Economic Growth and Inequality

A reassessment of the empirical evidence

Presented by

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This paper addresses the development of poverty and inequality on future economic development. By using high-quality panel data the econometric relationship between numerous macro economic variables and economic growth has been analyzed. Some of the variables analyzed were GDP growth, investments, education levels and GDP per capita. The findings will be thoroughly analyzed, for they contribute to the discussion of the implications of inequality on future economic growth. The added value of this paper is the inclusion of the applicability of the Kuznets' hypothesis for Latin American countries, by using high-quality panel data as well.

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1 Introduction

As the year 2015 is nearing, economists' attention should be on reaching one of the United Nations' Millennium Development Goals[2], which is to halve global poverty by 2015. Poverty does not only affect the political sphere, but the economic sphere of a country as well. The tunnel parable by Hirschman (1973) could explain the general implications of poverty in the political sphere. The opinions on the implications of inequality on economic development are on the other hand potentially contradictory. Some authors argue that initial inequality is favorable for economic development (Kaldor, 1960; Kalecki, 1971), while opponents disagree with this statement and argue that initial inequality is extremely harmful for further economic development (Klasen, 2004; Knowles, 2001).

Inequality and poverty can be discussed and measured along different dimensions, such as absolute and relative poverty. Absolute poverty can be defined in reference to a prior defined poverty line, which is controlled for a country's purchasing power, as to cover for the basic needs of the population. Even after correcting for Purchasing Power Parity, absolute poverty lines vary across countries and change over time. The reason for this is that essential physical and social needs tend to evolve over time, as economies grow and societies evolve.

Inequality varies across countries and time as well, with Asia being the main driver of "equality" in the world. Since the 1980s Asia benefitted greatly from economic development, therefore pushing global poverty down. According to the Solow growth model, poor countries should experience greater economic growth, ceteris paribus, than developed countries. This proposition fits well the recent experience of several of the East Asian countries. Yet Sala- i-Martin (2002) argues that if the Asian growth rates persist this may lead to rising global inequality after 2015. The reason is that a substantial share of the world population lives in this region, so double-digit growth rates will eventually lead to increasing inequality levels. Up until now, Africa has been pushing the poverty as well as the global inequality levels up by lagging in economic development (Dollar, 2005). This is the point of view also of Dollar (2005) who points out that poverty reduction in low-income countries is extremely closely related with their economic growth rate.

[2] The first Millennium Development Goal is to reduce the population living in poverty by 50 %, starting from 1990 to 2015 For the full content about these Millennium Development Goals, please visit http://data.worldbank.org/about/millennium-development-goals

This paper will address the issue of inequality, poverty and economic development. The developments around global inequality and global poverty are issues that will be thoroughly discussed. There is an extensive literature on this topic, and the findings have been well documented as well. Initial inequality could affect the trend of economic development, leading to the research question '*How does inequality affect future economic development?'* The purpose of this thesis is to contribute to the active discussion around the implications of inequality on economic development. These discussions were very active at the beginning of the twenty-first century with many articles extending the existing literature.

This paper is divided into different sections. Section 2 provides the reader with the necessary theoretical framework. This section addresses the trends in global inequality as well as the relationship between economic growth and inequality. Section 3 analyzes the statistical relationship between initial inequality and economic growth and discusses the main results. This analysis is based on an econometric estimation. Section 4 carries out an econometric estimation of the relationship between inequality and GDP per capita growth. This section will focus on the famous Kuznets' hypothesis and its implications for Latin America. Concluding remarks will be provided in the last section of this article.

2 Theoretical framework

Measuring inequality can be very subjective, for there are different methods used by different academics- some commonly used variables are characteristics of the income distribution, land distribution, wealth distribution or asset distribution. Understanding the forces driving inequality is extremely important, for these factors also contribute to the economic conditions that we are living in today. A second note is whether a relationship exists between inequality and economic growth, and if so, through which channel it materializes.

2.1 Developments of global inequality

The two waves of globalization[3] have tremendously integrated the world economies, changing the face of global development and bringing an active debate regarding the consequences of this integration. According to Jay Mazur (2000) and Noam Chomsky (2002), this has led to higher relative inequality, and higher poverty, amongst and within countries. They argue that the rich has become richer, while the poor has become much poorer. Yet a study by Chen and Ravallion (2004) shows that the amount of people living on less than $1 a day has declined by 375 millions during the period of 1981 to 2001. Their findings suggest that the absolute global poverty has declined considerably. By using household survey data they estimated the extent of global poverty and reported that it declined by almost 50 percent- this does not say anything about relative inequality and poverty though. In addition, the widespread belief that economic integration manifest itself into greater inequality within countries were correctly discredited by Dollar and Kraay (2002). By collecting income distribution data they reported there is no general trend towards increasing or decreasing inequality within countries.

Measuring inequality can be extremely complicated, because of the variety of methods applied. Inequality can be measured based on income or wages and on the personal and the

[3] Pelkmans- Balaoing's lecture notes for the course 'Empirics of Globalization'. These notes were provided during the Minor 'Introduction to Development Economics' in September and October of 2008. The first wave of globalization has caused a serious decline in the transportation costs in the world, benefitting the developed as well as the developing countries- the former benefitting much more than the latter. The second wave of globalization brought a significant decline in communication costs, shifting the benefits from the developed countries to the developing countries. Therefore enabling them to compete in the world trade and be a part of the world economy.

household level. Global inequality has different meanings as well- distribution between countries, distribution among countries and distribution among the world population. According to Milanovic (2002), income between countries has diverged significantly from each other, with the developed countries benefitting much more than the developing countries. According to the United Nations Human Development Index of 2004, the GDP per capita in rich well-developed countries were eight times higher than the GDP per capita in other parts of the world.

The most commonly used method to measure inequality is the Gini index, which will be thoroughly used in this paper as well. The Gini index definition of the OECD will be used throughout this paper. According to the OECD, the Gini index measures the extent to which the distribution of income, among individuals or households within an economy, deviates from a perfectly equal distribution (OECD, 2002). Other methods used are the poverty headcount index, the squared poverty trap and the poverty gap[4]. The Gini index can be graphically illustrated by the area between the Lorenz curve and the 45°-equality line. The Lorenz curve plots the population distribution against the cumulative income share. If the distribution of income is completely equal, the Lorenz curve line and the equality line will merge, indicating that the Gini coefficient is zero. One drawback of the Gini is its insensitivity to adapt to distributional changes in the middle ranges (Week, 2005). For a graphical illustration of the Lorenz curve and the exact formulation of the Gini index, please see the Figure 1 in the Appendix.

There are several findings suggesting that the global Gini index declined during the last two decades. The global Gini index can be described as measuring the inequality amongst the income of the entire world population- from the poorest to the wealthiest individuals- or measured as the international inequality level. The most influential studies on this have been carried out by Bhalla (2000) and Sala- i- Martin (2002). These studies were based on the analysis of national accounts' data regarding consumption and income distribution. According to Bhalla, the global Gini declined by 3 percentage points reaching 0.64 during the course of two decades- 1980 to 2000- after rising in the previous decades- 1960 to 1980. However, the World Bank (2003) disagrees with Bhalla's findings. This discrepancy in results arises from the methodology used by both authors: Bhalla analyzes the level and trend in poverty over the last 50 years, while the World Bank uses only selected years for their

[4] The Gini index ranges from 0, where everybody has the same income, to 1, where the richest person has all the income. The poverty headcount index, the squared poverty trap and the poverty gap for measuring inequality are thoroughly analyzed in Calderon et al (2006)

analysis (Bhalla, 2003). In addition to Bhalla, Bourguignon and Morrison (2002) showed that the Gini index had been rising until 1980. Sala-i- Martin estimated that the global Gini coefficient has declined to around the 0.61, since the results of Bourguignon and Morrison in 2002. Yet the problem of measurement error[5] arises in the studies of Bhalla and Sala- i-Martin, according to Deaton (2004), for the reason that using data on national accounts for analyzing inequality and poverty tends to underestimate the true value of inequality. His main argument was that the growth rates for countries such as India and China are notably overestimated. Thus, even though inequality has decreased, the magnitude of this decline is not accounted for properly. Moreover, a study by Week (2005) questioned the belief that inequality is rising, for he shows that there is no trend increase in the inequality level of countries. He argued that the only countries which did experience a trend in rising inequality were the Anglo-Saxon 'neoliberal' countries, which were New Zealand, the United States, Australia and the United Kingdom. Week also indicated that there were great similarities between the countries, which did experience rising inequality. In fact, these countries implemented similar economic and social policies, with labour market deregulation perhaps being the most important (Week, 2005). This strongly contradicts the findings of Milanovic (2002), who argues that the global Gini index increased, by 3 percentage points between 1988 and 1993- rising from 0.63 to 0.66. According to Milanovic, inequality between countries contributed for the majority of the global Gini increase.

2.2 Relationship between inequality and economic growth

The relationship between economic growth and inequality has been a much debated and researched topic. Some academics argue that greater inequality is good for economic growth, whereas other argue that greater inequality constrains growth (Dollar and Kraay 2001; Sachs and Werner 1995; Person and Tabellini 1994; Goudie and Ladd 1999; Deininger and Squire 1998; Van der Hoeven and Shorrocks 2003). Cross-country analyses suggested that there is a negative relationship between inequality levels and economic development (Perotti, 1996; Alesina and Rodrik, 1994). According to the Inter-American Development Bank (1998), policy makers and international institutions aim to combat inequality and to identify situations where initial inequality could impair overall growth.

[5] Measurement error could imply that the data has been misused during the analysis and has therefore produced bogus results.

Therefore, Tanzi and Chu (1998) and Solimano et al (1999) argue that policy makers should explore measures that would promote growth and equity at the same time- such as the universal cash grant proposed by Ackerman and Alstott (1999). According to Bourguignon (2004), considering growth and income distribution at the same time is extremely important, as well as recognizing income distribution as a factor for growth and poverty reduction.

In general there are three models explaining the underlying mechanisms through which inequality and economic growth are linked. These are the *redistributive political economy* model, the *capital market imperfections* model and the *economic efficiency* model.[6] Distributive political economy-theorems, such as the neoclassical model of production and distribution, suggest that inequality is destructive for economic growth. It argues that inequality generates a pressure to implement pro-redistributive economic policies; affecting human capital investments and therefore constraining the growth process as well. The reason is that investing in human capital will only be profitable if the individuals could privately benefit of their returns of investments. In societies with high inequality levels, distributional conflict may influence political decisions and may therefore diminish the return on investment and economic development (Galor, 2009). The capital market imperfection model implies that due to credit constraints the poor can not profit from indivisible investments. This indicates that a more equal initial asset distribution will result in higher investment in human capital, according to Deininger and Olinto (1999). Credit market imperfections could explain how the redistribution of capital from capital-abundant firms and individuals to capital-poor and credit-constrained individuals increases investment, growth and efficiency. The main argument is that due to the lack of collateral they cannot borrow and therefore are not able of seizing profitable investment opportunities (Piketty, 1993). This issue has been properly addressed in the research of Benabou (1996), Aghion (1999) and Ravallion (2001). Credit-market failures can be primarily attributed to asset inequality, rather than income inequality, and could even explain the negative relationship which has been found by some authors between asset inequality and economic development (Birdsall and Londono, 1997; Ravallion, 1998). In the models of Banerjee and Newman (1993), Galor and Zeira (1993) and Aghion and Bolton (1997) credit is restricted because of asymmetric information and this will affect patterns of growth and inequality. Deininger and Squire (1998) argued that the creation and redistribution of newly acquired assets has a greater impact on poverty reduction and growth- therefore positively affecting inequality as well- than the

[6] For further understanding of these models, consult the work of K. Deininger and P. Olinto (1999)

redistribution of existing assets. The argument presented above is extremely important when privatizing state assets; otherwise this could lead to a much higher asset distribution inequality- therefore careful monitoring is strongly advised.

The effects of investments in education are also affected by the initial distribution of asset within a country. Deininger and Olinto (1999) argue that the interaction between these two variables is negative and significantly different from zero, indicating that strategies to increase education will not be profitable in countries with higher inequality in asset distribution. Barro (1991) showed that there is a positive relationship between initial human capital and the growth rate of real capita GDP.

3 Initial inequality on future economic development

Whether there is an existing relationship between inequality and economic growth, and how this relationship materializes are important questions that must be addressed by anyone interested in studying the process of economic developments. This section analyzes the relationship between initial inequality and its effects on economic development. According to Deininger and Squire (1998) initial inequality does have a negative effect on future economic growth. Adelman and Morris (1973) and Fishlow (1972) concluded that using cross-sectional data, inequality tends to rise more rapidly with economic development in developing countries than in other regions. However, the methodology of Adelman and Morris was heavily criticized by academics such as Cline (1975) arguing that their approach was indirect, thus not accurate. Using cross-sectional data, Papanek and Kyn (1987) argued that higher GDP growth rates do not trigger higher inequality levels: evidence in this direction had been gathered by Ahluwalia (1976) as well. Yet this contradicts with the findings of Fields (1980) who, using time-series, argue that developing countries tends to experience rise in inequality with economic growth as much as decline. Fields (1989) also suggested that there is no evidence pointing towards an increase in equality with economic development- whether analyzing spells, countries or Gini index. He documented no statistically significant link between initial income inequality and economic growth.

The Harrod-Domar model (1957) states that if the poor spend the majority of their income, while the rich save and invest a great part of their income, then this would boost savings, capital accumulation, and investments. According to this model, economic development depends on capital accumulation and labour. Capital accumulation can be achieved by endogenous savings and investments. Moreover, these investments will stimulate technological advances, leading to higher economic development- the larger the share of income of the rich. This model states that policies towards increasing investments tend to fuel economic growth. These implications were supported by Sheehan (1980) and Griffin and Khan (1972). They suggest that societies should have wealthy managers, investors and landowners if they want to experience significant growth rates.

3.1 What do the data show?

Initial inequality could influence future economic development, as discussed in the previous section. This section analyzes whether this relationship is significant, and if initial inequality affect economic growth positively or negatively. Higher inequality is likely to lead to a high population of credit-constrained individuals and firms. According to the findings of Tsiddon (1992), Galor and Zeira (1993), Saint-Paul and Verdier (1992) and Banerjee and Newman (1991), credit-constrained markets prevent the poor from investing in indivisible investments, therefore negatively affecting the economic development of a country. Channeling credit through special interest rates could constrain economic growth even further. The consequences of these interactions have been analyzed by Bencivenga and Smith (1991). Bruno et al (1996) argued that greater initial inequality would lead to lower divisible investments and consequently to slower economic growth Lower divisible investments will not increase the human capital of a country, nor will it absorb workers in high-income sectors. A second variable influencing economic growth is openness to trade of an economy. According to Sarkar (2006) there is no positive relationship between economic growth and trade openness. He reached this conclusion by using time series on individual countries. However, Yanikkaya (2003) and Yucel (2009) argue that by using cross-section data, there is a link between trade and growth- this relationship is positive as well as significant. Another variable worth analyzing is the relationship between education and economic growth.

Recent studies of Li and Zou (1998) and Forbes (1997) indicated that there is a positive relationship between initial inequality and economic growth. These studies were based on panel data, whilst controlling for country-fixed effects. By using the median income, Paltridge (1997) reaffirmed the findings of Li and Zou and Forbes. Therefore, our statistical relationship will be based on panel data instead of cross-country data.

Our analysis covers the period 1975 to 2008 and it comprises all the countries in the world. However, to attain high-quality data, countries with less than 5 observations for each variable where excluded from the data set. The variables analyzed are the initial GDP per capita, the initial inequality level, the education level of a country, investment as a share of the GDP per capita and openness to trade of a country. By using a panel data, the statistical relationship between initial inequality and economic growth will be analyzed, including-region-fixed effects. The specification which will be estimated is given by the following equation:

$$GDP\ growth_{i\,t} = A + B\,(IGDP_{i\,t}) + C\,(IGINI_{i\,t}) + D\,(EDU_{i\,t}) + E\,(INV_{i\,t}) + F\,(OT_{i\,t}) + \varepsilon, \qquad (1)$$

where *i* denotes countries, *t* denotes time, IGDP stands for initial GDP per capita, while IGINI denotes the initial inequality levels, EDU stands for education, INV denotes investment share of GDP per capita, while OT denotes the openness to trade of a country[7], and the letters A through G are coefficients to be estimated[8]. GDP growth will be calculated as an average throughout the years, as to properly analyze the effects of the initial inequality levels and the initial GDP per capita on future economic development. Traditionally there is a positive relationship between trade openness and future economic growth, as documented by Sachs and Werner (1995), Dollar and Kraay (2001), Edwards (1998) and Rodriguez and Rodrik (1999). They also argue that the growth benefits tend to diminish over time: especially for developing countries.

Table1: Determinants on economic growth- with education variable entailing 'mean years of schooling'

	Unstandardized Coefficients		Standardized Coefficients		
Model	**B**	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	3,956	0,198		19,986	0,000
GDP per capita	-3,45E-06	0,000	-0,019	-0,973	0,331
Gini	0,011	0,004	0,068	2,826	0,005
Investment share of GDP pc	0,021	0,003	0,130	7,094	0,000
Mean years of schooling	-0,012	0,001	-0,222	-10,383	0,000
Openness to trade	0,005	0,000	0,162	10,014	0,000
Dummy Africa	-1,04	0,122	-0,224	-8,546	0,000
Dummy Asia	0,302	0,105	0,075	2,864	0,004
Dummy Latin America	-1,202	0,118	-0,274	-10,185	0,000
Dummy Europe	-1,552	0,108	-0,438	-14,374	0,000
Dummy Oceanie	-0,326	0,136	-0,046	-2,400	0,016
No. observations	2958				
No. countries	87				
Period	1975- 2008				
Adjusted R^2	0,34				

[7] Data for the GDP growth, the initial GDP and the openness to trade were acquired using the dataset of the World Development Indicators. Yet the initial Gini index was provided by the World Income Inequality Database and the investment data was provided by the Summers-Heston data set. Education levels are measured as the mean years of schooling received, and this data has been provided by the World Bank.

[8] A similar study has been conducted by Deininger and Squire (1998) where they analyze the relationship between these variables. Their analysis has led to the above mentioned equation, yet this equation includes some additional variables on the right hand side. Another difference is that our model does not include the variable of the Black Market Premium on the right hand side.

After correcting the data set for countries with less than 5 observations, the data set consisted of 87 countries. To fill in the gaps in the data set, the interpolation technique was performed. As table 1 illustrates, GDP per capita has a negative impact on economic growth when looking at the coefficient, yet this relationship is not significant. This indicated that high levels of initial GDP per capita tend to constrain economic growth, indicating that poor countries with low GDP per capita should grow at a faster rate than rich well-developed countries. This outcome is in line with neoclassical growth models. However, this relationship is not significant. Interestingly, the inequality variable has a positive and significant impact- at the usual confidence levels- on economic growth, indicating that unequal societies tend to experience higher growth rates than egalitarian societies. This result strongly contradicts the findings of Deininger and Squire (1998), where they argue that inequality has a negative and significant impact on economic development. Our findings are supported by Li and Zou (1998) and Forbes (1997), who used panel data to reach this conclusion. The variables investment share of GDP per capita and openness to trade both enter positively and are significant at the usual confidence levels. The reason that investment is positively linked to economic growth is that higher endogenous savings and investment rates tend to boost efficiency and production, leading to an increase in output and economic growth. This was the conclusion reached by Aghion et al (2009) as well. The model also shows that economies that are actively participating in the world trade will experience higher growth rates than countries living in autarky. This is illustrated in table 1 where openness to trade has a positive and significant impact on economic development. The outcome of the variable openness to trade is in line with previous findings, especially those of Karras (2003). Table 1 show that the variable of education has a negative and significant impact on economic growth rates. For this part of the analysis, the variable of education consists of the 'mean years of schooling' data set provided by the World Bank. The reason for using this data set of education was to test the input side of the education level of a country. Our findings strongly contradict those of Barro (1997), who argued that education has a positive and significant effect on economic growth by using panel data. One plausible limitation of our model is the relatively low Adjusted R^2 of 34 percent.

After analyzing the results of table 1, a second analysis was performed by altering the variable of education. The variable education consists the 'literacy rate' instead of the 'mean years of schooling'. The reason was to test the level of basic education on economic growth. Again, to properly analyze the data, countries with less than 5 observations are excluded

from the data set, while breaks in data were solved using the interpolation method. The results are illustrated in table 2.

Table2: Determinants on economic growth - with education variable entailing 'literacy rate'

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	5,100	0,294		17,328	0,000
GDP per capita	-6,73E-05	0,000	-0,140	-4,878	0,000
Gini	-0,034	0,006	-0,179	-5,715	0,000
Investment share of GDP pc	0,032	0,006	0,148	5,609	0,000
Literacy rate	0,004	0,001	0,043	1,382	0,167
Openness to trade	0,006	0,003	0,163	5,754	0,000
Dummy Africa	-0,729	0,174	-0,126	-4,194	0,000
Dummy Asia	0,760	0,144	0,182	5,269	0,000
Dummy Latin America	-1,340	0,180	-0,355	-7,466	0,000
Dummy Europe	-2,742	0,200	-0,523	-13,700	0,000
Dummy Oceanie	-0,245	0,207	-0,031	-1,187	0,235
No. observations	1224				
No. countries	36				
Period	1975 - 2008				
Adjusted R^2	0,534				

The results in table 2 do vary from the previous one. The Adjusted R^2 has increased drastically, from 34 percent to 53 percent, indicating that this model portrays a better image of reality. Table 2 illustrates that the GDP per capita has a negative and significant impact on economic growth. The same conclusion was derived from table 1, with the only difference that in this analysis GDP per capita is significant as well. Again, this indicates that higher initial GDP per capita levels have a negative impact, ceteris paribus, on economic growth. The variable of inequality has, according to table 2, a negative and significant effect on growth, whereas in table 1 this effect was positive and significant. Table 2 suggests that egalitarian societies tend to outgrow unequal societies over time. A second major difference between table 1 and table 2 is the outcome of the variable education. According to table 2, the level of education in a country does positively effect economic development, yet this effect is not significant. The variables of openness to trade and investment does match with table 1, showing that high levels of endogenous investments and openness to trade of a country have strong positive effects for future economic growth. It can be also illustrated that

the coefficient signs of the region-fixed dummies do not vary: it is the significant level that vary.

After these puzzling results of education and inequality levels, a third analysis was performed. During this analysis, the variable education entailed the “real government current educational expenditure per pupil at primary school (PPP-adjusted 1985 international dollars” and was provided by the Barro-Lee data set on education. Once more, countries with less than 5 observations were excluded from the data set, while gaps in the data were filled according the interpolation method. The results are summarized in table 3.

Table3: Determinants on GDP growth - with education variable entailing ‘real government current educational expenditure per pupil at primary school (PPP-adjusted 1985 international dollars)’

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	4,796	0,161		29,833	0,000
GDP per capita	-3,85E-05	0,000	-0,216	-8,391	0,000
Gini	-0,034	0,004	-2,170	-9,527	0,000
Investment share of GDP pc	0,027	0,003	0,163	8,523	0,000
RGEEPP	1,87E-05	0,000	0,018	0,650	0,516
Openness to trade	0,007	0,001	0,227	13,807	0,000
Dummy Africa	-0,302	0,099	-0,720	-3,057	0,002
Dummy Asia	1,302	0,093	0,324	13,951	0,000
Dummy Latin America	-0,344	0,099	-0,093	-3,462	0,001
Dummy Europe	-1,743	0,089	-0,504	-19,584	0,000
Dummy Oceanie	-0,328	0,112	-0,046	-2,943	0,003
No. observations	2006				
No. countries	59				
Period	1975 - 2008				
Adjusted R^2	0,615				

The main difference between table 3 and the rest is that it has a much higher Adjusted R^2 than the rest, indicating that the model is much more realistic. As with the previous results, the variable GDP per capita has a negative and significant impact on economic development. The results of table 3 do not vary from those in table 2, with the dummies being the exception. In table 3 all the dummies are significant, indicating that region-fixed effects do play a significant role in the analysis, and that regions do differ in dimensions, even though this can not be easily observed.

4 Kuznets' Hypothesis

The Kuznets' hypothesis is a much debated topic in economics, for there are as many supporters (Oshima, 1970; Ahluwalia, 1976; Robinson, 1976; Paukert, 1993; Carter and Chenery, 1976) as there are opponents (World Bank, 1990; Ravallion 1995; Fields, 1989; Bruno et al 1996). Kuznets argued that there is a trade-off between pursuing growth and reducing inequality. According to Kuznets, the secular performance of inequality postulates an inverted U-shaped pattern. Inequality increases and then decreases with development- after a certain threshold has been surpassed. However, Anand and Kanbur (1993) are extremely skeptical about the existence of this 'turning point'- as indicated by their findings. The decline in the early stages of development is most prolonged for the lower quintile of society, according the findings of Chenery and Syrguin (1975) and Addelman and Morris (1973). Following the statement that inequality worsens with development, this hypothesis has received substantial attention. Kuznets' historical findings were based on historical data for three developed countries, which were the US, Germany and England, for the first half of the nineteenth century.

Opponents of the Kuznets' hypothesis argue that by using cross-country data instead of panel data and within-country time-series, country fixed-effects will not be fully eliminated and could create the illusion of the Kuznets' curve. According to the findings of Bourguignon (2004) country specificity in the way economic growth affects distribution does matter, and as a result no generalization could be possible.

According to Kuznets, the ratio of mean incomes amongst sectors undergo widening intersectoral differences at the early stages of development, as scarce resources are attracted by the urban sector, to the expense of the agricultural sector. Yet this gap will narrow, at a later stage of development, for two main reasons. Firstly, as capital becomes less scarce, more resources will become available to improve the less developed sector. Secondly, during the later stage of development of the urban sector, the impact on reducing the pressure of population in the agricultural sector will increase as well. Both of these dynamics leads to a higher productivity in the agricultural sector, reducing the income per capita differentials amongst these sectors (Kuznets, 1955; Ahluwalia, 1976). These models are based on exogenous productivity levels in both sectors- a major shortcoming according to Deininger and Squire (1998).

Recent studies have been more cautious when examining this hypothesis, by assessing the impact of other variables on income, such as openness to trade and education levels (Bourguignon and Morrison, 1990).

One aspect which is commonly argued amongst researchers is that Latin America ranks number one when it comes to inequality- the gap between rich and poor is extremely high because of particular underlying characteristics. The inequality that Latin America is experiencing does not match with its level of development. According to Londoño and Székely (1997) Latin American countries had an 'excess' poverty of 50 percent in the 1990s. This means that the level of inequality in Latin America did not corresponded with its level of development at that particular time. Many academics hypothesize that inequality might increase due to economic development, in low-income countries rather than in high-income countries, because inequality tend to increase systematically with economic development (Kravis, 1960; Oshima, 1962); therefore implying that Latin America is more vulnerable for experiencing the Kuznets' curve than Asia (Fields, 1989). However, Fields argue that in developing countries, inequality has increased as frequently as it in the developed world. He argues also that Latin America is not more vulnerable for rising inequality levels than Asia. According to the findings of Fishlow (1972) and Weiskoff (1970) some Latin American countries, such as Brazil and Argentina, experienced a systematic increase in their inequality levels. These findings are the primary reason for analyzing the applicability of the Kuznets' curve for Latin America.

4.1 What do the data show?

The East Asian encounter with trade openness supports the conventional wisdom that greater openness to trade tends to narrow inequality within a country, yet this was not the case for Latin American countries (Wood, 1997). Given existing inequality levels, the income benefits for the rich from distribution- neutral economic growth will exceed, on average, those of the poor (Ravallion, 2001; Dollar and Kraay, 2000). On the flipside, wage inequality within a country is rising, as skilled workers reap the majority of the benefits of trade openness. There is some empirical evidence that this is a worldwide trend (Galbraith and Liu, 2001). This might give the incorrect impression that this may cause inequality to rise as well. A careful study by Glewwe et al (2004) showed that although rising wage inequality, this is not

translating into higher inequality; due to the complexity of the underlying mechanism. If new sectors have been developing in an economy, and it pays more than the sectors in the informal or rural area, wage inequality might rise, yet income inequality will remain stable or even decline (Glewwe et al, 2004).

To properly estimate the Gini index for Latin America, the dataset is restricted to countries which have five or more observations available of all the variables analyzed during the period 1975 to 2008. In this analysis Latin America comprises of Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay and Venezuela. By using panel data for country-specific effects and coefficients on the Latin American Gini index, the following equation emerges:

$$Gini_{i\,t} = A + \beta_i (Y_{i\,t}) + \beta_i (1/Y_{i\,t}) + \beta_i (EDU_{i\,t}) + \beta_i (OT_{i\,t}) + \beta_I (DC) + \varepsilon, \qquad (2)$$

where *i* denotes countries, *t* denotes time, *Y* denotes the real GDP per capita, while 1/*Y* denotes the inverse GDP per capita[9], EDU denotes the education level[10], OT stands for the trade openness, DC denotes the country dummy and A and β_i are coefficients to be estimated[11]. According to the Stolper- Samuelson theorem greater openness to trade relates to a decline in wage inequality, if a country is labour-abundant vis-à-vis the rest of the world (Van Marrewijk, 2007)[12]. Including the variable of openness to trade could impose some econometric problems according to some authors; however, trade openness is measured as indicated by the World Development Indicator data set. The problem arises when trying to asses for the causal link between trade openness and inequality[13]. The education level is incorporated into the equation, because of the findings of Papanet and Kyn (1986). They

[9] By introducing the inverse GDP per capita small values of GDP per capita can be included in the analysis as well. The inverse GDP per capita makes it possible to analyze extreme small values of GDP per capita, for these values are important for the development of GDP per capita over time.

[10] Education is measured as the literacy rate, according to the World Development Indicator data set, for the data set of Nehru on education was not sufficient for this analysis.

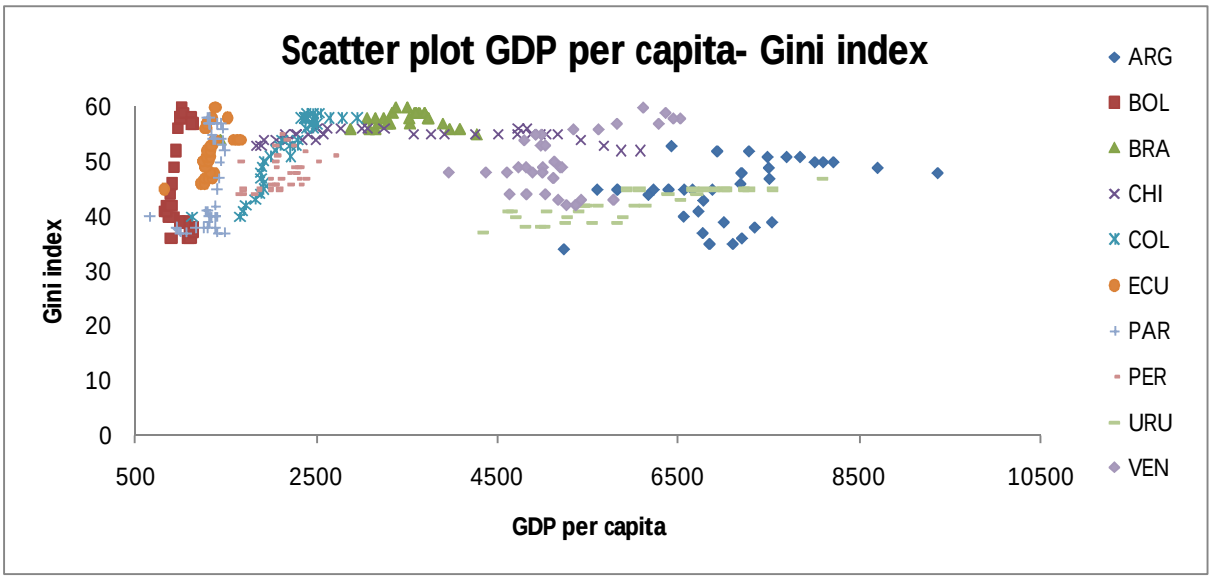
[11] Using this method, some countries were excluded from the analysis. Missing values were filled using the interpolation method as suggested by Londoño and Székely (1997). Regression (2) was based on the findings of Welschen, A (2010), where she conducted a somewhat similar study for East Asia. Given that her results was inconclusive, this paper has broaden the scope of the analysis- and instead of analyzing East Asia, the analysis was executed for Latin American countries, for the applicability of the Kuznets' hypothesis is not clear for this region.

[12] A major shortcoming of this theorem is the simplicity of it. It does not take trade barriers, such as tariffs, quotas and transport costs, into account.

[13] Openness to trade is measured as the percentage of merchandised trade of GDP.

argue that basic education is of quantitative importance on the income-share received by the poor, yet education is not of high importance for reducing inequality.

Figure 2: **Scatter plot GDP per capita- Gini index Latin America**



Source: World Development Indices

Figure 1 portrays the relationship between GDP per capita and the Gini index, yet this relationship is not clear. The scatter plot has been obtained by pooling all the observations together. Testing whether higher inequality is associated with higher economic growth, will give a more empirical view on the issue. By using a panel data the Kuznets' hypothesis will be tested. After running a simple multiple-regression, additional variables were added to the analysis as to control for their impact on the Gini index.

Table 4 below shows the results of the regression analysis of the model with the independent variables and their significant coefficients. After controlling for country-fixed effects, the analysis is complete. While carrying out the analysis, a standard significance level of 5 percent will be looked for.

Table 4: Determinants on Gini index- Latin America

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	53,012	5,041		10,517	0,000
GDP per capita	-3,00E-03	0,000	-0,828	-8,437	0,000
Openness to trade	0,980	0,029	0,184	3,355	0,001
Literacy rate	0,123	0,059	0,143	2,095	0,037
Inverse GDP pc	-18112,253	2253,101	-0,769	-8,039	0,000
No. observations	340				
No. countries	10				
Period	1975 - 2008				
Adjusted R^2	0,225				

As documented in table 4 the GDP per capita and the inverse GDP per capita are both negative and significant, indicating that the Gini index decreases on average with an increase in GDP- at higher levels as well as lower levels. The variables openness to trade and education levels are both positive as well as significant. This shows that an increase in openness to trade or education level within a country, will lead to a higher inequality level. This is consistent with the findings of Spilimbergo et al (1999) where they documented that openness to trade is associated with higher inequality. One argument which they have suggested to explain their findings is that liberal governments engage mainly in liberal trade policies instead of redistribution policies, creating the positive correlation between inequality and openness to trade. Trade specialization could also impact the inequality levels in a country, as suggested by Acemoglu and Ventura (2002).

Although the adjusted R^2 is around the 22 percent, the model does explain that these variables account for over 22 percent of the outcome. This could imply a limitation of the model, as some can argue that other variables account for the remaining 78 percent. Yet Ravallion (2001) and Dollar and Kraay (2000) find similar results. The results of the model suggest that the variables analyzed are significant, yet there are some underlying fundamental distribution problems that are not accounted for in this analysis. This statement will be addressed shortly.

Table 5: determinants on Gini index- Latin America with country-fixed effects

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-1,921	5,053		-0,380	0,704
GDP per capita	0,000	0,000	0,135	1,030	0,304
Openness to trade	0,098	0,030	0,185	3,265	0,001
Literacy rate	0,513	0,048	0,597	10,770	0,000
Inverse GDP pc	-479,700	3414,053	-0,020	-0,141	0,888
Dummy AGR	-7,318	1,595	-0,313	-4,587	0,000
Dummy BOL	5,453	2,505	0,233	2,177	0,030
Dummy BRA	15,359	1,308	0,657	11,745	0,000
Dummy CHI	2,731	1,220	0,117	2,239	0,026
Dummy COL	8,727	1,465	0,374	5,956	0,000
Dummy ECU	4,647	2,038	0,199	2,281	0,023
Dummy PAR	-0,225	2,040	-0,010	-0,110	0,912
Dummy PER	2,665	1,503	0,114	1,773	0,077
Dummy URU	-10,820	1,206	-0,463	-8,969	0,000
No. observation	340				
No. countries	10				
Period	1975- 2008				
Adjusted R^2	0,657				

After controlling for country-fixed effects, the country dummies were in most cases significant. This can be verified by table 5, where country-fixed effects were compared with each other. The results indicate that these effects do not vary between countries significantly, indicating that these countries can be grouped together. The total number of observation could impose a limit on controlling for country-fixed effects. The table above shows that an increase in GDP per capita has almost no effect, ceteris paribus, on the Gini index. The variables GDP per capita and inverse GDP per capita are no longer significant, showing that the Kuznets' curve no longer applies when controlling for country-fixed effects, even though these two variable coefficients are in line with the Kuznets' hypothesis.

One of the most important aspects of the inequality in Latin America is the distribution problem according to Londoño and Székely (1997). This could explain the low adjusted R^2 in table 4, indicating that the distribution fundamental impose a problem rather than the

variables analyzed. The main argument is that given the development level of Latin America, it should have a lower Gini index and lower poverty levels. This means that inequality reduction policies should be different than those implemented in other developing regions, such as South Asia, Middle East and Africa. The burden for solving this daunting distribution problem lies on public policy implementations. Improved public-expenditure and redistributive-tax policies should be pursued, given the capitalistic framework these countries operate in, for the policies implemented in the 1960s did not have a major impact on fighting inequality (Felix, 1983). Chen and Ravallion (1997) argued that Latin America would have the lowest inequality levels in the developing world, if properly controlled for their distribution problems. According to the findings of Bourguignon, distribution does significantly affect poverty and inequality reduction. If Latin American politicians would create a more equal distribution of income- or wealth- the inequality and poverty levels in these countries would decline dramatically. Thus, if another region where to have the Latin American distribution problem, they would be experiencing much higher levels of inequality. Further research in this field could shed some light on this distribution problem.

5 Concluding remarks

This paper analyzed imperative macro economic factors affecting economic development, for this field has been the focus of researchers since the 1950s. The focus was mainly on the relationship between inequality and economic growth. This paper contributed to the lasting political and economic debate about the implications of inequality on future economic development. After analyzing the prior literature and the documented effects of inequality on economic growth, the research question '*How does inequality affect future economic development?'* can be properly addressed. First, this paper analyzed the relationship between inequality and economic growth by using panel data for the period 1975 to 2008. The analysis focused on the variables of GDP per capita, the inequality levels, education- measured as 'mean years of schooling'-, investments and openness to trade of an economy. Regional dummies were included in the analysis as to correct for region-specific effects. The foremost results were those of inequality levels on economic growth, and those of education on economic growth. The data suggest that higher inequality levels contribute to a higher economic growth rate, while egalitarian countries experience lower economic growth rates. The data also suggest that higher education levels tend to constrain economic growth. This outcome was not in line with prior findings, such as those of Barrro (1997). Therefore, the data on education was changed into 'literacy rate', and the same analysis was performed. The findings suggested that inequality is harmful for future economic growth, while education has a positive link to economic growth. These results are in line with those of Deininger and Squire (1998). Since the effect of education on economic growth was not significant, a third analysis was executed, with education entailing 'real government current educational expenditure per pupil at primary school (PPP-adjusted 1985 international dollars'. The results do not differ from the second analysis, the effects of inequality and education remains the same. Since the results are inconclusive, further research is required as to the significance of the relationship of inequality on future economic growth, for the data used can easily reach different results.

The second part of this paper focused on the Kuznet's hypothesis and its applicability on Latin America. To properly address this question, panel data was used for the period of 1975 to 2008. The variables analyzed were the inequality levels, education- measured as the 'literacy rate'-, openness to trade and the inverse GDP per capita. The variable inverse GDP per capita was included as to cover for the relatively small values of GDP per capita. Firstly, the analysis suggested that higher levels of GDP per capita were characterized by lower

inequality levels. Secondly, the same analysis was performed, while country-fixed effects were included. The findings suggested that the Kuznets' curve was not applicable for these countries. Nevertheless, further research could identify whether the Kuznets' curve exist by using cross-country data, instead of panel data. Since there is room for further research, the findings provided above should not be presented as definitive answers to these complex relationships.

6 Literature

Aghion et al. 2009. When Does Domestic Savings Matter for Economic Growth? *Harvard Business School*. Working Paper 09-080

Ahluwalia, M. 1976. Inequality, Poverty and Development. *Journal of Development Economics 3,* pp. 307-342

Barro, J. 1997. Education and Economic Growth

Barro, R., Lee, J. 1996. International measures of schooling years and schooling quality, *American Economic Review* Vol. 86, No. 3, pp. 107-182

Bhalla, S. 2003. Crying Wolf on Poverty: Or How the Millennium Development Goals for Poverty Has Already Been Reached

Borjas, G. 2010. Labor Economics. McGraw-Hill, *fifth edition*, page 292

Bourguignon, F. 2004. The Poverty-Growth-Inequality Triangle. Prepared for the Indian Council for Research on International Economic Relations on February 4

Bruno, M., Ravallion, M., Squire, L. 1996. Equity and Growth in Developing Countries- Old and New Perspectives on the Policy Issues. The World Bank. Policy Research Working Paper 1563

Calderón, M., Chong, A., Gradstein, M. 2006. Foreign Aid, Income Inequality, and Poverty. *Inter-American Development Bank Research Department*. Working Paper 547

Deininger, K., Olinto, P. 1999. Asset distribution, inequality, and growth. *World Bank Policy Research*. Policy Research Working Paper 2375

Deininger, K., Squire, L. 1966. A new data set measuring income inequality. *World Bank Economic Review* Vol. 10, No. 3, pp. 565-591

Deininger, K., Squire, L. 1998. Nes ways of looking at old issues: inequality and growth. *Journal of Development Economics*, Vol. 57, pp. 259-287

Derby, N. 2003. Statistical Consulting Report. Prepared for Linn Gould of the Health Services Department

Dollar, D. 2005. Globalization, Poverty, and Inequality since 1980. *The World Bank Research Observer*, Vol. 20, No. 2, pp. 145-175

Felix, David. 1983. Income Distribution and the Quality of Life in Latin America: Patterns, Trends, and Policy Implications. *Latin American Research Review*, Vol. 18, No. 2, pp. 3-33

Fields, Gary. 1989. Changes in Poverty and Inequality in Developing Countries. *The World Bank Research Observer* 4*,* No. 2, pp. 168-185

Forbes, K. 2000. A Reassessment of the Relationship Between Inequality and Growth. *The American Economic Review,* Vol.90, No.4, pp. 869-887

Galor, Oded. 2009. Inequality and Economic Development: An Overview. Prepared as an introduction for Galor, O., Inequality and Economic Development: The Modern Perspective, 2009

Heshmati, Almas. 2004. Growth, Inequality and Poverty Relationships. *IZA Discussion Paper*, No. 1338

Hirschman, A., Rothschild, M.1973. The Changing Tolerance for income inequality in the course of economic development with a mathematical appendix. *The Quarterly Journal of Economics*, Vol. 87, No 4, pp. 544-566

Kanbur, R. 2004. Growth, Inequality and Poverty: Some Hard Questions. Prepared for State of the World Conference on February 13-14, 2004

Karras, G. 2003. Trade Openness and Economic Growth- Can we Estimate the Precise Effect? *Applied Econometrics and International Development*, Vol. 3, No. 1, pp. 7-26

Kuznets, Simon. 1955. Economic Growth and Income Inequality. *The American Economic Review*, Vol. 45, No. 1, pp. 1-28

Londoño, J., Székely, M. 1997. Persistent Poverty and Excess Inequality: Latin America, 1970- 1995. Inter- American Development Bank. Working paper 357

OECD website, accessed on 17th of August. Retrieved from : http://stats.oecd.org/glossary/detail.asp?ID=4842

Prabirjit, S. 2007. Trade Openness and Growth: Is There Any Link? *Journal Economic Issues*, Vol. 3, pp. 763-785

Ravallion, Martin. 2001. Growth, Inequality, and Poverty. *World Bank Policy Research*. Policy Research Working Paper 2558

Richardson, J. 1995. Income Inequality and Trade: How to Think, What to Conclude. *The Journal of Economic Perspectives*, Vol. 9, No. 3, pp. 33-55

Rodriguez, F. 2000. Inequality, Economic Growth and Economic Performance. *Background Note for the World Development Report 2000*

Shamsadini, S., Moghadassi, R., Kheirandish, M. 2010. Relationship Between Trade Openness and GDP Growth a Panel Data Analysis. *World Applied Sciences Journal* 8 (7), pp. 906-911

Son, H. 2007. Interrelationship between Growth, Inequality, and Poverty: The Asian Experience. *Asian Development Review*, Vol. 24, No. 2, pp. 37-63

Spilimbergo, A., Londoño, J., Székely, M. 1999. Income distribution, factor endowments, and trade openness. *Journal of Development Economics*, Vol. 59, pp. 77-101

Su, Q. 2001. Economic inequality and economic growth

Verdier, T. 2002.Models of Political Economy of Growth. *European Economic Review*, Vol. 38, Issues 3-4, pp. 757-763

Weeks, J. 2005. Inequality in Some Developed OECD Countries. *Economic & Social Affairs*, Working paper No. 6

Welschen, A. 2010. Growth and Inequality: The Kuznets' Curve for the 'Four Tiger' and the 'ESEAN'. Prepared for the International Research Project in combination with the seminar Trade and Growth 2010

Wood, A. 1997. Openness and Wage Inequality in Developing Countries: The Latin American Challenge to East Asian Conventional Wisdom. *The World Bank Economic Review*, Vol. 11, No.1, pp. 33-57

World Bank Education Statistics: various years

World Development Indicator data set: various years

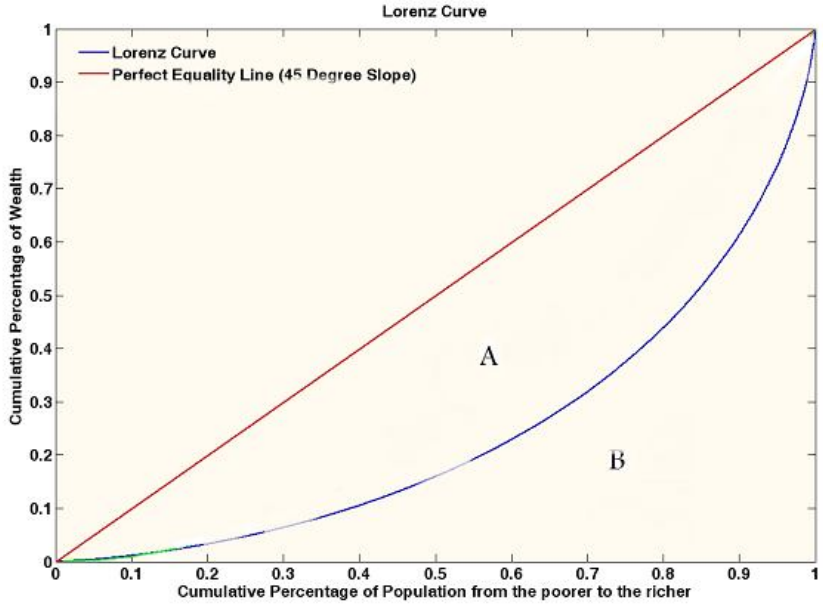
World Income Inequality data base: various years

Yanikkaya, H. 2003. Trade openness and economic growth: A cross-country empirical investigation. *Journal Development Economics*, Vol. 73, pp. 57-89

Yucel, F. 2009. Causal Relationships between Financial Development, Trade Openness and Economic Growth: The Case of Turkey. *Journal of Social Sciences* 5, pp. 33-42

7 Appendix

Figure 1: Lorenz Curve



The intuition behind the construction of the Lorenz curve suggests that the area between the 45° line and the actual Lorenz curve can be used to measure inequality levels (Borjas, 2010). The Gini index can be calculated using the mathematical approach proposed by Brown (1994):

$$G = \left| 1 - \sum_{k=0}^{k=n-1} (X_{k+1} - X_k)\,(Y_{k+1} + Y_k) \right|,$$

where G denoted the Gini index, X_k denotes the cumulative proportion of the population for k=0,...,n, with $x_0=0$, $x_n=1$; Y_k denotes the cumulative proportion of income for k=0,...,n, with $Y_0=0$, $Y_n=1$, and k represents the number of observations.