
The Macroeconomic Impact of Competition: a Panel Data Approach

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Abstract

This thesis aims to evaluate the macroeconomic impact of competition and competition law on two main variables: economic growth and inequality. Using data from 109 countries, for the 1961-2010 period, we estimate a model that evaluates the effect of competition, measured using the Competition Law Index (CLI), on economic growth measured by the GDP Growth Rate, and Inequality, measured by the Gini coefficient. We concluded that competition promotes economic growth, in line with the literature. Additionally, we find that this impact is greater for low and lower-middle income countries, which highlights the importance of competition as a engine to economic growth. Similarly, we find evidence that competition decreases inequality. On average, an increase in CLI by 0.1 (10%) leads to a 0.25 (0.12) increase (decrease) in economic growth (inequality).

Keywords: Competition; Competition Law; Economic Growth Rate; Income Inequality.

JEL Classification: C23, C22, O11, O40, O47.

Resumo

Com esta dissertação pretendemos avaliar o impacto da concorrência e da lei da concorrência sobre as seguintes variáveis macroeconómicas: o crescimento económico e a desigualdade. Utilizando uma base de dados para 109 países, entre o período de 1960-2010, estimamos um modelo que avalia o impacto da concorrência, utilizando o Competition Law Index (CLI), no crescimento económico, medido pela taxa de crescimento, e na desigualdade, medida pelo coeficiente de Gini. Concluimos que a concorrência promove o crescimento económico, que vai de acordo com a literatura disponível. Similarmente, os nossos resultados apontam que este impacto é superior nos países de baixo e de médio baixo rendimento, o que realça a importância da concorrência como um mecanismo de crescimento económico. Adicionalmente, encontramos evidência que a concorrência diminui a desigualdade. Em média, um aumento no CLI de 0.1 (10%) gera um aumento (decréscimo) de 0.25 [0.12] no crescimento económico [desigualdade].

Palavras-Chave: Concorrência, Lei da Concorrência, Taxa de Crescimento; Desigualdade de Rendimentos.

Classificação JEL: C23, C22, O11, O40, O47.

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1 Introduction

Over the last few decades, in particularity, since the 1990s, competition between firms has been rising, and as such competition law has become an important part of the regulation in any given country. The consumer's ability to choose between different providers of goods and services, forces firms to compete with one another, for the consumers preference. Economists believe, that competition can have a positive impact on the economy. Although it is hard to measure the impact that competition and competition law has on the economy, the relationship is easier to identify. Enforcing competition law by competition agencies, and other policy-makers, promotes more competition in the markets, leading to higher productivity growth in these industries, which eventually leads to higher economic growth.

According to the literature, greater competition levels in a market are usually linked to gains in productivity and innovation (Aghion, Blundell, Griffith, Howitt, and Prantl, 2009). Competition leads to a better resource allocation, granting more efficient firms the chance to penetrate industries, and improve its market share, leaving behind the not so efficient firms. Higher levels of competition are also related to better management practices, enhancing the productive efficiency of firms. Several studies have shown that competition has a positive effect on innovation, given that, when facing competition, competitive rivals will innovate more (Aghion, Bloom, Blundell, Griffith, and Howitt, 2005). This is evident, in moderately competitive markets, which innovate the most. More competition may lead to further investment in innovation, since it may cut down the firm's rents before innovation, more than it does after implementing the innovation. It means that more competition may increase the incremental profits and encourage R&D to escape competition.

Taking this into account, this paper aims to shed light on the relationship between competition law and, both, inequality and growth rate. In particular, we aim to understand whether there is a positive impact of competition on development countries and low-income regions. Our results suggest that promoting competition, will decrease inequality and promote higher growth rates.

The rest of the dissertation is organized as follows. The Section 2 covers the literature re-

view, where we analyze topics related to competition, we discuss the several measures used by researchers to measure competition, as well as the impacts of competition on a macroeconomic level . In Section 3, we describe the data used for our empirical research and the description of the model we employ. In Section 4 we reflect on the empirical results obtained, with our research, presenting the impacts of competition on economic growth and inequality. Finally, in Section 5, we present the concluding arguments and summary of our research.

2 Literature review

2.1 Measuring Competition at a Microeconomic Level

One of the most common methods to measure the level of competition within an industry is the Herfindahl-Hirshman Index (HHI) (Fernández-Kranz and Santaló, 2010). The HHI is a standard concentration index that adds the market share's square players to the industry in a specific period. The index varies from 0 to 1, where values close to 0 (1) mean high (low) competition levels.

According to Leong and Yang (2020), if the HHI assumes a value below 0.01, it means that the industry faces low concentration and highly competitive pressure. On the other hand, if the value is above 0.25, it indicates high concentration levels or less competitiveness. However, this index is extremely sensitive to the relevant market definition, which can be problematic when analyzing market power from different industries over a long period. Nonetheless, the U.S. Census Bureau highlights that the magnitude of HHI is limited since it only includes manufacturing industries from listed and non-listed companies, and it is only available every five years. Compustat provides data on annual sales that can be used as an alternative to the HHI. However, this proposed index only offers data on listed companies. Some authors combine these two indexes and employ a fitted HHI measure (Horberg and Phillips, 2010; Dupire and M'Zali, 2016; Leong and Yang, 2020). When combining both indexes, the authors obtain data to measure the level of industry concentration that considers all information on both public and private firms across all industries. Leong and Yang (2020) use other measures such as the number of players present in an industry: usually, a higher number of players present in the industry is positively correlated with the competition. They also considered the proportion of total sales of the top four players in the industry. In this case, if the proportion of sales is large, presumably, the market will be more concentrated on these four players.¹

Several authors have also created alternatives indicators to measure competition. Nickell

¹Despite being easy to calculate and globally agreed upon researchers as an expression of oligopolistic concentration in a market, the HHI lacks to an extent since it does not reflect the pressure of imports on the market neither the latent competition. To compensate for this flaw on the HHI, Funakoshi and Motohashi (2009) added a control indicator obtained from the manufacturer invisible import rate, which eliminates the invisible imports at the market scale. Another issue of the HHI is that it is determined for each market, and cannot be applied to firms that operate in more than one market. To deal with this, the authors assign weights based on the sales per market.

(1996) uses a survey-based measure of competition for one time period only. This survey measure considers the manager's answers to a yes or no survey, which assumes the value one if the manager's answer to the questions is yes. The author argues that the managers of the surveyed companies are the most aware of their competitors and, therefore, is an important measure of competition. Additionally, the author considers that the average levels of rent, as higher rents are usually a sign of lower competition. Therefore, the level of competition is reflected by these two variables, since (i) the firm's managers are the ones most aware of the competitor that the firms face, and (ii) the level of rents complement this measure. Aghion, Braun, and Fedderke (2008) establish a link between competition and productivity using the size of the mark-ups over the marginal cost of production, as a measure of competitive pressure. To account for possible unreliability issues, the authors follow two distinct methods to calculate mark-ups. First, the authors follow a method suggested by Roeger (1995), who computes the dual of the square residuals (DSR) and obtains the relation between price-based productivity measure and the mark-up; afterwards, the author would obtain the nominal square residuals, on which the productivity shocks are annulled. Additionally, they follow Aghion, Bloom, Blundell, Griffith, and Howitt (2005) and analyses the extent of pricing power in an industry, using a Lerner Index proxy. Since mark-ups are the price practiced by firms above the marginal cost, a decrease of mark-ups is associated with higher competition.

2.2 Measuring Competition at a Macroeconomic Level

Taking into account that we are interested in analyzing the impact of competition at a macroeconomic level, it is important to find macroeconomic indicators of competition.

Ospina and Schiffbauer (2010) combine mark-ups and cost competition. The authors obtain the cost competition from the World Bank Enterprise Survey to measure the degree of competition. Cost competition is a discrete variable that assumes values from 1 to 4 (from low to high importance) and represents the firm's response to the survey's questions. The World Bank Enterprise Survey contains information on several corporate control variables that capture differences in the firm-level and differences concerning the countries or industries.

Buccirossi, Ciari, Duso, Spagnolo, and Vitale (2013) propose a set of Competition Policy Indicators. These indicators consist on the degree of independence of competition authority or economic interests; the separation between the prosecutor and adjudicator in a competition case; how close the rules that make the partition between legal and illegal conducts are to their effect on social welfare; the scope of investigative powers the competition authority has; the level of the overall loss that can be imposed on firms and their employees if these are convicted; the toughness of competition authority given by the level of activity and the size of the sanctions that are imposed on firms; and their employees in case of a conviction; and the amount and the quality of the financial and human resources a competition authority can rely on when performing its tasks. According to the authors, these features are key in deterring anti-competitive behaviors, which are then aggregated to form the Competition Policy Indicators, which summarizes all key elements of a country's policy on the competition. They also generate the disaggregated CPI, based on disaggregated variables, that refer to specific competition policy conditions, related to certain cases, and behaviors. The disaggregated CPI allows us to understand the separated effects of institutional and enforcement features. To compute the CPI, the authors collect information, on the features that they consider having the strongest impact in deterring anti-competition behaviors. The authors attribute a score on a scale of 0 to 1 to each feature of competition policy, based on a general agreed best practice benchmark. They then summarize these features into three different CPI indexes: the antitrust CPI and the merger CPI; the institutional CPI and the aggregate CPI. According to Gutmann and Voigt (2014), the CPI problem is that it does not account for the endogeneity properly since the instruments used are not exogenous to the conditions of the economy. The CPI aggregates instruments for 22 industries of 12 OECD countries, which conveys that their results cannot be generalized, being questionable whether these results bear the same to undeveloped countries.

Similarly to the CPI, Bradford and Chilton (2018) compute a new form to measure competition, the Competition Law Index (CLI), which measures competition's stringency. This index combines the key elements of regulatory authorities and the competition laws practiced in each country, for each year after introducing competition law. The aggregation of these elements provides a measure of the intensity of the regulation of competition. With the CLI, the authors

aim to provide a measure of the intensity of competition regulation, for as many countries as possible for the longest possible period. The dataset incorporates information of 123 countries and includes all the competition laws imposed from the first time a competition law was introduced, totaling in a sample that spans from 1889 to 2010, and codes in total 700 individual laws across 100 variables. Although with limitations, the CLI is the first index that quantifies most jurisdiction's competition laws for the complete lifetime of competition law. With this index, the researchers hope that the CLI may improve the measurement of competition to better access the outcomes of competition law, especially the link between competition and several macroeconomic variables.

Recently, Loecker, Eeckhout, and Unger (2020) suggested a new approach named the production approach, which relies on a firm output and input data and posits cost minimization by producers. This approach's advantages are that it does not require a specific demand model for many heterogeneous markets over the long term and that the necessary data is publicly available.

2.3 Relevant empirical literature

For the purpose of our research question, it is extremely important to understand the link between competition and macroeconomic outcomes. The first step is, thus, to define competition. In the subsections below, we provide an overview of the empirical literature linking competition and different macroeconomic variables, as well as the different measures of competition used throughout.

2.3.1 Competition and Productivity Growth

Nickell (1996) uses two main industry-level measures of competition: a) the number of competitors in the market; and b) the level of rents. The author provides evidence that competition is statistically significant with faster productivity growth, and suggests that the gain in productivity can be due to the increase in the manager's incentive to work harder in the shareholder's interest. This suggestion is tested and proven empirically for Germany and the U.K. by Koke and Renneboog (2005), as corporate governance and product market competition can have a positive

effect on the productivity growth. This positive effect of competition on productivity growth has been also supported by other empirical studies, such as Porter and Sakakibara (2004), which state a positive correlation between industries facing foreign competition, and faster productivity growth in comparison to those operating only in domestic markets. These results have also been corroborated by Okada (2005) and Funakoshi and Motohashi (2009), as higher level of competition (measured by the level of industrial price-cost margin) is linked to higher productivity growth.

While there are not many studies available on the relationship between competition and productivity growth for developed countries, Aghion et al. (2008) provide the first study on South Africa using mark-ups on prices to measure competition. The evidence suggests that these mark-ups are higher in manufacturing industries when compared to the rest of the world. The authors argue that a reduction in mark-ups, associated with the implementation of competition policy and an increase of product market competition, positively impacts productivity growth, between 2% and 2.5% per year. Similar studies, finds the similar effects of competition on productivity growth in Latin America (Cole, Ohanian, Riascos, and Schmitz, 2005) and India (Aghion, Burgess, Redding, and Zilibotti, 2003).

Apart from productivity gains, there is some literature suggesting that competition can have a positive externality on other sectors. In particular, competition in the upstream sector can have a cascade effect and improve performance in downstream sectors, promoting both employment and productivity throughout the economy (Bourlès, Cetto, Lopez, Mairesse, and Nicoletti, 2013; Forlani, 2010).

The main reason seems to be that competition leads to better allocation efficiency, allowing new and more efficient firms to enter industries and earn more market share, causing less competitive firms to exit the market. Arnold, Nicoletti, and Scarpetta (2011) find that productivity growth is associated with a reallocation of resources, from the less productive to the more productive firms. In the same vein, Harris and Li (2008) finds that the productivity growth observed in the U.K. is mainly due to between-firm effects rather than within-firm effects. The between-firm effects come from the improvement in allocation efficiency, which allows the more efficient firms to enter the market at the cost of less efficient firm's. The within-firm effect refers to

the fact that firms under competition are better managed, which improves the firm's productive efficiency. Similarly, Hahn (2003) concludes that Korea's productivity growth arises from the industry's entry and exit. Nevertheless, there may also prevail within-firm effects, caused by competition. Notwithstanding, the effects of competition are also associated with within-firm effects, given that greater competition is associated with better-managed firms, and improving productive efficiency (Nickell, 1996). Product market competition can provide better discipline managers, given that the productivity-enhancing effects for companies owned and managed by an individual were not as great as the ones for companies with stronger shareholding control. Bloom and Reenen (2007), while studying the link between product market competition and the quality of management, found that poorly managed practices are prevalent in industries where competition is weaker, and believed that competition could eliminate this tendency.

2.3.2 Competition and Innovation

There is some empirically evidence that firms facing competition tend to innovate more, whether by creating new products or new cost-reducing production processes. Aghion et al. (2005) and Polder and Veldhuizen (2012) state that the relationship between innovation and competitive markets is shaped like an inverted-U, since moderately competitive markets tend to innovate more, or monopoly and markets with excessive competition innovate less. The inverted U, which characterizes the relationship between competition and innovation, can be explained as the effect of the relationship between the intensity of competition and the state of technological progress in the industry. There is an incentive for firms with similar technology to innovate in order to avoid competition. This incentive becomes stronger, the more competitive the industry becomes. Several authors have recently challenged this inverted-U relationship. Using the same database as Aghion et al. (2005), Correa (2011) reports a positive relationship during the period 1973-1982 and, due to a structural break in the data, no relationship within the 1983-1994 period. Additionally, Correa and Ornaghi (2014) finds a positive relationship between competition and both patent counts and productivity growth, two alternative measures of innovation. Similarly, Arnold, Nicoletti, and Scarpetta (2008), provide evidence that restrictions on competitive regulation have a strong negative impact on Information and Communications Technology (ICT) in technology,

pointing out that firms which operate in more liberal markets are more inclined to incorporate ICT in their production process than firms operating in a market more restricted.

2.3.3 Competition Policy

Taking into account that more competitive markets lead to an increase in productivity, applying policies that encourage or preserve competition will lead to faster economic growth. The literature suggests that policies that promote competition, like the enforcement of competition law and the removal of regulations that restrict competition, have a positive impact not only on productivity growth, but also on the overall economic growth. However, while it is difficult to distinguish the effect of individual policy changes, there are a few studies that demonstrate that the introduction of competition law can be directly linked to higher productivity (Gutmann and Voigt, 2014; Buccirossi, Cari, Duso, Spagnolo, and Vitale, 2013).

Evidence shows that there can be an increased growth due to product market deregulation. The available empirical literature, suggest that deregulation events, which lower product market regulation leads to higher economic growth (Factsheet on How Competition Policy Affects Macroeconomic Outcomes, 2014). The growth increment is suggested to be related to the shifting of resources from the less efficient to those who are more efficient in the market, through competition (Nicoletti and Scarpetta, 2003; Arnold, Nicoletti, and Scarpetta, 2011). According to Ospina and Schiffbauer (2010), regulatory policies aiming to improving competition, lead to higher gains of productivity. The authors also argue that countries that have implemented product-market reforms, have a more perceptible increase in competition, and therefore, have a similar increase in productivity, estimating the impact of competition to be around 12-15 per cent on productivity growth.

2.3.4 Competition and Inequality

There seems to be a gap in the literature on the relationship between competition and inequality. While some can benefit more than others with higher levels of competition, in general, imposing restrictions on competition cause more harm than good since prices tend to rise with these restrictions, harming consumers, especially the poorest ones (Hausman and Sidak, 2004). Some

studies suggest that market liberalization is especially beneficial for low-income people, given the reduction of prices and the increase in productivity (Schivardi and Vivano, 2011; Bertrand and Kramarz, 2002; Vivano, 2008). Urzua (2013) points out that poorer people are more often harmed from an uneven level of market power, and, similarly, Stucke (2012), states that policies that focus on competition should promote more economic opportunities and that competitive market should foster activities correlated with the consumer's better well-being and happier people.

2.3.5 Competition and Employment

Lastly, some researchers argue that higher levels of competition can positively impact employment in the long run. In this sense, Griffith, Harrison, and Macartney (2007) analyzed the impact of policy shocks and argued that product market liberalization decreases unemployment levels. Similarly, Fiori, Nicoletti, Scarpetta, and Schiantarelli (2012) investigated the effect of regulatory restrictions on product market competition and came to similar findings.

3 Data and Methodology

Data on the GINI coefficient and CLI were retrieved from Solt (2020) and Bradford and Chilton (2018), respectively.² The GDP growth rate was calculated based on the variable RGDPE retrieved from the PENN World Table (Version 10) (Feenstra, Inklaar, and Timmer, 2015).³ To select the necessary control variables, we follow Frost and Van Stralen (2018). We included the following variables: Unemployment level (*Unemp*), retrieved from the World Bank database; Total factor productivity (*TFP*), which defines Total Factor Productivity level at current PPPs; Share of gross capital formation (*Invest*), which represents the share of gross capital formation at current PPPs ; and Share of government consumption (*Gov*), share of government consumption at current PPPs. The latter three variables were gathered from the PENN World Table. Information regarding the geographical location of the countries, as well as their income level, was retrieved from the World Bank database.

3.1 Descriptive Statistics

All the data is described above. When matching all the datasets, we end up with an unbalanced panel with 109 available countries, over 60 years (1961-2010). We decided not to exclude any countries, even though some countries do not have data for all years. As mentioned before, the CLI only accounts for competition indicators, from the first competition law imposed in a given country. The CLI consists of two categories of variables, as mentioned above, one of the categories captures provisions on the Authority to regulate competition, and the other captures the Substance of the law. The category of variables, that the authors refer to as Authority, refers to provisions on the responsible to enforce competition law and its limits of application. The Substance, refers to substantive rules regulating competition, in particular merger control rules, abuse of dominance and anti-competitive agreements. After weighing these two categories, equally, the authors calculate an overall score from 0 to 24, which is then normalized to range from 0 to 1.

Our Gini takes a value between 0 (perfect quality) and 1 (perfect inequality). The control

²<https://fsolt.org/swiid/>

³<https://www.rug.nl/ggdc/productivity/pwt/?lang=en>

ID	Observations	Mean	Std. Dev.	Min	Max
<i>Growth Rate (%)</i>	2,349	4.400	6.429	-43.973	46.675
<i>Gini</i>	2,166	0.363	0.091	0.205	0.672
<i>CLI</i>	2,349	0.458	0.311	0	1
<i>Unemployment Total</i>	2,349	7.676	4.984	0.180	37.9
TFP level	2,349	0.749	0.242	0.130	1.734
<i>Share of Government Consumption</i>	2,349	0.178	0.071	0.019	0.719
<i>Share of Gross Capital Formation</i>	2,349	0.241	0.089	0.004	0.676

Table 1: Descriptive Statistics

variables are taken from the Penn World Tables (PENN) or the World Bank Database. Table 1 gives descriptive statistics.

We have decided to classify our countries both by income group and region group. In terms of income, our sample is divided into low, lower-middle, upper-middle and high-income countries. With this classification, we can better identify whether competition is important for low-income countries, and estimate the differences of its impact on different income groups and different regions. Figure 1 presents the overall trends for the region and income group, for the most important variables (Country Classification is shown in Appendix A).

According to Figure 1, the economic growth rate for each income group and region group has been increasing throughout time. The biggest improvement in growth occurs in lower-middle income countries and in the upper-middle income countries, which varies in 0.04 percentage point (pp) and 0.085 pp respectively. By region, we observe that despite not being significant in absolute value when compared with the other regions, the region of Asia and Africa, have seen the biggest fluctuation, and have increased the most over time when compared to the other regions. In terms of inequality, only the countries in the upper-middle income group have seen their inequality decreased exponentially, when compared to the other groups, which inequality has increased over the years observed, from 1960 to 2010. As mentioned before, competition law has become over time a more integral part of every country regulation, and as such, the CLI has been consistently rising over time in all income and region groups.

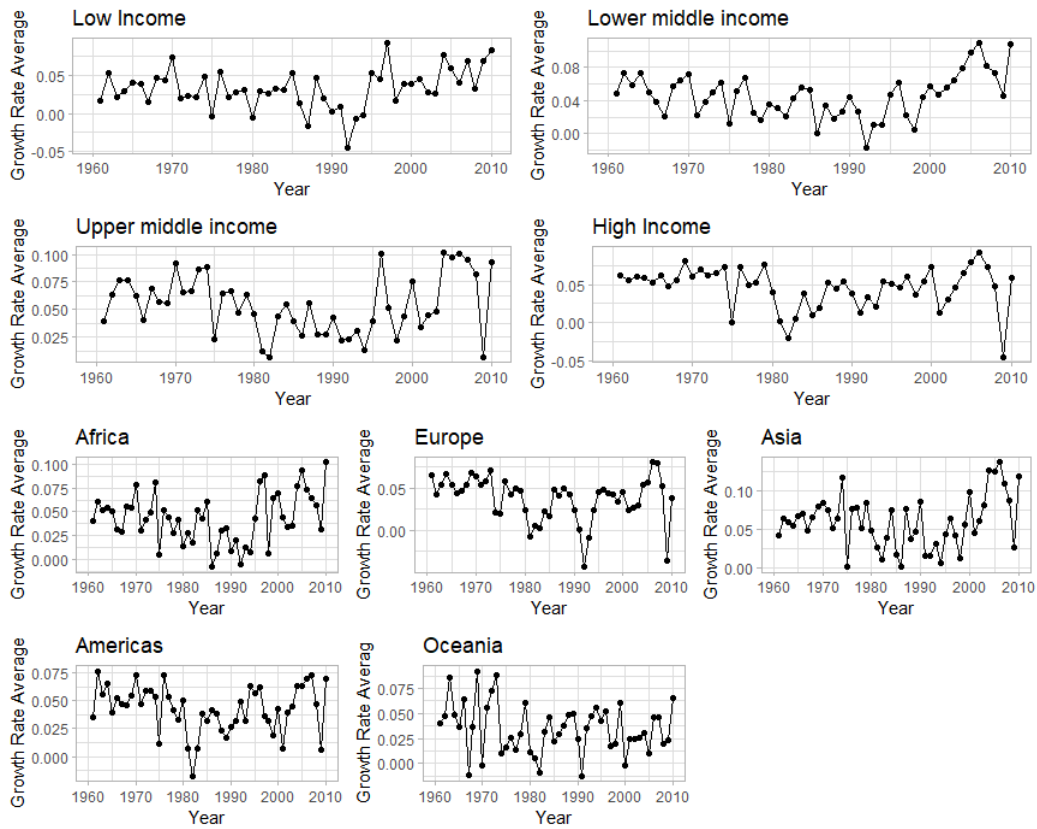


Figure 1: Growth Rate by Income Group and Region

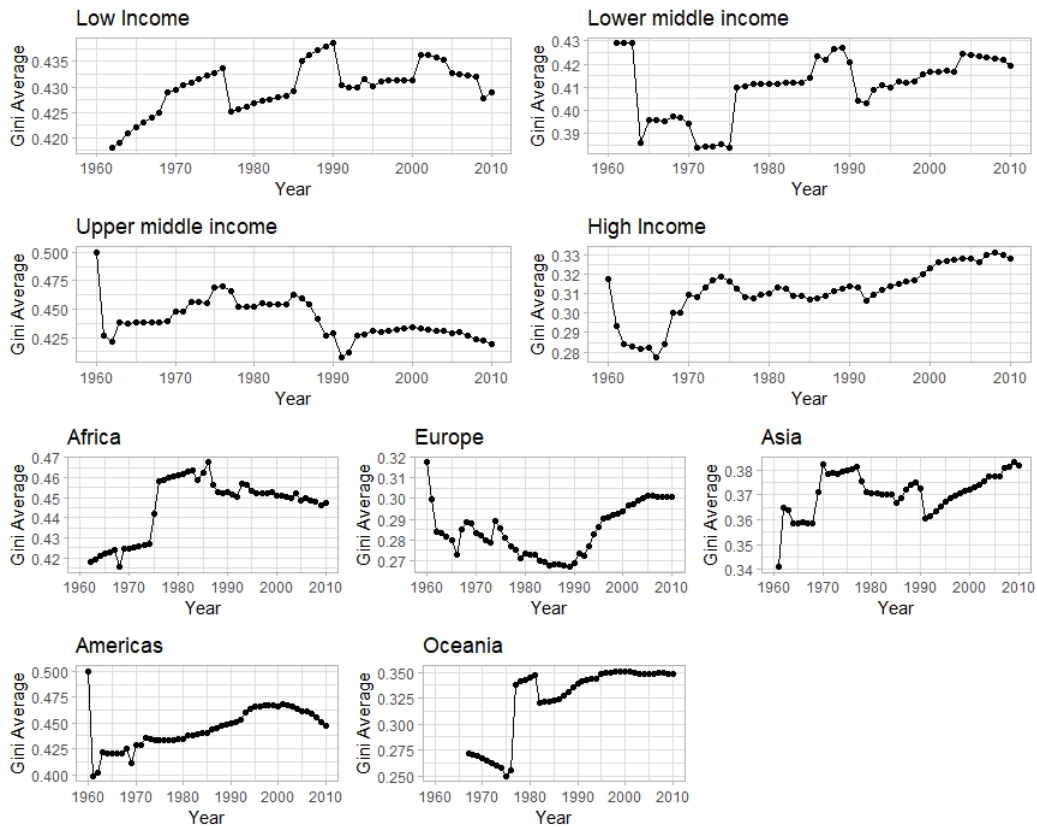


Figure 2: GINI by Income Group and Region

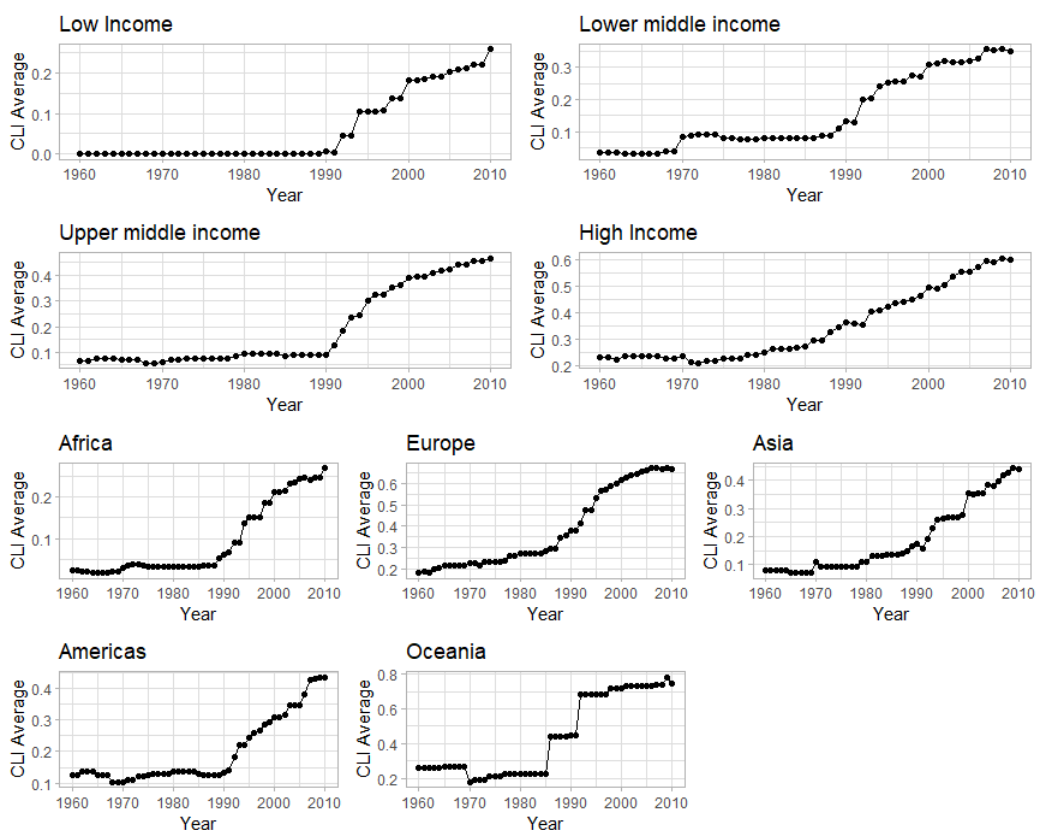


Figure 3: CLI by Income Group and Region

3.2 Model specification

To empirically estimate the effects of competition law on economic growth, we estimate both cross-country and panel data models for the sample of 76 countries. Following Frost and Van Stralen (2018), we apply the following regression equation:

$$GDPgrowth_{it} = \alpha_0 + \alpha_1 CLI_{it} + \alpha_2 Unemp_{it} + \alpha_3 TFP_{it} + \alpha_4 Invest_{it} + \alpha_5 Gov_{it} + \mu_{it}, \quad (1)$$

where $\mu_{it} = \eta_i + \nu_m + \gamma_r + \varepsilon_{it}$. η_i is an individual country fixed effect, ν_m is an income fixed effect, γ_r is a regional fixed effect, and ε_{it} is assumed to be independently and identically distributed among country-years. Subscript m varies from 1 to 4 and accounts for the four income groups (high-income, upper-middle, lower-middle, and low). Subscript r varies from 1

to 5 and accounts for the five regions identified by the the World Bank (Africa, Americas, Asia, Europe and Oceania). Subscript it denotes country i in year t .

To empirically study the effects of competition law on income inequality, we took advantage of the fact that the Gini coefficient ranges from 0 to 1 and we estimated a fractional logit model based on Equation 1 (Wooldridge, 2019; Papke and Wooldridge, 2008). To correctly estimate the model, we had to balanced the database (Wooldridge, 2019; Papke and Wooldridge, 2008) . Considering the average number of observations per country and the time available, we opted to keep only the countries with information for all the variables from 1990 onwards. In the end, 41 countries remained.⁴

⁴Argentina; Australia; Austria; Barbados; Belgium; Bulgaria; Canada; Chile; China; Costa Rica; Cyprus; Denmark; Egypt; Finland; France; Germany; Greece; Hungary; Ireland; Israel; Italy; Jamaica; Japan; Korea; Luxembourg; Netherlands; New Zealand; Norway; Panama; Paraguay; Portugal; Spain; Sri Lanka; Sweden; Switzerland; Thailand; Turkey; United Kingdom; United States; Uruguay and Venezuela.

4 Empirical Results

4.1 The Impact of CLI on GDP Growth

Results for the GDP growth rate are reported in Table 3. Following Fortuna and Neto (2020), Maurseth (2018) and Choi and Yi (2017), Equation (1) was estimated by: (1) pooled Ordinary Least Squares (OLS), (2) Random Effects (RE); (3) country Fixed Effects (FE); (4) Income Fixed Effects (IE); (5) Regional Fixed Effects (RFE); and (6) panel Generalized Method of Moments (GMM), which accounts for possible endogeneity by using lagged levels of all the variables as instruments.⁵ Apart from the OLS case, CLI contributes positively to economic growth. On average, a 0.1 increase in CLI (note that CLI varies from 0 to 1) leads to an increase in growth rate by 0.25.⁶ To account for a possible interaction between competition law and the level of income, we added an interaction term on the IE model (Table 2, IE with interaction). The model captures the relationship between the income level and the impact of CLI on economic growth, as follows:

$$\widehat{GDP\text{growth}} = 10.892 \times CLI - 2.723 \times CLI \times Income, \quad (2)$$

where *Income* varies from 1 to 4, 1 being the low-income countries and 4 the high-income countries. Interestingly, poorer countries seem to benefit more from competition law, as its impact on economic growth appears to fade as the average income increases (Table 3).

	Low-income	Lower-middle income	Upper-middle income	High-income
CLI marginal impact	8.169	5.446	2.723	0.100

Table 2: CLI marginal impact by income group

The selected control variables are statistically significant in almost all of the models and present the expected sign: higher levels of unemployment and government consumption are typically associated with lower economic growth (Connolly and Li, 2016; Castells-Quintana and

⁵The GMM model was estimated with Stata's `xtabond2` command proposed by Roodman (2009).

⁶This value corresponds to the average among the α_1 across the presented models. We did not include the value associated with the OLS model (as it is not statistically significant). To retrieve the average impact associated with CLI from model 6, we calculated an average of the alphas for the four income groups. The average is 4.1.

VARIABLES	(1) gdp_ols Growth rate	(2) gdp_re Growth rate	(3) gdp_fe Growth rate	(4) gdp_income Growth rate	(5) gdp_region Growth rate	(6) gdp_cross Growth rate	(7) gdp_endogenous Growth rate
CLI	0.001 (0.470)	1.583** (0.777)	1.654* (0.853)	1.708** (0.798)	1.722** (0.797)	10.892** (4.543)	4.080** (1.959)
Unemployment	-0.064* (0.033)	-0.124** (0.061)	-0.140* (0.071)	-0.121* (0.063)	-0.124** (0.061)	-0.135* (0.069)	0.072 (0.182)
TFP	-0.670 (0.725)	5.496*** (1.888)	7.213*** (2.433)	6.133*** (2.101)	5.502*** (1.914)	7.827*** (2.395)	14.507** (6.190)
Gov	-10.155*** (2.551)	-24.379*** (5.262)	-27.095*** (5.587)	-24.157*** (5.272)	-24.367*** (5.254)	-25.796*** (5.055)	-11.149 (11.464)
Invest	8.197*** (1.888)	8.764*** (3.323)	9.930** (3.991)	9.763*** (3.666)	8.364** (3.482)	8.887** (3.993)	36.906*** (13.027)
incomegroup_c						14.014*** (1.390)	
c.cli_overall_norm#c.incomegroup_c						-2.723** (1.325)	
Observations	2,349	2,349	2,349	2,349	2,349	2,349	2,240
R-squared	0.039		0.088				
Number of i		109	109	109	109	109	104

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3: Growth-Rate Regression Results

Royuela, 2012), whereas higher levels of productivity and investment are associated with stronger economic growth rates (Aghion, 2016).

4.2 The impact of CLI on GINI

Results for the GDP growth rate are reported in Table 3. Following the same reasoning as above, apart from the traditional OLS estimation (Model 1) and the standard fractional logit model (Model 2), we included income-fixed effects (Model 4) and regional-fixed effects (Model 5). In the case of country-fixed effects, we have also added time-fixed effects as in this case they were considered statistically significant. The reported estimated coefficients correspond to the marginal effects. Across all the models, CLI contributes to reducing inequality. On average, an increase in 10% on CLI leads to a marginal impact of 0.12 decrease in inequality.⁷ As a robustness check, we also estimated a fractional probit model and it is presented in Appendix B.

⁷This value corresponds to the average among the α_1 across the presented models. We did not include the value associated with the OLS model. If we have included it, the average value would be 0.7.

VARIABLES	(1)	(2)	(3)	(4)	(5)
	gini_ols	gini_logit	gini_logit_fe	gini_logit_income_fe	gini_logit_region_fe
	Gini	Gini	Gini	Gini	Gini
CLI	-0.320** (0.009)	-0.017** (0.005)	-0.004* (0.002)	-0.010* (0.005)	-0.017*** (0.004)
Unemployment	0.003*** (0.001)	0.022*** (0.005)	0.008*** (0.002)	0.025*** (0.004)	0.019*** (0.003)
TFP	-0.200*** (0.009)	-0.161*** (0.008)	-0.009** (0.004)	-0.108*** (0.010)	-0.064*** (0.007)
Gov	-0.485*** (0.040)	-0.077*** (0.006)	-0.001 (0.003)	-0.073*** (0.006)	-0.034*** (0.005)
Invest	-0.520*** (0.035)	-0.124*** (0.008)	0.011** (0.004)	-0.082*** (0.010)	-0.061*** (0.008)
Observations	861	861	861	861	861
R-squared (Pseudo R-squared)	0.4754	-	-	-	-
Number of i	41	41	41	41	41

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4: Gini Regression Results - Fractional Logit

5 Concluding Remarks

Since competition has its benefits, competition policy is important to restrain firms from undertaking certain behaviors that give them advantage over its competitors. In recent years, the importance of competition law has been highlighted and has become an integral part of countries regulation. It is important for the market and consumers to restrain firms from incurring in anti-competitive behaviors.

Although the impact of competition on microeconomic variables has been vastly studied, the same cannot be confirmed on a macroeconomic level. We developed a panel data analysis for 109 countries for the period of 1961-2010, where we aimed to provide evidence of the impact that competition law has on growth and inequality. This approach allows us not only to evaluate this impact, but also to evaluate the impact of competition on different countries of different income groups and regions.

Our results suggest that competition positively impacts economic growth, in particularity in the case of low-income countries, which suggests that promoting competition on this group can have a potentially higher impact on its economic growth and development. Similarly, our results point out that an increase in competition law has a positive marginal effect on inequality, enhancing the benefit for consumers of competition.

Finally, these results seem to evidence the important role that competition has in the economy. Moreover, how promoting it can be very beneficial to all economies, especially those in development.

6 Appendix

Appendix A

Country	Region	Income Group	Country	Region	Income Group	Country	Region	Income Group	Country	Region	Income Group
Angola	Africa	Lower middle income	Ethiopia	Africa	Low income	Lesotho	Africa	Lower middle income	Saudi Arabia	Asia	High income
Argentina	Americas	Upper middle income	Fiji	Oceania	Upper middle income	Lithuania	Europe	High income	Senegal	Africa	Low income
Armenia	Asia	Upper middle income	Finland	Europe	High income	Luxembourg	Europe	High income	Sierra Leone	Africa	Low income
Australia	Oceania	High income	France	Europe	High income	Malaysia	Asia	Upper middle income	Singapore	Asia	High income
Austria	Europe	High income	Gabon	Africa	Upper middle income	Malta	Europe	High income	Slovak Republic	Europe	High income
Barbados	Americas	High income	Germany	Europe	High income	Mauritania	Africa	Lower middle income	Slovenia	Europe	High income
Belgium	Europe	High income	Greece	Europe	High income	Mauritius	Africa	Upper middle income	South Africa	Africa	Upper middle income
Benin	Africa	Low income	Guatemala	Americas	Upper middle income	Mexico	Americas	Upper middle income	Spain	Europe	High income
Botswana	Africa	Upper middle income	Honduras	Americas	Lower middle income	Moldova	Europe	Lower middle income	Sri Lanka	Asia	Lower middle income
Brazil	Americas	Upper middle income	Hungary	Europe	High income	Mongolia	Asia	Lower middle income	Sudan	Africa	Lower middle income
Bulgaria	Europe	Upper middle income	Iceland	Europe	High income	Monoco	Africa	Lower middle income	Sweden	Europe	High income
Burkina Faso	Africa	Low income	India	Asia	Lower middle income	Mozambique	Africa	Low income	Switzerland	Europe	High income
Burundi	Africa	Low income	Indonesia	Asia	Lower middle income	Namibia	Africa	Upper middle income	Tajikistan	Asia	Low income
Cameroon	Africa	Lower middle income	Iran, Islamic Rep.	Asia	Upper middle income	Netherlands	Europe	High income	Tanzania	Africa	Low income
Canada	Americas	High income	Iraq	Asia	Upper middle income	Nicaragua	Americas	Lower middle income	Thailand	Asia	Upper middle income
Chile	Americas	High income	Ireland	Europe	High income	Niger	Africa	Low income	Togo	Africa	Low income
China	Asia	Upper middle income	Israel	Asia	High income	Nigeria	Africa	Lower middle income	Trinidad and Tobago	Americas	High income
Colombia	Americas	Upper middle income	Italy	Europe	High income	Norway	Europe	High income	Tunisia	Africa	Lower middle income
Costa Rica	Americas	Upper middle income	Jamaica	Americas	Upper middle income	Panama	Americas	High income	Turkey	Asia	Upper middle income
Croatia	Europe	High income	Japan	Asia	High income	Paraguay	Americas	Upper middle income	Ukraine	Europe	Lower middle income
Cyprus	Asia	High income	Jordan	Asia	Upper middle income	Peru	Americas	Upper middle income	United Kingdom	Europe	High income
Czech Republic	Europe	High income	Kazakhstan	Asia	Upper middle income	Philippines	Asia	Lower middle income	United States	Americas	High income
Denmark	Europe	High income	Kenya	Africa	Lower middle income	Poland	Europe	High income	Uruguay	Americas	High income
Dominican Republic	Americas	Upper middle income	Korea, Rep.	Asia	High income	Portugal	Europe	High income	Venezuela, RB	Americas	Upper middle income
Ecuador	Americas	Upper middle income	Kuwait	Asia	High income	Qatar	Asia	High income	Zambia	Africa	Lower middle income
Egypt, Arab Rep.	Africa	Lower middle income	Kyrgyz Republic	Asia	Lower middle income	Romania	Europe	Upper middle income	Zimbabwe	Africa	Low income
Estonia	Europe	High income	Latvia	Europe	High income	Russian Federation	Europe	Upper middle income			

Table 5: Country Classifications

Appendix B

VARIABLES	(1)	(2)	(3)	(4)	(5)
	<i>gini_ols</i>	<i>gini_probit</i>	<i>gini_probit_fe</i>	<i>gini_logit_income_fe</i>	<i>gini_logit_region_fe</i>
	Gini	Gini	Gini	Gini	Gini
CLI	-0.320** (0,009)	-0.017** (0.005)	-0.004* (0.002)	-0.010* (0.005)	-0.017*** (0.004)
Unemployment	0.003*** (0.001)	0.022*** (0.005)	0.008*** (0.002)	0.025*** (0.004)	0.019*** (0.003)
TFP	-0.200*** (0.009)	-0.162*** (0.008)	-0.009** (0.004)	-0.109*** (0.010)	-0.065*** (0.007)
Gov	-0.485*** (0.040)	-0.077*** (0.006)	-0.001* (0.003)	-0.074*** (0.006)	-0.035*** (0.005)
Invest	-0.520*** (0.035)	-0.125*** (0.008)	0.012** (0.004)	-0.083*** (0.010)	-0.062*** (0.008)
Observations	861	861	861	861	861
R-squared (Pseudo R-squared)	0.4754	-	-	-	-
Number of i	41	41	41	41	41

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6: Gini Regression Results - Fractional Probit

Appendix C

Table 7: Number of Observations by Country for the GDP

country	n()	country	n()	country	n()
Angola	6	Hungary	21	Panama	39
Argentina	41	Iceland	20	Paraguay	31
Armenia	10	India	4	Peru	39
Australia	32	Indonesia	29	Philippines	40
Austria	42	Iran	11	Poland	19
Bahrain	5	Iraq	1	Portugal	32
Barbados	35	Ireland	28	Qatar	6
Belgium	40	Israel	36	Romania	18
Benin	4	Italy	40	Russia	17
Botswana	11	Jamaica	33	Rwanda	4
Brazil	32	Japan	50	Saudi Arabia	13
Bulgaria	21	Jordan	16	Senegal	2
Burkina Faso	6	Kazakhstan	17	Sierra Leone	1
Burundi	3	Kenya	3	Singapore	40
Cameroon	5	Korea	42	Slovakia	17
Canada	41	Kuwait	19	Slovenia	17
Chile	34	Kyrgyzstan	11	South Africa	13
China	33	Latvia	15	Spain	42
Colombia	30	Lesotho	4	Sri Lanka	21
Costa Rica	21	Lithuania	17	Sudan	6
Croatia	15	Luxembourg	28	Sweden	36
Cyprus	36	Malaysia	27	Switzerland	36
Czech Republic	17	Malta	27	Tajikistan	15
Denmark	38	Mauritania	2	Tanzania	5
Dominican Republic	11	Mauritius	11	Thailand	40
Ecuador	26	Mexico	21	Togo	1
Egypt	36	Moldova	12	Trinidad and Tobago	40
Estonia	17	Mongolia	7	Tunisia	14
Fiji	13	Morocco	23	Turkey	27
Finland	42	Mozambique	1	Ukraine	16
France	41	Namibia	6	United Kingdom	40
Gabon	3	Netherlands	30	United States	50
Germany	28	New Zealand	25	Uruguay	32
Greece	30	Nicaragua	14	Venezuela	36
Guatemala	8	Niger	2	Zambia	10
Honduras	22	Nigeria	1	Zimbabwe	6

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