Master in Economic Development and Growth

The short and long-term effect of income inequality on economic performance

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Abstract

There is a relationship between income inequality and economic performance. This relationship is based on different channels between income inequality and economic performance. These channels are based on incentives, investment opportunities, policy, and taxation. The effects of the different channels are noticeable after different time-periods. This paper tested if income inequality affects economic performance and if there is a difference between the short-term and long-term effect. This paper found that income inequality has a positive effect on economic performance in, both, the short-term and long-term.

Key words: Income inequality, Short-term, Long-term

Table of contents

1) Introduction

Income inequality and the effect of income inequality on important issues in society has caught the attention of researchers and policy makers. During the last decade income inequality has made it to the forefront when it comes policy making and research. Research on income inequality reached a tipping-point after a study by Piketty and Saez (2001) on income inequality in the United States took centre stage, this happened during and in the aftermath of the financial crisis of 2007-2008 (Kornbluth, Chaiken, Dungan, Reich, Cvetko, Krauss & D'Ambrosio, 2014). This was partly a result of the increased income inequality and the negative effects of the financial crisis on society (Kornbluth et al, 2014).

During the 1950s, 1960s and 1970s the income inequality literature had mainly focused on the effect of economic performance on income inequality. This research was mostly inspired by Simon Kuznets (1955). Kuznets (1955) predicted that there was an inverted U-shape relationship between economic performance and income inequality. Less developed economies are relatively equal. When a country starts to develop their level of income inequality increases as well, the increase in income inequality stops at a certain point of development. After this point of development income inequality starts to decrease again with further economic development (Kuznets, 1955).

During the last decade, more interest has been put on the effect of income inequality on economic performance, with many important recent contributions (Aghion, Caroli & Peñalosa, 1999; Piketty & Saez, 2001; Cingano, 2014; Halter, Oechslin & Zweimuller, 2014). Income inequality had increased over the past decades making it more interesting for research to focus on the effects of income inequality (Milanovic, 2016). However, the increase in income inequality research has not resulted in one unanimous conclusion, the results are divided when it comes to the effect of income inequality on economic performance (Aghion, Caroli & Peñalosa, 1999). There are studies that concluded that income inequality has a negative effect on economic performance (Engerman & Sokoloff, 2005; Cingano, 2014), there are studies that are inconclusive (Aghion, Caroli & Peñalosa, 1999; Halter, Oechslin & Zweimuller, 2014), there are studies that concluded that income inequality had a positive effect on economic performance (Li & Zou, 1998; Forbes, 2000), and there are studies that show that change (both increase and decrease) in income inequality has a negative effect on economic performance (Banerjee & Duflo, 2003). The different conclusions by the different studies is the result of different channels between income inequality and the use of different databases. There are

different channels through which income inequality can affect economic performance. There are channels that are hypothesized with a negative effect of income inequality on economic performance, and there are channels that are hypothesized with a positive effect of income inequality on economic performance. For example, higher income inequality could lead to a decrease of human capital for the population with lower income (negative effect on economic performance), but could lead to more investment possibilities (positive effect on economic performance). The aim of this paper is to contribute to understand if and how income inequality affects economic performance. This paper looks at 164 different countries for the time-period 1960-2015. In addition, this paper argues that there is a difference between the short-term effects and the long-term effects of income inequality on economic performance. The hypothesis is that the negative channels between income inequality and economic performance have a time lag in their effect compared to the positive channels. To build further on the previous example; the decrease of human capital in the lower income population is assumed to take a longer time-period than the investment possibilities.

Studies before the turn of the millennium did not take time dimension in to account when researching the relationship between income inequality and economic performance because the income inequality data was not sufficient available (Aghion, Caroli & Peñalosa, 1999). The data with regards to income inequality has increased during the last decade and a half, this has resulted in income inequality studies that included the time dimension when it comes to the effect of income inequality on economic performance. However, a broader country coverage would increase the strength of the results and could account for differences between countries with different levels of income (Halter, Oechslin & Zweimüller, 2014). The United Nations (UNU-WIDER, 2017) has published an updated version of their World Income Inequality Database (WIID) in January 2017. This updated WIID gives this paper the perfect opportunity to incorporate the critique and feedback that earlier papers had on the research of the effect of income inequality on economic performance by including the time dimension and using a more extensive database than earlier work. This paper tries to incorporate the shortcoming of earlier work and answer the following research question: what is the effect of income inequality on economic performance and is there a difference between the short-term and long-term effect of income inequality.

When researching income inequality, it is important to realize what income inequality is and the different concepts of income inequality. There are four different concepts of income

inequality (Nissanke & Thorbecke, 2006; Milanovic, 2016). The first concept measures income inequality by taking the mean income of a country—without weighing the country's population size—and compare the mean income to other countries. This concept is especially helpful when analysing the income divergence or income convergence between countries. The second concept measures income inequality by taking the mean income of a country—with weighing the country's population size—and compare the mean income to other countries. Concept two is strongly influenced by countries with a high population. The third concept measure income inequality by interpersonal inequality at the global or national level. Compared to concept one and concept two does concept three not look at the mean income of a country but at the individual income or a household variant. The third concept results in the world's income distribution by taking all individuals separately, or it results in the country's income distribution by taking all individuals in that country separately. The fourth concept measures income inequality by using vertical and horizontal income inequality. Vertical income inequality indicates the income inequality between different individuals in different income groups. Horizontal income inequality indicates the income inequality between income-groups or social-groups. The income inequality between the bottom 10 percent earners would be an example of horizontal inequality. This paper focusses on the income inequality between individuals in a country, this is in line with concept three. The individual within country distribution provided by concept three is the best concept to measure the evolution of income inequality over time (Nissanke & Thorbecke, 2006). Concept three has received a high degree of attention from income inequality scholars during the last few years, however, the mean focus was on the global distribution and not on the national distribution (Milanovic, 2016). This paper however argues that income inequality on the national level is the most relevant income inequality for research. National income inequality effects both the national society and the domestic economy through different channels. In addition, most policies are designed on the national level and are focused on national society and the domestic economy, this implicates that income inequality on the national level is an important research area (UNDP, 2013). This argumentation reasoning supports the decision of this paper to base the research on income inequality concept three and the national level.

This paper assumes that there is a difference between the effect of income inequality—in the short-term and long-term— on economic performance in different countries depending on the country's development level. This assumption results in a division of different countries in four groups: high-income, upper middle-income, lower middle-income, and low-income. The four

country groups are based on the income division by the United Nations (2014), countries are allocated to a group based on their Gross National Income (GNI) in 2012 and remain in their division during the time-period used in this study.

The results of this paper indicate that income inequality has a positive effect on economic performance in the short-term. This result holds when this paper looks at all countries and for multiple country income-groups. The short-term effect is measured with a lag of 5-years. This paper did not find evidence that income inequality has a negative effect on economic performance in the long-term. However, this paper did find evidence that income inequality has a positive effect on economic performance in the long-term when 10-year lag is taken as long-term. This means that this study finds evidence that support the claim that income inequality has a positive effect on economic performance.

The rest of this paper is structured as follows. The next section—the second section— looks at different theories that explain the level of economic performance in a country. In addition, the second section looks at different theories that explain how income inequality could affect economic performance. The different theories result in the research question that this paper aims to answer, and a hypothesis about the answer to the research question. The third section presents the empirical model that this study uses to support answering the research question. The fourth section explains the data used in this paper. The fifth section present the results, analysis, and a robustness analysis. This paper ends with a concluding section where the research question is answered.

2) Literature review

This section explains the different theories that are needed to answer the research question. This section starts with general theories that explain the economic performance of a country. The second part of this section consists out of theory related to the effect of income inequality on economic performance. The third part of this section includes the research question and the hypothesis of this paper.

2.1) Economic growth theory

To understand the relationship between income inequality and economic performance it is important to look at theories that explain economic performance and economic growth in a broader setting. The first model that this paper analysis is the Harrod-Domar model, this model

is important because it forms for the base for the Solow-model. The Harrod-Domar model explains the economic performance growth of a country by using the Gross Domestic Product (GDP) per capita growth (Solow, 1994). In the Harrod-Domar model economic growth depends on the investments (the investments are equal to the savings), on the output-capital ratio, and the depreciation of capital (Solow, 1994). The output-capital ratio is a summation of the increase (or decrease) in labour productivity and the increase (or decrease) in the labour force (Solow, 1994). In the Harrod-Domar model investments have a positive effect on economic growth while depreciation of capital has a negative effect on economic growth. If the economy is growing too fast the country could run out of labour supply by the labour force, if the economy is growing too slow the increase in the labour force results in unemployment (Solow, 1994). Within the Harrod-Domar model there is no alteration between the income-level of countries (the model uses the same mechanism for relatively high-income and relatively low income countries). This makes the Harrod-Domar a neutral theory of economic growth.

The Solow-model is based on the Harrod-Domar model but extends the Harrod-Domar model by including diminishing returns (to control for different income levels between countries) (Solow, 1956). The Solow-model includes diminishing returns on capital per capita. When a country develops, and becomes richer the capital per capita increases. In this scenario, Solow (1956) assumes that with diminishing returns on capital per capita the output increase per capita decreases when the country develops. The diminishing returns on capital assumption means that a similar increase in absolute capital per capita has a stronger effect on the economic growth of a relatively poor country than on a relatively rich country. Thus, in the Solow-model a country with a relative low GDP per capita level achieves faster economic growth than a country with a relative high GDP per capita level. In the Solow-model economic growth can be achieved through two different channels: capital accumulation and productivity growth (Solow, 1956). The diminishing returns on capital per capita imply that growth through capital accumulation is relative more effective in low-income countries than in high-income countries. On the other hand, high-income countries can achieve relatively more economic growth out of productivity growth than low-income countries. However, the Solow-model does not take national policies or the amount of human capital available into account.

The presence of human capital has a strong influence on the economic performance and economic growth of a country (King & Rebello, 1990). Structural change in a country's

economy by the movement of labour towards relatively productive sectors and away from relatively unproductive sectors influences economic growth in a positive way. This structural change can only be achieved with the presence of human capital (Nelson & Pack, 1999; Foster, Haltiwanger & krizan, 2005). However, it is important to realize that the presence of human capital by itself does not influence the economic performance of a country, this human capital must be employed or deployed in a productive way. A balanced and controlled interaction between productivity growth—Solow-model—, the presence of employed human capital, and national policies lead to economic growth (Barro, 1999).

2.2) Income inequality theory

The description of the broader theories that explain the economic performance and growth of a country is important to put the effect of income inequality on economic performance in the correct context.

The effect of income inequality on economic performance has long-term implications and the income inequality level could influence the economic performance of a country centuries later. Studies show that income inequality during the European colonialization resulted in an economic development convergence (Engerman & Sokoloff, 2005). Europeans created extreme income inequality societies in some of the countries that were colonized. Colonies that started off with high income inequality did not develop as strongly as colonies with lower initial income inequality; institutions kept income inequality high during the development process (Engerman & Sokoloff, 2005). Slaves were imported to colonies—Brazil and the Caribbean— for example with the perfect soil and climate for lucrative crops (sugar plants). Europeans specialised those colonies on their comparative advantage of plantations. The slaves had no income while the European elite had a high income as result of the plantations, this resulted in extreme income inequality (Engerman & Sokoloff, 2005). Other former colonies in South-America had a large native population size, the natives were relatively poor compared to the elite rich Europeans; this resulted in high income inequality (Engerman & Sokoloff, 2005). This contrasts with colonies that are high-income countries now—United Stated and Canada— because those colonies started off more equal because of low native population and the soil and climate supported a wide range of farming instead of only for lucrative crops (Engerman & Sokoloff, 2005). Institutions kept the income inequality in place trough out the centuries and this resulted in the development level difference between countries like Brazil, the Caribbean,

and other South-American countries compared to the United States and Canada (Engerman & Sokoloff, 2005).

The effect of income inequality on economic performance is transmitted through different channels and at a different pace. The effects of some channels are relatively faster than the effects of other channels. This study first explains the different channels before focussing on the difference between the short-term and long-term. Different scholars have researched different channels by focussing on one channel (Alesina & Rodrik, 1994; Bénabou, 1996; Perotti, 1996; Aghion & Bolton, 1997; Keefer & Knack, 2002) and researchers that focussed on multiple channels (Aghion, Caroli & Peñalose, 1999; Nissanke & thorbecke, 2006; Cingano, 2014). The researchers that focus on multiple channels between income inequality and economic performance do not use the same channels but there is a strong overlap. There are channels that assume that income inequality has a negative effect on economic performance and there are channels that assume that income inequality has a positive effect on economic performance (Aghion, Caroli & Peñalose, 1999; Nissanke & thorbecke, 2006; Cingano, 2014).

First this study looks at the channels that assume that income inequality has a negative effect on economic performance, subsequently this study looks at the channels that assume a positive effect. The first negative channel is based on that when high income inequality is presence the rent-seeking activities increase. When the gap between the relatively poorer share and the relatively richer share of the society increase, this increases the chances that the relatively richer share of the population pursuits rent-seeking activities (Bénabou, 1996). The increase in rent-seeking activities result in less secure property rights (through lobbying of the rich). A decrease in property rights has a negative influence on economic performance since it decreases the incentive for people to invest and build up human and physical capital (Bénabou, 1996; Keefer & Knack, 2002 Acemoglu, Johnson & Robinson, 2004). The second negative channel assumes that higher income inequality leads to political instability and social tensions. The political instability and social tensions results in a higher uncertainty within the economy. Higher uncertainty effect the investments negatively because investors reduce their investments when there are uncertainties. A decrease in investments results in a decrease of economic growth (Alesina & Perotti, 1994; Nissanke & thorbecke, 2006). The third negative channel assumes that higher income inequality results in a relatively poorer voter. The poorer voter will most likely vote for an increase of redistribution taxation. Those redistribution taxations will mostly affect the possessors of human capital and physical capital negatively. This results in a

distortion within society and the economy, resulting in a decrease of economic growth (Alesina & Rodrik, 1994; Nissanke & thorbecke, 2006; Cingano, 2014). In addition, the higher taxation as result of higher income inequality could result in a decrease in trust in businesses and trust in policies towards businesses. This could result in a quality decrease of the business environment and eventually in a decrease of economic growth (Cingano, 2014). The fourth negative channel is based on the presence of imperfections in capital markets. High income inequality results in a relatively large share of low-income families in society. With the presence of capital market imperfections then it becomes difficult for low-income families to invest in human capital or business (Aghion & Bolton, 1997). This means that with high income inequality a relatively larger share of the population cannot invest in factors (human capital and business) that are economic performance enhancing (Aghion & Bolton, 1997; Nissanke & thorbecke, 2006). The fifth negative channel assumes that higher income inequality results in a smaller income share for the middle class. A relatively smaller middle income class results in an increase of fertility and thus an increase in the population (Perotti, 1996). A larger population increases the total cost of the education system (the education system is in most countries a government expenditure), this means that there is less education investment available per student and thus lowering the human capital. Lower human capital has a negative effect on economic growth of a country (Perotti, 1996; Nissanke & thorbecke, 2006). The sixth negative channel assumes that higher income inequality could stop the development of advanced technologies because of an absent domestic demand. New advanced technologies could require a minimal amount of domestic demand. If domestic demand is not there because of income inequality (a large share of the population cannot afford luxury goods) the advancement of this new technology could stop. The development stop of new technologies has a negative effect on economic growth in a country (Cingano, 2014). The seventh and last negative channel assumes that higher income inequality leads to a higher share of income for the rich but the rich could make unproductive investments that do not lead to an increase in economic performance (Aghion, Caroli & Peñalosa, 1999).

This section has reviewed the channels that assume that income inequality has a negative effect on economic performance but there are also channels that assume that income inequality has a positive effect on economic performance. The next section describes the positive channels of income inequality on economic performance. The first positive channel is related to social mobility, if income inequality goes hand in hand with creating incentive for people to work hard and invest in personal development and human capital (for example through education)

to move upwards within society. The ambition to move upward in society and the investment in education could have a positive effect on economic growth because of an increase in human capital (Cingano, 2014). The second positive channel from income inequality to economic performance is based on aggregate savings. Rich individuals spend relatively less of their income on consumption and have a higher savings rate, this leads to higher aggregate savings and thus higher capital accumulation. Capital accumulation has a positive influence on economic growth (Cingano, 2014). Aghion, Caroli, and Peñalosa (1999) argue that the textbook approach about the relationship between income inequality and economic growth is that income inequality is increasing incentives for individuals, the increase in incentives affects economic growth positively. This textbook approach is in line with the arguments by Cingano (2014).

Halter, Oechslin, and Zweimüller (2014) look at the effect of income inequality on economic growth but consider the time dimension. This results in the conclusion that high income inequality increases economic growth in the short-term but decreases economic growth in the long-term (Halter, Oechslin and Zweimüller 2014). The positive effects from income inequality—aggregate savings, realization of high-return projects, and stimulating R&D—are based on economic mechanism and could materialize in the short-term. The negative effects of high income inequality—promoting expensive fiscal policies, ineffective state bureaucracy, hampering human capital formation, and leading to political instability—are based on political and institutional mechanism and take a relative longer time-period to materialize (Halter, Oechslin & Zweimüller 2014). The channels described by Halter, Oechslin, and Zweimüller (2014) show strong similarities to the channels explained in this paper. The finding that income inequality has a positive effect on economic growth in the short-term is supported by Forbes (2000).

2.3) Research question

The literature described in this paper indicates that there are different channels through which income inequality effects economic performance, some channels indicate a negative effect and some channels indicate a positive effect. The discussion about the effect of the different channels and which channels had the strongest effect leads to the research question of this study; what is the effect of income inequality on economic performance and is there a difference between a short-term and long-term effect.

After reviewing the literature this paper comes to the following hypothesis when it comes to answering the research question. Income inequality has a positive effect on economic performance in the short-term. However, income inequality has a negative effect on economic performance in the long-term. This would mean that there is an effect of income inequality on economic performance and that there is a difference between the short-term effect and long-term effect.

3) Empirical model

This section describes the different empirical models used by this paper to answer the research question and hypothesis that are both explained in the literature review section of this paper. This section explains the empirical model used for the main results and for the robustness results. In addition, this section includes a description of the different variables that are used in the empirical models and what the expected effect of those variables is on the economic performance of a country. This section concludes with the explanation of different tests that are conducted to increase the strength of the empirical model and eventually increase the strength of the result that are presented in section five.

3.1) Empirical model main test

The four empirical models used in this paper are designed to test the effect of income inequality on economic performance and if there is a difference between the short and long-term effect of income inequality on economic performance. This study uses four different models to test the research question of this paper and uses two different proxies for income inequality. The first model looks at 164 countries and uses disposable income GINI as proxy for income inequality. The second model divides the 164 countries in four income level-groups and uses disposable income GINI as proxy for income inequality. The third model looks at 164 countries and uses multiple GINIs as proxy for income inequality. The fourth model divides the 164 countries in four income level-groups and uses multiple GINIs as proxy for income inequality. The use of multiple GINIs is justified due to the lack of data. Ideally, the GINI based on disposable income would be the one that would capture the effect of the different channels described in the literature review the best. However, not all countries measure income inequality in disposable income GINI and this paper did not want to exclude those countries. This is the reason why this paper uses empirical models with a GINI based on disposable income and a GINI based on different income inequality measurements.

The four different empirical models are based on the paper by Halter, Oechslin, and Zweimüller (2014). The empirical model used in the paper by Halter, Oechslin, and Zweimüller (2014) has the advantage that it is specially designed to test for the relationship between income inequality and economic performance. In addition, the model by Halter, Oechslin, and Zweimüller (2014) takes the short-and long-term effect of income inequality in consideration. The paper by Halter, Oechslin, and Zweimüller (2014) uses different GINIs as proxy for income inequality because they use a different—outdated— database by Deiniger and Squire (1996) and the WIID of 2008 (UNU-WIDER, 2008). In addition, this paper uses different control variables because in my reasoning those are the better option following the theory described in the economic growth theory section of the literature review.

The first empirical model this paper uses to test the effect of income inequality on economic performance with a distinction between the short-term and long-term effect is the following:

$$\Delta GDPC_{it} = \beta_0 CON + \beta_1 GINI1_{it-5} + \beta_2 GINI1_{it-10} + \beta_3 LnGDPC_{it-1} + \beta_4 HC_{it} + \beta_5 UNEM_{it} + \gamma_i + \alpha_t + \mu_{it} \tag{1}$$

The second empirical model this paper uses to test the effect of income inequality on economic performance with a distinction between the short-term and long-term effect, and a distinction between the different levels of income is the following:

$$\Delta GDPC_{it} = \beta_0 CON + \beta_1 GINI1_{it-5} + \beta_2 GINI1_{it-10} + \beta_3 LnGDPC_{it-1} + \beta_4 HC_{it} + \beta_5 UNEM_{it} + \beta_6 DEV + \gamma_i + \alpha_t + \mu_{it} \tag{2}$$

The third empirical model this paper uses to test the effect of income inequality on economic performance with a distinction between the short-term and long-term effect is the following:

$$\Delta GDPC_{it} = \beta_0 CON + \beta_1 GINI2_{it-5} + \beta_2 GINI2_{it-10} + \beta_3 LnGDPC_{it-1} + \beta_4 HC_{it} + \beta_5 UNEM_{it} + \gamma_i + \alpha_t + \mu_{it} \tag{3}$$

The fourth empirical model this paper uses to test the effect of income inequality on economic performance with a distinction between the short-term and long-term effect, and a distinction between the different levels of income is the following:

$$\Delta GDPC_{it} = \beta_0 CON + \beta_1 GINI2_{it-5} + \beta_2 GINI2_{it-10} + \beta_3 LnGDPC_{it-1} + \beta_4 HC_{it}$$
$$+ \beta_5 UNEM_{it} + \beta_6 DEV + \gamma_i + \alpha_t + \mu_{it}$$

(4)

The economic performance of a country in all four empirical models is measured in GDP per capita growth and is expressed in the empirical model by $\Delta GDPC_{it}$, the "i" stands a specific country in time "t". The GDP per capita growth is the percentual difference between GDP per capita in year t compared to year $t-1$. GDP per capita is an economic performance measure that is commonly used. In addition, GDP per capita controls for differences when it comes to the population size of different countries and controls for population growth over time. Within the 164 there are large differences when it comes to population size.

Income inequality in empirical model one and two is measured in a GINI based on disposable income. The disposable income GINI is expressed in model one and two as $GINI1$. In empirical model one and two the variable $GINI1$ is present twice; one for the short-term effect of income inequality and one for the long-term effect. The short-term effect of income inequality ($GINI1_{it-5}$) on economic performance is measured with a lag of five years. The long-term effect of income inequality ($GINI1_{it-10}$) on economic performance is measured with a lag of ten years. The short-term and long-term timeframe is based on the model by Halter, Oechslin, and Zweimüller (2014). Based on the channels between income inequality and economic performance described in the literature review and in line with the hypothesis of this paper is the expectation that the short-term GINI has a positive effect on economic performance. However, the expectation is that income inequality has a negative effect on economic performance when looking at the long-term GINI. By using lags for income inequality this study controls not only for the short-term and long-term effects but also for reverse causality. Reverse causality could arise when economic performance influences income inequality, this is the case according to the Kuznets-curve (Kuznets, 1955). By adding a time-dimension by using lags in the empirical models the potential problem of reverse causality is prevented.

In empirical model three and four the GINI is based on multiple GINIs (disposable income, gross income, consumption, and other). Every country has one GINI to preserve the continuity. The multiple GINI is expressed in empirical model three and four as $GINI2$. Identical to the disposable income GINI is the short-term effect of income inequality ($GINI2_{it-5}$) on economic

performance with a lag of five years. The ten-year lag between the effect of income inequality based on multiple GINIs ($GINI2_{it-10}$) and economic performance is identical to the lag of the income inequality based on disposable income. The expectation for the short-term effect of income inequality based on multiple GINIs on economic performance is positive, while the expectation for the long-term effect is negative. Both expectations are in line with the expectations for empirical model one and two, the literature review, and the hypothesis.

The description of the Solow-model (Solow,1956) in the literature review contains the assumption of diminishing returns on economic growth when a country reaches a higher stage of development. This assumption would mean that GDP per capita ($LnGDPC_{it-1}$) has a negative effect on GDP per capita growth. This paper has taken the natural logarithm of GDP per capita to control for large GDP per capita differences per country and over time. In addition, this paper assumes that there is a lag of one-year between the effect of GDP per capita on GDP per capita growth ($t-1$).

The presence of human capital (HC_{it}) in a country is expected to have a positive influence on the economic performance and thus the GDP per capita growth. The expectation that an increase in human capital has a positive influence on economic performance is in line with the theory described in the literature review. However, as mentioned in the literature review; human capital only has a positive effect on economic performance when it is employed. To control for the employment this paper includes the variable unemployment ($UNEM_{it}$) in the four empirical models. The expectation is that unemployment has a negative effect on GDP per capita growth and thus economic performance.

In empirical model two and four this paper includes an indication variable for the development level (DEV) of a country. The indication variable divides the 164 countries in four groups depending on their income level; high-income, upper middle-come, lower middle-income, and low-income.

This paper tests and control for time fixed effects and country fixed effects in the four empirical models. This paper expects that time fixed effects and country fixed effects has an influence on the GDP per capita growth of a country. In this case of time fixed effects and country fixed effects this paper controls for those effects. To control for those effects this paper includes time

fixed effects (α_t) and country fixed effects (γ_i). In addition, the four empirical models include a constant variable (CON) and an error term (μ_{it}). In table 1 an overview is given from the different variables and the expected sign.

Table 1: Empirical model variables

Variable	Name in empirical model	Expected sign	Source
GDP per capita growth	$\Delta GDPC_{it}$		World Bank
Income inequality disposable income (5-years)	$GINI1_{it-5}$	Positive	WIID 3.4
Income inequality disposable income (10-years)	$GINI1_{it-10}$	Negative	WIID 3.4
Income inequality multiple GINIs (5-years)	$GINI2_{it-5}$	Positive	WIID 3.4
Income inequality multiple GINIs (10-years)	$GINI2_{it-10}$	Negative	WIID 3.4
GDP per capita (natural logarithm)	$LnGDPC_{it-1}$	Positive	World Bank
Human capital	HC_{it}	Positive	Penn World Table
Unemployment	$UNEM_{it}$	Negative	World Bank
Development level	DEV		United Nations

3.2) Empirical model robustness test

This paper uses two empirical model tests to control for the robustness of the main results. The empirical model to test the robustness is identical to the empirical models used in the main test section except for the income inequality GINI that is used.

These two empirical models are designed to test the robustness of the four main empirical models without moving to far away from the test methods explained in the previous section. The first empirical model this paper uses to test the robustness of the main results when it comes to effect of income inequality on economic performance with a distinction between the short-term and long-term effect is the following empirical model:

$$\Delta GDPC_{it} = \beta_0 CON + \beta_1 GINI3_{it-5} + \beta_2 GINI3_{it-10} + \beta_3 LnGDPC_{it-1} + \beta_4 HC_{it} \\ + \beta_5 UNEM_{it} + \gamma_i + \alpha_t + \mu_{it} \tag{5}$$

The second empirical model this paper uses to test the robustness of the main results when it comes to the effect of income inequality on economic performance with a distinction between the short-term and long-term effect, and a distinction between the different levels of income is the following empirical model:

$$\Delta GDPC_{it} = \beta_0 CON + \beta_1 GINI3_{it-5} + \beta_2 GINI3_{it-10} + \beta_3 LnGDPC_{it-1} + \beta_4 HC_{it} \\ + \beta_5 UNEM_{it} + \beta_6 DEV + \gamma_i + \alpha_t + \mu_{it}$$

(6)

The two empirical models to test the robustness of the main results from the first four empirical models uses the same variables except for income inequality. While in the main empirical models, the GINI is based on disposable income or multiple GINIs—but only one type of GINI per country—uses the robustness check as many GINIs as possible ($GINI3$). This means that the GINI used in the robustness test contains different GINI measurements per country. The benefit from using multiple GINIs per country is that the number of observations increase, the downside—and the reason why this is not a main test—is that different GINIs could affect the results because there is no consistency. This means that the differences between the different GINIs effect the results.

3.3) Preliminary tests

To increase the strength of the four main empirical models and the two robustness empirical models, multiple preliminary tests are included. The preliminary tests are designed to test if this study uses the correct empirical models and if adjustments are necessary to increase the strength of those empirical models and its results. The results of the first test are described in the data section of this paper and focusses on outliers in the dataset. The result of the other six tests are described in the result section. The second test focusses on the possible presence of multicollinearity. The third test focusses on the distribution of the residuals and if there are normally distributed. The fourth test focusses on the potential presence of heteroscedasticity. The fifth test uses the Hausman test to test if a random or fixed effect model is appropriate. The sixth test focusses on the potential presence of autocorrelation. The seventh and last test focuses on the potential presence of time fixed effects.

4) Data

This section describes the data used by this paper to test the hypothesis described in the literature review. The data described in this section forms the base for the four main empirical models and the two robustness empirical models that are described in the previous section.

4.1) Countries

The data used for this paper is collected in a new database constructed for this study, this database consists out of 164 different countries for the time-period 1960-2015. The 164 countries are divided in four different groups based on their income level: high income, upper middle-income, lower middle-income, and low-income. The countries are clustered based on their income level (Gross National Income per capita 2012) using the income classification of the United Nations (2014). The income classification by the United Nations does not include all countries of this study. Therefore, the countries that were not included received their classification by comparing their GDP per capita in 2012 with the GDP per capita in 2012 of countries that received a classification. Table 2 gives an overview of all countries included in this paper and their income group. The aim of this paper was to include as many countries as possible but at the same time recognises that the income levels of countries can affect the different channels between income inequality and economic performance in different ways and could change the strength of a channel.

Table 2: income classification countries

Income classification	Country
High-income (45)	Australia, Austria, Bahamas, Barbados, Belgium, Canada, Chile, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, Iceland, Ireland, Israel, Italy, Japan, Republic of Korea, Latvia, Lithuania, Luxembourg, Malta, Netherlands, New Zealand, Norway, Poland, Portugal, Puerto Rico, Qatar, Russia, Singapore, Slovakia, Slovenia, Spain, Sweden, Switzerland, Trinidad and Tobago, United Kingdom, United States, and Uruguay
Upper middle-income (43)	Albania, Algeria, Angola, Argentina, Azerbaijan, Belarus, Belize, Botswana, Brazil, Bulgaria, China, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, Fiji, Gabon, Hungary, Iran, Jamaica, Kazakhstan, Kosovo, Lebanon, Macedonia, Malaysia, Mauritania, Mexico, Montenegro, Namibia, Panama, Peru, Romania, Saint Lucia, Serbia, Seychelles, Suriname, Thailand, Tunisia, Turkey, Turkmenistan, and Venezuela
Lower middle-income (44)	Armenia, Bhutan, Bolivia, Bosnia and Herzegovina, Cameroon, Cape Verde, Côte d'Ivoire, Egypt, El Salvador, Georgia, Ghana, Guatemala, Guyana, Honduras, India, Indonesia, Laos, Lesotho, Micronesia, Moldova, Mongolia, Morocco, Nicaragua, Nigeria, Pakistan, Papua New Guinea, Paraguay, Philippines, Samoa, São Tomé and Principe, Senegal, Solomon Islands, South Africa, Sri Lanka, Sudan, Swaziland, Syria, Tuvalu, Ukraine, Uzbekistan, Vanuatu, Vietnam, West Bank and Gaza, Yemen, and Zambia
Low-income (32)	Afghanistan, Bangladesh, Benin, Cambodia, Central African Republic, Chad, Democratic Republic of the Congo, Ethiopia, Gambia, Guinea, Guinea-Bissau, Haiti, Kenya, Kyrgyzstan, Liberia, Madagascar, Malawi, Mali, Mozambique, Myanmar, Nepal, Niger, Rwanda, Sierra Leone, Somalia, Tajikistan, Timor-Leste, Togo, Uganda, and Zimbabwe

Source: based on United Nations (2014) and The World Bank (2017)

The time-period is based on the slow change in income inequality on the slow change of income inequality and the availability of the necessary data. Income inequality changes slowly so to capture the effect in a strong way a long time-period is needed.

4.2) Variables

The World Bank (2017) provides—for most countries—GDP per capita growth for the time-period 1961-2015. This paper research the relationship between income inequality and economic performance, the economic performance is measured in GDP per capita growth. GDP per capita growth is the difference—expressed as a percentage and based on constant local currency—in GDP per capita between two connecting years.

The GDP per capita this paper uses is also collected from the World Bank (2017) but for the time-period 1960-2015. The extra year was possible because GDP per capita growth is a variable based on the GDP per capita from the year before. GDP per capita is measured in

constant 2010 United States Dollars and is calculated by dividing GDP by the midyear population size.

The unemployment data is collected from the World Bank (2017) and is measured as a percentage of the labour force that is not employed but is available for work and is seeking work. The unemployment data is collected for the time-period 1980-2014, the time-period 1960-1979 was not available when it comes to unemployment data.

The human capital that is present in a country is measured by using the human capital per capita index provided by the Penn World Tables (Feenstra, Inklaar & Timmer, 2015). The human capital index is based on the average years of education and the rate of return on education. The human capital index does not have a fixed scale. To illustrate the scale of the human capital index; the lowest human capital index score in 2014 was 1.19 in Niger, the highest human capital index score in 2014 was 3.73 in the United Kingdom (Feenstra, Inklaar & Timmer, 2015). An overview of which variable the different databases provided is included in table 1 (in the empirical model section 3.1).

4.3) GINI

This paper uses GINI observations as proxy for income inequality, GINI is a commonly used measurement to describe in income inequality in a country (Ravallion, Thorbecke & Pritchett, 2004). A GINI observation takes a value between zero and hundred; zero indicates perfect income equality (everybody had the same income) while hundred indicates perfect income inequality (one-person receives all the income) (Ravallion, Thorbecke & Pritchett, 2004). A GINI indicates the income distribution between the population in a country. This paper focusses on income inequality and the GINI that is associated with income inequality. However, there are countries that do not measure their GINI on the base of income inequality but on the base of consumption. The consumption inequality includes money spent for example on food, housing, entertainment, and restaurant services (Milanovic, 2017 pp 12-18). The GINI based on consumption is in most cases closer to zero than the GINI based on income inequality; the reason for this is that the lower income share of the population spends most or all their income on consumption while the richer income share of the population spends relatively less on consumption.

A country's GINI is based on national household surveys where they ask different questions to determine a country's income inequality (Milanovic, 2017 pp 12-18). Because there is no global household survey the availability of GINI data per country is going to be different (Milanovic, 2017 pp 12-18). This results in different GINIs per country with different distinctions (income vs. consumption, quality, type of income, population share, urban vs. rural), it could be the case that for year x in country y multiple GINIs are present.

4.4) Income inequality

The income inequality data is collected from the World Income Inequality Database 3.4 (WIID 3.4) (United Nations, 2017). The WIID 3.4 is latest version of the WIID and updated in January 2017. There are income inequality observations for 182 different countries in the WIID 3.4 database. The collected income inequality data in the WIID 3.4 is for the time-period 1867-2015, the number of observations increase over time because in 1867 there is only one observation and that is for the United Kingdom (United Nations, 2017). The WIID 3.4 income inequality data includes GINIs and income inequality per quintile, decile, and percentiles group share. This paper only uses the GINI data.

The WIID 3.4 (United Nations, 2017) makes different distinctions between GINIs, this means that one country has multiple GINIs for the same year (appendix 1 provides an example of one year and the distinctions). The different distinctions have all their own upsides and downsides. For the construction of income inequality based on disposable income (GINI1), income inequality based on multiple GINIs (GINI2), and income inequality based on all GINIs (GINI3) multiple decisions had to be made.

The first distinction relates to the quality of the data. The WIID 3.4 (United Nations, 2017) divides the data in four different quality groups: high, average, low, and unknown. The income inequality observation quality is high when the underlying concepts are known and when the income concepts and survey are of high quality. The income inequality observation is average when the income concept or the survey is unclear. The income inequality observation quality is low when the income concept and the survey is unclear. The income inequality is unknown when the data behind the observation is unclear and unreliable, this is mostly the case for earlier observations (United Nations, 2017). In this study, the observations with the highest quality label were chosen.

The second distinction is related to the measurement of the GINIs. In the WIID 3.4 (United Nations, 2017) there is a distinction between four different GINI measurements: disposable income, gross income, consumption. The category disposable income (used for GINI1) incorporated income inequality changing taxation policies. The category disposable income includes the types of income: net earnings, net income, and disposable monetary income. The second category gross income does not include taxation policies and include the following types of income: gross earnings, gross income, market income, and primary income. The category other includes the following type of incomes: earnings, factor income, income, income/consumption, monetary income, and primary income. The category consumption looks at the money spent on consumption goods (United Nations, 2017). GINI1 is based on disposable income and only uses those income inequality observations. In the GINI2 data this paper choses one type per country; the preference goes to disposable income then gross income then other, and then consumption. However, GINI2 takes the number of observations in considerations, for example if a country has disposable income data for 3 different years but consumption data for 25 years this paper decided to look at consumption for that country. For the robustness check (GINI3) this paper included as many as income inequality data but followed the order used during GINI2 with the same exception of continuity.

The third distinction is based on the division of income. The WIID 3.4 makes a distinction between household per capita, household adult equivalent, without adjustment, and other. The household per capita looks at the income of a household and divides it by the number of people in that household. The household adult equivalent takes different calculation into account that give different weights to family members, the without adjustment does not take any adjustment or calculation into consideration. The category other include observations that did not fit the criteria of the previous three categories (United Nations, 2017). This paper made the decision to first look at the household per capita observations, this decision is based on the number of household per capita observations, the household per capita observations are overrepresented in the WIID 3.4 and this paper values continuity. Household adult equivalent is the second observation this paper uses, the third is without adjustment, and the fourth is other.

The fourth distinction is based on the area coverage. The WIID 3.4 divides the observations in all, urban, rural, and other (United Nations, 2017). This paper aims to include as largest part of the population as possible, that is the reason that the category all is the first choice. The second choice is the category urban because this paper assumes that the largest share of the population

lives in an urban environment. The third choice is the category rural, and the fourth choice is the category other.

The fifth and sixth distinction is based on population and age, respectively. Population is divided in all and employed plus others. Age is divided in all and age categories (United Nations, 2017). This paper choices the category all above employed plus other and above age categories.

The sixth different distinctions resulted in decisions between different observations for the same country in the same year. Exceptions were made when there was a clear trend for a specific country or when the observations were not considered reliable.

4.5) Descriptive statistics

This section looks at the different statistics around the data used. In the empirical model section this paper stated that this section tests for outliers. Outliers can change the results and are removed from the dataset. This paper looked at the data in the dataset and when there was a clear observation that was not in line with the trend of that country the outlier is removed. The different statistics are described in table 3 and table 4.

Table 3: descriptive statistics all countries

Variable all countries	Observations	Mean	Standard deviation	Min	Max
GDP per capita growth	7,132	2.16	4.72	-20.77	30.34
GINI disposable income (GINI1)	1,617	35.51	10.80	15.00	69.40
GINI multiple inequality (GINI2)	2,335	36.67	10.49	15.00	77.30
GINI all inequality (GINI3)	3,010	37.62	10.83	15.00	77.30
GDP per capita	7,270	9,367.28	14,321.63	115.43	11,001.10
Human capital	6,564	2.07	0.72	1.00	3.73
Unemployment	2,859	9.12	6.36	0.00	57.00

The difference between all country observations availability is visible in table 3, with 7,270 observations is GDP per capita the variable with the most observations. On the other hand, the GINI based in disposable income (GINI1) is the variable with the fewest observations: 1,617. This paper looks at 164 different countries for the time-period 1960-2015, this means if a variable was available for the complete time-period and all countries then this variable would have 10,824 observations. In addition, in table 3 can be seen that the GINI based on disposable

income (GINI1) has less observations than the GINI based on multiple income inequality (GINI2) (2,335), and the GINI based on multiple income inequality has less observations than GINI based on all income inequality (GINI3) (3.010).

In table 3 we can see that there are strong differences between income inequality. The GINI based on disposable income (GINI1) has a difference of 62.30 GINI points between the lowest (15.00) and highest observation (77.30).

In table 4 it becomes clear that there is a biased towards high-income countries in the empirical models (1, 3, and 5) that focus on all countries. High-income countries provide most of the observation for all variables. The biggest difference is between the GINI based on disposable income (GINI1) in the high-income countries with 1,023 observations compared to 6 observations in the low-income countries.

Table 4 shows that the when looking at the minimum and maximum values of the observations there are no big differences between the countries (except for GDP per capita). The GDP per capita growth observation numbers are relatively close to each other with 2,034 observations, 1,809 observations, and 1,913 observations for high-income, upper middle-income, and lower middle-income countries, respectively. However, the GDP per capita growth variable for low-income countries has with 1,376 observations less observations than the other three income-groups.

Table 4: descriptive statistics countries per income level

Variable high-income countries	Observations	Mean	Standard deviation	Min	Max
GDP per capita growth	2,034	2.65	3.74	-18.37	25.63
GINI disposable income (GINI1)	1,023	29.98	6.15	18.00	57.30
GINI multiple inequality (GINI2)	1,134	31.65	8.03	18.00	67.20
GINI all inequality (GINI3)	1,411	32.87	8.69	18.00	67.20
GDP per capita	2,079	26,230.13	17,357.27	1,102.53	11,000.10
Human capital	2,105	2.77	0.51	1.29	3.73
Unemployment	1,332	8.17	4.65	0.00	28.1
Variable upper middle-income countries	Observations	Mean	Standard deviation	Min	Max
GDP per capita growth	1,809	2.41	5.01	-20.77	19.28
GINI disposable income (GINI1)	453	42.83	10.49	15.00	67.70
GINI multiple inequality (GINI2)	619	41.27	11.02	15.00	74.30
GINI all inequality (GINI3)	819	41.50	11.21	15.00	74.30
GDP per capita	1,880	4,926	3,025.96	131.96	19,492.68
Human capital	1,595	2.04	0.56	1.01	3.41
Unemployment	826	11.00	8.04	0.50	57.00
Variable lower middle-income countries	Observations	Mean	Standard deviation	Min	Max
GDP per capita growth	1,913	2.09	4.80	-17.56	30.34
GINI disposable income (GINI1)	135	52.22	6.02	35.90	69.40
GINI multiple inequality (GINI2)	428	42.17	9.93	22.80	77.30
GINI all inequality (GINI3)	558	42.29	10.29	22.80	77.30
GDP per capita	1,916	1,789.71	1,164.22	258,06	7,623.12
Human capital	1,511	1.73	0.49	1.03	3.24
Unemployment	572	9.37	6.51	0.30	39.30
Variable low-income countries	Observations	Mean	Standard deviation	Min	Max
GDP per capita growth	1,376	1.21	5.36	-19.32	22.99
GINI disposable income (GINI1)	6	48.81	13.14	30.50	62.50
GINI multiple inequality (GINI2)	154	39.85	8.26	26.82	74.60
GINI all inequality (GINI3)	222	41.68	10.51	24.30	74.60
GDP per capita	1,395	628.53	457.33	115.43	3,362.02
Human capital	1,353	1.41	0.41	1.00	3.31
Unemployment	129	5.94	5.40	0.10	29.80

4.6 Limitations

The data used in this paper is not perfect and has limitations. The first limitation is the fact that for multiple years, multiple countries, and multiple variables observations are not available. The missing observations create a bias towards high-income countries because those countries provided relatively most of the data. This paper divides the countries in four income-groups,

this reduces the bias of high-income countries. Income inequality data is relatively new, this means that there is a time bias towards later years because more observations are present.

The second limitation is related to the continuity in WIID 3.4. The WIID 3.4 uses different sources, this means that the GINI observations are constructed in different ways. In addition, there are different quality levels when it comes to the GINI observations, the lower quality GINI observations could influence the results. The GINIs in the WIID 3.4 are based on different concepts, this could influence the continuity of the data and effect the results. This means that this paper uses different GINIs to increase the observations (GINI2 and GINI3), there is a correlation between the different GINI but it could still influence the results. However, the WIID 3.4 is the most extensive database when it comes to income inequality and has been updated recently (January 2017), this means that the income inequality data used in this paper is the most up to date income inequality data available.

The third and last limitation is that the income inequality channels influence wellbeing in a country and GDP per capita is not perfect when measuring wellbeing in society, so GDP per capita growth is not perfect when looking at the change in wellbeing. However, at this point there is not a wellbeing measurement that is available for as many countries and as many years as GDP per capita and GDP per capita growth.

5) Results

This section describes the main results from the main empirical models. Firstly, different preliminary tests to the model are analysed. In addition, this paper describes the results from the robustness empirical model. Finally, the results are discussed and used to answer the research question by comparing the results with the hypothesis. However, this section starts with different preliminary tests.

5.1) Preliminary tests

This paper uses different tests to increase the strength of the results, the first preliminary test is for outliers and is explained in the data section. The second preliminary test this paper uses is for multicollinearity. This paper tests all four main empirical models and all two robustness empirical models for multicollinearity. The multicollinearity results show that there is no value above 0.8 or below -0.8 (the cut-off point this paper uses). However, human capital and GDP per capita are closely related: 0.71 in the GINI1 empirical model, 0.72 in the GINI2 empirical

model, and 0.71 in the GINI3 empirical model. The third preliminary tests the normal distribution of the residuals. This study looks at the histograms of the residuals to conclude if they are normally distributed. The residual histograms show a normal distribution. The fourth preliminary test is for heteroscedasticity; the created scatterplot does indicate that there is heteroscedasticity. The presence of heteroscedasticity is confirmed by the modified Wald test at a 1 percent significant level. To control for the presence of heteroscedasticity and minimise the effect of heteroscedasticity robust standard errors are used.

The fifth preliminary test is to tests if the fixed effect model or the random effect model is appropriate. For this preliminary test, the Hausman test is used by this paper; the Hausman test shows that for the empirical models used in this paper the fixed effects model is the appropriate model to use for the analysis. The sixth preliminary test focusses on the question if there are time-fixed effects next to the already incorporated country fixed effects. The preliminary test results show that time fixed effects are present; this means that different years' influence GDP per capita growth. This paper includes country fixed effects and time fixed effects in the all four main empirical models and all two robustness empirical models.

The seventh preliminary test—and last test—is for the possible presence of autocorrelation. The presence of autocorrelation means that an observation of year t has influence on the observation t+1. This paper expects that the variables GDP per capita, unemployment, human capital, and income inequality have autocorrelation. This paper tests for autocorrelation by using the Wooldrige test for autocorrelation in panel data. The Wooldrige test indicates that there is autocorrelation at a 1 percent significant level; to control for autocorrelation this paper uses clustered robust standard errors

5.2) Main results

The main results that arise from the four main empirical models—in combination with the preliminary tests—are presented in tables 5, 6, 7, and 8. This paper tries to answer the research question "what is the effect of income inequality on economic performance and is there a difference between a short-term and long-term effect", the different main results help answering this question. The main results of empirical model one are described in table 5. The results in table 5 are presented in four different columns; this paper added a control variable (GDP per capita, human capital, and unemployment) to every column to control for the missing data in the control variables.

Table 5: results empirical model 1: the effect of GINI1 of all countries on economic performance

Variables	(GINI1) income inequality	(GINI1) income inequality	(GINI1) income inequality	(GINI1) income inequality
GINI based on disposable income (5-year lag)	-0.0509	-0.00445	-0.00947	0.0764
	(0.0514)	(0.0559)	(0.0598)	(0.0754)
GINI based on disposable income (10-year lag)	0.112**	0.141***	0.146***	0.164***
	(0.0463)	(0.0477)	(0.0501)	(0.0517)
GDP per capita (ln, 1-year lag)		-4.158**	-4.034**	-6.355**
		(1.895)	(1.922)	(2.698)
Human Capital			1.213	1.371
			(1.823)	(2.377)
Unemployment				-0.231***
				(0.0716)
Time fixed effects	Yes	Yes	Yes	Yes
Constant	-0.822	33.73**	30.08*	53.24*
	(1.148)	(16.77)	(17.71)	(27.35)
Observations	889	889	823	757
R-squared	0.353	0.367	0.387	0.420
Number of Countries	65	65	62	59

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

In table 5 can be seen that the GINI based on disposable income with 5-year lag has a negative effect on economic performance in the first three regressions but a positive effect in the last regression, however, in all four regressions the GINI based on disposable income with 5-year lag is not significant. This means that based on the results in table 5 there is no significant relationship between income inequality and economic performance in the short-term. The GINI based on disposable income with a 10-year lag has a significant (at 1 percent) positive effect on economic performance in the long-term for all four regressions. This means that—in regression 4—an increase of 1 GINI point leads to an increase of GDP per capita growth of 0.164 percent points.

GDP per capita has a negative significant (at 5 percent level) effect on GDP per capita growth in all three regressions. GDP per capita is measured in the natural logarithm and with a lag of 1-year, this means that GDP per capita influence the GDP per capita growth of a year later. In the fourth regression, an increase of one-percent (because it is measured in the natural logarithm) in GDP per capita leads to approximately a 6.4 percent point decrease of GDP per capita growth in the next year. The effect of human capital on economic performance is positive in both regression but not significant, this means that human capital does not influence economic performance according to the results in table 5. The unemployment result indicates that unemployment has a negative significant (at 1 percent level). This means that an

unemployment increase of 1 percent points leads to a 0.00231 percent point decrease of GDP per capita growth.

The number of observations in table 5 vary between 889 and 757. Those observations come from 65 (regression 1 and 2), 62 (regression 3), or 59 (regression 4) countries.

The results in table 6 are—like table 5—centred around the GINI based on disposable income, however, in table 6 there is are different income groups. Table 6 presents the results form empirical model 2. Table 6 describes the results for high-income countries, upper middle-income countries, and lower middle income countries; unfortunately, are there not enough observations present for low-income countries.

The GINI based on disposable income with a lag of 5-years has not a significant positive effect in the high-income and upper middle-income countries, and a not significant negative effect in the lower-middle-income countries. The GINI based on disposable income with a lag of 10-years has not a significant effect on GDP per capita growth in the upper middle-income and lower middle-income countries. However, The GINI based on disposable income with a lag of 10-years has a positive significant (on the 10 percent level) effect on GDP per capita growth in the high-income countries. This means if the GINI based on disposable income increase with 1 point in the high-income countries then GDP per capita growth in high-income countries increase with 0.0753 percent points.

Table 6: results empirical model 2: the effect of GINI1 income groups on economic performance

Variables	(GINI1) High income	(GINI1) Upper income	(GINI1) Lower income	(GINI1) Low income
GINI based on disposable income (5-year lag)	0.0311	0.157	-0.0937	
	(0.0744)	(0.106)	(0.153)	
GINI based on disposable income (10-year lag)	0.0753*	0.141	-0.0284	
	(0.0433)	(0.0915)	(0.0981)	
GDP per capita (ln, 1-year lag)	-9.201***	-6.087**	-28.57**	
	(3.248)	(2.734)	(8.226)	
Human Capital	-0.230**	-0.465***	-1.094**	
	(0.0874)	(0.0952)	(0.308)	
Unemployment	-4.947	-0.126	-3.138	
	(3.252)	(6.418)	(21.24)	
Time fixed effects	Yes	Yes	Yes	
Constant	107.0***	47.29*	234.5*	
	(33.30)	(26.43)	(96.34)	
Observations	510	207	40	
R-squared	0.561	0.538	0.771	
Number of Countries	38	16	5	

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

GDP per capita has a negative significant effect on GDP per capita growth in the high-income, upper middle-income, and lower middle-income countries. This means for the upper middle-income countries that an increase of 1 percent in their GDP per capita level the GDP per capita growth decreases with 0.061 percent points (because GDP per capita is measured in the natural logarithm). Human capital has a significant negative effect on GDP per capita growth for the high-income, upper middle-income, and lower middle-income countries. This means that an increase of 1 index point in human capital leads to a decrease of 1.094 percent points in GDP per capita growth for the lower middle-income countries. Unemployment does not have a significant effect on GDP per capita growth for the high-income, upper middle-income, and lower middle-income countries.

Table 6 shows that there is a larger sample of observations available for the high-income countries (510 observations and 38 countries) than upper middle-income countries (207 observations and 16 countries) and a larger sample than lower middle-income countries (40 observations and 5 countries).

In table 7 the results are presented that are derived from empirical model 3. Empirical model 3 uses the GINI based on multiple GINIs (GINI2) for all countries in the data sample. The GINI based on multiple GINIs with a lag of 5-years has a positive coefficient for all four regressions,

but only in regression 2 and 3 the results are significant. Both in regression 2 and 3 the short-term GINI indicates that an increase of 1 GINI point results in an increase of 0.122 percent point in GDP per capita growth. The long-term GINI based on multiple GINIs positive non-significant for all four regressions, this means that the results in table 7 indicate that there is no relationship between the GINI based on multiple GINIs with a 10-year lag and economic performance.

Table 7: results empirical model 3: the effect of GINI2 of all countries on economic performance

Variables	(GINI2) income inequality	(GINI2) income inequality	(GINI2) income inequality	(GINI2) income inequality
GINI based on multiple GINIs (5-year lag)	0.0955	0.122**	0.122*	0.131
	(0.0595)	(0.0551)	(0.0635)	(0.0870)
GINI based on multiple GINIs (10-year lag)	0.0245	0.0626	0.0486	0.0800
	(0.0451)	(0.0452)	(0.0470)	(0.0572)
GDP per capita (ln, 1-year lag)		-4.824***	-4.545***	-6.100***
		(1.344)	(1.566)	(2.201)
Human capital			1.810	2.393
			(1.521)	(1.690)
Unemployment				-0.241***
				(0.0684)
Time Fixed effects	Yes	Yes	Yes	Yes
Constant	-2.815	35.98***	30.44**	47.88**
	(1.721)	(11.51)	(12.34)	(20.22)
Observations	1,128	1,128	1,015	851
R-squared	0.302	0.329	0.334	0.381
Number of Countries	112	112	97	83

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

GDP per capita has a significant negative effect on GDP per capita growth in all three regressions. In regression four an increase of 1 percent in GDP per capita results in a decrease of GDP per capita growth of approximately 0.061 percent point in GDP per capita growth the following year. The effect of human capital is positive non-significant for all two regressions, this means that the results in table 7 indicate that there is no relationship between human capital and GDP per capita growth. Unemployment has a significant (at 5 percent level) negative effect on GDP per capita growth. This means that an increase in unemployment of one percent point leads to a decrease of 0.241 percent point in GDP per capita growth.

Empirical model 3 includes more observations than empirical model 1: 1,128 (regression 1), 1,128 (regression 2), 1,015 (regression 3), and 851 (regression 4). Empirical model 3 also includes almost twice as many countries as empirical model 1.

The last table that is used to describe the main results is table 8; the results in table 8 are based on empirical model 4. Table 8 includes the results that are constructed by using the GINI based on multiple GINIs and four different income groups. Table 8 includes regressions for high-income, upper middle-income, lower middle-income, and low-income countries. Unfortunately, there are not enough observations present for the low-income countries to produce clear results.

Table 8: results empirical model 4: the effect of GINI2 income groups on economic performance

Variables	(GINI2) High income	(GINI2) Upper income	(GIN2) Lower income	(GINI2) Low income
GINI based on multiple GINIs (5-year lag)	0.0797	0.0695	0.386**	-1.875
	(0.0883)	(0.0893)	(0.179)	
GINI based on multiple GINIs (10-year lag)	0.0196	0.119	0.0449	17.35
	(0.0668)	(0.101)	(0.0790)	
GDP per capita (ln, 1-year lag)	-7.690***	-4.011*	-14.49**	-754.4
	(2.828)	(2.169)	(6.667)	
Human capital	-0.216**	-0.469***	-0.351*	186.5
	(0.0812)	(0.0808)	(0.194)	
Unemployment	-1.131	0.690	13.84	946.4
	(2.970)	(5.080)	(15.57)	
Time Fixed effects	Yes	Yes	Yes	Yes
Constant	80.45***	30.83	60.35	451.7
	(25.67)	(22.79)	(61.09)	
Observations	552	213	74	12
R-squared	0.525	0.509	0.699	1.000
Number of Countries	42	20	15	6

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

The results presented in table 8 indicate that only in the lower middle income countries there is a significant (at the 5 percent level) relationship between income inequality and economic performance in the short-term. This means that an increase of 1 GINI point results in an increase of GDP per capita growth of 0.386 percent points 5-years later in lower middle-income countries. The GINI based on multiple GINIs with a 10-year lag is not significant for all country income-groups. This means that the results presented in table 8 indicate that there is no relationship between income inequality and economic performance in the long-term.

Table 8 indicates that there is a significant negative relationship between GDP per capita and GDP per capita growth. This means that a one percent increase in GDP per capita in a high-income country results in a decrease of 0.07690 percent points in GDP per capita growth in the following year. The results in table 8 indicate that human capital has a negative effect on economic performance. An increase of one human capital index points results in a decrease of

0.469 percent points of GDP per capita growth in upper middle-income countries. Unemployment is not significant for all four country income-groups, this means that the results presented in table 8 indicate that there is no relationship between unemployment and economic performance.

In table 8 the high-income countries have more observations than the other three country income-groups combined, this could mean that the results in table 7 have a biased towards high-income countries.

5.3) Robustness results

The section examines if the main results presented in the previous section hold when a robustness test is performed. For the robustness test this study uses empirical model 5 and 6—described in the empirical model section—and use the same preliminary tests as with the main empirical models.

Table 9: results empirical model 5: the effect of GINI2 of all countries on economic performance

Variables	(GINI3) income inequality	(GINI3) income inequality	(GIN3) income inequality	(GINI3) income inequality
Gini based on all GINIs (5-year lag)	0.0392	0.0468	0.0454	0.0848*
	(0.0302)	(0.0313)	(0.0314)	(0.0446)
Gini based on all GINIs (10-year lag)	0.0480**	0.0775***	0.0651***	0.0800***
	(0.0224)	(0.0248)	(0.0233)	(0.0249)
GDP per capita (ln, 1-year lag)		-4.326***	-4.385***	-5.095***
		(0.927)	(1.112)	(1.696)
Human capital			0.799	2.321
			(1.238)	(1.589)
Unemployment				-0.259***
				(0.0622)
Time fixed effects	Yes	Yes	Yes	Yes
Constant	-1.082	33.38***	33.17***	38.13**
	(1.959)	(8.128)	(9.023)	(15.57)
Observations	1,506	1,506	1,362	1,087
R-squared	0.284	0.319	0.325	0.369
Number of Countries	119	119	103	87

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

In table 9 the robustness results are presented when this paper uses the GINI based on all GINIs (GINI3) for all countries. The GINI based on all GINIs with a year lag is only significant (on the 10 percent level) for the fourth regression. This means that the results in regression four indicate that income inequality has a positive effect on economic performance in the short-

term. An increase of 1 GINI point results in a 0.0848 percent point increase in GDP per capita growth 5-years later.

The GINI based on all GINIs with a lag of 10 years is significant for all four regressions. This means that the results in table 9 indicate that an increase in income inequality has a positive effect on economic performance. An increase of 1 GINI point results in a 0.0800 percent point increase in GDP per capita 10-years later according the results of regression four.

GDP per capita has a significant negative effect on GDP per capita in all three regressions. This means that a one percent increase in GDP per capita results in approximately 0.0436 percent point decrease in GDP per capita growth a year later. Human capital is not significant in all two regressions, this means that in table 9 there is no evidence that supports a relationship between human capital and GDP per capita growth. Table 9 presence evidence for a significant negative relationship between unemployment and GDP per capita growth. If unemployment increase with 1 percent point the GDP per capita growth decreases with 0.259 percent points.

In table 10 the robustness results derived from empirical model 6 are presented. Table 10 looks at the GINI based on all GINIs and separates the results per country income group. When looking at the GINI based on all GINIs with a 5-year lag only the low-income country group is significant, this means that an increase in income inequality leads to a decrease in economic performance in the short-term in low income countries.

The long-term GINI based on all GINIs is positive significant for the upper middle-income and low-income countries. This means that table 10 provides evidence for a positive long-term effect between income inequality and economic performance for upper middle-income and low-income countries.

GDP per capita has a significant negative effect on GDP per capita growth in all four country income-groups. This means that an increase in GDP per capita leads to a decrease of GDP per capita growth in the following year.

Table 10: results empirical model 6: the effect of GINI3 income groups on economic performance

Variables	(GINI3) High income	(GINI3) Upper income	(GINI3) Lower income	(GINI3) Low income
Gini based on all GINIs (5-year lag)	0.0296	0.0804	0.142	-1.235***
	(0.0540)	(0.0467)	(0.109)	(0.000200)
Gini based on all GINIs (10-year lag)	0.0547	0.105**	0.0900	9.005***
	(0.0357)	(0.0459)	(0.0686)	(0.00111)
GDP per capita (ln, 1-year lag)	-6.302***	-4.176***	-20.61***	-524.5***
	(1.631)	(0.878)	(6.722)	(0.0649)
Human capital	-0.286***	-0.358***	-0.341**	70.50***
	(0.0890)	(0.0971)	(0.144)	(0.00961)
Unemployment	-0.671	-0.662	7.479	477.4***
	(2.006)	(3.404)	(8.146)	(0.0525)
Time fixed effects	Yes	Yes	Yes	Yes
Constant	65.34***	31.66***	124.2**	1,417***
	(12.88)	(9.320)	(55.24)	(0.188)
Observations	671	292	103	21
R-squared	0.477	0.454	0.588	1.000
Number of Countries	42	22	17	6

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

Human capital has a significant negative influence on GDP per capita growth in all four country income groups. An increase in human capital results in a decrease of GDP per capita according to the results presented in table 10. Unemployment is only significant for low-income countries, an increase in unemployment results in an increase in GDP per capita growth.

The high-income countries provided the most observations, more than the other three combined. Especially the low-income countries have few observations (21), this also results in a questionable R-squared. This means that the results for low-income countries are not that strong.

5.4) Discussion

This study tried to answer the research question "what is the effect of income inequality and is there a difference between a short-term and long-term effect". The hypothesis of this paper that resulted from the literature review is that income inequality has a positive effect on economic performance in the short-term, and that income inequality has a negative effect on economic performance in the long-term.

Firstly, the results for the short-term effect of income inequality on economic performance for all countries are discussed. The results presented in table 5 show that there is no significant

relationship between income inequality (when using the disposable income GINI) and economic performance in the short-term. The results presented in table 7 indicate that there is a significant relationship between income inequality (when using the GINI based on multiple GINIs) and economic performance in 2 out of the 4 regressions. This means that this paper found evidence that supports the hypothesis that the short-term income inequality has a positive effect on economic performance for all countries. These results are supported by one of the robustness test in table 9.

Secondly, the results for the short-term effect of income inequality on economic performance per country income-group are discussed. When looking at the GINI based on disposable income results per country income-group (table 6) this paper did not find evidence that supports the hypothesis that income inequality has a positive effect on economic performance in the short-term. In table 8 the results indicate that when using the GINI based on multiple GINIs there is a positive effect from income inequality on economic performance in the short-term in lower middle-income countries. This means that this paper found evidence that supports the hypothesis that income inequality has a positive effect on economic performance in the short-term. However, this evidence is only present for the lower middle-income countries. These results are not supported by the robustness test in table 10. In the robustness test this paper did find evidence for a negative relationship between income inequality and economic performance in the short-term for low-income countries, however, those results are based on a small number of observations and for this reason this paper dismisses those results.

Thirdly, the results from the long-term effects of income inequality on economic performance for all countries are discussed. This paper found that when using the GINI based on disposable income as proxy for income inequality that income inequality has a positive effect on economic performance in the long-term (table 5). This is result is the opposite from the hypothesis by this paper that income inequality would have a negative effect on economic performance in the long-term. These results are not supported when using the GINI based on multiple GINIs as proxy for income inequality (table 7). Those results indicate that there is no significant relationship between income inequality and economic performance in the long-term. The robustness results (table 9) support the results that income inequality has a positive effect on economic performance in the long-term. This is not in line with the hypothesis that expected a negative effect from income inequality on economic performance in the long-term. It could be the case that when looking at the long-term effect of income inequality 10 years is not long-

term but short-term, this would explain why this paper finds a positive relationship between income inequality and economic performance when 10 year is taking as long-term.

Fourthly, the effect of income inequality on economic performance in the long-term when looking at different country income-groups are discussed. This paper finds evidence that income inequality (GINI based on disposable income) has a positive effect on economic performance in the long-term in high-income countries, but find no significant relationship for the other three income-groups (table 6). However, this paper finds no significant evidence for a relationship between income inequality and economic performance in the long-term when using a GINI based in multiple GINIs as proxy for income inequality (table 8). The robustness results are not in line with the main results, the robustness results indicate that there is a positive effect from income inequality on economic performance in the long-term for upper middle-income and lower middle-income countries. This means that the results indicate the opposite from what the hypothesis of this paper expected. As with discussion point three it could be the case that 10-years is not long-term when looking at the effect of income inequality on economic performance.

The result of his study support the hypothesis that income inequality has a positive effect on economic performance in the short-term. However, no evidence for the hypothesis that income inequality has a negative effect on economic performance in the long-term was found. The reason for the positive effect in the long-term could be that 10-years is not long-term when it comes to income inequality and a longer time-period is needed.

The results presented by this study are in line with the findings by Forbes (200) who found that there is a positive effect from income inequality on economic performance in the short-run. The results are partly in line with the results with the study by Halter, Oechslin, and Zweimüller (2014), that study presented a positive relationship between income inequality and economic performance in the short-term similar to the results of this study. However, Halter, Oechslin, and Zweimüller (2014), find a negative relationship between income inequality and economic performance in the long-term while this paper finds a positive relationship. Multiple papers (Alesina & Perotti, 1994; Alesina & Rodrik, 1994; Bénabou, 1996; Keefer & Knack, 2002; Nissanke & thorbecke, 2006) find a negative relationship between income inequality and economic performance, those results are not in-line with the results of this paper.

This paper found evidence that GDP per capita has a negative influence on economic performance (table 5, 6, 7, and 8). The results presented by this paper are in line with the Solow-model and the assumption that there are diminishing returns when it comes to GDP per capita and GDP per capita growth. Those results are supported by the robustness tests (table 9 and 10). The results for human capital are not significant (table 5 and table 7) for all countries and for the different income groups this paper found supporting evidence for a negative effect form human capital on economic performance (table 6 and table 8). These results are supported by the robustness tests (table 9 and 10). The expectation was that human capital had a positive effect on economic performance while this paper found evidence for a negative effect. It could be the case that the high correlation between GDP per capita and human capital (as explained in section 5.1) is responsible for this negative effect. This paper found evidence that unemployment has a negative effect on economic performance (table 5 and 7) for all countries, but could not find evidence when looking at the different income-groups (table 6 and 8). Those results are supported by the robustness tests (table 9 and 10). This means that this paper found evidence that supports the expectation that unemployment has a negative effect on economic performance.

6) conclusion

This study investigated the relationship between income inequality and economic performance. In addition, this paper made a distinction between the short-term and long-term effect of income inequality on economic performance. The aim of the paper was to answer the research question "what is the effect of income inequality and is there a difference between a short-term and long-term effect". The hypothesis of this paper and is that income inequality has a positive effect on economic performance in the short-term, but in the long-term the effect of income inequality on economic performance is negative. Income inequality influences economic performance through different channels.

The different channels can be divided in a positive effect or negative effect from income inequality on economic performance. The first positive channel is based on creating incentives for people to work and be ambitious. The second positive channel is based on aggregate savings and the assumption that rich people save more, this leads to a higher capital accumulation and eventually in an increase in investments. The first negative channel assumes that higher income inequality leads to more rent-seeking activities. The second negative channel argues that higher income inequality results in political and social instability. The third negative channel makes

the argument that income inequality leads to a relatively poorer voter and eventually redistribution demands by an increase in taxation. The fourth negative channel assumes that higher income inequality leads to less investment by the poorer part of the population. The fifth channel argues that higher income inequality leads to higher fertility rates. The sixth negative channel assumes that higher income inequality leads to a development stop when it comes to advanced technologies. The last negative channel argues that the rich could make unproductive investments.

In the hypothesis, this study argues that the negative results of income inequality have a slower effect than the positive effects. This means that first the positive effects of income inequality on economic performance are visible and after a longer time-period the negative effects of income inequality on economic performance become visible.

This paper analysed the relationship between income inequality and economic performance by looking at 164 different countries for the time-period 1960-2015. In addition, this paper divided the countries in four different groups depending on their income-level.

The results of this paper indicate that income inequality has a positive effect on economic performance in the short-term when looking at all countries. In addition, this paper found evidence for a positive effect from income inequality on economic performance in the short-term when looking at the lower middle-income countries. When looking at the long-term effect of income inequality on economic performance this paper found evidence that indicates that income inequality has a positive effect on economic performance. These results hold when looking at all countries and for high-income countries.

The results of this paper support the hypothesis that income inequality has a positive effect on economic performance in the short-term. However, contradict the hypothesis that income inequality has a negative effect economic performance in the long-term.

This paper had different limitations. The data was not available for all countries and all years, this resulted in a biased towards high-income countries and more recent years. The different GINIs used in this paper as proxy for income inequality are collected from different sources and are constructed in different ways. In addition, there are channels between income inequality and economic performance that are based on wellbeing and GDP per capita is not a

perfect proxy for wellbeing. However, this paper used a recent updated version of the most extensive income inequality database, this paper could use new data that is not used before to test the relationship between income inequality and economic performance.

For future research, it would be interesting to see if the results hold when looking at different timeframes for short-term and long-term effects. It would also be interesting to see if there are differences when the level of income inequality is considered, is there for example a turning point. In addition, the data availability is going improve during the next years, the data improvement could lead to different results. Especially an increase in data availability in the low-income countries could help analyse the relationship between income inequality and economic performance.

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Appendix
Appendix 1: example of distinctions between income inequality data

Year	Country	Quality	Type of inequality	Division of income	Area	Population	Age
2004	India	Low	Consumption	Household per capita	All	All	All
2004	India	Average	Consumption	Household per capita	Urban	All	All
2004	India	Average	Consumption	Household per capita	Rural	All	All
2004	India	High	Income, disposable	Other	All	All	All
1987	Ireland	High	Income, gross	Household per capita	All	Employed	All
1987	Ireland	High	Income, gross	Household adult equivalent	All	All	All
1987	Ireland	High	Income disposable	Other	All	All	All
1987	Ireland	High	Income disposable	Without adjustment	All	All	All
1987	Ireland	High	Income disposable	Household adult equivalent	All	All	All
1994	Sweden	Average	Income disposable	Household adult equivalent	All	All	Age categories
1994	Sweden	High	Income disposable	Household adult equivalent	All	All	All

Appendix
Appendix 1: example of distinctions between income inequality data