INCOME INEQUALITY DYNAMICS: THE ROLE OF CORRUPTION

Master Thesis International Economics

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Date final version	27 August 2018

ABSTRACT

This paper investigates the dynamics of income inequality in a panel of 19 countries over the period 1984-2012, focusing on the role of corruption. Applying a fixed-effects model to both the top income shares and the Gini coefficient, the results suggest that higher levels of corruption are associated with higher levels of income inequality. However, this result is not robust to all different regression specifications. Additionally, corruption and the level of financial development show to affect income inequality in a different way for Latin American countries, confirming previous empirical results that income inequality dynamics are different for this region. Finally, the effect of corruption on income inequality is dampened by increased levels of government spending.

Acknowledgements

I would first like to thank my thesis advisor Dr. A.P. Markiewicz for the valuable comments and suggestions during the research process and on earlier drafts of this thesis. Additionally, I would like to thank the Erasmus School of Economics, and all teachers that contributed to my experience during this master's program. This final year of study has been a challenging, but foremost rewarding and enlightening experience.

Finally, I would like to express my profound gratitude to my family, my friends, and my parents in particular. They have provided me with unfailing support and continuous encouragement throughout all my years of study, for which I am very grateful. This accomplishment would not have been possible without them. Thank you.

Charley Stokhof

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"Over a long period of time, the main force in favor of greater equality has been the diffusion of knowledge..."

- Thomas Piketty, *Capital in the Twenty-First Century*

1. Introduction

In December 2017, the Paris School of Economics presented the World Inequality Report 2018 (WIR), showing a comprehensive study of the inequality trajectories of both developing and developed countries over the past 40 years. With a clear critical tone, the popular notion of the late 20th century that globalization would lead to a decrease in inequality is dismissed. Due to a sharp increase in middle-class incomes in emerging market economies, such as China, India and Brazil, inequality between countries has indeed decreased. Nevertheless, the report shows that within-country inequality has increased over the past few decades and is even on the rise in most countries. According to some, high growth at the top is necessary in the early stages of economic development to lift the poorest to a higher standard of living. However, now that significant progress has been made in poverty reduction, the continued persistence of large income disparities invalidates this argument and can no longer be condoned as merely a side-effect of economic growth. Although a certain level of inequality is inevitable, when persistent socioeconomic disparities are not properly addressed, this will eventually lead to a stagnation of development and increased political unrest. It is therefore no surprise that combatting inequalities is one of the Sustainable Development Goals (SDGs) formulated by the United Nations. By 2030, the aim is to sustain income growth of the bottom 40 percent of the income distribution at a higher pace than the national average. Nevertheless, to tackle the problem, it is important to first create a better understanding of its roots.

The question remains what the biggest contributors to this rising income inequality are. The fact that comparable regions with similar macroeconomic conditions show completely different inequality trajectories, suggest policies and political institutions are vital in determining inequality. But what if these political institutions lie at the heart of the problem? In 1996, the then-president of the World Bank already declared that for developing countries to achieve economic growth, we first have to deal with the "cancer of corruption" (Bhargava, 2005). Still today, corruption within the political system is prevalent in many world regions. The ambition to "substantially reduce corruption and bribery in all their forms" is even specifically mentioned in the SDGs and addresses the governments of every country to promote anti-corruption policies. An example of a region with

notoriously high levels of both corruption and socioeconomic disparities, is Latin America. Despite increasingly high levels of economic growth, countries such as Brazil and Argentina have been unable to bridge these gaps. The increasing economic significance of this region on the global financial market, and its large population, makes it an interesting area of study when it comes to income inequality dynamics.

Although studied extensively, still no consensus has been reached regarding the main determinants of income inequality. Furthermore, the direct effect of corruption on the income distribution is a more recent development in the academic literature, and generally focuses on its effect on the Gini coefficient rather than top income shares. To be able to create appropriate policies aimed at reducing corruption, it is vital to create a better understanding of its distortionary effects on the distribution of income. Additionally, the same holds true for the dynamics of income inequality. To reach the ambition of the United Nations and significantly increase the income share of those at the bottom of the distribution, we must recognize the drivers behind these increased disparities.

The immediate objective of this paper is two-fold: to investigate the hypothesis that corruption significantly affects income inequality, and to create a better understanding of the dynamics of income inequality using the most exhaustive world inequality database so far. In addition, the inclusion of multiple countries from Latin America allows for the investigation of the hypothesis that the dynamics of income inequality are different for this region. The findings of this papers suggest that higher levels of corruption are indeed associated with higher levels of income inequality. The hypothesis that Latin American countries are different when it comes to the dynamics of inequality, is also supported by the empirical results of this paper. Both corruption and the level of financial development show opposite effects on level of income inequality for Latin America, compared to the other countries included in the sample. Finally, the results suggest that higher levels of government spending dampen the adverse effect of corruption on income disparities. Due to the set-up and scope of this investigation, this paper does not aspire to claim causality or to have found the perfect income inequality equation. Nevertheless, the main contribution is to add to the discussion and open the door for future research. Finally, this paper aims to create a better understanding of the dynamics of income inequality in order for governments to create targeted policies aimed at reducing corruption and inequalities and improving macroeconomic performance.

The rest of this paper is organized as follows: Section 2 provides an overview of the current literature regarding the main determinants of income inequality, including the relationship with corruption. Section 3 provides a detailed description of the data, Section 4 describes the econometric method, and Section 5 presents the results of the empirical analysis. Finally, Section 6 provides a discussion of the main results, and Section 7 concludes and discusses the possible implications for economic policy.

2. Literature Review

2.1 Preliminary considerations

This section provides an overview and evaluation of the existing body of literature regarding income inequality, laying down the foundation for the data analysis. However, before going into the theory it is important to clearly define several concepts. First, the literature on inequalities makes a distinction between wealth and income inequality. When referring to income inequality, income is usually defined as the income generated from the two main factors of production, labor and capital. One of the central findings of recent studies on inequalities, and emphasized in the Thomas Piketty's *Capital in the 21st Century*, is that rising income inequality is mainly driven by a rise in capital incomes. Capital income accounts for a much larger proportion of total income for the top part of the income distribution than it does for average individuals. This finding has motivated researchers to also investigate wealth inequality, where wealth is defined as the sum of non-financial and financial assets owned by an individual or household (Piketty, 2013, p.61)[1]. However, both the measurement and taxation of wealth shows even larger discrepancies across countries than it does for income. In addition, public records on wealth distribution are relatively scarce making cross-country comparisons regarding wealth inequality still difficult to conduct. For these reasons, this paper focuses on income inequality, with pre-tax national income as the benchmark measurement. A more detailed description of all variables, including measurement methods, will be given in Section 3.

Another important distinction to be made is between within-country income inequality and between-country income inequality. When looking at the global income inequality dynamics over the past few decades, these two concepts show different paths of development. Due to globalization and increasing fluidity of nationalities, income inequality on a global scale is gaining in relevance and

[1] Examples of non-financial assets: land, dwellings, commercial inventory, machinery, infrastructure, patents, etc. and financial assets: bank accounts, mutual funds, bonds, stocks, insurance policies, etc.

interest. However, data limitations make the construction of a global income distribution and subsequent statistical analyses challenging. Although the use of panel data allows for country and regional comparisons (e.g. by using dummy variables), this paper studies income inequality on a national level with the dependent variable always being a within-country measurement.

2.2 Why income inequality matters

2.2.1 How income inequality affects us

There is no universal agreement regarding the perfect level of income inequality or the extent to which governments should focus on reducing it. However, income inequality is an issue greatly cared about in most societies, and an important component of government policy. The current literature presents a wide range of arguments as to why income inequality matters.

First, there are multiple ethical issues regarding inequalities, and how it affects our well-being. Most traditional economic models measure utility in terms of absolute values. However, it has become a widely accepted notion that our subjective well-being is also based on our position relative to others, and that it is inherent to us to measure our possessions, our qualifications and our accomplishments relative to those around us. This also holds for income. Even when being able to provide for ourselves and our family, if the rest of the population earns twice as much, we would perceive this as unfair. The famous Kuznets curve describes how economic inequalities first rise with economic development, before they start to decrease. In these beginning stages of economic growth, inequalities can be perceived as a sign of opportunity for future growth. If you see potential to become wealthier in the future, you accept large income differences and would not want income to be redistributed completely. Hirschman and Rotschild (1973) first described this phenomenon as the "tunnel effect", where tolerance for income inequality is larger when income mobility in a society is high. Over time, when the income differences are expected to decline this tolerance towards inequality decreases. When it turns out that economic growth only materializes as a persistent advantage for the rich, income inequality becomes a structural problem and can no longer be justified as merely a difference in exerted effort (Hirschman & Rotschild, 1973; Graham & Felton, 2006).

The notion that income inequality can operate as a signaling mechanism for opportunities of growth is supported by multiple studies. In a paper from 2013, Bjørnskov et al. show that our perceived fairness of the income generation process significantly affects our attitude towards income

redistribution policies, and even our exerted effort on the labor market. In addition, our perceived fairness turns out to be an accurate predictor of individual tolerance towards income inequality. These variables, influencing our attitude towards inequalities, differ across cultures. Graham and Felton (2006) show that income inequality has a significantly larger effect on subjective well-being in Latin America than it does in OECD countries. In addition, Alesina et al. (2003) investigated whether income inequality affects the American poor differently than their European counterparts, and found that this is indeed the case due to differences in their ideas regarding fairness and income mobility. The extent to which income inequality affects our well-being will thus depend on both the economic and socio-political context. Nevertheless, although what constitutes a fair society might differ across cultures, extreme inequalities defy the basic values underlying most modern cultures.

Additionally, besides these ethical concerns that mainly affect the poor part of the population, income inequality has implications for the economy. A significant amount of research shows that economic development is significantly affected by income inequality. In the empirical literature on economic growth and income inequality, both the direction and strength of this relationship seems ambiguous. Although the exact statistical relationship between economic growth and income inequality goes beyond the scope of this thesis, it is important to discuss why increased income inequalities can lead to economic and political issues that are detrimental to a country's development. Alesina and Perotti (1994), and Persson and Tabellini (1991) were among the first to present empirical evidence supporting the hypothesis that income inequality and economic growth are negatively related. Alesina and Perotti suggest the deterrence of investment flows, due to increased political and social instability caused by income disparities, to be the main reason for this. Persson and Tabellini state that the government policies that follow from increased inequalities are the main channel through which growth is affected, arguing that redistribution policies also lead to less capital accumulation. Alesina and Rodrik (1994) confirm this hypothesis by showing that income disparities leads to higher levels of taxation, decreasing investment rates and subsequently slowing down growth. These early studies specifically focus on investment and physical capital accumulation, which are important engines of economic growth. However, over the past few decades these macroeconomic variables have lost in importance to human capital accumulation.

When looking at the more recent academic literature on income inequality, there is a gradual shift towards its negative consequences on variables such as skill development and educational attainment. Galor and Moav (2004) describe this development as the "human capital accumulation theory". They argue that human capital has replaced physical capital as the main source of economic

growth. For human capital to remain a growth engine, it should be wide spread among individuals. The authors even suggest that the growing importance of human capital has caused the consequences of income inequality for economic growth to have been reversed. They reason that the formation of physical capital was fueled by income disparities because the growing share of top income earners caused larger investment rates. However, this positive effect is now offset by the negative consequences of income inequality on human capital accumulation. The consequences for education and skill development are indeed one of the main concerns in recent reports on income inequality by the World Inequality Lab and the OECD. In an official OECD report, Cingano (2014) confirms that income inequality has significantly and negatively affected economic growth for the OECD countries over the past 30 years, presenting data that confirms income inequality depresses skill development, especially for individuals whose parents have a low-level of educational attainment.

Apart from the economic consequences, a reoccurring theme in the literature is that extreme income inequality will unavoidably lead to political tensions. Whether it is because the poor are not sharing in economic prosperity, increased educational inequality or because no longer accepted for ethical reasons, distributional injustice will fuel unrest. The above shows why high levels of inequality will not be sustainable when economic development and well-being of the population are the objectives. In addition, it affirms the interaction between income inequality and macroeconomic variables, and that the direction of causality or reason for correlation is in no case unambiguous. When investigating macro aggregate variables, this is generally the case. Although this does not dismiss the hypothesis that income inequality is affected by these macroeconomic variables, it should be considered when interpreting the results of statistical analyses.

2.2.2 Global trends in income inequality

To illustrate why combatting income inequality is high on many political agendas, this sub-section provides a brief overview of the global dynamics of income inequality over the past few decades by summarizing the main findings of the WIR 2018.

From the 1920s to the 1970s, within-country income inequality experienced a steep decline in most world regions. This decline was mainly caused by factors such as the emergence of social security systems, progressive taxations, and broader access to education. In emerging market economies, shocks to the political system caused even more drastic drops in inequality. However, although the trajectory of income inequality strongly differs across countries, the past few decades

have been characterized by a strong increase in income inequality in most countries, as measured by top income shares. In Russia, China, and India, this was mainly due to liberalization programs and the switch to a market economy. Among the industrialized regions, Anglo-Saxon countries experienced the steepest increase in inequalities, with the US being the most prominent example. The income shares of the top percentile in the US rose from below 11% in the late 1970s to over 20% in 2014. In the US, the main driver behind this rise has been increasing labor income disparities due to extreme surges in top incomes of CEOs (World Inequality Report, 2018; Piketty & Saez, 2003). The rise of income inequality in Continental Europe has been more moderate, due to more effective redistribution policies beneficiating the lower- and middle-income groups. Regions with the highest levels of income inequality are Brazil, The Middle East, and South Africa. Although income inequality in part of these regions experienced an overall decline compared to the 1980s, inequality over the past few decades seems to have stagnated at extremely high levels. The data availability for the remaining emerging and low-income economies is scarce, making it impossible to create an accurate picture of the dynamics of income inequality in those regions. The data that is available for these countries is usually based on household surveys rather than official income-tax data making it likely that the levels of top incomes are understated. The WIR emphasizes that income inequality is expected to be high in these countries, and that income inequality is even more prevalent than the official numbers suggest.

The global dynamics show that the development of income inequality is shaped differently across countries, even when the macroeconomic conditions are similar. This confirms that political institutions and government policies are vital in shaping income inequality. Additionally, the preceding evaluation of the economic and socio-political consequences show that the growing concern and the amount of research regarding income inequality is justified. To build policies aimed at tackling inequalities, it is necessary to create a better understanding of both its long-run determinants and the institutions responsible for creating these policies.

2.3 Main determinants of income inequality

This section will focus on the main variables used in the regression analysis of this paper and elaborate on how they are expected to affect income inequality. In the current literature, there exists no consensus regarding the main determinants, and statistical analyses use many different regression specifications. As mentioned in the introduction, the regression analysis is based on multiple academic papers, and includes variables that have been shown to significantly affect income

inequality by a wide range of studies. For most of these variables the expected effect on income inequality is ambiguous, and the empirical evidence and economic theory suggest positive, negative, or even non-linear relationships. This section will elaborate on the existing empirical evidence regarding these variables before turning to the topic of corruption.

2.3.1 Economic and financial development

Because there is a clear association between economic development and the income distribution, this variable is included in the majority of the analyses, generally measured by GDP per capita. Including this variable makes it possible to investigate whether the benefits of economic growth mainly accrue to the top earners. One of the main finings of Roine et al. (2009) is that this is indeed the case. The earlier works linking income inequality to economic growth, acknowledge the bidirectional interaction between growth and inequality, with the larger share of income from capital as the main reason for increased disparities (Alesina and Rodrik, 1994; Alesina and Perotti, 1994). Salaries at the top of the income distribution are more directly affected by shocks to economic growth, because they are more dependent on income from capital but also on performance related payments such as bonuses. Performance related payments fluctuate more strongly with the development of the economy than the general wage rate (Roine et al, 2009). Nevertheless, eventually the benefits of economic growth are likely to trickle down to the lower income groups as well, in line with Kuznets' hypothesis. To account for this possibility, a squared term of GDP per capita will also be included in the regression specification.

Apart from economic development, the development of financial markets in particular is expected to significantly influence income inequality. A widely-cited model linking financial development and inequality is that of Greenwood and Jovanovic (1990). They propose that the relationship between these two variables follows an inverted U-shape, just like the Kuznets curve suggests for economic growth and income inequality. According to their model, in the early stages of financial development primarily the rich are able to access the benefits of growing capital markets. When financial development further increases, causing economic growth through increased savings and investment, the rest of the population will also be able to reap the benefits of increased access to capital and the income distribution stabilizes. Although the theory of Greenwood & Jovanovic makes sense when looking at financial development over a longer period of time starting at the very early stages, the more recent models looking at inequality dynamics over the past few decades suggest a linear relationship. Hence, the financial development measurement in this paper will also

enter the regression linearly. Nevertheless, the empirical evidence on the direction of its relationship with inequality shows ambiguous results.

Standard economic theory seems to suggest financial development to have an overall equalizing effect on income. According to Roine et al. (2009) the main channel through which the poor can benefit from financial development is by diminishing credit constraints. The development of financial markets allows for a more efficient allocation of resources across individuals, making it possible for all income groups to benefit from economic growth. This notion is supported by Beck, Demirgüç-Kunt, and Levine (2004) who find a negative relationship between financial intermediary development and income inequality, suggesting broader access to finance to be the main cause for their findings. Similarly, Clarke, Zou, and Xu (2003) also find a negative relationship between these two variables. However, they argue that the strength of the relationship depends on the sectoral structure of the economy. In countries with a larger modern sector, less dependent on e.g. agriculture, financial development has a smaller effect on reducing inequality.

There are also studies suggesting that the positive outcomes of financial development disproportionately benefit the top part of the income distribution, thereby widening the gap between the rich and the poor. Studying the links between inequality and finance, Claessens and Perotti (2005) argue that financial reform in developing countries does often not materialize in more equality because these reforms are merely focused on deepening financial markets, rather than broadening them, such as the deregulation of stock markets. This so-called top-down approach of deregulation, benefits the top income earners without creating broader access to capital for the rest of the population. This notion is supported by the main findings of Roine et al. (2009), that financial development over the 20th century has been particularly pro-rich. In their results, increased financial development significantly increases the income share of the top percentile. According to these studies there is a discrepancy between what economic theory suggests and what happens in practice when financial markets become a more integrated part of the economy.

The above shows that the expected effect of the development of financial markets on the income distribution is not straightforward. It will depend on whether the development is not just focused on deepening, but also on broadening capital markets. Additionally, the effect of financial development might depend on other factors such as the sectoral structure of the economy or the overall level of economic development (Clarke et al., 2003). Although further investigation of non-linear relationships regarding financial development is beyond the scope of this paper, the above evaluation provides possible explanations for the results found in the statistical analysis.

2.3.2 Globalization

Due to the huge increases in trade liberalization programs leading to large cross-border trade and investment flows, the macroeconomic consequences of globalization have become an extensively studied topic in economics. In the context of this paper, openness refers to a country's presence on global trading markets, measured as the sum of total imports and exports as a share of GDP. Access to global trading markets is often seen as a positive sign of economic development, but the effects of trade on issues such as poverty and income inequality on a national level are ambiguous. Early economic theories, such as the classical Heckscher-Ohlin model of trade and Samuelson's factor-price equalization theory, suggest that the effects of trade on inequality will depend on the initial factor endowments of a country. Their theories suggest that increased globalization causes wages of unskilled labor to equalize across countries. Consequently, countries that are relatively capital or high-skilled labor abundant will experience a decrease in wages from unskilled labor, leading to higher wage inequality. The opposite would hold true in a developing country, that is relatively more labor-abundant. There are, however, multiple aspects that are not considered in the Heckscher-Ohlin model, making the predictions regarding openness and income inequality rather unrealistic. O'Rourke (2001) provides an overview of these aspects, firstly arguing that other factors of production such as technology should also be considered because it creates a different dynamic between skilled and unskilled labor both within and between countries. Additionally, he argues that developing countries are not necessarily labor abundant, such as is generally assumed. Indeed, trade liberalization has caused developing countries to increasingly attract capital-intensive activities, causing a shift in factor endowments. According to O'Rourke, the multiple dimensions of globalization make it difficult to establish a general relationship between trade and the within-country distribution of income.

Apart from the notion that the assumptions underlying the traditional models are outdated, a large part of the literature on the links between openness and inequality stresses the importance of government policy. Whether the benefits from increased trade trickle down to the bottom of the income distribution of course greatly depends on how these benefits are distributed. Reviewing the impact of globalization on income inequality, Cornia (2003) discusses how the effects of trade liberalization on income inequality strongly depends on other forms of domestic liberalization, such as capital account liberalization, firm privatization, and tax reforms. These factors co-determine how increased integration of developing countries onto global trading markets influences the wage inequality gap. In addition, policy responses of developed countries such as increased protectionism

of labor-intensive sectors also influence the trade effects on income inequality. Related to this is the more general finding of López-Córdova and Meissner (2005) that international trade actually stimulates democratization. Considering that countries with a democratic political system tend to have more equitable income distributions, this suggests international trade to decrease income inequality in the long-term.

The above discussion shows that the effect of openness on income inequality depends on multiple factors. Especially its effect on the Gini coefficient will greatly depend on variables such as the sectoral structure of the economy, the initial factor endowments, and the distribution of these factors among a country's population. However, most countries included in the sample with top income shares as the dependent variable are industrialized countries that are relatively capital abundant. It is therefore likely that the coefficient on openness in these regressions will be positive, which would indicate that mostly the rich seem to be benefiting from increased openness to trade.

2.3.4 Education

One variable that is undeniably associated with income inequality is the stock of human capital, usually measured by educational attainment. As already explained, human capital accumulation has become one of the main engines of economic growth over the past few decades. Being one of the main determinants of income in most societies, it follows that a country with high educational inequality also has a highly unequal income distribution. Early models relating education to income inequality, such as the one by Mincer (1958), confirm this prediction. Mincer also states that the effect of educational attainment on inequality will depend on the rates of return to education. If the rates of return disproportionately increase with higher levels of education, more average years of schooling within a population might be correlated with higher levels of inequality.

Knight and Sabot (1983) also relate the effect of education on inequalities to the rates of return to education. They argue that an expansion of education causes an increase in the supply of educated workers. Subsequently, the rates of return from education fall, decreasing the relative wage gap between skilled and unskilled workers thereby decreasing income inequality. Owen and Weil (1997) come to the same conclusion regarding the development of returns from education but present intergenerational income mobility as the main channel through which this affects income inequality. They state that the complementarity between educated and uneducated workers causes the wage for unskilled work to be relatively high in countries with high levels of human capital. Subsequently, this makes it more likely that uneducated parents will be able to afford an education

for their children. In addition, the incentive for children of educated parents to also obtain a high level of education decreases. This development creates higher levels of income mobility, and hence, lower income inequality

Educational attainment might also be an explanation why countries have experienced such different income inequality trajectories over time. O'neill (1995) shows that the convergence of levels of education within developed countries has significantly contributed to a convergence of incomes. Additionally, he argues that the returns to education in these countries have become disproportionately high compared to developing countries due to a surge in high-skilled jobs. Consequently, global income dispersion has become worse.

The empirical literature suggests that education is an important factor in the determination of income inequality, however, its effect on the income distribution is ambiguous. This will mainly depend on whether the returns to education disproportionately rise for higher levels of education. If this is the case, then higher levels of educational attainment are expected to be associated with higher levels of income inequality.

2.3.6 Technology

Before turning to the matter of corruption, the topic of technology requires specific attention. Recent reports published by the IMF and the OECD have identified technological progress as an important contributor the increased inequality of wages within countries (OECD Publishing, 2011). The main channel through which technology increases income dispersions is by increasing the return on high-skilled jobs and capital. Both in industrialized and developing countries, technological progress seems to be skill-biased, and decreases the demand for low-skilled activities (IMF Publishing, 2007). Although even Kuznets (1955) already mentions technology in his famous paper, this identification of technological process as a contributor to increasing income dispersions is a more recent development. In fact, Kuznets argues that higher levels of technology can decrease inequalities because it mainly increases the income of those at the bottom of the income distribution of the urban population. Additionally, increased technology causes a more diverse sectoral composition of the economy, thereby making the low-income individuals less vulnerable to unexpected shocks to the business cycle. However, in the context of the mid-20th century, technological progress is so closely related to economic development, that is not often included or even mentioned as a separate variable in empirical analyses on income inequality. Even in recent

studies on income inequality, it is rare to find a variable measuring technology in the regression specifications. There are multiple possible explanations for this.

First, it is unclear through which channel the effect of technology on income inequality operates, and whether this effect is direct or indirect. Just as it might be closely related to economic development in the very early stages, technological progress is often cited as one of the main channel through which globalization affects income inequality (IMF Publishing, 2007). As explained in sub-section 2.3.2, the economic reasoning behind this comes from the Stolper-Samuelson theorem, stating that increased trade liberalization leads to a decrease in income inequality in developing countries, where low-skilled labor is abundant. However, this decreasing effect of globalization on income inequality in developing countries has not found conclusive empirical evidence, suggesting that shocks to technology should be treated exogenously. Nevertheless, as emphasized by the 2011 OECD report, it is very challenging to disentangle the effect of technology from the effects of globalization or other factors on returns to skill. Freeman (2009) support this notion by stating that the fragmentation and subsequent offshoring of the production process are consequences of technological development. As the 2007 IMF report states, whereas globalization has caused a wider spread of technology, technological progress has assisted in deepening of trade relationships between countries.

Additional to the difficulty of separating the effect of technology from other factors, a second challenge arises from finding an accurate measure of the level of technology. Especially when investigating income inequality in a panel data analysis, it is important to find a measure that is comparable across countries. For instance, when technology is expected to effect income inequality through its effect on high-skilled labor, it should be considered that what constitutes high-skilled labor might differ between developing and more advanced economies (IMF Publishing, 2007). Furthermore, data availability over a longer time-span is especially challenging for a variable that is relatively new in the mix of macroeconomics. A variable that is related to technology, and sometimes included in regressions on income inequality is the share of agriculture in total output. It can be argued that as the level of technology in a country advances, the economy will become less dependent on the agricultural sector. However, the effects of a large agricultural sector on the income distribution is ambiguous. On the one hand, in line with Kuznets arguments, more urbanization can lead to increased opportunities and a more stable income for low-income individuals that are more likely to be employed in the agricultural sector. On the other hand, the increased sectoral fragmentation of the economy might lead to larger income disparities. The latter is

what is expected when the share of agriculture is considered as a proxy for technological development.

Although more research is needed on the exact role of technology in income inequality dynamics, further inquiry goes beyond the scope of this paper. Nevertheless, it is important to acknowledge its contribution and therefore two different measures will be used in the regression analysis proxying the level of technological development, following Roine et al. (2009). These variables are the share of agricultural output in total output and the number of yearly patent applications.

2.4 Corruption and income inequality

The above evaluation of the determinants of income inequality confirms the importance of political institutions in shaping a country's income distribution. As Alesina and Rodrik (1994) put it, while economics involves expanding the pie, it is up to political institutions to redistribute it. But what if these institutions are the exact root of the problem? Good governance has been proven to play a key role in development and sustainable economic growth (Gupta & Abed, 2002). Corruption, on the other hand, is generally believed to be detrimental for a country's macroeconomic performance and economic development. Before evaluating the existing literature on its relationship with income inequality, it is important to be clear on the definition of corruption used in this paper. The most commonly used definition of corruption is "the abuse of public or corporate office for private gain" (Bhargava, 2005). The measure of corruption used in the regression analysis is that of the International Country Risk Guide (ICRG), measuring corruption within the political system. This includes grand and political corruption, involving heads of state, ministers, lawmakers or other senior government officials, but not so-called petty or small corruption.[2] The latter involves the payments of relatively small amounts of money to, for example, speed up or circumvent certain routine bureaucratic processes. This type of corruption might decrease inequalities because it mostly benefits lower- and middle-class individuals, such as low-paid public officials or teachers (Uslaner,

[2] Precise definitions by the World Bank: "*Grand corruption* is defined as corruption that involves heads of state, ministers, or other senior government officials and serves the interests of a narrow group of businesspeople and politicians, or criminal elements." ; "*Political corruption* involves lawmakers, such as monarchs, dictators, and legislators, acting in their role as creators of the rules and standards by which a polity operates. Such officials engage in corruption when they seek bribes or other rewards for their own political or personal benefit and in return provide political favors to their supporters at the expense of the public interest." and "*Petty corruption* involves the payment of comparatively small amounts of money to "facilitate" routine official transactions, such as customs clearance or the issuing of building permits." (The World Bank, 2005)

2005). As will become clear in the following sub-section, the empirical literature shows that the opposite holds true for grand corruption, whereby the benefits mostly seem to accrue to the already well-off individuals in the top of the income distribution. However, petty corruption is unlikely to have a significant impact on the macroeconomic environment, and is also much harder to measure and monitor than grand corruption (Uslaner, 2005). In the remainder of this paper, corruption will thus refer to grand corruption within the political system.

Corruption and inequality are two closely related concepts. The abuse of office "for private gain" already implies that, by definition, corruption creates inequalities by making people subordinate to others. As stated previously, perceived fairness of society matters greatly for our attitude towards income inequalities. In a highly corrupt society, it is likely that the largest part of the population will not perceive the income generation process to be fair. Corruption might therefore not only induce income inequality, but also enlarge the incidence of income inequality for the population. In the Sustainable Development Goals formulated by the United Nations, combatting corruption is seen as one of the main hurdles in overcoming inequalities and poverty. Additionally, corruption is still a prevalent problem in many world regions, especially developing economies. A recent publication of the Transparency International, a global coalition against corruption, states that corruption is a problem that keeps to continuously hurt ordinary people in everyday life. The report even shows that for some world regions, such as the Caribbean and Latin America, levels of corruption are on the rise (Pring, 2017. This section will first provide an overview of the existing empirical evidence regarding the effect of corruption on income inequality. Subsequently, the possible channels through which corruption can affect the income distribution will be discussed.

2.4.1 Empirical results in the existing literature

The first research regarding the macroeconomic consequences of corruption mainly focused on its effect on economic growth, suggesting the deterrence of both domestic and foreign investment flows, the composition of government expenditures, and an overall inefficient allocation of resources as the most important channels (Mauro, 1995). Political turmoil has been proven by multiple studies to significantly affect risk-perceptions of investors, attracting less foreign direct investment, and decreasing public confidence in the economy (Sylwester, 2000). These early studies already recognize a possible correlation between corruption and inequalities through its effect on government spending and economic growth. This prompted other researchers to investigate the direct effect of corruption on the distribution of income.

The largest part of the literature suggests a positive relationship; higher corruption is associated with higher income inequality. In a cross-country study, Gupta, Davoodi, and Alonso-Terme (2000) provide empirical evidence for this hypothesis. Using the ICRG corruption index, they find an increase of one standard deviation in corruption to increase the Gini coefficient by 11 points. An additional paper confirming a positive relationship between corruption the Gini coefficient is that of Gyimah-Brempong and Munoz de Camacho (2006). Using panel data for 61 different countries, they furthermore find regional differences regarding the size of the relationship. According to their study, corruption has the largest effect on the income distribution in Latin American countries, followed by OECD, Asian, and African countries, respectively. Dincer and Gunalp (2008) attempt to extend the cross-country research on corruption and income inequality because they argue that unobserved country heterogeneity and subjective measures of corruption limit the data comparability across countries. Trying to overcome this, they use a panel dataset covering all 50 U.S. states and an objective measure of corruption, namely the number of government officials convicted in a state for corruption related crimes. Confirming the results of the previous studies, they find an increase in corruption to significantly increase levels of income inequality and poverty. An additional interesting finding of Dincer and Gunalp (2008) is that the coefficients on the corruption variable increase as the level of income inequality aversion increases. Considering income inequality aversion is higher at the bottom of the income distribution, they state that lower income groups are most negatively affected by corruption.

Another branch of the literature suggests a non-monotonic relationship between corruption and income inequality. Li, Xu, and Zou (2000) are among the first to provide empirical evidence for this hypothesis. Investigating the effect of corruption on the income distribution for 47 countries, they find that income inequality is especially high in countries with intermediate levels of corruption. On the other hand, countries with low or extraordinarily high levels of corruption experience low levels of inequality. Additionally, they find that corruption explains a significant part of the differences in the Gini coefficient across industrial and developing countries. Chong and Calderon (2002) find additional evidence that the effect of corruption might depend on the level of economic development. They find institutional quality, of which the level of corruption is the most important aspect, to have a positive relationship with income inequalities in developing countries, while this relationship is negative for developed countries. This suggests that, at first, reform of political institutions might increase inequalities rather than reduce them.

A variable that is inevitably associated with the level of corruption, is government spending. This interaction was already confirmed by Tanzi and Davoodi (1998), who find higher levels of corruption to be associated with higher levels of public investment. Additionally, government spending is identified as one of the channels through which corruption distorts the income distribution. Li et al. (2000) investigate the notion that corruption and government spending are interacted and find that the effect of corruption on income inequality is indeed dependent on the level of government spending. More specifically, they find corruption to raise income inequalities to a smaller extent in countries with higher levels of government spending. Dzhumashev (2014) does find empirical evidence that the incidence of corruption on economic performance significantly depends on the size of public spending. Although not included in the analysis, the author recognizes the possible implications of this result regarding income inequalities.

The above studies show that the effect of corruption on income inequality is not clear-cut and might depend on other factors such as the level of economic development and government spending. Possible explanations for this require an evaluation of the channels through which corruption affects the income distribution.

2.4.2 Possible channels through which corruption affects income inequality

The main channel through which corruption is generally believed to influence economic growth is through its effect on economic efficiency. When political institutions are particularly ineffective, it is sometimes argued that corruption can lead to so-called "greasing of the wheels" by for example speeding up certain bureaucratic processes. The main argument here is that, by reflecting the true price, bribes act as a market-clearing mechanism and corruption can be efficiency-enhancing (Lui, 1985). Nevertheless, as highlighted by Gupta et al. (2002), this view overlooks the fact that corruption can lead to permanent distortions that consistently benefit only one part of the population. Additionally, the intended beneficiaries of social programs are not necessarily those individuals with the highest willingness to pay, nor the appropriate resources. The current empirical literature agrees that the negative consequences of corruption are primarily caused by a misallocation of resources, creating permanent social and economic distortions.

Gupta et al. (2000) suggest multiple direct channels through which corruption distorts a country's income distribution. First, corruption can lead to biased tax systems whereby tax evasion opportunities mainly accrue to the top income earners. Tax avoidance opportunities tend to be more readily available for those at the top of the income distribution, mainly due to the composition of

their income (Feenberg & Poterba, 1993). Second, corruption can influence the amount of government expenditure dedicated to social programs as well as the targeting of these programs. Gupta et al. argue that the wealthy elite might bribe government officials to direct social spending towards higher education, and away from poverty-alleviating programs, thereby only benefiting the already well-off individuals. Furthermore, corruption affects the income distribution through its effect on the accumulation and distribution of human capital. Biased tax systems and poor targeting of social spending decreases the resources available for education, which is in line with the finding from Mauro (1998) that higher corruption is associated with lower levels of educational attainment. Finally, Gupta et al. suggest the low-income groups, by being less well-connected, face higher risk when making the decision to invest in resources such as human capital, physical capital or land. Through this unequal distribution of risk, corruption is thus likely to perpetuate income inequality.

In addition to the elite trying to influence government spending through bribes, the composition and allocation of public spending is influenced by the personal incentive of corrupt government officials. As stated by D'Agostino, Dunne, and Pieroni, will allocate their spending towards projects that are expensive, and of which the market value is unknown for bribes to be more easily collectible. They argue that such a project is much more likely to involve high technology ICT or infrastructure, rather than improvement of education. As to the interaction between the size of government spending and corruption, Li et al. (2000) argue that increased government spending is financed by higher taxation in the modern sector, in turn decreasing the income dispersion with the traditional sector. In addition, Dzhumashev (2014) argues that the size of the government might reflect its accountability and the degree of control of corruption. In that case, the interaction between corruption and government spending is expected to diminish the adverse effects of corruption. However, when the size of the government reflects the degree of government intervention, and the opportunities for rent-seeking and corruption, the negative consequences of corruption might be exacerbated by increased government spending.

In summary, misallocation of resources causes corruption to affect the income distribution through multiple channels. These channels include biased tax systems, biased targeting of public spending, increased educational inequalities, and an unequal distribution of risk in factor accumulation.

2.4.3 Is Latin America different?

As mentioned previously, one world region where income inequality is notoriously high is Latin America, even when compared to other regions with similar macroeconomic conditions. Additionally, Latin America is associated with persistently high levels of corruption. In a report published in October 2017, the Transparency International even stated that the issue of corruption is still on the rise, and that Latin American populations are faced with corruption on a daily basis. Given the empirical evidence regarding the relationship between corruption and income inequality, the question arises whether the dynamics of income inequality are different for this region, and whether the distribution of income is differently affected by variables such as corruption.

Certain studies in the empirical literature indeed suggests that the relationship between corruption and income inequality is different for Latin America than for other regions. Apart from finding differences across developing and industrial countries, Li et al. (2000) find income inequality in Latin America to be affected to a larger extent by corruption than the other regions under investigation. Their results suggest that government spending is the main channel through which corruption affects income inequality in this region. Although government spending by itself did not significantly affect the Gini coefficient in their regression, it did for Latin American countries.

Gyimah-Brempong and Munoz de Camacho (2006) show that corruption is most disruptive for the income distribution in Latin America, compared to the OECD countries, Asia, and Africa. The authors argue that this result is due to differences in the nature of corruption across these regions. They distinguish between two types of corruption, "degenerative" and "developmental". Developmental corruption occurs when public officials abuse their position to provide resources and protection to the private sector, often in return for part of the profits. Because it is in their best interest to "fund" projects that create economic growth, this is not necessarily detrimental for economic development or inequalities. Degenerative corruption, however, involves the abuse of public office merely for personal gain, such as the extortion of private property. The latter inevitably leads to lower levels of investment, and capital consumption. According to the authors, degenerative corruption is prevalent in Latin America because public officials have relatively large bargaining power compared to the private sector (Gyimah-Brempong and Munoz de Camacho, 2006, p. 248).

Multiple empirical studies specifically focus on the corruption-income inequality relationship in Latin America. Dobson and Ramlogan-Dobson (2010) find robust evidence of a trade-off between corruption and income inequality in Latin American countries. In contrast to most

empirical studies in the literature, they find higher levels of corruption to be associated with lower income inequality. According to Dobson and Ramlogan-Dobson, the existence of a large informal sector in Latin America is the main reason for this finding, and they name several reasons why institutional reform, and corruption-reducing measures, are likely to enhance inequalities. Institutional reform, such as increased taxes and compliance to regulations will increase production costs of firms in the informal sector, who tend to employ the low-income earners. In addition, they argue that corruption causes the promotion of government projects aimed at the employment of the poor, such as road constructions. Although initiated to gain political power, these projects benefit the poorer part of the population, and might no longer be undertaken when institutional reform induces more regulations and a more competitive tendering process. To assess whether the existence of a large informal sector really affects the relationship between corruption and income inequality, Dobson and Ramlogan-Dobson (2012) extent their own research by investigating this for a large sample of countries. In support of their hypothesis, they find that as the informal sector in a country grows, corruption becomes less detrimental for income inequality. Considering that the size and occurrence of informal sector greatly differs across regions, this finding might be a good explanation for the regional differences found in other empirical studies. Anders and Ramlogan-Dobson (2011) find additional evidence for an inverse relationship between income inequality and corruption in Latin America. They also present the existence of a large informal sector as the main reason for their findings, however, they also suggest that that as corruption becomes more organized over time, it might cause certain public goods to improve. Countries with high levels of income inequality might therefore benefit from growing corruption, in terms of a more equal distribution of income.

The above results indicate that the effect of corruption on top income shares and the Gini coefficient might be different for Latin America. Although plagued by issues such as corruption and inequalities, this region is also characterized by large economic growth over the past decades in countries such as Chile and Brazil. It will therefore be interesting to see whether the above findings still hold when using different dependent variables and more recent data.

2.4.4 Two-way causality between corruption and income inequality

Before turning to the empirical part of this paper, it is important to address the possibility of two-way causality between corruption and income inequality. Although the largest part of the empirical literature focuses on the causality from corruption to income inequality, several studies suggest the causality to be bidirectional.

Uslaner (2005) argues that the unequal distribution of income is one of the main roots of corruption. In a cross-sectional model including, corruption, income inequality, trust, and regulation, Uslaner finds income inequality to indirectly affect corruption through lower levels of trust. This increased feeling of mistrust in the government and the economy causes corruption to prevail and perpetuate. Chong and Gradstein (2007) empirically investigate the two-way causality and their results support the notion that there is a feedback mechanism between institutional quality and income inequalities. They argue that large discrepancies in wealth or income might cause a small group of elites to seize political power. Once power is established, all institutional reform aimed at equalizing the distribution of income will subsequently be undermined by the established elite. An additional is proposed by Aspergis et al. (2010) who state that low income individuals are more likely to suffer from the consequences of corruption, such as deprivation of health or educational services. This causes them to be easy targets of bribery, whereas top income earners are more likely to be on the receiving end of bribery because they have access to the necessary resources.

Although the exact root of the problem might be ambiguous, it is clear that there exists a feedback mechanism between corruption and income disparities. Even in disregard of the empirical results, it is intuitive that individuals are more likely to engage in corrupt activities in a society with extreme income disparities, than in a society with appropriate redistribution policies and low inequalities. Unfortunately, the problem of bidirectional causality is an unavoidable challenge when investigating variables at the macro aggregate level, and the set-up and scope of this paper does not allow to fully address the problems arising from possible endogeneity. However, it should be taken into account when interpreting the results. Nevertheless, the main contribution of the analysis is to show that there exists a significant association between corruption and income inequality, and to add to the discussion on income inequality dynamics.

3. Data

This section provides a detailed description of the data used in the econometric analysis. Table 1 displays all main variables, together with their definition and sources. First, some general remarks regarding the use of different databases and data availability are made, followed by a description of the different dependent and explanatory variables. Tables 2 and 3 show the summary statistics and pair-wise correlations for the main variables, respectively.

3.1 General remarks

The sample includes data from 19 different countries for the period 1984-2012, including countries from different stages of economic development and levels of corruption[3]. Unfortunately, the data availability for some variables such as the income share of the top percentile is limited, making it impossible to include all countries in every regression. In Section 4, when describing the econometric method, an overview is given of which country is included in which regression. From Table 3 it becomes clear that some of the explanatory variables have a high and statistically significant pair-wise correlation, such as *Education* and *Agriculture*. Although this does not bias the estimates, it should be taken into account when interpreting the coefficients and the goodness of fit of the model. In addition, in the regressions on the Gini coefficient, different regression specifications are tested to control for the fact that some concepts might be captured by the same variables. Especially when the regression results contrasts with what the theory suggests, it is important to consider strong pair-wise correlations as a possible cause. Subsequently, certain variables can then be removed to see whether the goodness of fit of the model improves.

The top income shares are obtained from the 2018 publication of the World Inequality Database (WID) together with the UNU-WIDER World Income Inequality Database (WIID), most recently updated in 2017. The set-up of both databases allows for the comparison across countries and over long periods of time. The WID, however, has one important qualitative advantage over the WIID, in that it uses fiscal data rather than household surveys to capture income inequality dynamics. Household surveys are used in many different research settings and can be of great value in understanding certain social and demographic dynamics of a population.

[3] Countries included in the analysis are Australia, Argentina, Brazil, Canada, The People's Republic of China, Colombia, Chile, France, Germany, India, Italy, Japan, The Netherlands, Spain, Russia, Sweden, The United Kingdom, The United States of America, and Venezuela

Table 1: Definition and sources of main variables

Variable	Variable definition.	Source
Top income shares	Share of total income before tax earned by the top 1% highest earners	World Inequality Database (WID), UNU-WIDER World Income Inequality Database (WIID)
Gini	Gini-coefficient	UNU-WIDER World Income Inequality Database (WIID)
GDPpc	GDP per capita measured in 2011US$	Maddison (2006)
Corruption	ICRG Corruption (inverted for interpretation of coefficients), ranging from 0.00 to 6.00	International Country Risk Guide (The PRS Group)
Govspend	Central government expenditure as share of GDP	World Development Indicators (World Bank)
Openness	Total imports and exports as share of GDP	World Development Indicators (World Bank)
Findev	Financial development: sum of bank deposits and total market capitalization as share of GDP	Financial Structure and Development Database
Agriculture	Share of agricultural production in GDP	World Development Indicators (World Bank)
Education	Gross enrolment ratio secondary education (ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education shown)	World Development Indicators (World Bank)
Dcpriv	Domestic credit to the private sector as share of GDP	World Development Indicators (World Bank)
Patents	Number of patent applications of residents per 1.000.000 inhabitants	World Development Indicators (World Bank)

Table 2: Summary statistics for the main variables

Variable	Obs.	Mean	S.D.	Min	Max
Top1	379	11.04	4.40	4.360	26.91
Top10	498	36.62	6.68	22.37	55.41
Top10-1	379	24.54	3.00	16.24	33.93
Bot90	498	63.91	6.47	44.59	77.63
Gini	492	37.07	10.38	20.40	61.80
GDPpc	545	22.37	13.25	1.02	50.90
Corruption	540	2.08	1.33	0.00	5.00
Govspend	540	0.24	0.12	0.03	0.51
Openness	543	0.48	0.24	0.12	1.54
Findev	501	1.16	0.70	0.083	3.04
Agricult	439	0.0692	0.0708	0.00610	0.334
Educ	487	93.09	24.60	30.02	162.6
Dcpriv	425	0.834	0.530	0.0877	2.213
Patents	504	292.86	590.44	0	3026.8

Table 3: Pair-wise correlations for the main variables

	Top1	Top10	GINI	GDP	Govsp	Openn	Findev	Dcpriv	Educ	Patent	Agri.	Corr.
Top1	1											
Top10	0.93*	1										
GINI	0.65*	0.62*	1									
GDPpc	-0.07	-0.23*	-0.62*	1								
Govspend	-0.36*	-0.44*	-0.62*	0.56*	1							
Openness	-0.21*	-0.27*	-0.34*	0.36*	0.45*	1						
Findev	0.04	0.04	-0.42*	0.67*	0.16	0.19*	1					
Dcpriv	-0.04	0.03	-0.47*	0.69*	0.31*	0.12	0.84*	1				
Educ	-0.3*	-0.29*	-0.38*	0.72*	0.48*	0.44*	0.44*	0.44*	1			
Patent	-0.04	0.03	-0.30*	0.34*	-0.01	-0.21*	0.56*	0.62*	0.15	1		
Agricult.	0.19*	0.18*	0.24*	-0.73*	-0.49*	-0.42*	-0.44*	-0.42*	-0.75*	-0.3	1	
Corruption	0.51*	0.43*	0.58*	-0.58*	-0.48*	-0.34*	-0.40*	-0.47*	-0.52*	-0.17	0.39*	1

Statistically significant correlations are indicated by an *

Nevertheless, household surveys consist mainly of self-reported information that often does not give an accurate description of the actual situation. Especially when it comes to levels of top income and wealth, there are multiple limitations to this method. First of all, the sample included in surveys is often small. Considering that the extreme rich consist of a small group of people, it is likely that these individuals are not included in the survey. In addition, to account for extreme outliers in the data these surveys often make use of correction codes. As a consequence, top incomes and wealth levels tend to be underestimated thereby giving a misrepresentation of income inequality (World Inequality Report, 2018, p.29). To overcome the drawbacks of the WIID, the WID combines different types of datasets including administrative tax data. This data is primarily gathered for tax collection purposes, and therefore gives a more accurate representation of actual income levels of individuals. It must be noted that the use of fiscal data is not free of limitations either. The problem of underestimation of top incomes is not entirely resolved by this method due to issues such as tax evasion. In addition, differences in fiscal policies across countries can cause discrepancies in the data. Still, this method has shown to significantly improve the accuracy of measurements of income inequality.

Although the most recent update of the WID is the most exhaustive database on world income inequality to date, it does not contain data on top income shares for all countries. To answer the main research question, variation across countries in economic development and level of corruption is necessary, and a subset of Latin American countries. For these reasons, the WIID and WID are combined for the econometric analysis of this paper.

3.2 Dependent variables

Top income shares

In the income inequality literature, most researchers use the top decile of the income distribution to describe the high-income earners (Roine et al., 2009). However, an important finding of recent studies is that the top decile consists of a heterogeneous group of people. As emphasized by the research of Atkinson and Piketty (2007), the top percentile of the income distribution mainly obtains their income from capital, whereas for the rest of the top decile labor is the most important source of income. When speaking of the extreme rich, it would therefore be more appropriate to focus on the top percentile and consider the rest of the top decile as the upper middle class (Roine et al., 2009). Unfortunately, data on the top percentile is less widely available than that of the rest of the income distribution, making it impossible to include it as the dependent variable for all countries in the sample. Nevertheless, the top decile is still a good approximation of the most well-off individuals in the population that are, as described in the literature review, the most likely beneficiaries of corruption.

One of the great advantages of the WID, is that it uses the so-called Distributional National Accounts (DINA) method for the construction of top income shares. By using data on national income, the lack of a homogenous concept of income in other databases is partially corrected for. Additionally, because they use the same pre-tax income concepts for all countries, the data is independent from fiscal policy in a given year and country.[4] As described in the methodology guidelines of the WID, national income is defined as the gross domestic product, minus consumption of fixed capital, plus net foreign income. The measurement of pre-tax national income is given by the following definition: "Pre-tax national income is the sum of all pre-tax personal income flows accruing to the owners of the production factors, labor and capital, before taking into account the operation of the tax/transfer system, but after taking into account the operation of pension system." Pensions are taken into account because this makes the income shares independent of the age structure of the population and thus more suitable for cross-country comparisons (Alvaredo et al., 2016, p. 30).

[4] Homogeneity of the concept of national income across countries is made possible due to the international guidelines on macroeconomic national accounts as constructed by the 2008 United Nations System of National Accounts (SNA). See Alvaredo et al. (2016) for an elaborate description of the methodology of the WID.

Figure 1: Top income percentile share for 14 countries 1984-2012

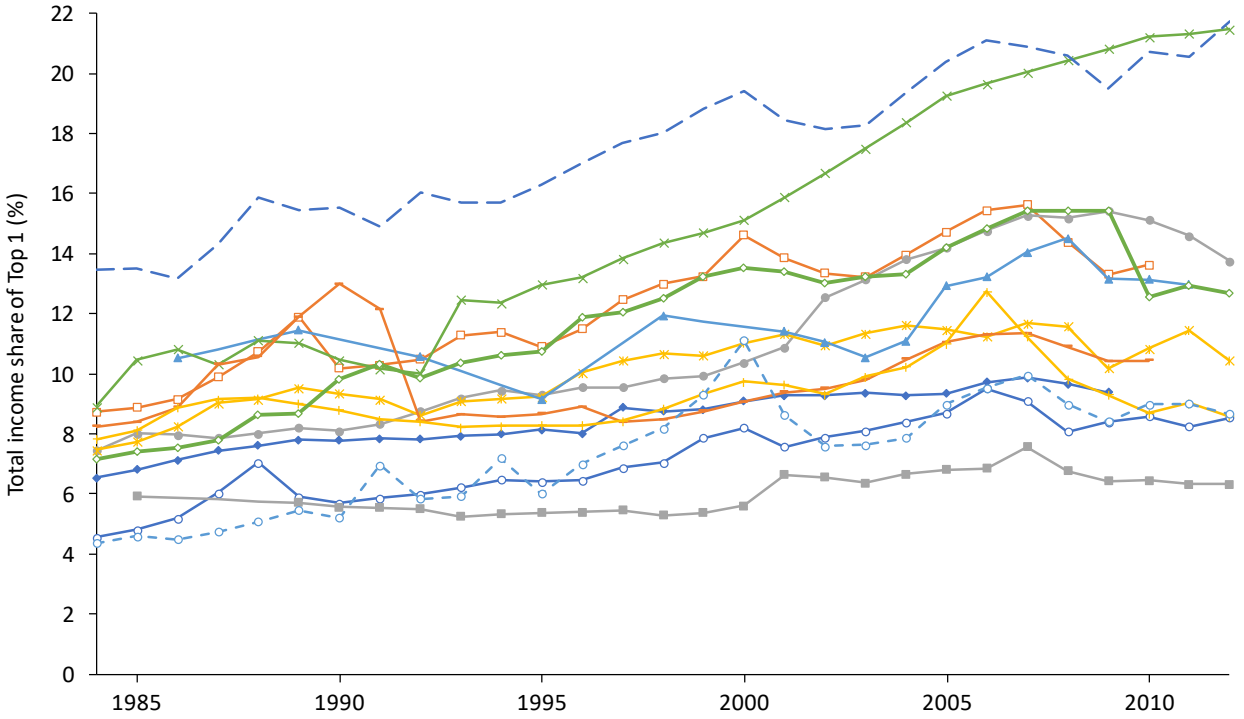
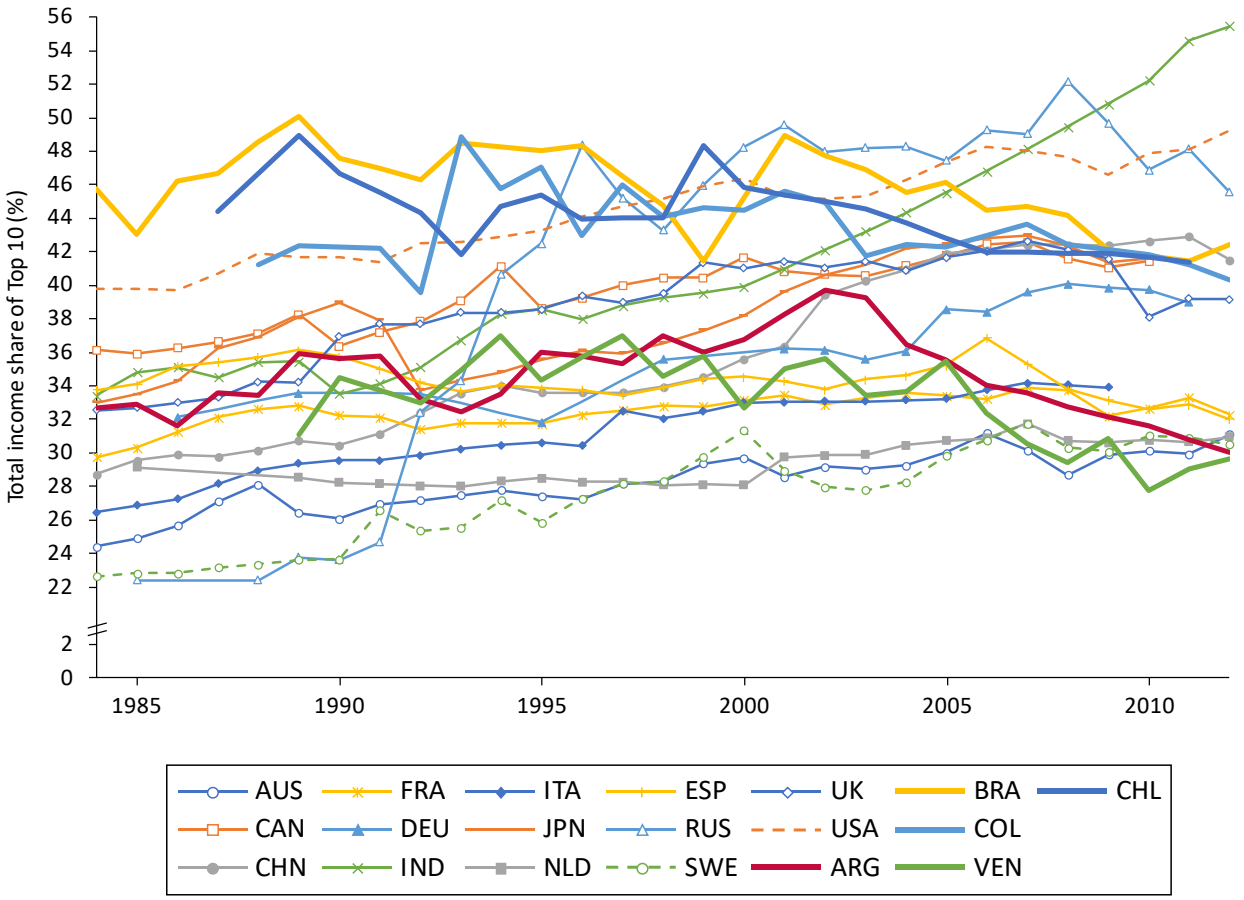


Figure 2: Top income decile share for 19 countries 1984-2012



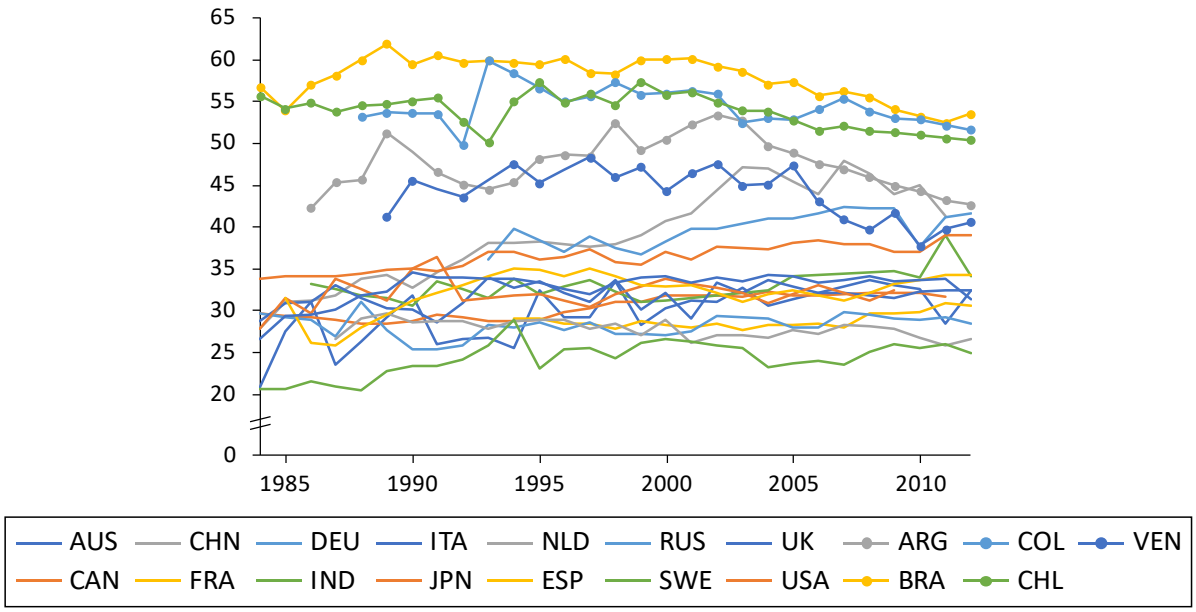
Although the WIID aims to use the same guidelines for all countries, because it combines multiple databases the heterogeneity of the income concept remains an important limitation of this database. By combining databases such as the OECD Stat and SEDLAC there might be certain discrepancies due to methods of reporting and monitoring. Nevertheless, all data on income shares is before taxes, making the data sufficiently comparable for the purposes of this paper.

Figures 1 and 2 display the trajectories of the income shares of the top percentile and decile, respectively. Both graphs seem to display an increasing trend, but especially the income share of the top percentile shows a significant increase over the past few decades. This confirms the expressed concerns in the WIR and the current literature on inequalities, that the extremely rich groups in society are gaining income shares at the expense of the rest of the population.

Gini coefficient

As mentioned previously, the analysis also includes regressions with the Gini coefficient as the dependent variable. The Gini coefficient is the most commonly used measure to quantify the level of income inequality, where a value of zero indicates perfect equality and a value of 100 maximal inequality. The data is extracted from the WIID, and available for all countries included in the dataset. This makes it possible to make inferences regarding the effect of corruption, not just on the top income shares, but on the overall level of income inequality in a country.

Figure 3: Gini coefficient for all countries 1984-2012



Additionally, due to its wide availability, the Gini coefficient can be used in the regressions investigating whether Latin American countries are differently affected by corruption.

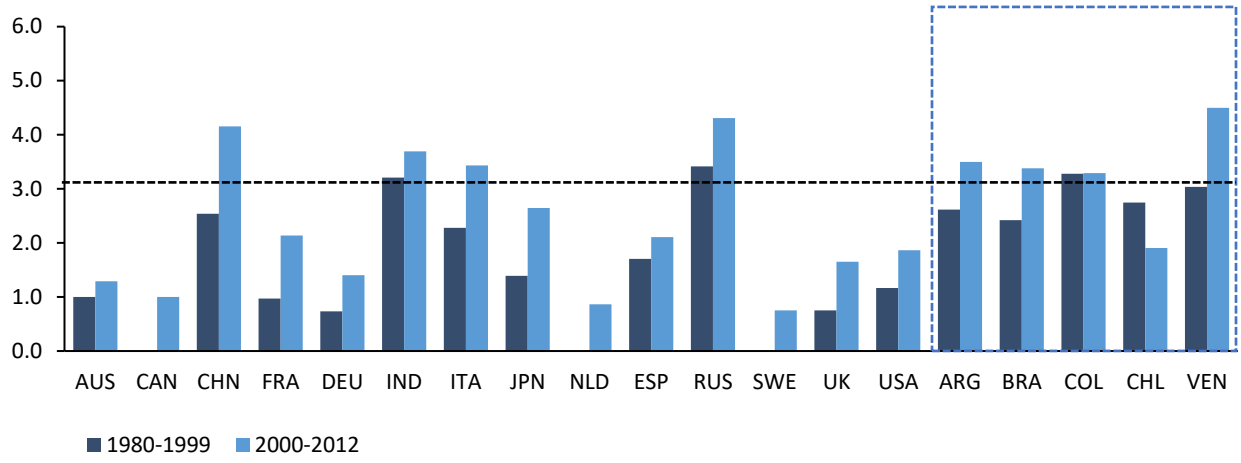
Figure 3 displays the Gini coefficient for all countries included in the dataset over the period 1984-2012. The series for Latin American countries are highlighted by a marker to emphasize the prevalence of income inequality in the region. Although the Gini coefficient for Latin America shows a decline over the whole period, it seems to have stagnated at a very high level for all Latin American countries. For the other countries, mostly industrialized, inequality seems to have increased but the level of the Gini coefficient remains below that of their Latin American counterparts. These observations confirm the findings of the WIR suggesting that countries with similar macroeconomic conditions have followed different trajectories of income inequality.

3.3 Explanatory variables

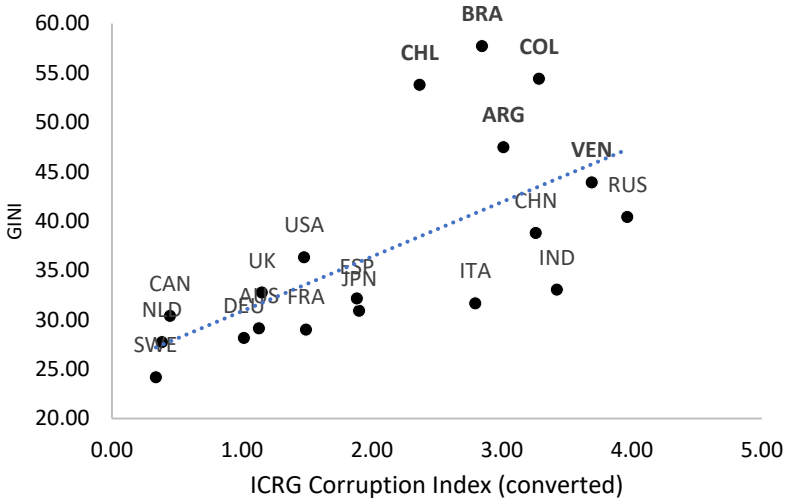
Corruption

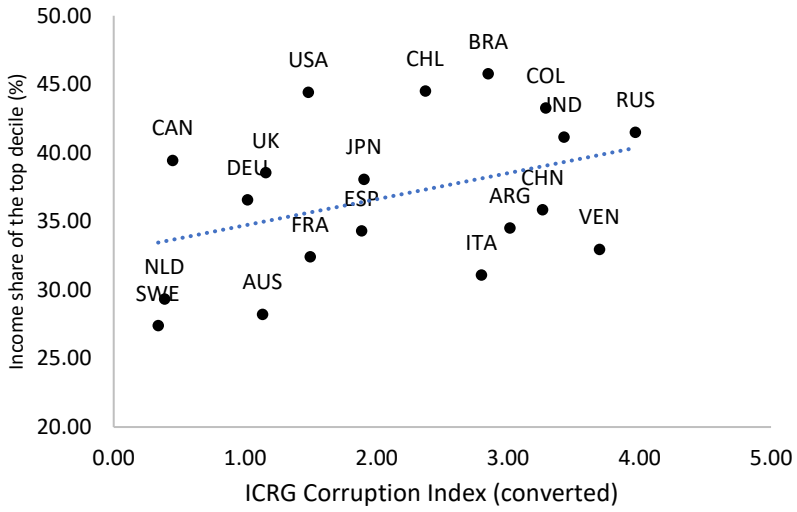
The measure for corruption is taken from the *International Country Risk Guide* (ICRG) composed by the PRS Group. As explained in their methodology, the ICRG system is an elaborate risk assessment based on political and financial information, and economic data. By combining subjective analyses and objective data, they have been able to create a comprehensive risk rating across multiple components such as corruption, but also regarding socioeconomic conditions or financial risk. Although part of the risk assessment remains subjective, the use of objective measures creates an advantage over other indexes merely based on perceptions such as the Corruption Perception Index (CPI) of the Transparency International. An additional advantage is that the ICRG index comprises data starting from 1984, whereas the CPI was first launched in 1995. The ICRG system is used by organizations such as the IMF and the Transparency International, and the only risk methodology that has been used in courts to assess political risk. As mentioned before, the corruption index of the ICRG measures the level of corruption within the political system, involving grand and political corruption. The index is based on a 6-point scale, whereby the higher the risk, the lower the point total. This means that a score of 0.00 indicates an extremely corrupt society, whereas a score of 6.00 indicates a society where corruption is barely present.

Figure 4: ICRG Corruption index for all countries included in the dataset



Figures 5 & 6: Correlation between corruption and income inequality





To make the coefficients on the corruption variable logically interpretable, the ICRG index is converted, making 6.00 the highest level of corruption that can be attributed to a country. Consequently, a positive coefficient on *Corruption* indicates that corruption increases income inequality.

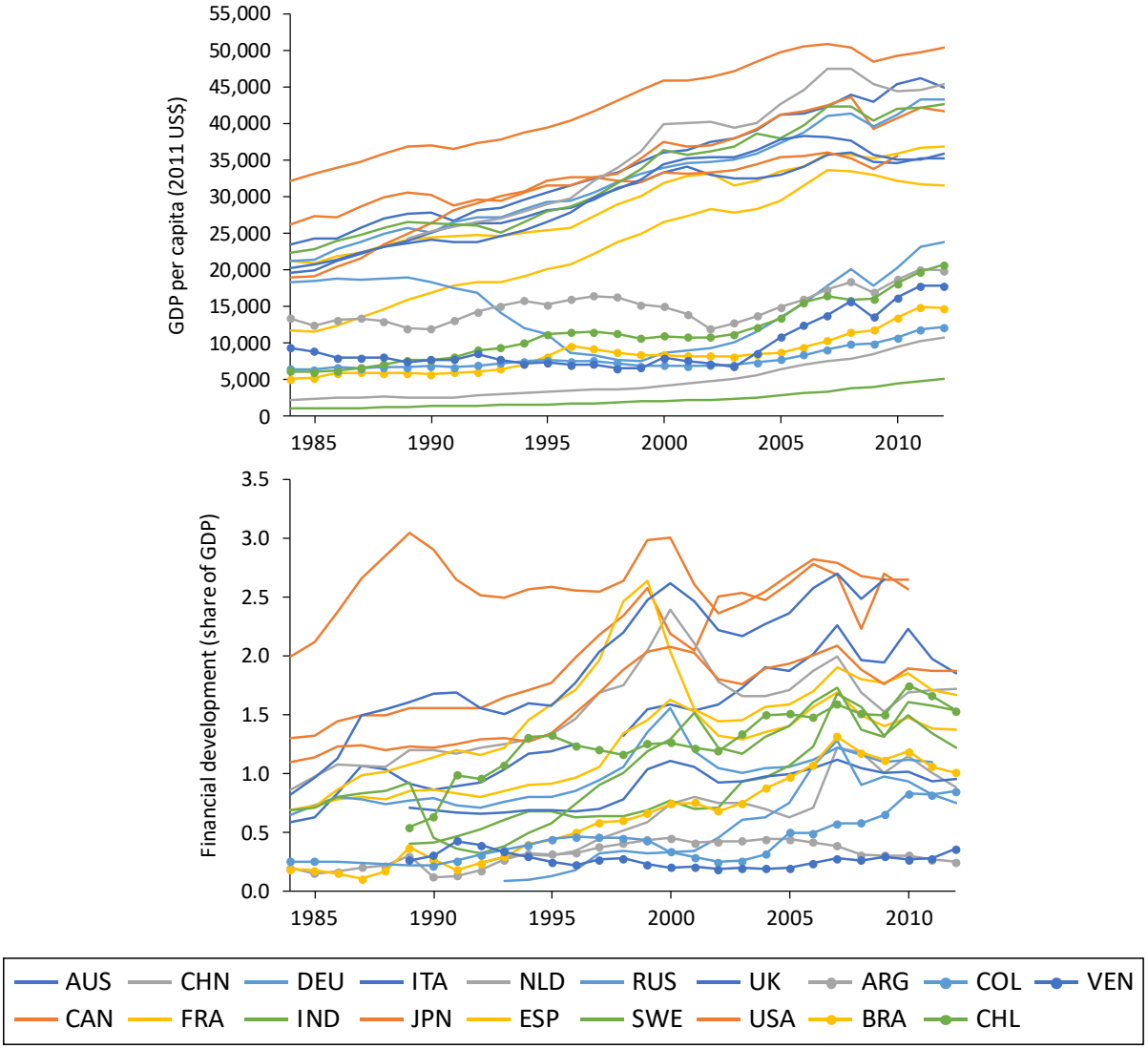
To show the development of corruption over time, figure 3 displays the average of the index for all countries in the sample over the period 1984-1999 and 2000-2012. The average level of corruption was higher for all countries over the latter period, confirming the persistence of corruption in current societies. The figure shows that there are significant differences in the level of corruption between countries. Additionally, to highlight the relatively more corrupt countries in the sample, the graph displays a cut-off level at a score of 3.0 or higher on the ICRG index. The average over 2000-2012 is above this level for eight out of the nineteen countries included in the sample, of which four are Latin American. Of the five Latin American countries in the sample only Chile is not above this level, confirming the prevalence of corruption in this region.

Additionally, as a preliminary investigation of the relationship between income inequality and corruption, figure 4 displays a scatterplot with the average of the ICRG Corruption index on the x-axis, and the average Gini coefficient on the y-axis over the period 1984-2012. The figure shows evidence of a positive correlation between corruption and income inequality, and justifies the investigation of a linear relationship between these two variables.

Financial development

In contrast with variables such as openness, there is no general *de facto* measure for financial development. Additionally, the variables must be available for a wide set of countries, and over a long time-span. This is the case for the *stock market capitalization* of a country, measured by the value of listed stocks and corporate bonds as a share of GDP. The size and depth of capital markets is often seen as an important sign of the maturity and health of the financial system of a country (Claessens & Perotti, 2005). Nevertheless, this measure does not include private credit, a variable that has been shown to be important for both financial development and income inequality (Roine et al.,2009; Claessens & Perotti, 2005). Following the method of Roine et al. (2009), an additional measure included in the analysis is therefore *bank deposits,* measured by the demand, time and saving deposits in deposit money banks as a share of GDP.

Figure 7 & 8: Economic and financial development for all countries, 1984-2012



The authors show that this variable strongly relates to the share of private credit in the economy and shows higher correlations with top income shares. Additionally, data on this variable is more widely available and over a longer time-span than for private credit. Consequently, the *Findev* variable used in the regression analyses on top income shares is the sum of the *stock market capitalization* and *bank deposits* variables. Nevertheless, because private credit data is available for most years included in the analysis of this paper and has been shown to be a significant determinant of the Gini coefficient, this variable is included in the regression analysis on the Gini coefficient (OECD Publishing, 2011). *Dcpriv* measures domestic credit to the private sector and, as defined by the World Bank, refers to the financial resources provided to the private sector by financial corporations such as deposit

money banks and monetary authorities.[5] All data regarding financial development is obtained from the Financial Development and Structure Dataset constructed by the World Bank and the IMF International Financial Statistics database.

To show the different levels of economic and financial development, Figures 7 and 8 display the variables *GDPpc* and *Findev* over the period 1984-2012 for all countries in the sample. To highlight the Latin American countries, their series are provided with a marker. All countries show improvement in terms of both financial and economic development. Nevertheless, for the level of economic development especially, Latin American countries show low levels of improvement compared to the other countries. This reconfirms that the growth of these economies has stagnated compared to other world regions. This might have significant implications not only for income inequality by itself but also on the effect of corruption on income inequality in this region.

Openness

A country's openness to the rest of the world is commonly captured by its presence on the global trading market. The standard measure, also used in this paper, is the sum of exports and imports of goods and services as a share of GDP. Data is obtained from the WDI database constructed by the World Bank.

Education

As discussed, the stock of human capital is an important determinant of income inequality. An education variable is therefore also included in the analysis. There are many different measures regarding educational attainment, such as the distribution of education or literacy rates, however, these are not available for all years and countries included in the sample. One widely available measure is the gross enrolment ratio, measuring the level of participation for a given level of education. This statistical measure was first introduced by United Nations Scientific and Cultural Organization (UNESCO) and is defined as "Number of students enrolled in a given level of education, regardless of age, expressed as a percentage of the official school-age population corresponding to the same level of education." A high gross enrolment ratio indicates a high level of participation at the specified educational level. Additionally, it indicates whether a country can accommodate all eligible children in the population and is therefore a good measure of the capacity

[5] Definition by World Bank: "Domestic credit to private sector refers to financial resources provided to the private sector by financial corporations, such as through loans, purchases of nonequity securities, and trade credits and other accounts receivable, that establish a claim for repayment." Examples include the provision of loans and purchases of nonequity securities

of the education system. The variable used in the analysis of this paper is the gross enrolment ratio of secondary education and is obtained from the WDI database constructed by the World Bank.[6]

Further control variables

The remaining variables used in the analysis are government expenditure as a share of GDP (*Govspend*) to account both for the activity and size of the government. The agricultural share in GDP (*Agricult*) is defined as the net value added by the agricultural sector as a percentage of GDP, and follows the ISIC guidelines regarding the sector classifications. Both *Govspend* and *Agricult* are obtained from the World Bank WDI database. GDP per capita is obtained from Maddison (2006), whereby GDP per capita is measured in 2011 US Dollars. For purposes of robustness, an additional variable proxying the level of technology is *Patents*. This variable measures the yearly number of patent applications per 1.0 million inhabitants and is obtained from the World Intellectual Property Organization (WIPO).[7]

4. Methodology

4.1 Estimation method

The use of panel data makes it possible to exhaust both the time-series, and cross-sectional dimension of the data, exploiting the within-country and cross-country variation to examine how changes in corruption, and other forms of economic development affect income inequality. This section elaborates on the main econometric method used for the analysis, and the different regression specifications. In addition, the challenges regarding the interpretation of the results arising from possible endogeneity will be discussed.

As discussed, this paper follows the methodology of multiple academic papers in terms of the explanatory variables and the econometric method for the analysis (Gupta et al., 2002; Dobson & Ramlogan-Dobson, 2010; Li, Xu, & Zou, 2000). Although the larger scope and focus allows for these studies to apply multiple different estimation methods, estimation of a fixed effects model using OLS is the main method used in all of them. There are multiple aspects to consider

[6] Secondary education as defined by the World Bank: "Secondary education completes the provision of basic education that began at the primary level, and aims at laying the foundations for lifelong learning and human development, by offering more subject- or skill-oriented instruction using more specialized teachers." (World Bank, 2018)
[7] This variable is defined by the WIPO as follows: "Patent applications are worldwide patent applications filed through the Patent Cooperation Treaty procedure or with a national patent office for exclusive rights for an invention--a product or process that provides a new way of doing something or offers a new technical solution to a problem. A patent provides protection for the invention to the owner of the patent for a limited period, generally 20 years."

when deciding on the appropriate econometric method. First differencing (FD) and fixed effects (FE) are the leading models to account for unobservable heterogeneity, but which of these competing methods to use depends on several factors. First, the FE estimator centers around the assumption of serially uncorrelated errors, whereas for FD estimation only the first difference of the errors needs to be uncorrelated. Considering that the dataset consists of panel data with the number of cross-sectional units N smaller than the number of time periods T, it is likely that the time-variant unobservable factors are correlated, and the assumption of the FE model is violated. Additionally, the top income shares are likely to be non-stationary[8]. However, because the dataset is unbalanced, two observations will be lost for every missing period in the computation of the FD estimator. Assuming that these values are missing due to factors uncorrelated with the idiosyncratic errors, an unbalanced panel does not impose a problem for the FE model. An additional advantage of the FE model is that it does allow for the missing values to be correlated with the unobserved fixed effect (Woolridge, 2015, p.440).

Finally, first-differencing does not make much sense if the main variable of interest does not change much over time. In this sample, the corruption variable does change over time within countries, however, most of the variation comes from cross-country differences, and the year-on-year variation is not large enough for an FD regression. For these reasons, the FE model is applied in the analysis of this paper. and the baseline regression specification for the fixed-effects model is as follows:

$$y_{\mathrm{it}} = \beta_1 \boldsymbol{X}'_{\mathrm{it}} + \gamma_{\mathrm{t}} + \mu_{\mathrm{i}} + \varepsilon_{\mathrm{it}} \qquad (1)$$

Where $\boldsymbol{X}'_{it}$ is a vector of control variables and the variables of interest, γ_t captures fixed time effects, and μ_i captures the unobserved fixed effect. The regressions are run with different measures of income inequality as the dependent variable, including the top one percentile, top decile, and Gini coefficient. The explanatory variables that will be included in every regression specification are GDP per capita, openness to trade, financial development, and corruption.

[8] To test for a unit root, the Im-Pesaran-Shin test is performed on the *Top1* and *Top10* variables. The Im-Pesaran-Shin test is preferred over other unit root tests because it allows for an unbalanced panel. P-values for the $Z_{t-\widetilde{bar}}$ test-statistic are 0.1686 and 0.0072 for the *Top1* and *Top10* variables, respectively. A time trend is included.

Table 4: Countries included in the different regressions

Dependent variable	Countries included
Top 1	Australia, Canada, China, France, Germany, India, Italy, Japan, The Netherlands, Spain, Russia, Sweden, United Kingdom, United States
Top 10	Australia, Canada, China, France, Germany, India, Italy, Japan, The Netherlands, Spain, Russia, Sweden, United Kingdom, United States, Argentina, Brazil, Colombia, Chile, Venezuela
GINI	Australia, Canada, China, France, Germany, India, Italy, Japan, The Netherlands, Spain, Russia, Sweden, United Kingdom, United States, Argentina, Brazil, Colombia, Chile, Venezuela

Subsequently, different control variables are added to the model. However, as mentioned in the previous section, not all variables are available for the entire set of countries, and therefore different regression specifications are estimated for different subsets of the sample. Table 4 provides an overview of which subset of countries is included in which regression specification. Because it is unlikely that the homoskedasticity assumption is met, all regressions are run and reported with heteroskedasticity robust standard errors. In addition, equation 1 will be altered by including a dummy variable measuring whether a country is Latin American or not. This variable will then be interacted with the corruption variable to answer the question of whether Latin American countries are different in terms of the effect of corruption on income inequality. Additionally, the variable measuring financial development will also be interacted with the LA-dummy to investigate further differences in the dynamics of income inequality in this region. To investigate the notion of Li, Xu, and Zou (2000), that corruption influences income inequality to a lesser extent in countries with high levels of government spending, an additional term interacting *Govspend* and *Corruption* will be included.

5. Results

5.1 Top income shares

Table 5 shows the results of the baseline regression with the income share of the top decile (*Top10*) as the dependent variable. Economic development, as measured by GDP per capita, seems to affect inequality in a U-shaped way, rather than the inverted-U as suggested by the Kuznets hypothesis. A possible explanation for this could be that the hypothesis of a Kuznets curve applies to the very early stages of economic development.

Table 5: OLS using FE model - income share of the top decile

Top10	(1)	(2)	(3)	(4)	(5)	(6)
GDPpc	-0.682***	-0.678***	-0.515*	-0.649***	-0.617***	-0.703***
	(0.224)	(0.219)	(0.280)	(0.213)	(0.208)	(0.241)
$GDPpc^2$	0.00661*	0.00624*	0.00584	0.00494	0.00642*	0.00662*
	(0.00356)	(0.00356)	(0.00451)	(0.00367)	(0.00325)	(0.00354)
Openness	7.631	7.839	11.69	6.328	9.707	8.173
	(6.349)	(6.219)	(7.120)	(5.300)	(6.467)	(6.612)
Findev	3.424*	3.191*	2.762*	3.930**	2.449	3.364**
	(1.712)	(1.570)	(1.340)	(1.717)	(1.490)	(1.599)
Education	0.00330	0.00611	-0.0140	0.00195		-0.00159
	(0.0354)	(0.0354)	(0.0367)	(0.0286)		(0.0348)
Corruption	0.282	0.614*	0.205	0.102	0.799**	1.089*
	(0.347)	(0.334)	(0.359)	(0.300)	(0.330)	(0.621)
*Corr*LA*		-1.218*			-1.925**	
		(0.696)			(0.850)	
Agriculture			-57.84***			
			(18.22)			
Govspend					-0.577	1.608
					(6.719)	(9.447)
*Gov*Corr*						-3.335*
						(1.867)
*Findev*LA*				-9.584***		
				(3.152)		
Constant	35.19***	35.33***	36.69***	36.55***	35.65***	34.36***
	(3.995)	(3.762)	(4.860)	(3.643)	(3.962)	(5.406)
Obs.	413	413	333	413	464	410
R-squared	0.492	0.503	0.544	0.547	0.466	0.506
Countries	19	19	19	19	19	19

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

Considering both the country sample and the investigated period of this analysis, the notion that economic development first decreases inequalities, before increasing them is not counter-intuitive. As discussed in the literature review, most countries were able to reduce inequalities before the 1980s, but it is currently on the rise in most regions. As seen in Figure 7, economic development in terms of GDP per capita has increased for all countries over the investigated period, making it plausible that the effect of economic development on inequality displays a U-shape in this analysis. The coefficients on the *Openness* variable show the expected positive sign, suggesting increased integration onto global markets increases the income share of the top decile, and thereby income inequality. Nevertheless, this variable is not significant for any of the regressions, just as the *Education* variable. An explanation for the disappointing result could be that the gross enrollment

ratio of secondary education does not accurately capture the development of human capital accumulation. Additionally, it is a possibility that *Education* is not an accurate predictor of income inequality as measured by the income share of the top decile. As will become clear in the following section, the variable is significant in the regressions on the Gini coefficient. The share of agriculture shows a negative sign, and significantly decreases the income share of the top decile. At first, this result might seem counter-intuitive because when the agricultural sector employs the majority of the population and wages are relatively low, this causes a sharp contrast with top income earners. However, when considered as a proxy for technological development it is in line with the theory discussed in the literature review. Higher levels of technology, as measured by a lower share of agricultural production in total output, are associated with higher levels of income inequality.

The most interesting results regarding corruption from this regression are shown in columns 2 and 5. When interacting the corruption variable with a dummy indicating whether a country is Latin American, the overall effect of corruption on the income share of the top decile changes direction. Whereas corruption seems to positively impact the income share of this group in the overall sample, it has a negative impact for Latin American countries. This result suggests that in Latin America, a higher level of corruption negatively affects the income of the richest part of the population, thereby reducing income inequality. This confirms the findings of Dobson and Ramlogan-Dobson (2010) that there is a trade-off between income inequality and corruption in Latin American countries. In addition to corruption, financial development also seems to differently affect income inequality in Latin America. Whereas the overall effect of *Findev* is positive, the coefficient again changes direction when interacted with the dummy for Latin America. Finally, column 6 confirms the finding of Li et al. (2000), that increased government spending reduces the positive relationship between corruption and income inequality. Government spending by itself does not significantly affect the income distribution.

To disentangle the effect of corruption from those at the extreme end of the income distribution, Table 6 shows the results of the baseline regression with the *Top1* and *Top10-1* as the dependent variables, representing the extreme rich and the upper middle class, respectively. For these income groups, economic development seems to negatively affect their income share, and hence decreases income inequality. The existence of a non-linear relationship with economic development does not find much support in the data. Considering that the dataset for the *Top1* variable mainly consists of industrialized countries, it is no surprise higher levels of economic development are associated with lower income inequality.

Table 6: OLS using FE model - income share of the "rich" and "upper middle class"

	(1)	(2)	(3)	(4)	(5)	(6)
	Top1	**Top1**	**Top1**	**Top10-1**	**Top10-1**	**Top10-1**
GDPpc	-0.376*	-0.384*	0.112	-0.270	-0.241	-0.363**
	(0.195)	(0.191)	(0.0878)	(0.186)	(0.185)	(0.120)
$GDPpc^2$	0.000557	0.000667	-0.00547*	0.00161	0.00121	0.00440
	(0.00338)	(0.00338)	(0.00252)	(0.00267)	(0.00232)	(0.00286)
Openness	-0.553	-0.332	1.252	4.831*	4.020	6.279
	(3.111)	(3.178)	(2.136)	(2.706)	(2.598)	(3.935)
Education	0.0101	0.00930	-0.0143	0.0118	0.0146	0.0140
	(0.0220)	(0.0222)	(0.0228)	(0.0189)	(0.0175)	(0.0144)
Findev	2.734**	2.724**	1.689*	-0.690	-0.660	-0.257
	(0.944)	(0.918)	(0.850)	(1.274)	(1.076)	(1.002)
Corruption	-0.425	-0.666	-0.435	0.365*	1.210*	0.0515
	(0.273)	(0.416)	(0.246)	(0.184)	(0.580)	(0.145)
Govspend		1.875			-6.818	
		(6.915)			(7.040)	
*Gov*Corr*		0.787			-2.754	
		(1.162)			(1.976)	
Agriculture			-18.52			-29.67
			(19.39)			(22.68)
Constant	11.97***	11.59**	7.758***	24.75***	26.18***	26.12***
	(3.142)	(3.983)	(1.448)	(2.936)	(3.929)	(4.846)
Obs.	329	329	249	329	329	249
R-squared	0.734	0.736	0.778	0.329	0.381	0.456
Countries	14	14	14	14	14	14

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

This result still supports the theory that the benefits of economic growth first accrue to the top of the income distribution, before they trickle down to the bottom. The countries in this sample are likely to have already reached the tipping point, after which economic growth is associated with decreased income disparities. Just as for the income share of the top decile, the variables measuring globalization and educational attainment in these regressions do not seem to account for much of the variation in the dependent variable. However, the variables *Openness* shows to positively affect the income share of the upper middle class in column 4. Considering this variable is measured by trade in goods and services, and not investment flows, it is likely that increased openness on global trading markets especially benefits income from labor. As discussed, this is the main source of income for the upper middle class, being a possible explanation for the benefits of globalization to accrue to this part of the population, rather than the top percentile. For two out of the three

regressions on the *Top1* the sign on the coefficient is negative, however, the lack of significance does not allow for any conclusive statements.

Again, the most interesting results come from the variables *Findev* and *Corruption,* that suggest these population groups to be affected by these variables in opposite ways. A higher level of financial development seems to positively influence the income share of the top 1 percentile, whereas it negatively affects the income of the upper middle class. Unfortunately, the coefficient on *Findev* for the upper middle class is not significant (with a p-value around 0.10). Similarly to financial development, corruption also shows to oppositely affect the two income groups. This time, the coefficient on *Corruption* for the top one percentile is not significant, and the p-value again hovers around 0.10. Nevertheless, corruption shows to have a significant and positive effect in columns 4 and 5, on the income share of the upper middle class. Considering the result regarding corruption from Table 5, this suggest that the positive effect of corruption on income inequality is due to a positive effect on the income share of the upper middle class, rather than the extreme rich. However, this suggestion is not conclusive because the regression on the *Top1* is limited to a smaller set of countries.

Agriculture again carries the expected sign when proxying the level of technological development. Additionally, higher levels of government spending seem to limit the effect of corruption on the income share of the upper middle class, whereas it increases the benefits associated with corruption for the extreme rich. Nevertheless, the coefficients on both variables are not significant so no conclusions can be drawn to disentangle the effect of these variables for the different subsets of the income share of the top decile.

5.2 Gini coefficient

Table 7 shows the results for the model with the Gini coefficient as the dependent variable. The overall conclusions regarding the main variables are similar to those for the income share of the top decile in Table 5. The hypothesis regarding economic development discussed in the previous section is supported, and financial development, measured here by *Dcpriv,* seems to significantly increase income inequality. Additionally, although only significant in column 4, the variable *Openness* shows to have a positive effect on the Gini coefficient confirming the notion that globalization can lead to increased inequalities. The coefficient on the variable measuring educational attainment is positive and significant for most regressions. Although counter-intuitive at first, this result confirms the notion that increased educational attainment might disproportionately increase the returns to

Table 7: OLS using FE model – the Gini coefficient

Gini coefficient	(1)	(2)	(3)	(4)	(5)	(6)
GDPpc	-0.610**	-0.633**	-0.716**	-0.522	-0.556**	-0.461*
	(0.247)	(0.246)	(0.292)	(0.308)	(0.259)	(0.249)
$GDPpc^2$	0.00710**	0.00746**	0.0124***	0.00917**	0.00646*	0.00469
	(0.00324)	(0.00314)	(0.00330)	(0.00371)	(0.00330)	(0.00358)
Openness	9.316	9.039	9.134	9.749*	9.765	9.397
	(6.255)	(6.048)	(5.649)	(5.118)	(5.910)	(6.068)
Dcpriv	3.480**	3.137**	2.422	3.445*	4.395**	4.230**
	(1.347)	(1.278)	(1.548)	(1.717)	(1.542)	(1.618)
Education	0.0509**	0.0549**	0.0286	0.0181	0.0388**	0.0413**
	(0.0193)	(0.0208)	(0.0224)	(0.0271)	(0.0159)	(0.0187)
Corruption	0.697	0.941	0.746**	0.479	1.852**	0.449
	(0.403)	(0.567)	(0.287)	(0.329)	(0.768)	(0.405)
*Corr*LA*		-0.590				
		(0.674)				
Agriculture			-44.38**	-43.98**		
			(19.60)	(18.78)		
*Dcpriv*LA*				-6.211*		-6.054
				(3.279)		(3.622)
Govspend					14.86*	
					(7.539)	
*Gov*Corr*					-6.455**	
					(2.763)	
Constant	30.68***	31.07***	38.28***	38.47***	26.92***	30.66***
	(6.742)	(6.373)	(5.669)	(5.667)	(7.578)	(6.292)
Obs.	335	335	269	269	334	335
R-squared	0.382	0.386	0.497	0.511	0.399	0.395
Countries	19	19	19	19	19	19

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

education for high-skilled individuals. If this is indeed the case, increased levels of education might be associated with larger wage discrepancies and, hence, increased levels of income inequality. Again, the sectoral composition of output shows to significantly affect income inequality. The variable *Agriculture* significantly decreases the Gini coefficient in all specifications it is included in, confirming the hypothesis that technological development increases income inequality.

The corruption variable is significant in two out of the six regressions. The sign is positive in every specification, suggesting that a higher level of corruption causes a higher level of income inequality. In addition, the inclusion of the *LA* dummy again reverses the effect of the level of corruption on income inequality. Although the negative coefficient on the interaction variable is not large enough to change the direction of the overall effect, these results again confirm a different

relationship between the level of corruption and income inequality in Latin America than in other countries. Nevertheless, the results do not allow for a conclusive interpretation because the coefficients on the interaction variable are not significant. That income inequality dynamics in Latin America are different, however, is again confirmed. The variable measuring financial development, *Dcpriv*, reverses the overall positive effect. The level of financial development decreases the Gini coefficient for countries in this region. Finally, the effect of corruption on income inequality is dampened when government spending is high, again confirming the result of Li et al. (2000).

5.3 Additional robustness checks and limitations

To account for the possibility of a non-linear relationship between corruption and income inequality, a squared term of the *Corruption* variable was included in the regressions on the *Top10* and the Gini coefficient. Nevertheless, the coefficient on the squared term was not significant in any of the regressions. Additionally, the variable *Agriculture* was replaced by *Patents* for purposes of robustness. Although only significant in one of the regressions on the income share of the top decile, the variable *Patents* did carry the expected positive sign considering it should proxy the level of technological development. For brevity, the results of these regressions are only reported in the Appendix of this paper.

It must be acknowledged, that the results presented in the previous section are subject to several limitations. First, as mentioned in Section 2.4.4., it is highly likely that the empirical model is subject to endogeneity in the form of bidirectional causality between corruption and income inequality. It is highly plausible that in countries where income disparities are particularly high, people are more likely to engage in corruption. Second, as put forward by Mendez and Sepulveda (2006), corruption and income inequality might both be affected by factors that are omitted from the model. They name the legal framework, and the specific cultural disposition of a country as two possible sources. Although the use of a fixed-effects model, by including both country- and year-fixed effects, partially corrects for endogeneity it will not address all possible sources of this problem. Furthermore, it must be considered that the *Corruption* variable is correlated with some of the explanatory variables, and the coefficients can therefore not be interpreted as total effects. For these reasons, this paper cannot claim to have found a direct causal link between corruption and income inequality, nevertheless, it clearly provides evidence that the two concepts are positively correlated. As mentioned before, the main contribution of this paper is to add to the discussion on

the dynamics of income inequality and the role of corruption, to open the door for future research and address the possible implications regarding economic policy.

6. Discussion

Before turning to the conclusion and policy implications, this section will elaborate on the main results presented in Section 5.

First, financial development seems to have an overall increasing effect on income inequality, where the benefits mainly seem to accrue to the top percentile of the income distribution. This result supports the notion that the income of the top 1 percentile primarily consists of capital income, whereas the next nine percentiles mainly obtain their income from labor. The latter group might therefore gain an advantage from strong capital markets that is less direct than the advantage for the top one percentile. Nevertheless, theory suggest that as financial markets develop, middle class individuals will experience less capital constraints and overall inequality should decrease (Roine et al., 2009). Considering that the upper middle class still represents a relatively wealthy subset of the population, this theory is not entirely contradicted by these results. The rest of the population might still experience an increase in their income as a result of financial development. Whether this materializes in a higher income share for this group, however, depends on whether this increase outweighs the benefits for the top one percentile (Roine et al., 2009). The regressions on the Gini coefficient suggest that this is not the case, and that increased financial development is associated with higher levels of income inequality. As discussed in the literature review, the main explanations for this is that financial development has been focused on the deepening of capital markets, which is highly correlated with increases in top income shares. Nevertheless, as found by Clarke et al. (2003), the effect of financial development might depend on the sectoral structure or level of development of the economy. This might be an explanation for the equalizing effect of financial development in Latin American countries. These countries, as shown in Figure 8, are still at earlier stages of financial development than most other countries in the sample. The benefits arising from stronger capital markets that benefit the whole population, such as broader access to capital for previously credit-constrained individuals, still outweigh the excessive benefits related to top incomes.

Although the results regarding corruption are not robust to all regression specifications, the evidence suggests that the benefits from corruption indeed mainly accrue to the top of the income distribution and increase overall income inequality. When looking at the regressions on the top income shares, corruption mostly seems to positively affect the income share of the upper middle

class, rather than the extreme rich. A possible explanation for this could be that the elite that still obtains the largest part of their income from labor, a characteristic from the upper middle class, is presented with more opportunities to engage in corrupt affairs. In the societies where corruption is highly prevalent, it is a part of everyday life, and the extreme rich that mainly obtain their income from capital might not be involved in bureaucratic hassles as often. To disentangle the effect of corruption and find the exact beneficiaries remains a challenge. Nevertheless, the overall results, including its effect on the Gini coefficient, are as expected from the theory presented in the literature review: corruption is associated with a misallocation of resources, biased towards the already well-off individuals in society. These findings are no surprise and present of the reasons why corruption remains a persistent problem. Those at the top of the income distribution are also the most likely to be able to influence political institutions. The exact institutions that should create policies focused at combatting corruption.

The results regarding corruption in Latin America support earlier empirical findings that there exists a trade-off between corruption and income inequality in this region. As discussed in the literature review, a possible explanation for this trade-off is the existence of a large informal sector in these countries. Decreases in corruption and increased institutional quality, are associated with more rules and compliances. This causes firms in the informal sector to incur increased costs of operation. Additionally, having to comply to more rules and regulations firms might be forced to hire more high-skilled personnel. Considering that this sector is likely to employ those at the bottom of the income distribution, these developments will directly affect this population group, rather than the more well-off individuals. Additionally, in highly corrupt societies redistribution activities, such as government project that employ large shares of manual laborers, might be promoted by corrupt government officials, merely to gain political power (Dobson & Ramlogan-Dobson, 2010). What could be a third explanation for the trade-off between corruption and income inequality in Latin America, because corruption is so imbedded in everyday life, the beneficiaries of corruption might be middle-class individuals, such as police officers. In the report published by Transparency International, the authors stated that policemen were said to be especially corrupt in Latin American countries (Pring, 2017, p.6). For these reasons, it is a possibility that the benefits of corruption in countries where it is highly persistent, are more equally distributed across the population.

Finally, increased government spending seems to diminish the distortionary effect of corruption on the income distribution, in line with previous empirical findings. High levels of government spending need to be financed by taxes. According to Li et al. (2000) this burden will

mainly fall on the modern or entrepreneurial sector which reduces the income disparities with the traditional sector. Furthermore, as put forward by Dzhumashev (2014), high levels of government spending might be a signal of good governance and control of corruption. Although these explanations might explain the findings found in this sample, government spending is of course also a channel through which corruption originates. Increased government spending might increase the opportunities for corrupt activities and increase the incidence of corruption in society. Whether the interaction between corruption and government spending depends on other factors, such as the level of economic or financial development, is an interesting area for future research.

7. Conclusion and policy implications

This paper evaluates the current dynamics of income inequality by investigating the role of corruption and other macroeconomic variables on the income distribution Additionally, the hypothesis that income inequality dynamics are different for Latin American countries is investigated. The use of a panel data set for 19 countries over the period 1984-2012, allows for the consideration of country specific and time-invariant factors. Additionally, whereas most previous studies on income inequality only use the Gini coefficient as the dependent variable, the use of the most recent dataset of the World Inequality Lab allows for the inclusion of top income shares as measures of inequality. Recent updates to this dataset even include data on the income share of the top percentile of the income distribution, that has shown to be a better approximation of the extreme rich in society than the top decile.

Although the coefficient on corruption is not significant in every regression specification, the results suggest a positive association between corruption and the level of income inequality. Furthermore, corruption and the level of financial development show to differently affect income inequality in Latin America than the other countries included in the sample. This confirms the notion that income inequality dynamics are different for this region. Additionally, corruption seems to affect income inequality to a lesser extent when government spending increases.

The findings of this paper show that the fight against corruption is an important part of the fight against income inequality. Corruption distorts the income distribution through a misallocation of resources, deterring growth and development. Government policy aimed at tackling income inequality, should additionally focus on anti-corruption measures, such as strengthening the rule of law and creating more transparent processing regarding government decisions. Furthermore, channels to report corrupt individuals and activities should be accessible, and whistleblowers should

receive appropriate protection. Because the beneficiaries of corruption are likely to be the same people that have access to resources to engage in corruption, and to influence government policy, the distortionary effects are perpetuated. This is one of the problems in Latin America. The finding of a trade-off between corruption and income inequality in this region, does not mean corruption should be overlooked. Rather, government policy aimed at reducing corruption should be accompanied by appropriate targeting of government expenditures to alleviate the transition to increased institutional quality.

There is still plenty of room for future research regarding the dynamics of income inequality. There are multiple feedback mechanisms between the variables involved in determining income inequality. The effect of corruption might depend on other variables as well, such as the level of technological development. Additionally, when investigating a larger sample of countries, the dynamics of income inequality might be found to differ in other world regions as well. Creating a better understanding of the dynamics and determinants of income inequality, is a vital step towards a more equal and harmonized world.

References

Alesina, A., & Perotti, R. (1994). The political economy of growth: a critical survey of the recent literature. *The World Bank Economic Review*, *8*(3), 351-371.

Alesina, A., & Rodrik, D. (1994). Distributive politics and economic growth. *The quarterly journal of economics*, *109*(2), 465-490.

Alesina, A., Di Tella, R., & MacCulloch, R. (2004). Inequality and happiness: are Europeans and Americans different?. Journal of Public Economics, 88(9), 2009-2042.

Altig, D., & Carlstrom, C. T. (1999). Marginal tax rates and income inequality in a life-cycle model. *American Economic Review*, *89*(5), 1197-1215.

Apergis, N., Dincer, O. C., & Payne, J. E. (2010). The relationship between corruption and income inequality in US states: evidence from a panel cointegration and error correction model. *Public Choice*, *145*(1-2), 125-135.

Atkinson, A. (2004). Income Tax and Top Incomes over the Twentieth Century.

Bhargava, V. (2005). The Cancer of corruption. In *World bank global issues seminar series* (pp. 1-9)

Bjørnskov, C., Dreher, A., Fischer, J. A., Schnellenbach, J., & Gehring, K. (2013). Inequality and happiness: When perceived social mobility and economic reality do not match. *Journal of Economic Behavior & Organization*, *91*, 75-92.

Chong, A., & Calderon, C. (2000). Institutional quality and income distribution. *Economic Development and Cultural Change*, *48*(4), 761-786.

Chong, A., & Gradstein, M. (2007). Inequality and institutions. *The Review of Economics and Statistics*, *89*(3), 454-465.

Cingano, F. (2014), "Trends in Income Inequality and its Impact on Economic Growth", OECD Social, Employment and Migration Working Papers, No. 163, OECD Publishing.

Claessens, S., & Perotti, E. (2007). Finance and inequality: Channels and evidence. *Journal of Comparative Economics*, *35*(4), 748-773.

Clarke, G. R., Zou, H. F., & Xu, L. C. (2003). *Finance and income inequality: test of alternative theories* (Vol. 2984). World Bank Publications.

Cline, W. R. (1997). Trade and income distribution. Peterson Institute.

Cornia, Giovanni Andrea (2003) : The Impact of Liberalisation and Globalisation on Income Inequality in Developing and Transitional Economies, *CESifo Working Paper*, No. 843, Center for Economic Studies and Ifo Institute (CESifo), Munich

D'Agostino, G., Dunne, J. P., & Pieroni, L. (2016). Government spending, corruption and economic growth. *World Development*, *84*, 190-205.

Dincer, Oguzhan C.; Gunalp, Burak (2008) : *Corruption, income inequality, and poverty in the United States*, Nota di lavoro // Fondazione Eni Enrico Mattei: Global challlenges, No. 54.2008, Fondazione Eni Enrico Mattei (FEEM), Milano

Dobson, S., & Ramlogan-Dobson, C. (2010). Is there a trade-off between income inequality and corruption? Evidence from Latin America. *Economics letters*, *107*(2), 102-104.

Dobson, S., & Ramlogan-Dobson, C. (2012). Inequality, corruption and the informal sector. *Economics Letters*, *115*(1), 104-107.

Dzhumashev, R. (2014). Corruption and growth: The role of governance, public spending, and economic development. *Economic Modelling*, *37*, 202-215.

Feenberg, D. R., & Poterba, J. M. (1993). Income inequality and the incomes of very high-income taxpayers: evidence from tax returns. *Tax policy and the economy*, *7*, 145-177.

Freeman, R. B. (2009). Globalization and inequality. In *The Oxford handbook of economic inequality*.

Galor, O., & Moav, O. (2004). From physical to human capital accumulation: Inequality and the process of development. *The Review of Economic Studies*, *71*(4), 1001-1026.

Graham, C., & Felton, A. (2006). Inequality and happiness: insights from Latin America. *Journal of Economic Inequality*, *4*(1), 107-122.

Greenwood, J., & Jovanovic, B. (1990). Financial development, growth, and the distribution of income. *Journal of political Economy*, *98*(5, Part 1), 1076-1107.

Gregg, P., Jonsson, J. O., Macmillan, L., & Mood, C. (2017). The role of education for intergenerational income mobility: A comparison of the United States, Great Britain, and Sweden. *Social Forces*, *96*(1), 121-152.

Gupta, M. S., & Abed, M. G. T. (2002). *Governance, corruption, and economic performance*. International Monetary Fund.

Gupta, S., Davoodi, H., & Alonso-Terme, R. (2002). Does corruption affect income inequality and poverty?. *Economics of governance*, *3*(1), 23-45.

Gyimah-Brempong, K., & d Munoz de Camacho, S. M. (2006). Corruption, growth, and income distribution: Are there regional differences?. *Economics of Governance*, *7*(3), 245-269.

Hirschman, A. O., & Rothschild, M. (1973). The Changing Tolerance for Income Inequality in the Course of Economic Development* With A Mathematical Appendix. *The Quarterly Journal of Economics*, *87*(4), 544-566.

International Monetary Fund (2007). *World Economic Outlook: October 2017 – Globalization and Inequality*. IMF Publishing

Knight, J. B., & Sabot, R. H. (1983). Educational expansion and the Kuznets effect. *The American Economic Review*, *73*(5), 1132-1136.

Kuznets, S. (1955). Economic growth and income inequality. *The American economic review*, *45*(1), 1-28.

Leamer, E. E., Maul, H., Rodriguez, S., & Schott, P. K. (1999). Does natural resource abundance increase Latin American income inequality? 1. *Journal of development Economics*, *59*(1), 3-42.

Levine, R., Demirgüç-Kunt, A., & Beck, T. (2001). *Law, Politics, and Finance*. The World Bank.

Li, H., Xu, L. C., & Zou, H. F. (2000). Corruption, income distribution, and growth. *Economics & Politics*, *12*(2), 155-182.

López-Córdova, J. E., & Meissner, C. M. (2005). *The globalization of trade and democracy, 1870-2000* (No. w11117). National Bureau of Economic Research.

Lui, F. T. (1985). An equilibrium queuing model of bribery. *Journal of political economy*, *93*(4), 760-781.

Méndez, F., & Sepúlveda, F. (2006). Corruption, growth and political regimes: Cross country evidence. *European Journal of political economy*, *22*(1), 82-98.

Mincer, J. (1958). Investment in human capital and personal income distribution. *Journal of political economy*, *66*(4), 281-302.

OECD (2011). *Divided We Stand: Why Inequality Keeps Rising,* OECD Publishing.

O'Rourke, K. H. (2002). Globalization and inequality: historical trends. In *Annual World Bank Conference on Development Economics 2001* (pp. 39-67).

Owen, A. L., & Weil, D. N. (1997). *Intergenerational earnings mobility, inequality, and growth* (No. w6070). National Bureau of Economic Research.

Persson, T., & Tabellini, G. (1994). Is inequality harmful for growth?. *The American economic review*, 600-621.

Piketty, T., & Saez, E. (2003). Income inequality in the United States, 1913–1998. *The Quarterly journal of economics*, *118*(1), 1-41.

Piketty, T., (2013). *Capital in the twenty-first century*. Cambridge: Belknap Harvard.

Pring, C., (2017). *People and Corruption: Latin America and the Caribbean*. Transparency International Publication.

Roine, J., Vlachos, J., & Waldenström, D. (2009). The long-run determinants of inequality: What can we learn from top income data?. *Journal of Public Economics*, *93*(7-8), 974-988.

Saez, E., Slemrod, J., & Giertz, S. H. (2012). The elasticity of taxable income with respect to marginal tax rates: A critical review. *Journal of economic literature*, *50*(1), 3-50.

Sylwester, K. (2000). Income inequality, education expenditures, and growth. *Journal of development economics*, *63*(2), 379-398.

Tanzi, V., & Davoodi, H. (1998). Corruption, public investment, and growth. In *The welfare state, public investment, and growth* (pp. 41-60). Springer, Tokyo.

Uslaner, E. M. (2005). Economic inequality and the quality of government.

Appendix

Table A1: Regression on the top decile including squared corruption term and *Patents*

Top10	(1) top10	(2) top10	(3) top10	(4) top10
GDPpc	-0.667***	-0.675***	-0.609***	-0.687***
	(0.212)	(0.213)	(0.189)	(0.208)
$GDPpc^2$	0.00602*	0.00611	0.00594*	0.00585
	(0.00344)	(0.00353)	(0.00304)	(0.00351)
Openness	7.485	7.787	10.47	8.882
	(6.351)	(6.210)	(6.751)	(6.690)
Findev	3.311*	3.177*	2.550	3.418**
	(1.688)	(1.571)	(1.541)	(1.625)
Education	0.00567	0.00655		-0.00409
	(0.0367)	(0.0365)		(0.0345)
Corruption	0.992	0.780	0.768**	0.293
	(0.868)	(0.930)	(0.311)	(0.348)
$Corruption^2$	-0.146	-0.0384		
	(0.160)	(0.177)		
*Corr*LA*		-1.136	-1.833*	
		(0.753)	(0.875)	
Govspend			-1.672	
			(7.640)	
Patents			0.00479	0.00483*
			(0.00285)	(0.00260)
Constant	34.73***	35.20***	34.55***	34.33***
	(4.000)	(3.959)	(4.158)	(3.960)
Obs.	413	413	437	395
R-squared	0.496	0.504	0.470	0.512
Countries	19	19	19	19

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

Table A2: Regression on the Gini coefficient including squared corruption term and *Patents*

Gini coefficient	(1)	(2)	(3)	(4)
GDPpc	-0.625**	-0.669**	-0.580**	-0.416
	(0.254)	(0.263)	(0.245)	(0.241)
$GDPpc^2$	0.00753**	0.00833**	0.00640*	0.00377
	(0.00307)	(0.00315)	(0.00327)	(0.00354)
Openness	9.099	8.551	9.183	9.271
	(6.023)	(5.649)	(5.959)	(5.719)
Dcpriv	3.795**	3.403**	3.329**	4.143**
	(1.518)	(1.276)	(1.220)	(1.471)
Education	0.0471**	0.0516**	0.0370*	0.0263
	(0.0180)	(0.0198)	(0.0212)	(0.0210)
Corruption	-0.168	-0.204	0.693	0.417
	(0.941)	(0.922)	(0.417)	(0.417)
Corruption ^{2}	0.163	0.243		
	(0.214)	(0.199)		
*Corr*LA*		-0.942		
		(0.732)		
Patents			0.00114	0.00134
			(0.00102)	(0.000871)
*Dcpriv*LA*				-6.576*
				(3.536)
Constant	31.63***	32.73***	32.52***	32.56***
	(6.020)	(5.667)	(6.093)	(5.545)
Observations	335	335	323	323
R-squared	0.387	0.394	0.354	0.371
Number of id	19	19	19	19

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