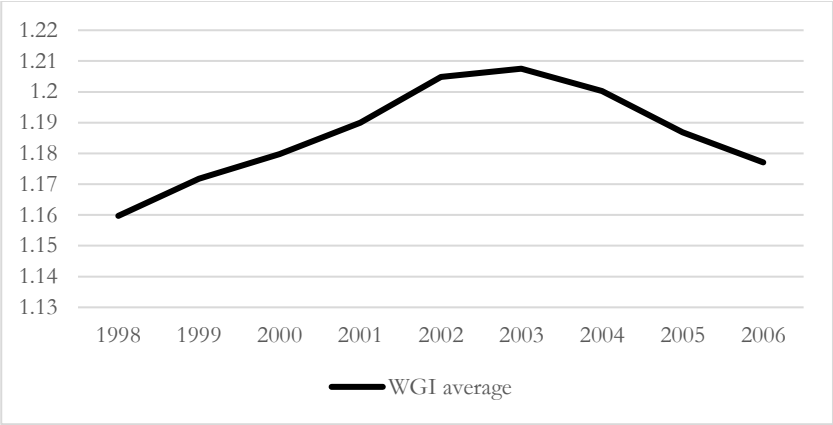

Figure 3 – Evolution of the WGI indicators' average for OECD

The institutional quality as proxied by the WGI shows an increase until 2003, reflecting possible improvements in institutions, followed by a decrease until 2006. Overall, for the period between 1998 and 2006, institutional quality has increased for OECD countries.

- Public Debt

Another variable present in the parsimonious model is debt measured by the General government debt (% of GDP) which measures the gross debt of the general government as a percentage of GDP (OECD, 2020). Debt can be used to finance productive investment, such as infrastructures in which case the relationship with economic growth would be positive, or unproductive spending, in which case the relationship is negative. Debt is most likely to impact economic growth when its levels are high: in such case interest rates might rise and consequently private investment decreases, or there can be an increase in expected future taxes, all leading to less economic growth (Chalk & Tanzi, 2002). High public debt can also affect economic growth through increased volatility (Panizza & Presbitero, 2013).

Therefore, public debt is correlated negatively and in a non-linear way to potential economic growth, with a critical threshold beyond which debt becomes detrimental to economic growth (Mencinger, Aristovnik, & Verbic, 2015). For general government debt,

the threshold considered to impact growth negatively can be set at 60% (Égert, 2013). Similarly, for the group of European countries, Masuch et al. (2016) use the Maastricht threshold, which is equally established at 60% of GDP. Since OECD has a representative sample of European countries within, we choose the same threshold for our variable.

The data is available on the OECD database[4] and the resultant series is portrayed in Figure 4, for the years between 1996 and 2006.

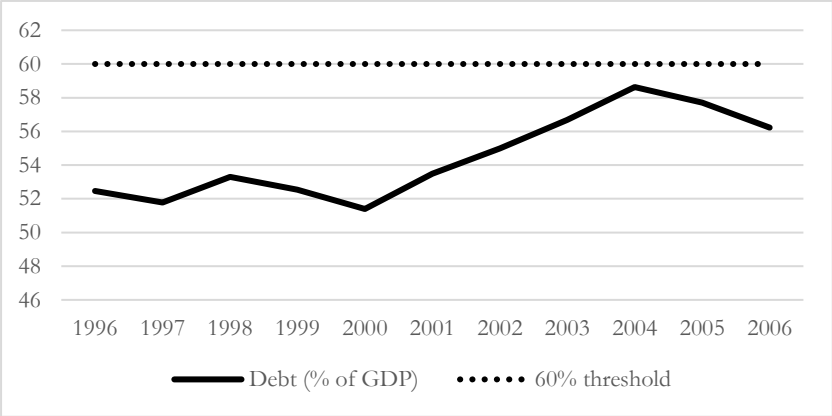

Figure 4 – Evolution of the debt to GDP ratio for OECD

The evolution of the variable General government debt shows a contained variation between 1996 and 2006, with debt values varying between 51% and 58% of GDP, while never reaching the 60% threshold.

For robustness matters, other variables are added to the model, namely structural ones such as Trade (% of GDP), Government expenditure on education (% of GDP), General government final consumption expenditure (% of GDP), Gross capital formation (% of GDP), Research and development (R&D) expenditure (% of GDP), and Inflation (annual %), all taken from the World Data Bank. Hereafter these variables will be denoted respectively as Tr, $GEEDU$, $GEXP$, GCF, RD, and INF.

- Trade

Trade is measured as the sum of exports and imports of goods and services as a share of gross domestic product (World Bank, 2020). Trade is an important determinant of economic growth, affecting it through several channels: increased investment, diffusion of

[4] In https://data.oecd.org/gga/general-government-debt.htm, last accessed in April 2020.

technology, economies of scale, and increased competition for firms with gains in productivity (Singh, 2010). Trade is expected to affect economic growth through increased TFP productivity, and to be conducive to low inflation, being beneficial to subsequent economic growth (Bouis et al., 2011). Notwithstanding, evidence shows a two-way relationship between trade and economic growth. The series[5] is depicted in Figure 5.

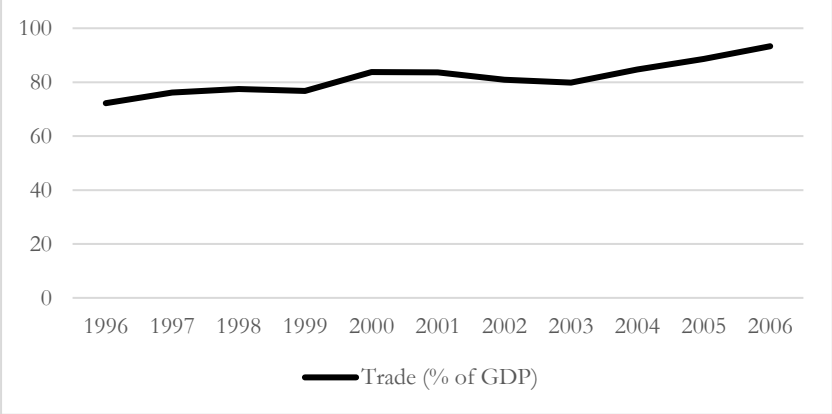

Figure 5 - Evolution of Trade for OECD

The results show an increasing trend for Trade, from 1996 to 2006. The most noticeable increase happened after 2003 with Tr reaching approximately 90% of GDP by 2006.

- General government final consumption expenditure

General government final consumption expenditure includes all current government expenditures for purchases of goods and services (World Bank, 2020). It also includes most expenditures on national defense and security but excludes government military expenditures that are part of government capital formation. Its evolution[6] is shown in Figure 6.

[5] https://data.worldbank.org/indicator/NE.TRD.GNFS.ZS?end=2019&start=1996, last accessed in April 2020.

[6] https://data.worldbank.org/indicator/NE.CON.GOVT.ZS?end=2019&start=1996, last accessed in April 2020.

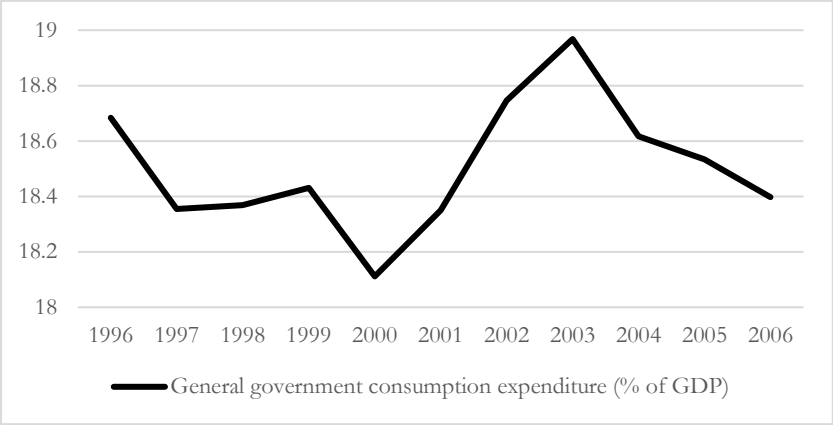

Figure 6 – Evolution of General government consumption expenditure for OECD

For $GEXP$ we notice a big increase after 2000, which can indicate the increase in the provision of social goods such as housing, health care, and education. This increase can reflect an increase in social protection which typically happens after recession periods, going back to normal levels as the economy recovers (Connolly, 2016). After reaching a peak of almost 19% of GDP in 2003, $GEXP$ shows a decreasing trend.

- Government expenditure on education

Government expenditure on education is used as a proxy for human capital measuring the flow contributing to its improvement. Despite not measuring the quality of education, this measure is especially useful to compare education expenditures between countries and over time with the size of their economy. Moreover, this variable measures the prioritization given to education among other public spending accounts, with high percentages to GDP, suggesting high prioritization for education (World Bank, 2020).

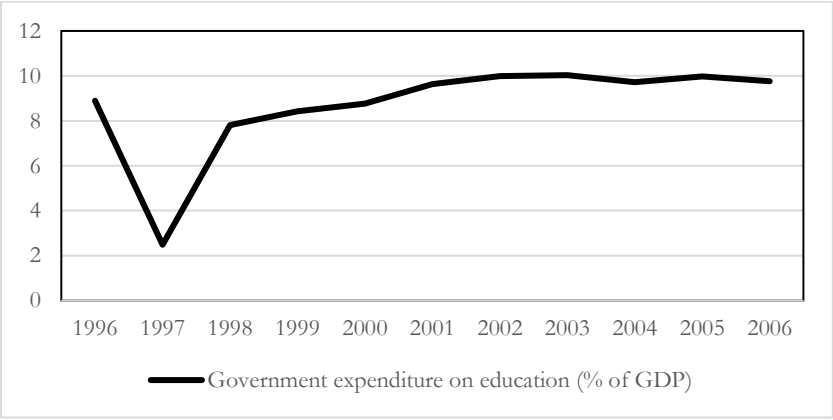

Figure 7 - Evolution of Government expenditure on education for OECD

The low peak in 1997 is due to the lack of available data in that year for 30 OECD countries. Without considering this downturn, $GEEDU$ shows an increasing trend from 1998 to 2003, reaching 10% of GDP, and from 2003 onwards there is low variability. Globally we can verify that investment in human capital as measured by $GEEDU$ has been increasing.

- Gross capital formation

Gross capital formation enters the regression as a proxy for investment in physical capital. It measures the flow that feeds the capital stock, with outlays on additions to the fixed assets plus the net changes in the level of inventories (World Bank, 2020). GCF constitutes an essential determinant of economic growth, increasing the level of production and consequently, of economic growth (Solow, 1956). The evolution[7] of gross capital formation can be found in Figure 8.

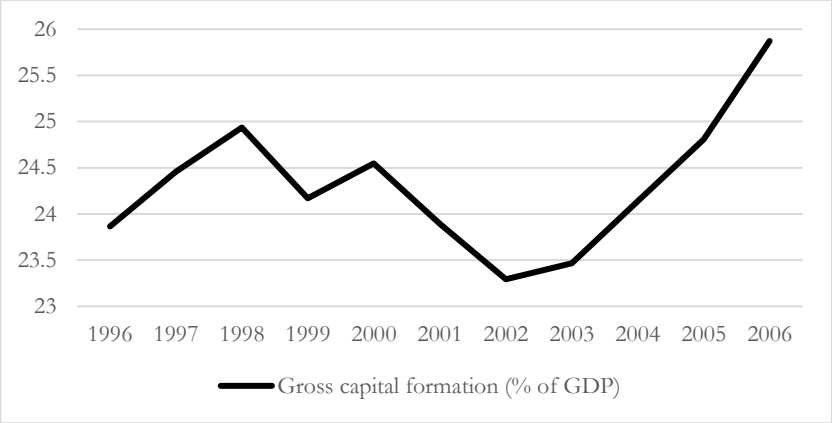

Figure 8 - Evolution of Gross capital formation for OECD

The series shows a decrease of GCF from 1998 to 2002 reaching the lowest value of approximately 23% of GDP in 2002. After that year, the values increase with gross capital formation reaching almost 26% of GDP by the year 2006.

- R&D expenditure

R&D expenditure reflects the investment, both public and private, on research to increase knowledge and more efficient uses of the existing resources (World Bank, 2020). R&D

[7] https://data.worldbank.org/indicator/NE.GDI.TOTL.ZS?end=2019&start=1996, last accessed in April 2020.

expenditure is typically related to the creation of new technologies and faster absorption of existing ones, with a higher level of R&D expenditure allowing economic growth to be raised permanently (Bouis et al., 2011). Its evolution[8] is presented in Figure 9.

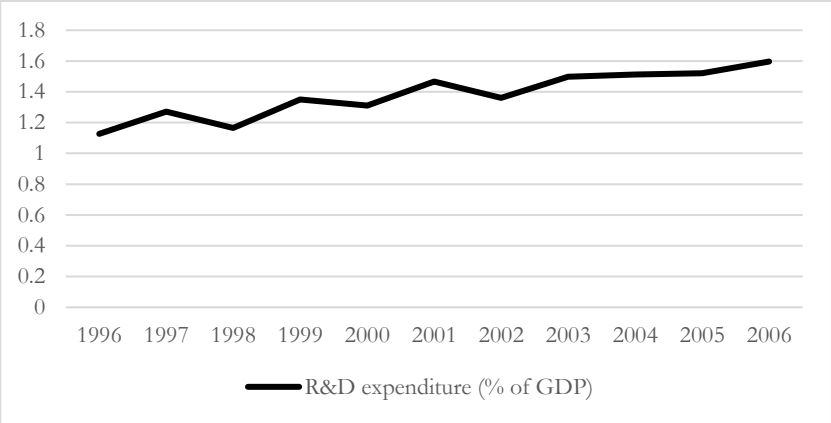

Figure 9 - Evolution of R&D expenditure for OECD

R&D expenditure shows on average an increasing trend of 0.62 percentage points from 1996 to 2017 in OECD countries. The small percentages of public R&D expenditure can be a result of a higher share of private R&D, with the latter being responsible for the majority of expenditure in this area in most OECD countries (Bassanini et al., 2001). Consequently, public R&D expenditure is expected to have smaller shares with its investments being mainly directed to medical and defense research or education (Bassanini et al., 2001).

- Inflation

Inflation is measure by the Consumer price index as described by the World Bank (2020). When inflation values are high, there is increased uncertainty and subsequent poor economic performance, reflecting the negative relationship between these two variables (Barro, 1996b). Hence, it is an important factor to influence economic growth with higher inflation leading to reduced long-run economic growth (Barro, 1996b). The series[9] is presented in Figure 10.

[8] https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS last accessed in April 2020.

[9] https://data.worldbank.org/indicator/FP.CPI.TOTL.ZG?end=2019&start=1996 last accessed in April 2020.

Figure 10 - Evolution of the inflation rate (annual %) for OECD

The inflation rate is typically an outcome of monetary policy, being one of the main goals of western economies, but it can also be a result of globalization. Pain, Koske, and Sollie (2008) verified that inflation started to decrease in the mid-1990s, the time in which globalization also started to rise. A decreasing tendency is depicted in our series with inflation showing a decline from around 9% to 3% between 1996 and 2006.

The descriptive statistics of each variable are presented in Table 2.

Additionally, we consider as an instrumental variable Legal origin, which takes into account the deep cultural and legal characteristics that exist behind formal institutions. This approach is present on Masuch et al. (2016), Acemoglu et al. (2004), and Eicher and Leukert (2009), where the deeper institutional determinants, typically constitutional institutions, are used as an instrument for the economic institutions. Legal origin will be a dummy variable used as an instrument for the institutional variable and the approach followed will be the same as in Porta et al. (1999), where the authors consider five different types of Legal origin from what countries can be grouped:

- English: Australia and Canada and Ireland, Great Britain, New Zealand, United States of America; and
- French: Belgium, Chile, France, Greece, Israel, Italy, Luxembourg, Mexico, Netherlands, Poland, Portugal, Spain, Turkey; and
- German: Austria, Czech Republic, Germany, Hungary, Japan, Korea, Slovakia, Slovenia, Switzerland; and
- Scandinavian: Denmark, Finland, Iceland, Norway, Sweden; and
- Soviet: Estonia, Latvia, Lithuania.

Table 2 - Descriptive statistics of the variables

Variable	Unit & Time	Number of observations	Minimum	Mean	Maximum	Standard Deviation
GDP per capita potential	Dollars & 1995-2021	432	8412.302	34359.77	91182.25	13410.44
GDP per capita	Dollars & 1996-2006	432	9227.63	37570.89	107765.8	16055.81
Institutions	Average & 1998-2006	432	-0.47	1.16	1.9601	0.53
General government debt	% of GDP & 1996-2006	432	6.65	72.79	238.73	41.23
Government expenditure on education	% of GDP & 1996-2006	432	5.89	12.96	22.4719	2.90
Trade	% of GDP & 1996-2006	432	18.34	91.47	408.36	54.39
General government expenditure	% of GDP & 1996-2006	432	8.12	18.83	26.91	3.69
Gross capital formation	% of GDP & 1996-2006	432	10.22	23.47	43.82	4.26
R&D expenditure	% of GDP & 1996-2006	432	0.25	1.74	4.58	0.98
Inflation rate	Consumer price index (annual %) & 1996-2006	432	-4.48	3.39	85.67	6.90

Notes: *(i)* Data withdrawn from OECD.stat and World Bank; *(ii)* We apply the first difference natural logarithm to GDP per capita potential; *(iii)* The institutional variable was calculated as an average of the six WGI indicators; *(iv)* The number of observations corresponds to the 12 years, considering the period of [1995;2006], for the 36 countries, with a total of 12×36=432 observations.

4. Empirical model and results

4.1 Contextualization

The goal of this research is to study the impact that institutions have on subsequent economic growth. Hence, we verify how the independent variable (institutions) alongside other initial conditions, affect the dependent variable (potential GDPpc growth), and with that find how much the former can be a useful tool to be controlled for better economic performances.

4.2. Model specification

The methodology used will concern panel data which comprises a time-series for each cross-sectional member in the data set. Panel-data allows us to follow the same cross-section unit, in this case, the same country, over a given time, permitting us to follow its evolution. The use of panel data comprises several advantages such as the possibility to observe the same unit over time, holding into account an evolutionary component of the variables and allowing to control for unobserved characteristics of the individuals. Besides that, it also facilitates a causality inference since we are looking for individuals over some time, instead of comparing individuals for one period in time (Woolridge, 2009).

The generic model is expressed as follows:

$$Y_{i,t} = \alpha + \beta_1 X_{1,i,t} + \beta_2 X_{2,i,t} + \cdots + \beta_k X_{k,t,i} + \varepsilon_{i,t}$$

In this equation, $Y_{i,t}$ is the dependent variable, α is the intercept, $X_1, X_2, \ldots, X_k$ represent the independent variables, $\beta_1, \beta_2, \ldots, \beta_k$ are the regression's coefficients and, finally, ε is the error term. Since we are dealing with panel data, the indices *i* represent each unit, in this case, each country (i = 1,…,36) and *t* represents each year (t = 1,…,12*)* resulting in 36×12=432 observations.

Considering the generic model is now important to adapt it to the scope of this research. As the intent is to study how initial conditions affect economic growth throughout time and across OECD countries, panel data is more appropriate. Hence, the first model will capture the links between the quality of institutions, the level of debt, the initial level of GDP per capita, and their impact on GDP per capita, assuming the following form:

(1) $$\Delta y_{i,t} = \beta_0 y_{i,t} + \beta_1 D_{i,t} + \beta_2 I_{i,t} + \beta_3 D_{i,t} \times I_{i,t} + \varepsilon_{i,t}$$

In equation (1), $\Delta y_{i,t}$ is the 15-year average GDP *per capita* growth (log change of potential GDP per capita), with *t* running from 1995 to 2006 for country i; $y_{i,t}$ is the initial

level of GDP per capita in constant prices (log of GDP per capita level in PPP) at time t for country i, representing the catching-up effect; $D_{i,t}$ is a dummy variable, at time t for country i, which takes the value 1 if government debt is greater than 60% of GDP and 0 otherwise; $I_{i,t}$ measures the institutional quality at time t for country I; $D_{i,t} \times I_{i,t}$ is the interaction term relating to the institutional quality with the debt dummy variable.

4.3. Interpretation of the results

When analyzing panel data, there are three possible models one can use: pooled ordinary least Squares (OLS), fixed-effects (FEM), or random-effects (REM). Hence, it is necessary to gauge which one of the three is adequate for the data used in the present analysis. Three tests can be performed to make such a choice: the F-test, the Hausman test, and the Breush-Pagan test.

The fixed-effect F-test allows us to choose between pooled OLS versus the fixed-effect model, where the null hypothesis is the absence of fixed-effects. The results of this test, presented in Table 3, allow us to reject the null hypothesis, meaning that period fixed-effects is the most suitable model. In this case, the use of pooled OLS is unable to deliver consistent estimates (Woolridge, 2009) and is consequently inadequate for the data in analysis. The Hausman test allows choosing between the fixed-effects and the random-effects model. In this case, the null hypothesis states that the random-effects model is appropriate. Applying the Hausman test, in which the null hypothesis is rejected, confirms that fixed-effects is the most appropriate model to use. Consequently, on the choice to analyze the data, we select the fixed-effects model.

Finally, the Breush-Pagan test makes it possible to choose between the random-effects models and the pooled OLS model (Baltagi, 2005).

Considering the concerns about the endogeneity of the institutional variable, we use Two-Stage Least Squares to estimate the model. In 2-SLS, one must find valid instrumental variables that fulfill two criteria: *(i)* the instruments must be uncorrelated with the error term in the initial equation, and *(ii)* the instruments are strongly correlated with the endogenous regressor (Eicher & Leukert, 2009).

As the name indicates, this method has two stages. In the first stage, the endogenous variables become the dependent variable which is regressed on all the exogenous and instrument variables, creating the fitted values series. Then, in the second stage, the

estimated series obtained from this regression replaces the original series of the endogenous variable.

In the first stage to test if the two variables, I and $D \times I$ are endogenous, we perform the Wu-Hausman test, which results are reflected in Table 4. Since we reject the null hypothesis, we can conclude that the variables are endogenous not only jointly but also individually in the case of the variable I. Additionally, we can also verify if the instruments used are relevant, using the Wald F-statistic value reported in Table 3 of the first stage. The values confirm that the instruments used are relevant.

In the baseline regression, institutions appear both alone and interacting with the debt dummy variable. Since using Legal origins is a valid instrument for institutions, using Legal origins interacted with the debt dummy can also be considered valid as an instrument for the institutions interacted with the debt dummy variable (Masuch et al., 2016).

Consequently, there will be two reduced form equations to estimate on the first step: one in which the dependent variable is I, the institutional variable; and the other one which has the interaction term, $D \times I$, as the dependent variable. The instrument chosen for the institutional quality is Legal origin (LO), as done by Masuch et al. (2016). The LO variable is disaggregated into its five possibilities: English, French, German, Scandinavian, and Soviet denoted respectively in the equation as eng, fr, ger, sca, and sov. The variable English was omitted to avoid perfect multicollinearity.

In the first step we use more observations (641) compared to the ones presented in Table 2 with the descriptive statistics (432). This is done to use as much information as possible and hence, obtain the best results and estimates for our first step.

The two instrumental equations are presented next:

$$(2) \quad I_{i,t} = \alpha_0 + \alpha_1 y1_{i,t} + \alpha_1 D_{i,t} + \alpha_2 fr_{i,t} + \alpha_3 ger_{i,t} + \alpha_4 sca_{i,t} + \alpha_5 sov_{i,t} + \alpha_6 D_{i,t} \times fr_{i,t} + \alpha_7 D_{i,t} \times ger_{i,t} + \alpha_8 D_{i,t} \times sca_{i,t} + \alpha_9 D_{i,t} \times sov_{i,t} + \varepsilon_{i,t}$$

$$(3) \quad D_{i,t} I_{i,t} = \delta_0 + \delta_1 y2_{i,t} + \delta_1 D_{i,t} + \delta_2 fr_{i,t} + \delta_3 ger_{i,t} + \delta_4 sca_{i,t} + \delta_5 sov_{i,t} + \delta_6 D_{i,t} \times fr_{i,t} + \delta_7 D_{i,t} \times ger_{i,t} + \delta_8 D_{i,t} \times sca_{i,t} + \delta_9 D_{i,t} \times sov_{i,t} + \varepsilon_{i,t}$$

The results of the estimation are presented in Table 3.

Table 3 - Estimation results of the first stage of the 2-SLS

	I		$D \times I$	
Explanatory variables	**Pooled OLS**	**Period fixed-effect**	**Pooled OLS**	**Period fixed-effect**
ln $(GDPpc)$	0.7948*** (0.044)	0.8845*** (0.035)	0.2173*** (0.034)	0.2394*** (0.030)
$French$	-0.4764*** (0.066)	-0.3858*** (0.048)	0.0027 (0.027)	0.0332 (0.026)
$German$	-0.2482*** (0.024)	-0.1833*** (0.022)	0.0591** (0.023)	0.0904*** (0.020)
$Scandinavian$	0.1146*** (0.024)	0.1786*** (0.020)	-0.0263*** (0.010)	0.0026 (0.009)
$Soviet$	-0.2144*** (0.036)	-0.0864*** (0.031)	0.1546*** (0.023)	0.2081*** (0.021)
$Debtover60$	-0.1751*** (0.023)	-0.0806*** (0.020)	1.4545*** (0.014)	1.5055*** (0.012)
$Debtover60 \times French$	0.2225*** (0.079)	0.1340** (0.062)	-0.4247*** (0.037)	-0.4565*** (0.034)
$Debtover60 \times German$	0.1999*** (0.031)	0.1527*** (0.029)	-0.2652*** (0.037)	-0.2761*** (0.034)
$Debtover60 \times Scandinavian$	0.2185*** (0.045)	0.1099*** (0.041)	0.3080*** (0.023)	0.2555*** (0.020)
Sample size	641	641	641	641
Adjusted R-squared	0.7309	0.7705	0.8844	0.9023
Wald F-statistic	194.1593 (0.000)	75.091 (0.000)	629.7694 (0.000)	204.8307 (0.000)
Period effect F-statistic		7.7920 (0.000)		2.5331 (0.000)

Notes: *(i)* In parenthesis and under each estimate it is mentioned the corresponding robust standard errors, using the cross-section SUR (Panel Corrected Standard Errors) method; *(ii)* The symbols ***, **, * indicate the level of significance, namely at 1%, 5%, and 10%; *(iii)* The Wald F-statistic tests the global significance of the regression, where the value inside parenthesis gives us the p-value; *(iv)* In the F-test, the value in parenthesis gives us the p-value.

Table 4 - Wu-Hausman endogeneity test

	Average potential per capita growth			
	3-years	**5-years**	**10-years**	**15-years**
F-statistic for $Institutions$ and $Institutions \times Debtover60$	6.8182 (0.002)	5.5730 (0.005)	1.6319 (0.200)	5.4135 (0.006)
t-statistic for $Institutions$	-3.6538 (0.000)	-3.2937 (0.001)	-1.8030 (0.074)	-3.0888 (0.003)

Note: Under the value of each statistic, in parenthesis, it is mentioned the respective p-value.

After estimating the two instrumental equations, we obtain the fitted values of the two dependent variables that will be later inserted in the original equation. In the second step, the fitted values of $I_{i,t}$ and $D_{i,t} \times I_{i,t}$ are plugged in the original equation (1). This two variables will be addressed in the next regressions as $\widehat{Institutions}$ and $\widehat{Institutions \times Debtover60}$.

4.3.1. The baseline and final models

On the second step of 2-SLS, the model is estimated by using both pooled OLS and country and period fixed-effects. When testing for the presence of country and period fixed-effects, we reject the null hypothesis, confirming the existence of country or/and time fixed-effects. Then, we perform the Hausman test that allows us to choose between the fixed-effects model and the random-effects model. The rejection of the null hypothesis indicates that fixed-effects exist for the country or/and the period and consequently, we estimate our model using fixed-effects for both dimensions.

Since our focus is to study the impact of institutions on subsequent economic growth, that is how we start, introducing the baseline model. The baseline model contains as independent variables the initial level of GDP per capita, $\ln(GDPpc)$, the institutional quality ($\widehat{Institutions}$), the $Debtover60$ dummy, and the interaction of the institutional variable with the debtover60 dummy ($\widehat{Institutions \times Debtover60}$). Next, adding all the structural variables that are referred on literature as determinants of economic growth, we want to test if the explanatory power of institutions holds. These variables intend to capture structural characteristics of the economy, which are typically included in regression analyses that aim to explain differences in economic growth in the long-run. Those variables are Government expenditure on education in % of GDP ($GEEDU$), Trade in % of GDP (Tr), General government final consumption expenditure in % of GDP ($GEXP$), Gross capital formation in % of GDP (GCF), R&D expenditure in % of GDP (RD) and Inflation (INF)[10]. With such exercise, we want to prove the relevance of institutions as a determinant of economic growth among other already recognized structural variables and show the importance of considering such a variable. We call this last model Final, and we

[10] The expected impact of such variables on economic growth referred to in the relevant literature is presented in Table 7 in the Appendix.

use it further to make a parallel analysis for different time growth spans of GDPpc potential economic growth for 3, 5, 10, and 15-years.

To verify if the variables added to the baseline model namely, $GEEDU$, Tr, $GEXP$, GCF, RD, and INF improve the model we perform a redundant variables test. This Wald F-test is done for every growth span, allowing us to verify if the added variables can jointly improve the power model. We reject the null hypothesis at 1% level of significance[11], proving that the Final model holds better explanatory power than the baseline one and consequently, the analysis of the results will be done for the Final model.

The results are presented in Table 5.

[11] The results of the Redundant variables test is showcased in Table 6.

Table 5 – Estimation results of the second stage of the 2-SLS

Explanatory variables	15-year average potential GDP per capita growth [1995, 2006]		
	Pooled OLS	Country and period fixed-effects	
	final	Baseline	Final
ln $(GDPpc)$	-2.7894***	-20.5595***	-18.2062***
	(0.180)	(5.568)	(5.325)
$\widehat{Institutions}$	0.6080***	16.8572***	16.2291***
	(0.171)	(0.056)	(5.332)
$Debtover60$	-0.9677***	-1.4532**	-1.5556**
	(0.225)	(0.586)	(0.614)
$\widehat{Institutions \times Debtover60}$	0.5478***	0.5166**	0.6525**
	(0.150)	(0.255)	(0.311)
$\ln(GEEDU)$	1.3067***		2.2272***
	(0.104)		(0.800)
$\ln(Tr)$	1.1467***		2.8390***
	(0.047)		(0.873)
$\ln(GEXP)$	-0.0103		5.3745***
	(0.183)		(1.209)
GCF	-0.0039		0.0220
	(0.005)		(0.027)
RD	-0.0912***		0.0952
	(0.027)		(0.268)
INF	0.0142		0.0380
	(0.009)		(0.027)
Sample size	178	178	178
Adjusted R-squared	0.9538	0.8311	0.8700
Wald F-statistic	1840.302	2160.614	1371.901
	(0.000)	(0.000)	(0.000)
Country and period fixed-effects		8.1714	6.9769
F-test		(0.000)	(0.000)

Notes: *(i)* In parenthesis and under each estimate it is mentioned the corresponding robust standard errors, by using the cross-section SUR (Panel Corrected Standard Error) method; *(ii)* The symbols ***, **, * indicate the level of significance, namely at 1%, 5%, and 10%; *(iii)* For the country and period effects F-test the value indicated in parenthesis is the p-value; (iv) The Wald test assesses the global significance of the regression, with the value inside parenthesis giving us the p-value.

The variable ln $(GDPpc)$, which represents the catching-up effect, i.e. the impact of the initial level of GDP per capita on subsequent economic growth, is significant at a 1%

level and affects growth negatively. That result is expected since higher initial levels of GDP per capita are linked with subsequently lower economic growth, known as conditional convergence. According to our results, in the final model, an estimated increase in 1% in the initial level of GDPpc results in a decrease of 0.18 percentage points (p.p.) in potential GDP growth, ceteris paribus (c.p.), being aligned with the empirical evidence.

The institutional quality variable, $\widehat{Institutions}$, is significant at 1% with a positive estimate. The results hold across the baseline and final models, with institutions holding their significance even when we add other macroeconomic variables, revealing their importance among the typically considered determinants of economic growth. The debt dummy interacted with the institutional variable, also significant and with an estimated positive coefficient, depicts the positive effect that sound institutions can have on subsequent economic growth in the case of high debts. According to our results, an estimated increase in 1 point in institutional quality is associated with an increase of 16.88 percentage points in potential GDP growth, in the case of high debt countries, and of 16.23 percentage points in the case of low debt countries, c.p. Therefore, a country that has good institutions can accommodate the negative impact of high debts on economic growth. On the opposite, if a country has low institutional quality, the presence of high debt will negatively impact subsequent economic growth. From this exercise, it is possible to infer that countries with high levels of debt and low institutional quality can benefit if they improve their institutional quality.

The debt dummy variable is significant at 5% and has a negative estimated impact, indicating the detrimental effect of high government debts on subsequent economic growth. This estimate gives us the difference between the potential GDPpc growth between high and low debt countries when institutional quality assumes a value of zero. According to our results, is estimated that GDPpc potential growth is 1.56% inferior in the case of high debts, (debts higher than 60% of GDP), relatively to low debts (debts inferior to 60% of GDP), holding everything else constant. Hence, we can conclude that high debts are more detrimental to potential GDPpc growth by 1.56% than low debts. High debts are detrimental to subsequent economic growth since they raise interest rates, crowd out private investment, and lead to higher expected future taxation (Mencinger et al., 2015).

Government expenditure on education is significant at 1% and the estimated effect is positive meaning that higher expenditure on education improves subsequent economic growth. This result is largely referred to in the literature and consequently expected since

improvements in human capital are typically linked with higher economic growth (Das & Quirk, 2016). According to our results, an estimated increase of 1% in $GEEDU$ leads to an increase of 0.022 percentage points on potential GDPpc growth in the final model, c.p. The estimate of government expenditures on education reflects the importance that investment in human capital has: education improves not only the skills of the workforce but also in the increase of R&D activities (Bassanini et al., 2001). Moreover, due to the high social returns that education encompasses, it is a particularly relevant area for government investment.

Trade is also significant at 1% and has a positive impact, showing the importance of integration in the international markets for countries to grow. Our results show that an estimated increase in 1% in Tr is associated with an increase in 0.0284 p.p. in the estimated potential GDPpc economic growth, c.p. Trade is also recognized as a variable to positively impact economic growth through a greater diffusion of knowledge and the possibility to create a more dynamic environment, increasing also the demand for better institutions (Alonso, 2011).

General government final consumption expenditure is significant at 1% and the estimated sign shows the importance of government expenditures both for the collective consumption, providing public goods and services but also for individuals with the provision of health care and housing (OECD, 2014). According to our results, we estimate that an increase in 1% in $GEXP$ is associated with an increase of 0.054 percentage points in potential GDPpc growth in the case of the final model, c.p.

Besides those referred variables, in the Final model the variables Gross capital formation, R&D expenditure, and Inflation are also featured being, however, not significant.

The non-significance of inflation can be possibly explained by the fact that half of our sample is constituted by countries that take part in the European Economic and Monetary Union (EMU), (19 out of 36 countries), which the main goal is to maintain inflation nearly constant at 2%. Consequently, the monetary policy reflected on the inflation rate does not impact the GDPpc potential growth.

The fact that GCF and RD variables are not found to be significant can be explained by the fact that both are related to investment. The literature refers to investment as one of the main channels through which institutions affect economic growth (Aron, 2000) with

good institutions improving the efficiency of investment, and consequently, such variables might present some degree of collinearity with the institutional variable.

4.3.2. Changing the time span of GDPpc potential growth

The next exercise changes the period for the GDPpc growth variable. Such exercise is done to verify if the model is more suitable to explain GDP growth in shorter or longer periods. The model is tested for three different periods of potential GDP (besides the 15-year average), namely for 3, 5, and 10-years. The interpretation of the estimates' results is the same for the different growth periods since the same explanatory variables are used. Notwithstanding, as the dependent variable changes across the different models a direct comparison between the four models is not possible, but conclusions can be drawn. Establishing parallelisms between the models we will look for the magnitude of the impact for each variable and verify how it changes for different growth time spans.

The results are presented in Table 6.

Table 6 – Estimation results for the baseline and final models with different growth spans for potential GDP

	Potential GDP per capita growth [1995, 2006]											
	3-year			5-year			10-year			15-year		
Explanatory variables	**Pooled OLS**	**Country and period fixed-effects**		**Pooled OLS**	**Country and period fixed-effects**		**Pooled OLS**	**Country and period fixed-effects**		**Pooled OLS**	**Country and period fixed-effects**	
		Baseline	**Final**		**Baseline**	**Final**		**Baseline**	**Final**		**Baseline**	**Final**
ln $(GDPpc)$	-9.6509***	-87.2165***	-99.0189***	-7.3688***	-42.3171***	-47.2129***	-3.7982***	-23.7049***	-22.3746***	-2.7894***	-20.5595***	-18.2062***
	(1.869)	(29.490)	(25.458)	(1.057)	(12.963)	(11.652)	(0.304)	(8.243)	(0.076)	(0.180)	(5.568)	(5.325)
$\widehat{Institutions}$	3.8780***	52.9263***	68.7503***	2.9186***	20.2593**	27.6423***	0.8236***	14.4922*	14.9512*	0.6080***	16.8572***	16.2291***
	(1.358)	(20.114)	(18.758)	(0.792)	(8.930)	(8.135)	(0.259)	(8.217)	(7.832)	(0.171)	(0.056)	(5.332)
$Debtover60$	-1.1137	-5.0919*	-10.4173***	-1.4092	-2.0332	-4.5109***	-1.3834***	-1.3000	-1.6963*	-0.9677***	-1.4532**	-1.5556**
	(1.864)	(2.993)	(3.210)	(1.095)	(1.338)	(1.446)	(0.296)	(0.878)	(0.945)	(0.225)	(0.586)	(0.614)
$\widehat{Institutions \times Debtover60}$	1.1013	1.6897	6.1228***	1.0225	0.7739	2.7049**	0.8411***	0.4675	0.9046*	0.5478***	0.5166**	0.6525**
	(1.420)	(1.678)	(2.273)	(0.820)	(0.765)	(1.035)	(0.188)	(0.420)	(0.523)	(0.150)	(0.255)	(0.311)
$\ln(GEEDU)$	8.6972***		19.0463***	3.9870***		9.8263***	1.4184***		4.0562***	1.3067***		2.2272***
	(2.928)		(6.787)	(1.281)		(3.180)	(0.216)		(1.323)	(0.104)		(0.800)
$\ln(Tr)$	3.3796***		37.6640***	2.0072***		15.5356***	1.1067***		4.8704***	1.1467***		2.8390***
	(1.011)		(8.709)	(0.521)		(3.695)	(0.088)		(1.604)	(0.047)		(0.873)
$\ln(GEXP)$	2.8454		39.0728***	1.3844		15.8235***	-0.4042**		8.5506***	-0.0103		5.3745***
	(2.680)		(12.114)	(1.167)		(5.039)	(0.200)		(1.912)	(0.183)		(1.209)
GCF	-0.0735		0.4804*	-0.0667		0.1649	-0.0087		0.0802*	-0.0039		0.0220
	(0.189)		(0.255)	(0.084)		(0.109)	(0.008)		(0.048)	(0.005)		(0.027)
RD	-1.0437***		0.8874	-0.6016***		0.5250	-0.0398		0.4548	-0.0912***		0.0952
	(0.003)		(3.076)	(0.152)		(1.323)	(0.028)		(0.499)	(0.027)		(0.268)
INF	-0.0169		0.4211	-0.0562		0.1273	0.0177		0.0660	0.0142		0.0380
	(0.244)		(0.257)	(0.121)		(0.116)	(0.012)		(0.046)	(0.009)		(0.027)
Sample size	178	178	178	178	178	178	178	178	178	178	178	178
Adjusted R-squared	0.2433	0.3283	0.4928	0.4212	0.5273	0.6367	0.9662	0.7201	0.7783	0.9538	0.8311	0.8700
Wald F-statistic	54.8981	101.9453	61.2786	117.9938	305.3437	171.7072	130.9589	883.1219	564.4848	1840.302	2160.614	1371.901
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Country and period effects F-test		1.9354	3.3478		2.6211	3.8092		3.9440	4.7249		8.1714	6.9769
		(0.000)	(0.000)		(0.000)	(0.000)		(0.000)	(0.000)		(0.000)	(0.000)
Redundant Variables F-statistic			4.5356			6.0940			6.2945			6.1603
			(0.000)			(0.000)			(0.000)			(0.000)

Notes: *(i)* In parenthesis and under each estimate it is mentioned the corresponding robust standard errors, by using the cross-section SUR (Panel Corrected Standard Error) method; *(ii)* The symbols ***, **, * indicate the level of significance, namely at 1%, 5%, and 10%; *(iii)* For the country and period effects F-test the value indicated between parenthesis is the p-value; *(iv)* The Wald test assesses the global significance of the regression, with the value inside parenthesis giving us the p-value.

Using different year averages of GDPpc potential growth we wanted to verify if the explanatory power of the variables was independent of time, and hence, test if the medium-term could also be used when studying the impact of such variables on economic growth. Hence, to analyze our results we will look into the four variations of the dependent variable and for each of those models consider which variables can explain subsequent economic growth the best, taking into account their significance and the magnitude of the coefficients.

The results allow us to verify that independently of the growth time span one chooses to study, all the variables, except RD and INF, are significant. Besides keeping their significance, all the variables keep their sign, being consonant with economic growth theory. Consequently, whether we are analyzing the medium or long-run the Final model keeps its relevance in explaining subsequent economic growth.

More specifically, $GDPpc$ is significant at 1% for all the four different growth spans of potential GDP influencing growth negatively. $\widehat{Institutions}$ is significant at 1% for 3, 5, and 15-year averages, and significant at 5% in the case of the 10-year average. $Debtover60$ is significant at 1% for the case of 3 and 5-year averages, and at 5% for the 15-year average. Finally, the variables $GEEDU$, Tr, and $GEXP$ are significant at 1% for all the growth spans. Gross capital formation shows to be significant for the 3 and 10-year period whereas R&D expenditure and inflation are never significant for any of the four variations of growth periods.

Consequently, we can notice that the model concerning the 3-year potential GDPpc growth has the most variables with higher significance, followed by the 5-year one, then the 15-year, and finally the 10-year model.

Additionally, we can notice some regularities across every growth span model concerning the magnitude of impact each variable has on subsequent economic growth. For every growth span, we can notice that:

The estimate of the variable $GDPpc$ has a bigger impact on potential economic growth across other explanatory variables, holding everything else constant. Consequently, for each model considered, the catching-up effect seems to explain the most of potential GDPpc growth. Convergence in outcomes is more likely if institutional structures are similar, with countries narrowing the differences existent between them, and consequently, convergence is more likely to happen if such conditions are present. The big impact of catching-up on our results can translate the requirement of a similar institutional

framework across OECD countries. Consequently, convergence leads not only to similar long-run performances but also more similar structural conditions (Marelli & Signorelli, 2010) As our estimation results show, there is convergence and hence OECD countries show similar institutional quality.

The magnitude of the estimate of $\widehat{Institutions}$ is the second biggest among the other explanatory variables. As a result, institutions appear to be quite important in explaining subsequent economic growth, both for the medium and long-run, demonstrating the importance of such variable. Moreover, since we are using the WGI which measure mainly the quality of administrative and economic institutions, rather than political ones, we can conclude that economic institutions are determinant to explain medium and long-run economic growth for developed countries. Economic institutions are particularly relevant to economic growth since they create incentives for society, encouraging individuals to innovate, accumulate and have control in their economic returns (Das & Quirk, 2016). Hence, the development of such institutions stimulates economic agents to participate in the marketplace and to create economic value.

The debt dummy variable has the sixth-highest impact on potential economic growth, across every growth period. Consequently, other variables can be taken as more impactful to explain subsequent economic growth both for medium and long-run.

Among the structural variables, $GEXP$ and Tr are the ones with the largest magnitude and consequently, the ones to impact the most GDPpc potential growth. Consequently, when considering other macroeconomic variables, the aforementioned variables are quite important in explaining potential economic growth

$GEEDU$ has the smallest coefficient among the other variables in the model, revealing a lesser relevance in explaining subsequent economic growth.

5. Conclusion

The impact of institutions on economic growth has been studied mostly for the case of developing countries where institutional quality still needs big improvements.

However, in the case of developed countries, there is insufficient knowledge of what institutions matter and how much they matter for economic growth. More specifically for OECD, where institutional quality is expected to be high, one can wonder how much of economic growth can be attributed to the impact of institutions, among other relevant determinants such as education or trade.

Within that framework, the goal of this dissertation was to verify the impact of institutions on medium and long-run economic growth for OECD countries for the period between 1995 and 2006.

After a brief overview of economic growth theories and determinants of economic growth, we investigated the broad and heterogeneous definitions of institutions so we could narrow our object of study. To proxy institutions, our choice relied upon the Worldwide Global Indicators that are typically used to measure governance and institutional quality. Conscious of the several obstacles that the study of institutions implies, one of them being endogeneity, the present investigation searches for ways to deals with such issue by *(i)* measuring institutions at the beginning of the period; and *(ii)* using instrumental variables estimation method.

Making use of panel data, we proceeded to the estimation of two models: a baseline model which includes the initial level of GDP per capita, the institutional variable, a debt dummy variable, and the interaction between these last two variables; then, extending the baseline model with the addition of structural variables typically referred in the economic literature, we obtain the Final model that attempts to explain subsequent economic growth more completely.

As a robustness exercise, we applied different time spans for the GDP growth variable, namely for 3, 5, 10, and 15-years to verify if the model could explain medium and long-run growth. Such exercise is useful for policy ends, since reforms in institutional quality, more specifically in the rule of law, property rights, and more generally in the delivery of good governance quality, can be impactful in shorter periods.

The results showed us the positive impact that institutions have on subsequent economic growth for the medium and long-run in the case of OECD countries, taking into account the effect of high-debts. Consequently, the importance of institutions revealed not

to be limited in itself: in the presence of high debts, good institutions can relieve the negative impact debt has on economic growth, cushioning their detrimental effect on output. This result is of particular interest for countries with high levels of debt since they can benefit if they improve their institutional quality. Hence, this interaction effect can be considered as one of the several channels through which institutions indirectly affect economic growth, with investment being another of them. This makes institutions an important tool for governance since it has many channels through which it can influence economic growth.

The structural variables added, namely GEEDU, Tr, and $GEXP$ improved the fit of the model and revealed to be significant through different periods, showing as well the signs following the economic literature. Albeit their positive impact on economic growth, institutions stand out among such variables with a bigger magnitude, and hence we can conclude that for developed countries, institutions are a robust variable in explaining potential GDPpc.

Showing that institutions have a positive impact on economic growth in developed countries, allows us to defend the well-known proposition that "institutions matter". However and, as a limitation, we proved that "some institutions matter", namely economic ones measured by the WGI, since a more general affirmation needs an extensive list of proxies that can represent the wide spectrum that institutions are. The use of different types of institutions, namely political ones, could be useful to find which type is more relevant for economic growth in developed countries, something that is left for future research.

Another limitation is related to the reduced sample size since the potential GDP per capita by definition limits the number of observations.

Finally, we expect that the present dissertation contributes to the existing literature by increasing the knowledge of institutions regarding their definition, categorization, and measurement but mainly, on how they impact economic growth in the case of developed countries.

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Appendix

Table 7 - The expected sign of the variables according to the relevant literature

Variables	Proxy	Impact / sign	Minimum
Initial level of GDP per capita	GDP per capita	Negative	(Chalk & Tanzi, 2002); (Masuch et al., 2016);
Institutions	WGI	Positive	(Masuch et al., 2016); (Pasimeni & Pasimeni, 2016)
Debt	General government debt (% of GDP)	Negative	(Chalk & Tanzi, 2002); (Masuch et al., 2016)
Investment in Human capital	Government expenditure on education (% of GDP)	Positive	(Barro, 1996b); (OECD, 2003); (Das & Quirk, 2016); (Lee & Kim, 2009)
Integration	Trade (% of GDP)	Positive	(Bloch & Tang, 2004); (Bouis et al., 2011);
Fiscal policy	General government consumption expenditure (% of GDP)	Positive Negative (measuring exclusively spending on education and defense)	(Bouis et al., 2011); (Barro, 1996b);
Investment in Physical capital	Gross capital formation (% of GDP)	Positive	(Solow, 1956);
Innovation	R&D expenditure (% of GDP)	Positive	(Bouis et al., 2011); (OECD, 2003); (Lee & Kim, 2009)
Monetary policy	Inflation rate (anual %)	Negative	(Barro, 1996b); (Bouis et al., 2011); (OECD, 2003).

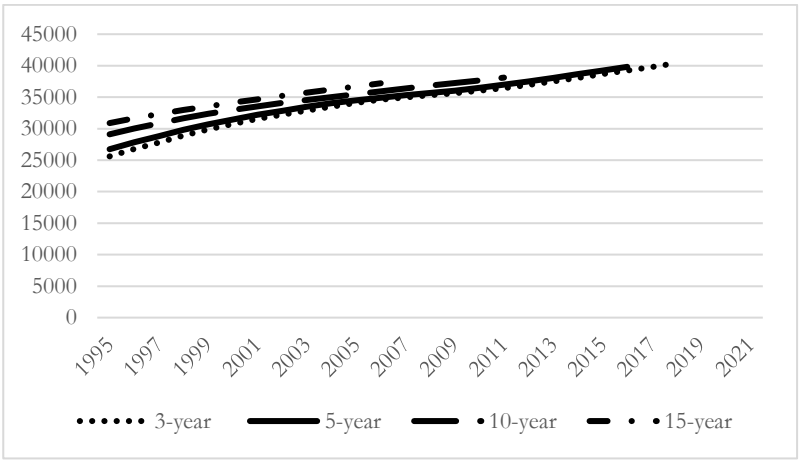

Figure 11 - Evolution of the different year averages for potential GDPpc for OECD, complete series

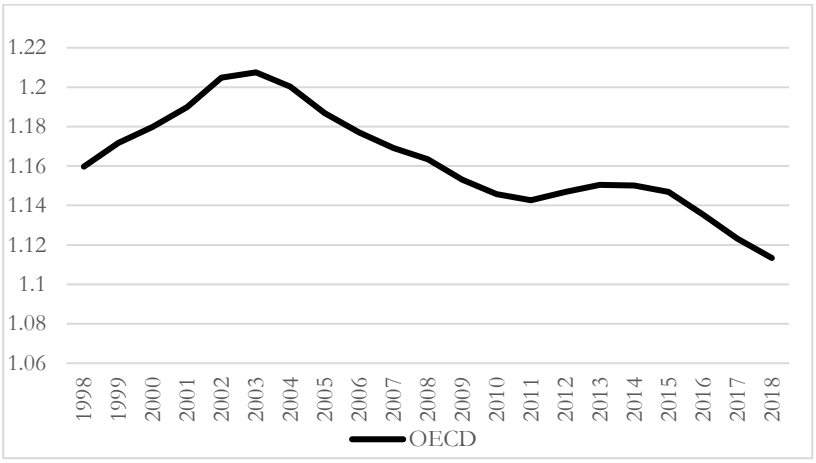

Figure 12 - Evolution of the WGI indicators' average for OECD, complete series

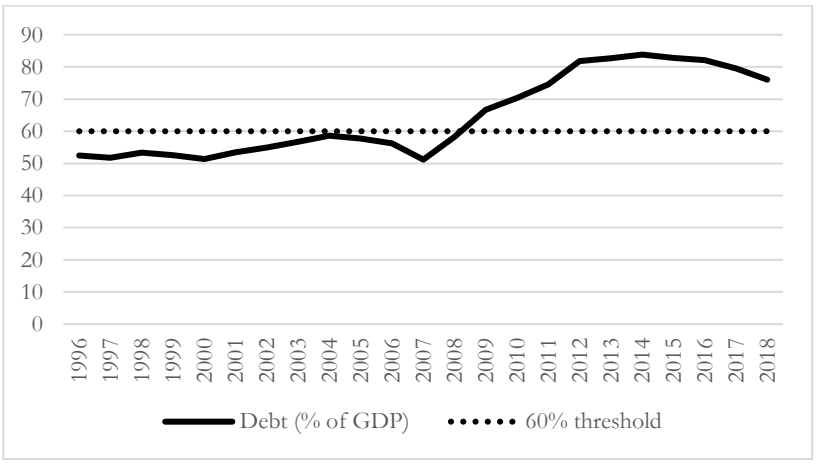

Figure 13 - Evolution of the Debt to GDP ratio for OECD, complete series

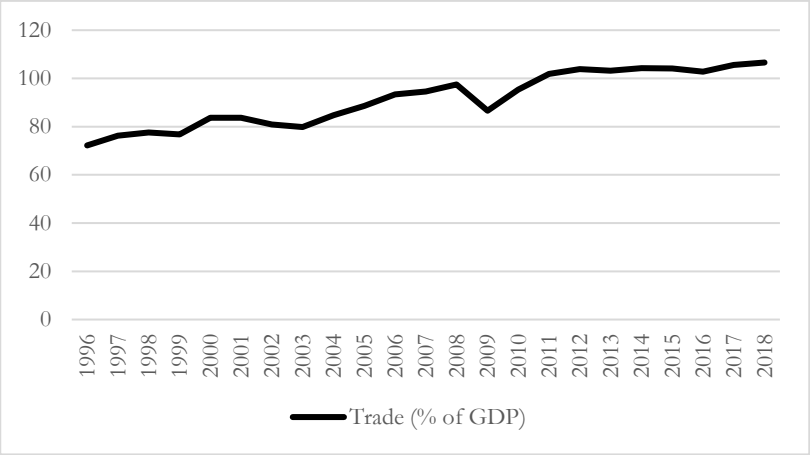

Figure 14 - Evolution of Trade for OECD, complete series

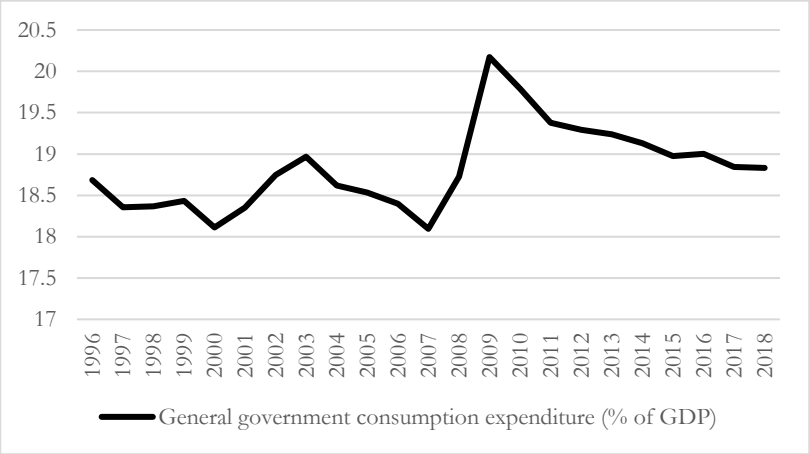

Figure 15 - Evolution of General government consumption expenditure for OECD, complete series

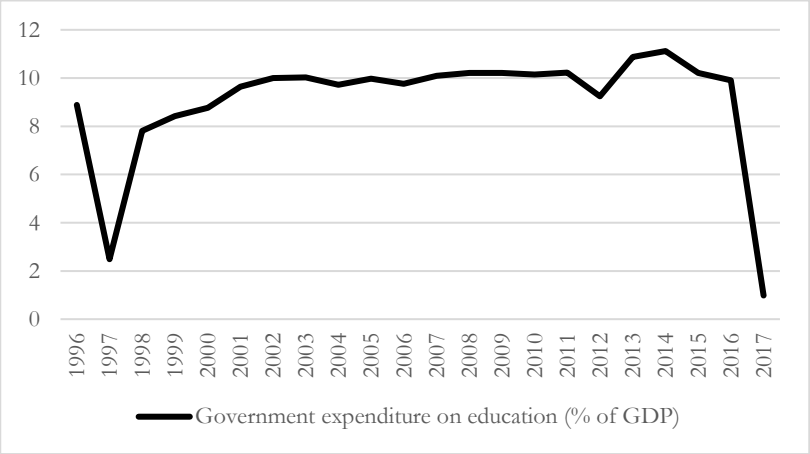

Figure 16 - Evolution of Government expenditure on education for OECD, complete series

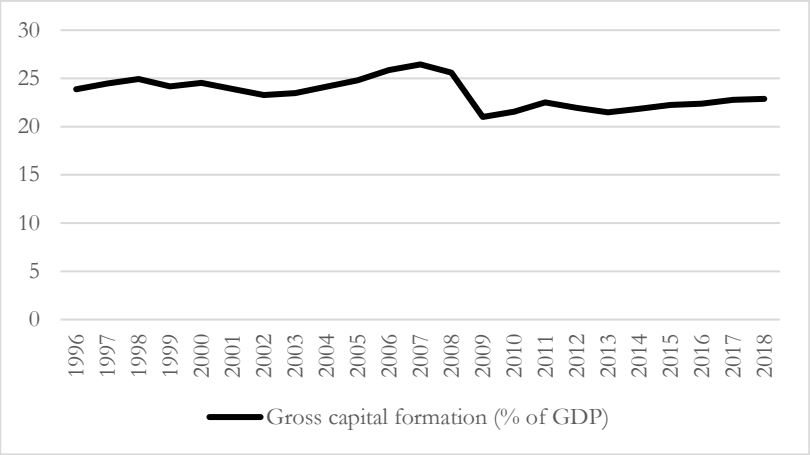

Figure 17 - Evolution of Gross capital formation, complete series

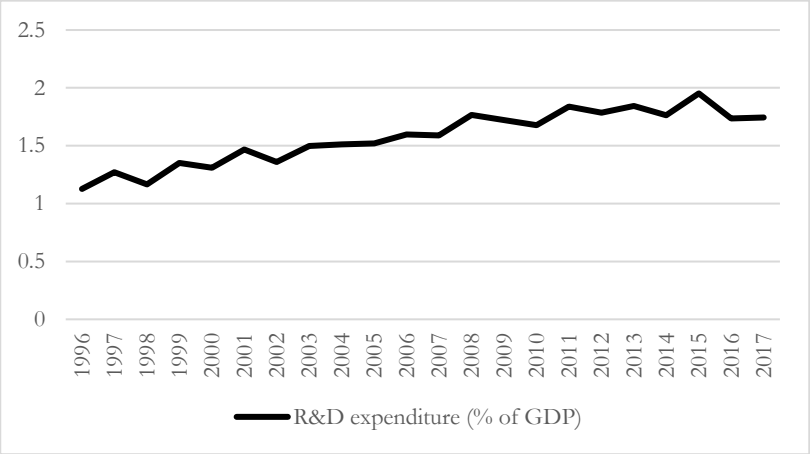

Figure 18 - Evolution of R&D expenditure, complete series

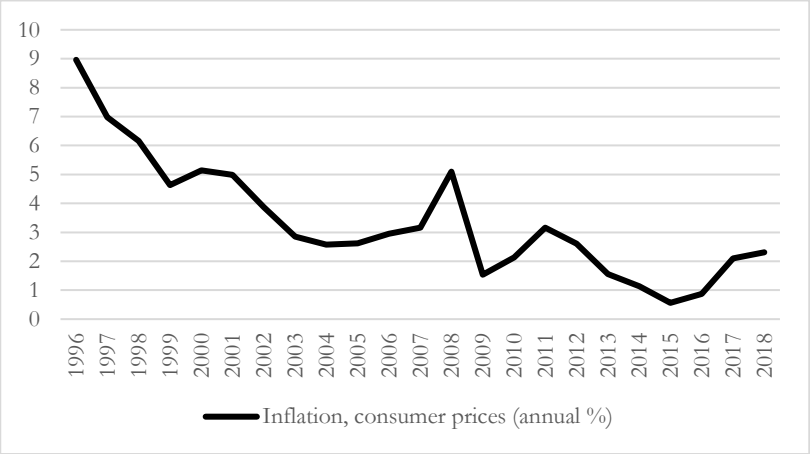

Figure 19 - Evolution of Inflation, complete series