Can economic development help to escape poverty and income inequality?

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Abstract

The link between economic growth and income inequality has received much attention in recent decades. The purpose of this paper is to empirically analyze the relationship between economic development and poverty and income inequality for developing countries. By taking data for 36 countries for the last decades – 1990 to 2010 –, this research aims to find evidence for the Kuznets hypothesis. Unfortunately, the results show no evidence of the existence of a Kuznets curve, even when including control variables and re-estimating the relationship for subsamples. The variable real GDP per capita, as a measure of economic development, has no explanatory power for the degree of poverty or inequality.

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I: INTRODUCTION

The link between economic growth and income inequality has received much attention in recent decades. Several institutions agree that since the 1980s income inequality between countries has decreased, while it has increased within countries (Kremer, Bovens, Schrijvers & Went, 2014). According to a report published by the United Nations, more than half of the people in the world live in countries where the disparity between rich and poor has increased (UN, 2013). Duménil and Lévy (2013) argue that an increase in inequality has negative consequences for economic growth. People with a low income have a large 'marginal incentive to consume' and thus they will spend a larger share of their income on new goods and services. On the contrary, rich people have a large 'marginal incentive to save' and they will mainly invest in financial products. Hence, when the disparity in incomes becomes larger, the effective demand for goods and services will decrease. Another view on the interdependence between growth and inequality assumes that economic development can be an important factor for poverty reduction. Azevedo, Inchauste and Sanfelice (2013) show evidence that economic growth has lowered the income inequality between rich and poor in Latin-America. In addition, Roemer and Gugerty (1997) argue that economic development is not only a tool for driving investment and innovation, but also for alleviating poverty.

Most of the existing literature on the relationship between economic growth and income inequality has been inspired by the theory of Simon Kuznets (1955), who established that, depending on the level of income per capita, inequality exhibits an inverted U-shape curve. So far, most studies have focused on the effect of income inequality on economic growth. Deininger and Squire (1998) have found that evidence of the presence of the Kuznets curve is not rigorous. They conclude that economic growth is faster at a higher level of income inequality, but the benefits from it are disproportionately biased in favour of the poor. This suggests that governments can implement policies which have the potential to improve the welfare of people with the lowest income. Moreover, rather than redistributing existing assets, the creation of new ones would be even more effective in reducing poverty (Deininger and Squire, 1998). Roemer and Gugerty (1997) establish that the development of income distribution of most developing countries does not follow the pattern predicted by the Kuznets hypothesis. Although such previous studies have a high informative power and strong empirical roots, research on the reverse relationship, the effect of economic growth on income

inequality, remains relatively scarce. The purpose of this paper is to evaluate whether and how economic development influences poverty and income inequality, where the focus will be on developing countries. Therefore, this paper will answer the following research question: *"Can economic growth in developing countries help to reduce poverty and income inequality?"* In addition, unlike previous studies, this paper is based on the most recent data available.

If economic development has a significant impact on poverty and income inequality, then developing countries can focus on the drivers behind economic growth to influence the income share of the poor and the rich. Therefore, it is also interesting to analyze the mechanisms that have a positive impact on income per capita. In this research, there will be an implicit focus on two important drivers, which are education and foreign direct investment (FDI) inflows. Hanushek and Wößmann (2007) argue that education investments have powerful effects on economic growth, because schooling improves job prospects and increases the individual earnings. FDI inflows seem to positively influence income per capita due to a rapid and efficient transfer of improved techniques and methods (Klein, Aaron & Hadjimichael, 2001). For each developing country will be analyzed whether education and FDI are a significant driver for growth.

The presence and magnitude of a Kuznets curve will be examined in stepwise estimation. In the first step, the corresponding relationship will be analyzed for the complete sample of developing countries. Afterwards, the total sample will be divided into groups and the interdependence between growth and poverty and inequality will be estimated again only for those countries where education and FDI inflows show a significant positive impact on real income per capita. The regressions will be performed for each driver separately. The reason for this stepwise estimation is to get a robust estimate by analyzing whether there is a different relationship between economic development and poverty and inequality among the smaller sample of developing countries with the same drivers of growth.

By analyzing the effect of GDP per capita on poverty and income inequality, conclusions can be drawn about how policies must be tailored to countries' specificities in order to achieve an effective relative welfare improvement for the poorest part of the population. Such recommendations are important mainly for least developed countries, which have a high poverty and income inequality.

The rest of the paper is organized as follows. In section 2 the theoretical framework regarding the Kuznets' theory will be discussed, because most of the inferences are embedded in it. Section 3 provides a literature review of recent research on the link between economic development and poverty and income inequality. The methodology and the data used are described in Section 4. An OLS regression is performed with the aim of estimating the effect of several variables on economic growth and through it, on poverty and income inequality. The data belong to the period 1990-2010. Furthermore, there will also be a discussion of the relevance of control variables which are used in the regression, namely education, inflows of FDI, credit market, unemployment rate, inflation and trade openness. The main results and interpretations are in Section 5. Section 6 summarizes the conclusions and possible policy recommendations.

II: THEORETICAL FRAMEWORK

The Traditional Kuznets Hypothesis

The relationship between income inequality and economic growth is described by the classical study of Kuznets from 1955. Simon Kuznets introduced a theory to explain differences in income inequality across countries. The Kuznets' model is graphically shown by an inverted U-curve, as shown on Figure 1. From this figure it can be seen that inequality rises with income in the early stages of economic development, but falls with income in the later stages. This means that inequality will increase until a certain average income per capita. After this turning point, further economic growth will decrease inequality (Kuznets, 1955)

When average income per capita is very low, there is also a low level of inequality. Since everybody lives at, or close to, the subsistence level, there is little room for inequality. A high inequality would imply that many people live below the subsistence level. As income per capita increases, inequality also increases in the early stages of development, because there is a shift from the traditional agricultural sector to the industrial sector. In the traditional agricultural sector wages were generally low. However, the modern industrial sector generates higher wages, but only for those who offer skilled labour. Therefore the wage differential increases as well, hence there is more inequality. At a further stage, as both human and physical capital have been accumulated, the wage differentials between unskilled and skilled labour diminish and therefore inequality decreases (Milanovic, 1994).

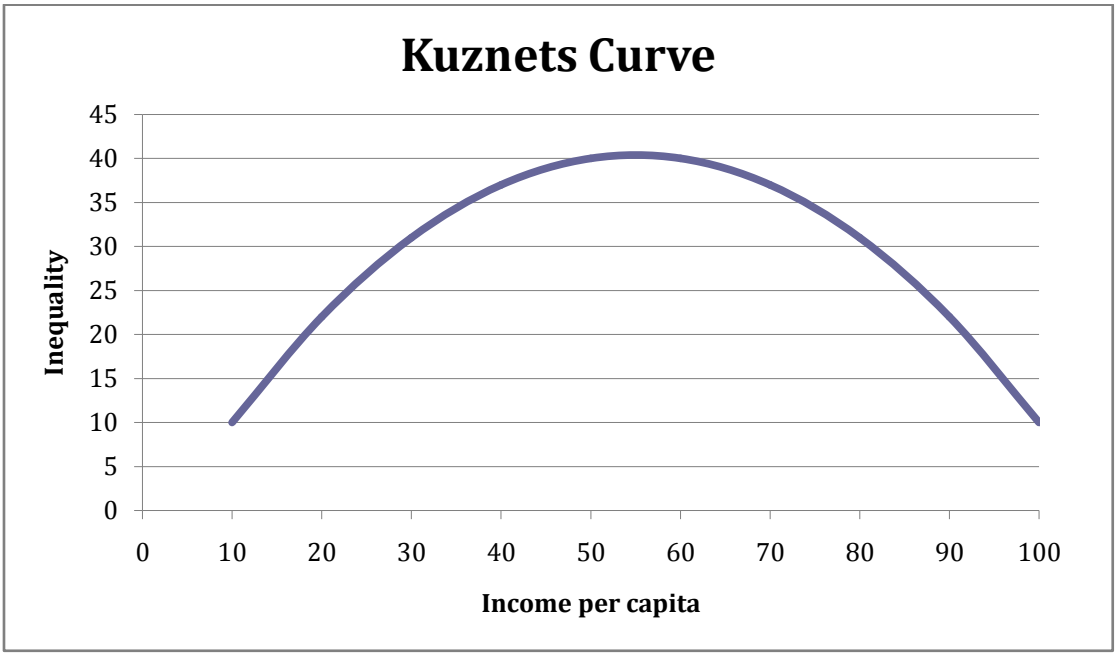

Figure 1: Kuznets Curve

Early Stages of Development

There are several mechanisms underlying the relationship between economic growth and income inequality, as mentioned by Kuznets (1955). Although the data available was limited in the 1950s, Kuznets managed to come up with some important implications concerning this relationship. He suggested that in order to answer the question how income inequality changes in the process of a country's economic growth, we have to look at the already developed countries. Kuznets used the size distribution of income within the United States, England and Germany and concluded that inequality first levelled off and later declined with an increase in economic development. However, finding a long-term steady state or even reduction of inequality for these developed countries is quite hard. This is due to two sources that lead to increasing inequality. The first source concerns the concentration of savings in the upper-income brackets. Since the low-income groups have barely enough money to pay for their daily consumptions, only the upper-income groups are able to save part of their earned money. Therefore, it is not surprising that these groups also have the largest proportion of income-yielding assets in their hands. The second source concerns the industrial structure of income distribution. Income distribution is a combination of the rural and the urban populations. According to Kuznets, it is widely known that (i) the average per capita income of the rural population is usually lower than that of the urban and (ii) inequality in the percentage shares within the distribution for the rural population is somewhat narrower than in that for the urban population. This leads to the idea that a major shift from the rural to the urban sector increases the weight of the unequal sector, triggering an increase in overall inequality. Moreover, this idea also holds if the assumption of wider inequality in the urban sector is relaxed, since income levels between urban and rural sectors are large due to productivity gains in the urban sector (Moran, 2005). These two sub-theories explain the simultaneous increase in inequality and economic growth.

Later Stages of Development

Since we now know the theories underlying the increase in income inequality corresponding to an increase in economic growth, it is also important to know how the reversal of this trend can be explained. Kuznets (1955) argued that*: "Once the early turbulent phases of industrialization and urbanization had passed, a variety of forces converged to bolster the economic position of the lower-income group within the urban population."* (p. 17). Furthermore, he stated: *"The major offset to the widening of income inequality associated with the shift from agriculture and the countryside to industry and the city must have been a*

rise in the income share of the lower groups within the non-agricultural sector of the population." (Kuznets, 1955, p. 17). Due to the urbanization of a country, the size of the rural sector diminishes and hence more of the poor agricultural workers will join the relatively rich industrial sector. Besides this, the workers who started at the bottom of the industrial sector were able to move up within this sector. Therefore, more people will earn the higher industrial wage. Moreover, the relative wages in the agricultural sector increase due to the decrease in the size of the agricultural labour force. This leads to an overall reduction in income inequality. Thus, we can conclude that at later stages of development, the relation between economic growth and income inequality is negative (Barro, 1999).

Kuznets' Theory about developing countries

In the light of the research question:*"Can economic growth in developing countries help to reduce poverty and income inequality?"* it is interesting to know what Kuznets' theory says about the reasons behind poverty and inequality in developing countries. Although the data used by Kuznets is quite narrow and he only looked at the difference between developed and developing countries, his findings can still help to find an answer. Kuznets particularly looked at the data after the Second World War and only acquired such for India, Sri Lanka and Puerto Rico. He found that these developing countries are characterized by a more unequal income distribution compared to the sample of developed countries, namely England, Germany and the United States. By taking a closer look at the difference between India and the United States, he argued that the higher income inequality in India is due to the fact that the country has no 'middle' class. This leads to a sharp contrast between the large proportion of the population who have an income well below the countrywide average and the very small proportion of the population with a very high income. The United States show a much more gradual rise in income and the income of the small top group does not exceed the countrywide average by a substantial amount. Due to this finding, one can argue that even the distributions of secular income levels would be more unequal in developing countries compared to the level in developed countries (Kuznets, 1955). This would lead to a variety of implications, of which three are discussed below.

In the first implication, Kuznets suggests that the developing countries have a much lower level of average income per capita. Therefore, a below-average income level in these countries is accompanied by much greater material and psychological misery than in developed countries. Moreover, the concentration of savings and assets is more pronounced in

these countries, since only the top of the population could realize savings (Kuznets, 1955). This can explain the wider inequality in the secular income structure in developing countries today. The second implication states that developing countries experience a lower rate of growth of income per capita. This is due to the limitations in the shifts in industrial structure and the opportunities for internal mobility and for economic improvement (Kuznets, 1955). The third implication is based on the first two. Although Kuznets (1955) could not find empirical evidence, it is quite realistic to assume that income inequality in the developing countries has not narrowed. The dynamic forces associated with rapid growth in the developed countries were the cumulative effect of continuous concentration of past savings by the upper-income shares and the political and social systems that effectively improved the positions of the lower-income classes. Since these forces were absent in the developing countries, one can argue that income inequality in these countries has not narrowed.

Although the Kuznets curve is initially developed for the relationship between economic growth and income inequality, it also indirectly says something about the effect of economic development on poverty. In the early stages of development inequality increases with income per capita, which can be caused by two situations: the income share of the rich increases relatively more than the income share of the poor, or the income share of the poor deteriorates, while the living standards of the rich improve. Thus, the effect on poverty is uncertain, since it is not sure whether the poor will really benefit from economic growth. In the later stages of development the Kuznets curve predicts that inequality decreases, which means that the income share of the poor will increase relatively more than the income share of the rich. Hence, in these later stages economic growth reduces poverty.

However, Kuznets (1955) admits that his arguments are based on very limited data; hence they have to be considered as theoretical implications instead of pure empirical findings. Nevertheless, he suggested that his theoretical findings can be used to form the basis of further empirical research and this is the exact purpose of this paper. In the next sections a model will be constructed in order to see if Kuznets' ideas are consistent with data concerning economic growth and poverty and income inequality in developing countries.

III: LITERATURE REVIEW

As described in chapter 2, the relationship between economic growth and income inequality is graphically shown by an inverted U-curve: inequality rises with income in the early stages of economic development, but falls with income in the later stages, since the poorest people will also benefit and there will be an improvement of the economy as a whole (Kuznets, 1955). However, whether the relationship between growth and inequality is indeed an inverted U-curve still remains an empirical issue. There have been many studies analyzing the interdependence between economic growth and poverty and income inequality in developed as well as developing countries. Still, the empirical literature on this relationship does not provide consistent results. In section 3.1 there will be a review of the literature concerning the impact of economic growth on income inequality. Subsequently, in section 3.2 there will be a discussion of previous studies on the relationship between economic development and poverty.

3.1 Growth and income inequality

One of the empirical investigations concerning the relationship between growth and inequality was performed by Ravallion (1995). He used cross-country data for 36 developing countries in the 1980s, which represented more than 70 percent of the population in the developing world. The results show no empirical evidence for a systematic interaction between the Gini coefficient and the mean income. Even when controlling for country-level fixed effects, Ravaillon (1995) rejects the Kuznets hypothesis. The data indicate that growth does not increase or decrease inequality.

Deininger and Squire (1998) examined the relation between long-term growth and inequality using cross-country data on income and asset distribution. In this paper, the Kuznets curve is empirically investigated using data for developed and developing countries over the world. The estimation results do not provide enough empirical support for a cross-country Kuznets curve. Even when testing the Kuznets curve for individual countries, the results indicate that changes in per capita income are not significantly related to changes in inequality in most of the analyzed countries. Many countries with a low per-capita income initially, experienced a high economic growth but no increase in inequality. On the contrary, for some countries the results did show evidence for the Kuznets hypothesis. Nevertheless, the results rejected the Kuznets curve almost as often as confirming it (Deininger and Squire, 1998). Deininger and

Squire (1998) even conclude that the Kuznets hypothesis is not relevant for developing countries.

Li and Zou (1998) empirically investigated the Kuznets curve and based their statistical analysis on the expanded dataset on income distribution constructed by Deininger and Squire in 1996. The authors created a theoretical model that indicates a positive relation between economic growth rate and income inequality, assuming that income inequality may give rise to economic growth if the model takes account of public consumption. This relation is empirically analyzed by regressing GDP growth rate on the Gini coefficient (as a measure of inequality) and other control variables like population growth rate and trade openness. Li and Zou (1998) performed panel estimation, using data from 46 developed and developing countries over the period 1947-1994. The estimated coefficients showed indeed a positive interaction between economic growth and inequality, which was significant in many cases (Li and Zou, 1998).

Barro (2000) used data for a broad panel of 84 countries to examine the interaction between income inequality and rates of growth and investment. To extend this framework, Barro (2000) used some determinants for economic growth. Furthermore, the Gini coefficient is used as a measure of inequality considering 10-year values around 1960, 1970, 1980 and 1990. The estimation results show cross-sectional variations among countries, but also differences over time within countries. The available evidence indicates a negative relationship between income inequality and economic growth for countries with a low GDP per capita on the one hand and a positive interaction for countries with a high GDP per capita on the other hand. In low-income regions, inequality seems to decelerate growth, while in high-income regions inequality seems to stimulate economic expansion. Furthermore, the estimation results indicate that growth falls with inequality when the income per capita is lower than $2000 and increases with inequality when the income per capita is larger than $2000 (Barro, 2000). Hence, this result implies a U-curve instead of an inverted U-curve as assumed by the Kuznets hypothesis. Since the curve does not fit the data, Barro (2000) concludes that the Kuznets relation does not empirically explain the differences in inequality over time or across countries.

Forbes (2000) argued that previous studies analyzing the relationship between growth and income inequality were limited by data availability concerning cross-country statistics for

inequality. Limited data availability can lead to measurement error and omitted-variable bias, since the time-series dimension was not large enough to perform a panel study. Forbes (2000) re-estimated the interaction between growth and inequality, challenging the belief that there is a negative interaction. To empirically analyze this relationship, Forbes (2000) used an improved and more consistent data set on income inequality to avoid measurement error. The data set included observations for 45 (developed and developing) countries over the world for the period 1966 until 1995. The Gini coefficient was used as a measure of inequality, which was taken from the latest available data. Forbes (2000) used the panel technique as an estimation method, arguing that this technique provides an accurate and clearer estimation of the correlation between changes in growth rate and changes in inequality. Another reason for using panel estimation was to account for omitted-variable bias, since it controls for country-specific effects. The estimation results imply that there is a significant positive relationship between economic growth and the level of income inequality within individual countries. This relation holds only for the short and medium term, since Forbes (2000) used five-year panels to estimate the coefficients. Although the results are robust across samples and model specification, the relationship may not hold for very low-income regions, because of limited data availability for poor countries. Furthermore, the positive interaction between growth and inequality may not hold in the long run, considering periods longer than ten years (Forbes, 2000).

Banerjee and Duflo (2003) investigated the interaction between growth and inequality in cross-country data. To empirically examine this relationship, Banerjee and Duflo (2003) used the data set on income inequality constructed by Deininger and Squire in 1996. This data set has more reliable and improved measures of inequality (for instance Gini coefficients and quintile shares of income), which should lead to better results compared to other data sets. Furthermore, the data set contains data for a large number of countries, including developed and developing countries. The analysis by Banerjee and Duflo (2003) is based on a time period of 5 years and 10 years. The estimation results confirm the Kuznets hypothesis: the data shows an inverted U-shaped relationship between growth and inequality. Changes in inequality seem to be associated with changes in economic growth.

Perotti (1996) examined the relation between democratic institutions, income distribution and economic growth by analyzing the channels through which income distribution has an impact on growth. The dataset used includes income quintile shares for 67 countries over the world,

which are used as a measure of inequality. The results indicate a negative impact of inequality on growth. This conclusion is based on three main channels, namely, fertility rate, sociopolitical instability and investment in education. Perotti (1996) argues that more equal societies have more investments in human capital and lower fertility rates, which leads to larger economic growth. On the contrary, more unequal societies are often politically and socially unstable, leading to lower investments in education, which have a negative impact on economic growth.

These empirical studies use different data and estimation methods, which lead to mixed results and an unclear representation of the relationship between economic growth and inequality. Furthermore, most of the previous studies focus on the impact of inequality on economic development. To contribute to the existing literature, this paper analyzes the reverse relationship using the most recent data.

3.2 Growth and poverty

It seems obvious that economic growth should reduce poverty, but the persistent problem of poverty in developing countries has led many to question the effectiveness of economic growth to increase the living standards of the poor. Ravaillon (1995) examined the relationship between economic growth and poverty using data for developing countries in the 1980s. The results indicate a negative interaction between average living standards and the levels of poverty: a three percent growth in consumption per capita leads to more than six percent reduction in the people living below the poverty line of $1 per day. Although economic development seems to benefit the poor, there are still differences in poverty reduction between countries at a given growth rate (Ravaillon, 1995).

Roemer and Gugerty (1997) analyzed the interdependence between economic development and poverty using data for 26 developing countries. They used the growth of income of the poorest 20 percent and the poorest 40 percent of the population as poverty indicators and regressed these calculations against the growth of GDP per capita. The estimation results indicate that economic growth benefits the poor. For the poorest 40 percent of the population, the rate of GDP growth has a one-to-one relationship with the average incomes. For example, when GDP per capita grows with ten percent, the average incomes of the 40 percent poorest of the population will also rise with ten percent. For the 20 percent poorest of the population this relationship is also positive, but weaker, with an elasticity of 0.921. Hence, these results

show that economic growth reduces poverty (Roemer & Gugerty, 1997). Furthermore, Roemer and Gugerty (1997) also show that macroeconomic policies and trade openness can be useful in alleviating poverty, since good policies lead to a faster GDP growth.

Another estimation of the relationship between growth and poverty was performed by Dollar and Kraay (2002), who examined how incomes of the poor vary with overall incomes. They used a data set covering observations for 92 countries over the period 1950-1999. Poverty was measured as the income share of the poorest 20 percent of the population. The results show that average incomes of the poorest 20 percent increase or decrease at almost the same rate as average incomes of the whole population. The reason behind this result is that the share of income of the poorest group does not vary systematically with the average income of the whole population. The corresponding interaction seems to hold across countries and income levels and even during crises. Furthermore, the results show that macroeconomic policies like trade openness benefit the poor, since their incomes increase (Dollar & Kraay, 2002). Dollar and Kraay (2002) conclude that economic growth benefits the poor to the same extent as other groups in the society and growth-enhancing policies can be useful for alleviating poverty.

Although these studies imply that economic growth benefits the poor, there have not been many studies analyzing the relationship between growth and poverty. Furthermore, the studies use datasets with time periods earlier than 2000. This paper contributes to the literature by using the most recent data to analyze the relationship between economic development and poverty.

IV: DATA AND METHODOLOGY

In this chapter there will be a description of the data and the techniques used to assess the relationship between economic development and poverty and inequality. In addition, there will also be an explanation of the methods used to analyze the relationship between economic development and the drivers behind economic growth. First the selection of the data will be discussed. Afterwards, there will be a description of the estimation technique and the model specification.

4.1 Data selection

The selection of data is based on the availability of the data concerning the Gini coefficient. For many countries there was very limited data available and therefore only those countries are selected for which at least 8 out of 21 measurements were present. The countries that are selected are all developing countries, where some countries are more developed than others. The range of measurements is from the year 1990 to 2010 to analyze the latest developments concerning the relationship between the Gini coefficient and GDP per capita in the developing countries. All the data is retrieved from the World Bank. The selected countries are shown in alphabetical order in Table 1.

Argentina	Dominican Republic	Latvia	Romania
Armenia	Ecuador	Lithuania	Russian Federation
Belarus	Estonia	Macedonia, FYR	El Salvador
Bolivia	Georgia	Mexico	Serbia
Brazil	Honduras	Moldova	Thailand
Chile	Hungary	Panama	Turkey
China	Indonesia	Paraguay	Ukraine
Colombia	Kazakhstan	Peru	Uruguay
Costa Rica	Kyrgyz Republic	Poland	Venezuela, RB

Table 1: Country Selection

4.2 Estimation technique

In this paper the fixed effects regression is applied to the panel data in order to analyze the relationship between economic development and poverty and income inequality, and thus to test the Kuznets hypothesis empirically. This model analyzes the impact of different

explanatory variables that vary over time. Furthermore, the fixed effects model also controls for factors within the country that may bias the dependent or independent variables, thus it controls for correlation between the error term and these variables. In addition, this model eliminates the effect of time-invariant characteristics from the explanatory variables and leaves behind the net effect of these variables. Thus, this fixed effects regression allows us to take into account the different effects that are fixed within each country, as they may be heterogeneous. Below there will be a description of the dependent and independent variables used in the regression analysis.

Gini coefficient

There are several ways of computing income inequality, for example by using the Gini-index, Theil index or Decile Dispersion index (The World Bank, 2014). Each method has both advantages and disadvantages. The biggest disadvantage of the Theil index is that the values are not always comparable across different units (for example countries or years). Since the chosen data consists of different countries as well as different years, the Theil index is not preferable. The Decile Dispersion Index is also not suitable for this research, because it is very vulnerable to extreme values. Since it is difficult to exclude the occurrence of extreme values beforehand, this method is also not the preferred one. The only option left is the Gini coefficient. The disadvantage of the Gini coefficient is that the total Gini of the total population is not equal to the sum of the Gini indices for its subgroups. However, this would not cause any problem, since this research is based on comparing the total population and not the subgroups (The World Bank, 2014). Therefore, the Gini-coefficient is used to estimate the degree of income inequality. The Gini coefficient is usually estimated according to the following formula: $G = 1 - \Sigma (P_i * (Q_i + Q_{i-1}))$. In this formula, the variable P_i stands for the population share of income group i and Q_i stands for the cumulative income share up to income group i. The Gini index measures the difference between the actual distribution of income or consumption expenditure within an economy and a perfectly equal distribution. The index ranges from 0 to 100, where the value 0 refers to perfect equality, while 100 indicates a degree of perfect inequality (The World Bank, 2014).

Income share held by lowest 20 percent

In this paper, the income share held by the lowest 20 percent of the population is used as a poverty indicator to analyze the relationship between economic growth and poverty over time. This percentage share of income is the share that accrues to subgroups of population indicated

by deciles or quintiles (The World Bank, 2014). This variable is chosen, since many previous studies have used income shares of the poor as a poverty indicator.

Real GDP per capita

Real GDP per capita is representing a country's wealth and is key in testing the Kuznets hypothesis. Therefore it is used as a measure for economic development. In this research, real GDP per capita is represented by the gross domestic product converted to international dollars using purchasing power parity rates (PPP). The PPP conversion factor for GDP is defined as the number of units of a country's currency required to buy the same amounts of goods and services in the domestic market as U.S. dollar would buy in the United States. In addition, GDP at purchaser's prices also refers to the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. Deductions for depreciation of fabricated assets, depletion and degradation of natural resources are also excluded (The World Bank, 2014).

The following control variables that may influence the relationship between economic growth and poverty and inequality are selected and added to the regression:

Education

Education is a factor that very likely will affect economic growth and income inequality. According to theory, the impact of education on income inequality is non-linear, following the same pattern of the Kuznets curve. There are two effects that can have different impacts on income inequality. The first one is the 'composition' effect: when the relative size of the group with more education increases, this initially raises income inequality but eventually lowers it. The reason is that as the group of educated people grows, education is not a scarce factor anymore. The second one is the 'wage compression' effect: this effect decreases the wage rate for educated people as the relative supply of educated workers increases, thereby lowering income inequality (Gregorio & Lee, 1999).

The relationship between education and poverty can be explained through the labour market: the higher the level of education, the larger the productivity and the larger the probability of finding a job and thus the higher the earnings (Berg, 2008). This result implies that education improves the living standards of the poor and is therefore necessary for poverty reduction.

Education can be measured by several indicators, for example public expenditure on education, school enrollment, literacy rate, primary completion rate and progression to secondary school. Although public spending on education is a good indicator for education

investments, it is not useful for this research, because public education investments in each year will usually yield economic results after a few years. Hence, with this measure of education one cannot estimate the direct relationship between education and economic development or inequality in a given year. Based on data availability, the primary completion rate is used as an indicator for education. The primary completion ratio includes the total number of new entrants in the last grade of primary school, irrespective of age, expressed as a percentage of the total population of the theoretical entrance age to this last grade. The rate can exceed 100 percent because of over-aged and under-aged children who enter primary school early or late and children who repeat grades (The World Bank, 2014). The primary completion rate can influence inequality, poverty or economic development earlier compared to public spending on education. Furthermore, it is also reasonable to assume that a part of the public spending on education invested years before is included in this rate of primary completion. The reason for this is that public spending on education does not only include investments in educational institutions, but also subsidies for students or households, which could have helped people to achieve a primary degree after a few years.

FDI Inflows

Foreign Direct Investment is a long-term investment reflecting a lasting management interest in and control by a resident entity in one economy of an enterprise operating in a different economy. 'Control' refers to acquiring at least 10 percent of the outstanding stocks of the company. FDI includes the sum of reinvestment of earnings, equity capital and other long-term and short-term capital (The World Bank, 2014). In this paper, the net inflows of FDI in a country as a percentage of GDP are used as a control variable. The net inflows refer to new investments minus disinvestments. A previous empirical study shows that the impact of foreign direct investments on income inequality is positive, but it does depend on the level of absorptive capacity in the host country (Wu & Hsu, 2012). Absorptive capacity defines the ability of a firm to recognize the economic potential of newly introduced information, assimilate it, and apply it commercially (Cohen & Levinthal, 1990). It is shown that FDI has little impact on income inequality when the host country has high absorptive capacity and a large impact when the level of absorptive capacity is low (Wu & Hsu, 2012). Furthermore, Klein et al (2001) argue that FDI is a key factor for achieving economic growth and indirectly reducing poverty.

Credit Market

To account for capital market imperfections, the lending interest is also used as a control variable. It refers to the interest rate provided by banks for short- and medium-run loans to the private sector. The rate usually depends on the creditworthiness of borrowers and the aims of financing (The World Bank, 2014). The lending interest rate can affect income inequality, since it differs between countries due to different terms and conditions and different risk premiums. The interest rate is expected to be higher in countries which are less developed, because the risk for the lender is higher as a result of the widespread lack of collateral. The higher the interest rate, the fewer the people who have access to credit. Therefore, if a small proportion of the population has access to credit, this might increase the income inequality within a country. Thus, a positive relation between the lending interest rate and income inequality is expected. In addition, a lower interest rate increases the access to credit and can be an important factor in reducing poverty.

Unemployment rate

The rate of unemployment measures the share of the labour force which is not currently working, but is able to work and actively seeking employment (The World Bank, 2014). Although definitions of unemployment may differ across countries, it is assumed to be a good approximation of the share of the population which is not employed at a given time. A study conducted by Aaberge et al. (2000) has established that a low level of unemployment is associated with a more equal income distribution and a lower level of poverty. Therefore, it can be assumed that a high level of unemployment will lead to a higher level of income inequality and more poverty.

Inflation

Inflation is included as a control variable, because it can be correlated with poverty and income inequality. In order to show the rate of price change in the economy as a whole, inflation in this model is measured with the GDP deflator. This means that the annual growth rate of the GDP implicit deflator is used, and it is calculated as the ratio of GDP in current local currency to GDP in constant local currency (The World Bank, 2014). The research by Albanesi (2006) shows that inflation and income inequality are positively related. Cardoso (1992) argues that during inflation the rise in wages is more slowly than the rise in prices, which can increase poverty.

Trade Openness

Trade Openness' in included as a control variable because it also might be correlated with income inequality. According to the Stolper-Samuelson theorem, trade liberalization will shift income toward a country's abundant factor (Davis, 1996). Developed countries are overall capital abundant. This is primarily the sector in which high-educated people work. As the degree of exports and thus trade openness increases, we expect the income to shift to the high-educated people. Conversely, developing countries are overall labour abundant. This is primarily the sector in which low-educated people work. As the degree of exports increases, we expect the income to shift to the low-educated people. Hence, one can conclude that exports are positively correlated to income inequality considering developed countries, ceteris paribus. On the contrary, exports are negatively correlated to income inequality and poverty considering developing countries, ceteris paribus. Furthermore, mainly the rich people in developing countries are able to import goods and services from abroad, especially in the case of luxury goods. If the goods contribute to future productivity and improve the living standards of the rich, this could increase the income inequality within the country and thus a positive relationship is expected concerning imports and inequality.

Both exports and imports of goods and services as a percentage of GDP are representing the degree of trade openness of a country. The higher the exports and imports of a country, the more a country is trading with other countries, and hence the more open to trade the country is. Exports of goods and services as a percentage of GDP: a measure for the value of all goods and other market services provided by the country to other all countries in the world (The World Bank, 2014). Imports of goods and services as a percentage of GDP*:* a measure for the value of all goods and other market services provided by the world to the country of interest (The World Bank, 2014).

4.3 Model specification

To get a clear overview of the relationship between economic growth and poverty and inequality, various regressions are used. All regressions are based on country and time fixed effects. The regressions for the analysis concerning economic growth and inequality, where the Gini coefficient is the dependent variable, are as follows:

Regression 1: Basic Regressions

$$Gini_{it} = \beta_0 + \beta_1 * \mathrm{GDP}_{\mathrm{it}} + \varepsilon_{\mathrm{it}}$$

$$Gini_{it} = \beta_0 + \beta_1 * \mathrm{GDP}_{it} + \beta_2 * \mathrm{GDP}_{it}^2 + \varepsilon_{it}$$

Regression 2: Regression including all control variables

$$Gini_{it} = \beta_0 + \beta_1 * \mathrm{GDP}_{it} + \beta_2 * \mathrm{GDP}_{it}^2 + \beta_3 * \mathrm{EDUC}_{it} + \beta_4 * \mathrm{FDI}_{it} + \beta_5 * \mathrm{CM}_{it} + \beta_6 * \mathrm{UNEM}_{it} + \beta_7 * \mathrm{INF}_{it} + \beta_8 * \mathrm{EXP}_{it} + \beta_9 * \mathrm{IMP}_{it} + \varepsilon_{it}$$

The regressions to analyze the impact of economic growth on poverty are listed below. In these regressions, the income share held by the lowest 20 percent of the population (ISL) is the dependent variable.

Regression 1: Basic Regressions

$$ISL_{it} = \beta_0 + \beta_1 * \mathrm{GDP}_{it} + \varepsilon_{it}$$

$$ISL_{it} = \beta_0 + \beta_1 * \mathrm{GDP}_{it} + \beta_2 * \mathrm{GDP}_{it}^2 + \varepsilon_{it}$$

Regression 2: Regression including all control variables

$$ISL_{it} = \beta_0 + \beta_1 * \mathrm{GDP}_{it} + \beta_2 * \mathrm{GDP}_{it}^2 + \beta_3 * \mathrm{EDUC}_{it} + \beta_4 * \mathrm{FDI}_{it} + \beta_5 * \mathrm{CM}_{it} + \beta_6 * \mathrm{UNEM}_{it} + \beta_7 * \mathrm{INF}_{it} + \beta_8 * \mathrm{EXP}_{it} + \beta_9 * \mathrm{IMP}_{it} + \varepsilon_{it}$$

The reason for this stepwise estimation of the relationship is to prove the existence of a robust effect of real GDP per capita on income inequality and poverty. In these regressions, GDP refers to the real GDP per capita in US dollars and EDUC denotes the primary completion rate. FDI stands for the inflows of foreign direct investment, while CM denotes the lending interest rate on the credit market. The variable UNEM refers to the share of the labour force which is not currently working, but is able to work and actively seeking employment. INF refers to the inflation rate and IMP and EXP are the imports and exports as a percentage of GDP. Finally, ε is the stochastic error term, the subscript *t* denotes the year with *t* = 1 referring to the year 1990 and the subscript *i* refers to the different countries.

In order to have a first impression of the relationship between economic development and poverty and income inequality, two scatter plots are made for the complete sample of developing countries.

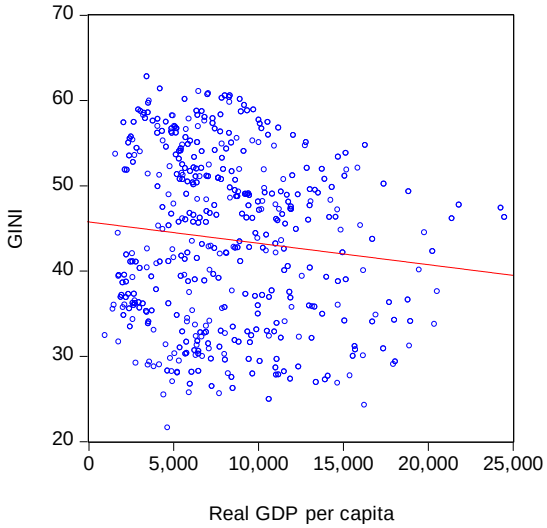

Figure 2: Scatter plot of the Gini on GDP, including a regression line

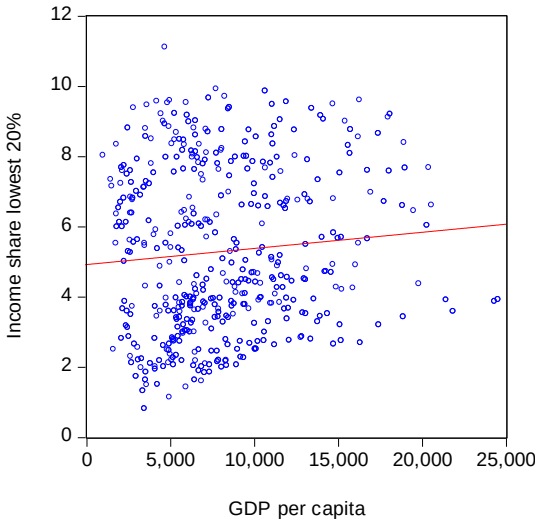

Figure 3: Scatter plot of the income share of the poor on GDP, including a regression line

The Kuznets curve predicts a positive interaction between economic growth and inequality for countries with a low GDP per capita (developing countries) and a negative relationship for countries with a high GDP per capita (developed countries). Figure 2 suggests that there is evidence for a different direction of the relationship. This is obvious from the line which depicts the best-fitted relationship between the observations. The scatter plot shows that economic development in developing countries can decrease the income inequality within the country, and thus suggests that we might find results that reject the Kuznets hypothesis. Figure 3 shows a slightly positive relationship between economic growth and the income share of the poor, which can be in line with the Kuznets theory. According to this theory, the impact of economic growth on poverty is not clear in the early stages of development. However, these figures only give a general impression about the dispersion of the data and hence the parameter estimates should be studied in detail in order to find real evidence of the effect of the level of economic development on poverty and income inequality.

The scatter plots in Figure 2 and 3 provide an important and interesting view on the relationship between economic growth and inequality for developing regions. If economic growth would really increase the income share of the poor and decrease the income inequality within the country, then developing countries can focus on the drivers behind economic growth in order to reduce the problem of (high) inequality between rich and poor. Thus, the relationships depicted by the scatter plots make it relevant to also analyze the mechanisms that positively influence income per capita.

Economic growth or GDP growth can be achieved through several mechanisms. In this paper there will an implicit focus on two important drivers behind economic growth, which are education and foreign direct investment (FDI) inflows.

In general, schooling improves job prospects for the poor and makes it possible to avoid living in poverty. Hanushek and Wößmann (2007) argue that education investments have powerful effects on economic growth. The distribution of skills in a nation seems to be closely related to the distribution of income. Better cognitive skills increase the individual earnings and result in stronger economic performance of countries. Even when controlling for other factors that are also important for economic development like open markets and established property rights, the quality of education seems to have a significant impact on the economic earnings of a nation (Hanushek and Wößmann, 2007). In addition, the cross-country regressions by Krueger and Lindahl (2000) also show a positive relationship between education investments and economic development. Thus, based on these empirical results one can assume that a more skilled population contributes to economic growth.

There have also been a few studies analyzing the relationship between foreign direct investments and economic development. Klein et al (2001) argue that FDI inflows have a positive impact on economic growth and poverty reduction. These foreign investments lead to a rapid and efficient transfer of improved techniques and methods, which increase the economic earnings. Alfaro, Chanda, Kalemli-Ozcan and Sayek (2004) analyzed the interactions between FDI, financial markets and economic growth. The empirical results, which are based on cross-country data between 1975 and 1995, indicate that foreign investments have a positive effect on the economic development of a country. Furthermore, the authors also argue that good financial markets are necessary for these positive effects to be realized in a beneficial way (Alfaro et al, 2004).

In order to control for other factors, a few variables that may influence the relationship between economic growth and the mechanisms are added to the regression.

The empirical study by Fischer (1993) shows a negative interaction between economic development and inflation. Using cross-sectional and panel regressions, Fischer (1993) argues that a high rate of inflation reduces investments and the rate of productivity growth and therefore reduces economic growth. The empirical results are in line with the view that a stable macroeconomic environment, meaning a reasonably low rate of inflation, is necessary for sustained economic growth. Credit market imperfections can also have a powerful impact

on economic growth. As mentioned before, the lending interest rate is expected to be higher in developing countries, because the risk for the lender is higher as a result of the widespread lack of collateral. A high interest rate decreases the access to credit and investments, which can be an impediment to economic growth. Therefore, a negative relationship is expected between the lending interest rate and economic growth.
Another variable that could influence economic development is trade openness. Harrison (1996) analyzed the impact of different openness measures on economic growth and found a positive relationship: a greater openness seems to be associated with a higher growth. Furthermore, more openness measures seem to positively influence economic growth when using panel data compared to cross-section data.

To analyze the impact and significance of education and FDI on real GDP per capita, the following regressions are used:

Regression 1: Basic regression

$$GDP_{it} = \beta_0 + \beta_1 * \mathrm{CM}_{\mathrm{it}} + \beta_2 * \mathrm{INF}_{it} + \beta_4 * \mathrm{EXP}_{it} + \beta_5 * \mathrm{IMP}_{it} + \varepsilon_{\mathrm{it}}$$

Regression 2: Regression including the variable education

$$GDP_{it} = \beta_0 + \beta_1 * \mathrm{EDUC}_{\mathrm{it}} + \beta_2 * \mathrm{CM}_{it} + \beta_3 * \mathrm{INF}_{it} + \beta_4 * \mathrm{EXP}_{it} + \beta_5 * \mathrm{IMP}_{it} + \varepsilon_{\mathrm{it}}$$

Regression 3: Regression including the variable FDI inflows

$$GDP_{it} = \beta_0 + \beta_1 * \mathrm{FDI}_{\mathrm{it}} + \beta_2 * \mathrm{CM}_{it} + \beta_3 * \mathrm{INF}_{it} + \beta_4 * \mathrm{EXP}_{it} + \beta_5 * \mathrm{IMP}_{it} + \varepsilon_{\mathrm{it}}$$

The first regression includes only control variables. Afterwards, the variables education and FDI investments are added separately to this basic regression in order to check the significance and explanatory power of these mechanisms, given the control variables that may influence the corresponding relationship. The measure for education is the primary completion rate and FDI refers to the FDI inflows in absolute numbers.
These regressions are performed for each country to analyze the impact of these drivers in different developing countries. Subsequently, the total sample of developing countries will be divided into two groups based on the significance of the drivers and this will be done for each driver separately. Thus, two different groups of countries will be analyzed, where the first group consists of developing countries where education has a significant positive impact on

economic development and the second group contains countries which show a significant positive effect of FDI inflows on real income per capita. The reason for this stepwise estimation is to analyze whether there is a different relationship between economic development and poverty and inequality when we only look at countries where these drivers of economic growth show a positive significant impact. The regressions performed for this analysis can be seen below. These regressions will be performed for each group of countries.

$$Gini_{it} = \beta_0 + \beta_1 * \mathrm{GDP}_{\mathrm{it}} + \beta_2 * \mathrm{GDP}_{\mathrm{it}}^2 + \beta_3 * \mathrm{CM}_{it} + \beta_4 * \mathrm{UNEM}_{it} + \beta_5 * \mathrm{INF}_{it} + \beta_6 * \mathrm{EXP}_{it} + \beta_7 * \mathrm{IMP}_{it} + \mathcal{E}_{\mathrm{it}}$$

$$ISL_{it} = \beta_0 + \beta_1 * \mathrm{GDP}_{\mathrm{it}} + \beta_2 * \mathrm{GDP}_{\mathrm{it}}^2 + \beta_3 * \mathrm{CM}_{it} + \beta_4 * \mathrm{UNEM}_{it} + \beta_5 * \mathrm{INF}_{it} + \beta_6 * \mathrm{EXP}_{it} + \beta_7 * \mathrm{IMP}_{it} + \mathcal{E}_{\mathrm{it}}$$

V: RESULTS

In this chapter there will be a detailed discussion of the parameter estimates and other regression results to judge the effect of the level of economic development on income inequality and poverty, and thus to empirically test the Kuznets hypothesis. First of all, the results concerning the relationship between real GDP per capita and the Gini coefficient will be reviewed. Next to that, there will be a discussion of the estimation results related to the effect of economic growth on the income share of the lowest 20 percent of the population. In the last section, the total sample of developing countries will be divided twice into two groups of countries, where the division will be based on the significance of education and FDI inflows for economic development. The parameter estimates of these last regressions will be analyzed to see whether there is a different interaction between economic growth and poverty and inequality among the smaller sample of developing countries.

5.1 Results on the relationship between economic development and income inequality

The results for the three different regressions related to the interaction between economic growth and inequality are represented in Table 2. This table contains the parameter estimates and standards errors for the dependent and independent variables. The dependent variable in these regressions is the Gini coefficient, which is an indicator for income inequality.

	Regression 1[1]	**Regression 2[2]**	**Regression 3[3]**
Intercept	42.65792*** (0.826222)	41.91475*** (1.588898)	35.43612*** (3.769918)
Real GDP	0.130134 (0.099744)	0.273309 (0.279800)	0.425638 (0.299603)
Real GDP squared	-	-0.004957 (0.009050)	-0.008102 (0.009688)
Education	-	-	0.019845 (0.028165)
FDI	-	-	0.099393** (0.044448)
Credit Market	-	-	0.019389 (0.012802)
Unemployment	-	-	0.177501**

			(0.082611)
Inflation	-	-	-0.002840 (0.002475)
Exports	-	-	-0.062445* (0.033493)
Imports	-	-	0.068525** (0.032748)
R-squared	0.923929	0.923988	0.963032

Table 2: Parameter estimates for complete sample regression related to inequality

Robust standard errors are in parentheses. ***, ** and * indicate significance at the 1%, 5% and 10% level respectively.

[1]: Regression 1 refers to the basic regression, which only includes the variable 'real GDP per capita'.

[2]: Regression 2 extends the basic regression by adding 'real GDP per capita squared'.

[3]: Regression 3 extends the second regression by adding control variables.

The results reported in Table 2 demonstrate that the level of income has a positive effect on income inequality. The parameter estimate for real GDP remains positive and even increases when control variables are added to the regression. Thus, the estimation results indicate that an increase in the level of real GDP per capita will result in a higher value of the Gini coefficient. In other words, a developing country which enjoys a higher level of income per capita will also have a higher level of inequality. This outcome contradicts the output on the scatter plot in Figure 2, which shows a negative relationship between economic development and income inequality. The variable GDP-squared measures the non-linear relationship between income and inequality. This term is added to the regression analysis to have a robust estimate. Its coefficient is negative, which implies a concave relationship between the corresponding variables, confirming the inverted U-curve. After adding the control variables, the parameter estimate increases in absolute values and keeps its sign. These results seem to be in line with the Kuznets hypothesis, since Kuznets (1955) argued that countries with a low GDP per capita (developing countries) will experience an increase in inequality during their economic growth. However, the coefficients for real GDP and real GDP squared are not significant in all regressions and thus the level of income has no explanatory power for the level of inequality. Hence, we cannot confirm the Kuznets hypothesis.

The third regression includes control variables that may influence the relationship between economic development and income inequality.

The variable education has a positive sign, indicating that a higher primary completion rate over the total population will lead to a higher level of income inequality within the country. One would assume that having education, in this case a primary degree, would improve the living standards of people. The estimated result contradicts the long-run impact of the 'composition effect' and the 'wage compression' effect, which are described in section 4.2. Both theories assume a negative interaction between the level of education and income inequality. Nevertheless, the coefficient is not significant and thus the variable has no explanatory power to reject the inverted U-shaped curve between education and income inequality, as predicted by theory. Furthermore, the insignificant result implies that the primary completion rate cannot serve to explain changes in income inequality within the sample of developing countries.

The effect of FDI inflows on inequality is positive and significant at the 5% level. Wu & Hsu (2012) argue that the impact of foreign direct investments on income inequality depends on the level of absorptive capacity in the host country. Since the empirical model in this paper does not contain a special measure for absorptive capacity, it will be assumed that this parameter has a high value for developing countries as a whole. Developing countries generally start with a lower level of technology and typically exhibit a catch-up effect when innovations are introduced. The underlying reason is the ability to quickly absorb and take advantage of new technology. This motivates the assumption that all countries in the sample have a high absorptive capacity. Wu & Hsu (2012) argue that FDI has little impact on inequality when the host country has a high absorptive capacity. Although the results do confirm the expectation that FDI inflows positively affect income inequality, the coefficient is not that small to assume a negligible impact. The estimated coefficient shows that FDI inflows can have a substantial impact on the disparity between rich and poor and hence, the result is not completely in line with earlier studies.

The coefficient of the lending interest is positive and confirms to the expectations that a high lending interest rate might increase the income inequality within a country, since a small proportion of the population will have access to credit. Nevertheless, the parameter is insignificant and the effect of credit market imperfections on income inequality can be neglected. The unemployment rate has a positive effect on income inequality and is significant at the 5% level. The result corresponds to earlier expectations. When a larger section of the population is unemployed, they have no effective means of escaping poverty

and remain in the lower-income quintiles for a long time. This in turn fossilizes income inequality. The parameter estimate for the inflation rate is negative and contradicts earlier studies, which assume a positive relationship between inflation and inequality. However, the coefficient is not significant and thus the inflation rate does not appear to be relevant to explain changes in inequality.

Exports seem to have a negative impact on income inequality, implying that as the exports of a country increase, income inequality within the country will decrease. The coefficient is significant at the 10% level and thus has explanatory power. The empirical result corresponds to earlier expectations for developing countries. Theory suggests that international trade will shift income towards a country's abundant factor. When a country produces goods for export, it is likely that those are manufactured using the factor which is domestically more abundant. Developing countries are mainly labour abundant. Thus, as soon as exports of labour-intensive goods increase, the revenues from trade will most likely accrue to the group of society which is providing labour, i.e. the relatively poor. The coefficient for imports is positive and significant at the 5% level. One reason for this may be the nature of the imports. If the imported goods are luxury goods, then it is likely that they are domestically purchased by the better-off. Consumption of such goods may increase not only the utility level of the upper quintiles of the population, but may also contribute to their future productivity, making them even richer in the future. This can happen when the imported goods are for example computers, which can broaden the skills and learning possibilities, or optimize business processes. Thus, when goods are mainly imported by the rich section of the population, this could deteriorate the income inequality between rich and poor.

Beside the parameter estimates, it is also relevant to judge how well the data fits the model. R-squared is a statistical measure that indicates how much of the variation in the dependent variable is explained by the independent variables. Generally, a higher R-squared means a better fit of the model. In regression 1 and 2 the value of R-squared is almost the same, which is quite obvious, since in regression 2 only GDP-squared is added to the previous regression. When expanding regression 2 by adding control variables, R-squared increases from 0.92 to 0.96. This value is quite high and implies that a lot of the variation in the Gini coefficient can be explained by the explanatory variables. Thus, regression 3 possesses the highest R-squared, testifying for the best fit from among the performed regressions. However, it should not be neglected that R-squared generally increases when more variables are added to the regression.

Although the results are not significant to confirm the inverted U-shaped relationship of the Kuznets curve, this does not invalidate the Kuznets hypothesis on a world scale in general, because the sample contains only developing countries.

5.2 Results on the relationship between economic development and poverty

The estimation outcomes for the three different regressions concerning the relationship between economic growth and poverty are represented in Table 3. This table contains the parameter estimates and standards errors for the dependent and explanatory variables. The dependent variable is the income share of the lowest 20 percent of the population, which is used as a measure for poverty.

	Regression 1[1]	**Regression 2[2]**	**Regression 3[3]**
Intercept	5.539065*** (0.202342)	5.583157*** (0.389262)	6.751659*** (0.896828)
Real GDP	-0.028756 (0.024427)	-0.037250 (0.068548)	0.006188 (0.071273)
Real GDP squared	-	0.000294 (0.002217)	-0.001047 (0.002305)
Education	-	-	-0.007108 (0.006700)
FDI	-	-	-0.031310*** (0.010574)
Credit Market	-	-	-0.008215*** (0.003046)
Unemployment	-	-	-0.032391 (0.019652)
Inflation	-	-	0.001592*** (0.000589)
Exports	-	-	0.011496 (0.007968)
Imports	-	-	-0.011170 (0.007790)
R-squared	0.914971	0.914975	0.961511

Table 3: Parameter estimates for complete sample regression related to poverty

Robust standard errors are in parentheses. *** indicates significance at the 1% level.

[1]: Regression 1 refers to the basic regression, which only includes the variable ‘real GDP per capita’.

[2]: Regression 2 extends the basic regression by adding 'real GDP per capita squared'.
[3]: Regression 3 extends the second regression by adding control variables.

The parameter estimate for income per capita is negative in the first two regressions, but becomes positive and much smaller when control variables are added to the regression. The negative coefficient in the first two regressions implies that an increase in the level of income per capita will decrease the income share of the lowest 20 percent of the population, i.e. the relatively poor. The estimate of real GDP per capita in the third regression shows a positive sign, indicating that economic growth will benefit the poor. This result complies with the scatter plot in Figure 3. Both outcomes can be in line with the Kuznets curve, since the effect of income on poverty is uncertain in the early stages of development. The coefficient for GDP-squared, which measures here the non-linear relationship between income and poverty, is positive in the basic regression, but becomes negative in the last regression. Thus, there is a concave relationship between economic growth and income of the poor, when the interaction is controlled for different variables. However, all parameter estimates for real GDP and real GDP squared are insignificant and thus have no explanatory power. Therefore, we cannot assess whether the relationship predicted by Kuznets (1955) holds in the empirical world, especially for developing countries.

The third regression extends the previous regressions by adding control variables that may have an impact on the interdependence between economic development and poverty.
Education seems to have a negative effect on the income share of the poorest people in the population, implying that an increase in the primary completion rate will deteriorate the living standards of the poor. This result contradicts earlier studies that show the positive effect of education on earnings. Still, the coefficient is insignificant and thus we cannot accept the negative relationship between education and poverty.

The parameter estimate for FDI inflows is negative, which indicates that foreign investments reduce the income share of the poor. In other words, the poorest people of the population do not benefit from these investments and thus FDI does not seem to be a key factor for poverty reduction, as shown by earlier studies. Still, the coefficient is significant at the 1% level, which implies that FDI inflows are an important factor to explain changes in the level of poverty. The lending interest rate has a negative effect on the living standards of the poor, which corresponds to the expectation that a higher interest rate decreases the access to credit

and thus can lead to a deterioration of the income share of the poor. The coefficient is significant at the 1% level and thus has a high explanatory power.
The coefficient of the unemployment rate also has a negative sign, implying that an increase in the level of unemployment leads to a decrease in the income share of the lowest 20 percent of the population. Although the sign of the variable is in line with earlier expectations, the coefficient is not significant and thus the unemployment rate cannot serve to explain changes in poverty.

The inflation rate appears to have a positive impact, meaning that a higher inflation rate will increase the income share of the poor. This result contradicts earlier studies based on the interaction between inflation and poverty. Although the estimated result is small, it is significant at the 1% level, indicating that the degree of poverty is influenced by the inflation rate. The level of exports has a positive effect on the income of the poor, implying that an increase in the exports will improve the living standards of the poor. This result corresponds to theory suggesting that as the degree of exports increases, the returns from trade will shift to the low-educated and poor people. Still, the estimated result is not significant. Therefore, we cannot confirm the corresponding interaction between exports and the degree of poverty. Imports seem to have a negative impact, but the coefficient is insignificant, indicating that the variable has no explanatory power. Hence, the estimated outcome does not support the expectation that imports increase the disparity between rich and poor.

The value for R-squared does not really change when GDP-squared is added to the regression. However, the coefficient does increase from 0.91 to 0.96 when the regression is expanded by adding control variables that may influence the relationship between economic development and poverty. This result indicates that the data become closer to the fitted regression line and thus the independent variables have a high explanatory power for the variation in the income share of the lowest 20 percent of the population. Nevertheless, it should not be neglected that R-squared usually increases when more variables are added to the regression.
As mentioned before, the insignificant results belong only to the sample of developing countries and thus cannot invalidate the Kuznets theory on a world scale.

5.3 Analysis of the drivers behind growth and re-estimation of the Kuznets relationship

Although the previous results do not show support for the Kuznets curve, the outcomes could be different if we only look at countries where the drivers of economic growth, in this case education and FDI inflows, show a significant positive impact on real GDP per capita.

Country	Coefficient Education	Standard Error	R-squared of regression 1[1]	R-squared of regression 2[2]
Colombia	0.160586***	0.026459	0.730415	0.941265
Costa Rica	0.203901***	0.061489	0.721330	0.898020
Ecuador	0.269935**	0.101869	0.771228	0.838273
Georgia	0.053108***	0.012579	0.855541	0.951714
Honduras	0.052937***	0.006532	0.821297	0.982960
Indonesia	0.228406*	0.120579	0.707352	0.847692
Paraguay	0.060976**	0.021082	0.508604	0.716970
Uruguay	0.394862***	0.041117	0.766413	0.967323
Venezuela	0.266729***	0.061821	0.534434	0.828147

Table 4: Parameter estimates, standard errors and R-squared for the relationship between education and economic development.

***, ** and * indicate significance at the 1%, 5% and 10% level respectively.

[1]: Regression 1 refers to the basic regression, which only includes control variables.

[2]: Regression 2 extends the basic regression by adding the variable primary completion rate.

In 9 of the 36 developing countries, education has a positive and significant effect on economic development, implying that an increase in the primary completion rate will lead to a higher real income per capita. The parameter estimates, standard errors and R-squared of the regressions for these countries are summarized in Table 4. The fourth column reports the R-squared of the basic regression that only includes control variables, which are the lending interest rate, inflation rate and the degree of trade openness measured by exports and imports of a country. The reasons for the chosen control variables are discussed in section 4.3. The last column shows the R-squared of the regression results when the measure for education is added. From the estimated outcomes it can be seen that R-squared increases by a large amount when the variable primary completion rate is added to the basic regression. Furthermore, in eight of the nine countries the coefficient for education is significant at the 1 or 5 percent level. Thus, the chosen measure for education seems to have a high explanatory power and serves to explain changes in economic development in these countries.

Country	Coefficient FDI	Standard Error	R-squared of regression 1[1]	R-squared of regression 2[2]
Armenia	6.524884***	1.373310	0.883611	0.964269
Belarus	3.512931***	0.956035	0.592495	0.808247
Bolivia	0.518144***	0.138498	0.950041	0.974156
Brazil	0.078967***	0.022425	0.813506	0.926864
Chile	0.434612***	0.099427	0.884796	0.949334
China	0.032815***	0.003405	0.673872	0.954656
Colombia	0.278624***	0.074478	0.730415	0.860537
Costa Rica	4.041536***	0.473254	0.721330	0.936615
Dominican Republic	2.346007***	0.350465	0.708149	0.930523
Ecuador	2.014580**	0.772093	0.771228	0.854038
Estonia	3.534500***	0.701658	0.619413	0.884908
Hungary	0.040297*	0.019313	0.863045	0.893854
Indonesia	0.231989***	0.064989	0.707352	0.841769
Kazakhstan	0.466215***	0.156463	0.772705	0.860913
Latvia	6.758602***	2.190778	0.463543	0.700824
Lithuania	4.177412*	1.951841	0.783513	0.843320
Paraguay	3.366552*	1.630333	0.508604	0.623328
Peru	0.386262***	0.091168	0.887543	0.948806
Romania	0.463956*	0.231051	0.822816	0.870343
Russian Federation	0.187824***	0.038336	0.626242	0.890086
Turkey	0.257898**	0.088488	0.677510	0.789346
Ukraine	0.466206***	0.091911	0.560876	0.860334
Uruguay	3.187961***	0.303418	0.766413	0.972058

Table 5: Parameter estimates, standard errors and R-squared for the relationship between FDI inflows and economic development.

***, ** and * indicate significance at the 1%, 5% and 10% level respectively.

[1]: Regression 1 refers to the basic regression, which only includes control variables.

[2]: Regression 2 extends the basic regression by adding the variable FDI.

Foreign investments positively influence real income per capita in the host country in 23 of the 36 developing countries. Table 5 reports the parameter estimates, standard errors and R-squared of the regressions for these countries. The fourth and fifth column of this table report

the R-squared of regressions with only control variables and the R-squared when the variable FDI is added to the basic regressions, respectively. The coefficient for FDI inflows is significant at the 1 or 5 percent level in 19 of the 23 countries, indicating a high explanatory power. In addition, in all countries the data show a much better fit of the model when the variable FDI is added to the regression, which can be seen from a higher R-squared in column five compared to column four.

FDI inflows seem to be a better driver for economic growth compared to education, since these investments have a significant impact on income per capita in much more developing countries than the primary completion rate. The estimated results for the total sample of developing countries did not confirm the inverted U-curve relationship between economic growth and poverty and inequality, as expected by Kuznets (1955). One can assume that the results for the total sample rejected the Kuznets hypothesis, because the sample also contained countries where education and FDI inflows were not a significant factor for or did not have a positive influence on economic growth. This difference in significance or sign of the variables between developing countries can have influenced the estimation results. Therefore, the relationship between economic development and poverty and inequality will be estimated again for a smaller group of countries. The estimation will be performed separately for each driver of economic growth, because the sample of countries where education is a significant factor for income per capita differs from the sample of countries where FDI inflows are significant.

	Regression 1[1]	**Regression 2[2]**
Intercept	44.55679***	3.313451***
	(3.778899)	(0.911141)
Real GDP	0.388087	0.212621
	(0.713110)	(0.171940)
Real GDP squared	-0.005312	-0.004194
	(0.028698)	(0.006919)
CM	-0.021405	0.005167
	(0.017202)	(0.004148)
UNEM	0.225825	-0.054436
	(0.140818)	(0.033953)
INF	-0.023348	0.002806

	(0.028351)	(0.006836)
X	-0.063349 (0.055290)	0.021651 (0.013331)
M	0.093434** (0.045312)	-0.028004** (0.010925)
R-squared	0.956722	0.948856

Table 6: Parameter estimates for the subsample regression, which includes countries where education has a positive and significant impact on real income per capita.

Robust standard errors are in parentheses. *** and ** indicate significance at the 1% and 5% level respectively.

[1]: Regression 1 reports the parameter estimates for the relationship between economic growth and inequality, where the Gini coefficient is the dependent variable.

[2]: Regression 2 reports the parameter estimates for the relationship between economic growth and poverty, where the income share of the lowest 20 percent of the population is the dependent variable.

The coefficient estimates and standard errors for the first subsample of countries, which contains countries where education has a positive and significant impact on economic development, are summarized in Table 6. Regression 1 refers to the relationship between economic growth and income inequality. The sign of the variables GDP per capita and GDP-squared have not changed. Even within the subsample of developing countries it seems that economic growth will increase the income inequality between rich and poor. This result confirms again the inverted U-shaped relationship, since Kuznets (1955) predicted that inequality will increase with economic growth for countries with a low GDP per capita. Although the outcomes are in line with the previous estimated results, the coefficients are still not significant. Therefore, we cannot accept the Kuznets curve within the group of developing countries. This result is in line with the scatter plot in Figure 4, from which it can be seen that there is almost no relationship between GDP per capita and the Gini coefficient.

The estimates for the inflation rate and lending interest rate are again insignificant, which means that even within a smaller sample of developing countries, they are not important factors for changes in income inequality. The coefficient for unemployment has increased in absolute values and has kept its positive sign, but it is not significant anymore. Hence, within the subsample we cannot assume that a decrease in unemployment will lower income inequality as well. The variables determining trade openness show consistency in terms of sign and explanatory power, with the only exception that exports were significant at the 10 percent level in the complete sample, while the coefficient is not significant anymore in the subsample. This suggests that imports do influence income inequality in developing countries, while this is not sure for the level of exports.

Regression 2 estimates the interaction between real income per capita and the income share of the lowest 20 percent of the population. The variables GDP and GDP-squared have not changed in sign or significance, indicating that they still have no explanatory power for changes in poverty. This result complies with the scatter plot in Figure 5, from which it can be seen that there is no interaction between economic development and the income share of the poor within the subsample. The regression line is almost a straight line. Therefore, we cannot confirm or reject the expectations of Kuznets (1955).

The lending interest rate and inflation rate are now insignificant. Hence, within the subsample they do not appear to be important for changes in the income share of the poor. The unemployment rate remains negative and insignificant. The coefficient for exports is still positive and insignificant, while imports are now significant at the 5 percent level, indicating that imports have now a high explanatory power for changes in poverty. Thus, within the subsample, we can assume that an increase in imports will deteriorate the disparity between rich and poor, which confirms the expectations.

The R-squared of both regressions for the subsample of countries are slightly lower than those of the complete sample. However, the reason for this could be that the complete sample also contains the explanatory variables education and FDI. Hence, only analyzing countries where education is a significant factor for economic growth does not lead to a better fit of the model.

Scatter plots for the subsample of countries where education is a significant factor for income per capita

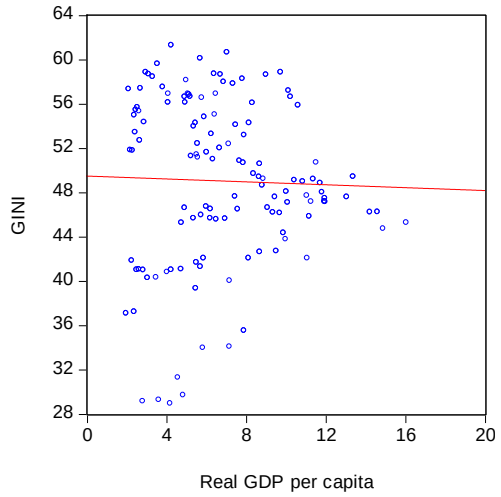

Figure 4: Scatter plot of the Gini on GDP

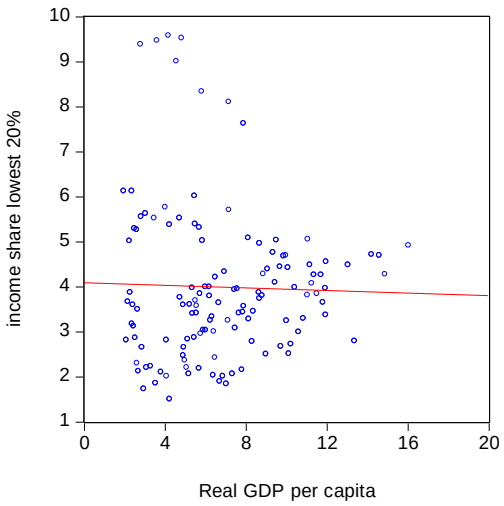

Figure 5: Scatter plot of the income share of the poor on GDP

	Regression 1	Regression 2
Intercept	42.52279*** (3.455204)	6.109616*** (0.821024)
Real GDP	-0.649768 (0.459046)	0.020823 (0.109078)
Real GDP squared	0.034908** (0.015759)	-0.003301 (0.003745)
CM	0.042971*** (0.012305)	-0.011369*** (0.002924)
UNEM	0.061892 (0.108181)	-0.001742 (0.025706)
INF	-0.003444 (0.002847)	0.000993 (0.000676)
X	-0.144357*** (0.046989)	0.029621*** (0.011166)
M	0.182481*** (0.059619)	-0.034716** (0.014167)
R-squared	0.953901	0.950025

Table 7: Parameter estimates for the subsample regression, which includes countries where FDI inflows have a positive and significant impact on real income per capita.

Robust standard errors are in parentheses. *** and ** indicate significance at the 1% and 5% level respectively.

[1]: Regression 1 reports the parameter estimates for the relationship between economic growth and inequality, where the Gini coefficient is the dependent variable.

[2]: Regression 2 reports the parameter estimates for the relationship between economic growth and poverty, where the income share of the lowest 20 percent of the population is the dependent variable.

Table 7 reports the estimated results for the subsample of countries where FDI inflows have a positive significant effect on income per capita. Regression 1 and 2 estimate the relationship between growth and inequality, and growth and poverty, respectively. From regression 1 it can be seen that GDP and GDP-squared have opposite signs compared to the complete sample. The negative coefficient for GDP implies that inequality will decrease with economic growth, contradicting the Kuznets curve. This result complies with the scatter plot in Figure 6. Still, the coefficient is insignificant. GDP-squared is significant at the 5 percent level, while the variable did not have any explanatory power in the complete sample. The positive outcome implies a convex relationship between growth and inequality, indicating a U-curve instead of an inverted U-curve as expected by Kuznets (1955). Therefore, we cannot accept the Kuznets hypothesis for the sample of developing countries. The coefficients of the lending interest rate, unemployment and inflation rate have kept their sign, but the significance of the

former two variables has changed. Credit market imperfections have now a high explanatory for changes in inequality, while the unemployment rate does not appear to be important anymore within the subsample. The degree of trade openness shows consistency in term of sign. In addition, both exports and imports are now significant at the 1 percent level, indicating a higher explanatory power than before.

Scatter plots for the subsample of countries where FDI inflows are a significant factor for income per capita

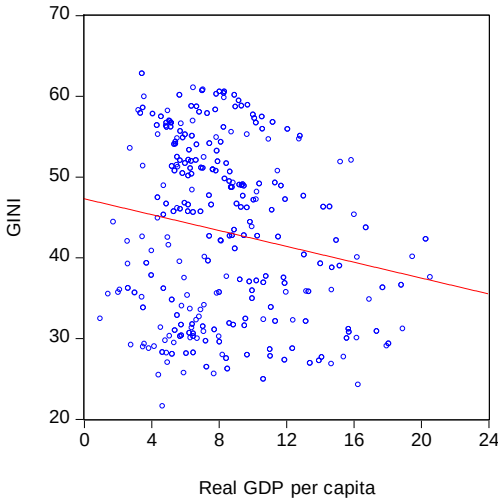

Figure 6: Scatter plot of the Gini on GDP

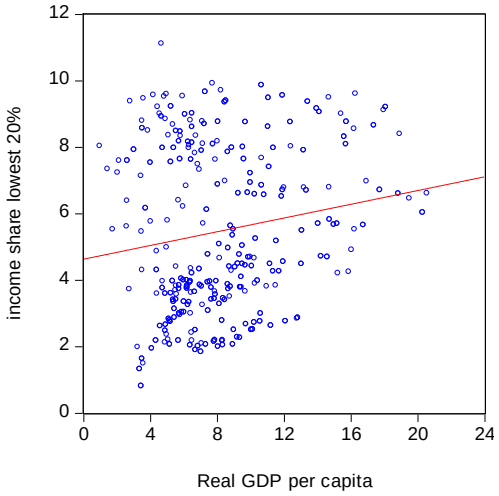

Figure 7: Scatter plot of the income share of of the poor on GDP

From the parameter estimates in regression 2 it can be seen that both GDP and GDP-squared have kept their sign. The positive sign of GDP per capita complies with the output on the scatter plot in Figure 7, implying that economic growth will reduce poverty. As mentioned before, this result can be in line with Kuznets' expectations. However, the coefficients are still insignificant. Therefore, we cannot draw conclusions concerning the Kuznets hypothesis. The lending interest rate has not changed in sign or significance, indicating that a higher interest rate decreases the income share of the poor, which confirms the expectations even within a smaller sample of developing countries. The coefficient for unemployment remains negative and insignificant. Therefore, the rate of unemployment cannot serve to explain changes in poverty. The positive sign of the inflation rate implies that an increase in this rate will increase the income share of the poor, which contradicts prior expectations. Although this variable had a high explanatory power before, it does not appear to be relevant anymore within the subsample.

The degree of trade openness seems to influence the income share of the poor. Hence, within the subsample we can assume that as the degree of exports increases, the returns from trade will shift to the poor. Furthermore, higher imports will benefit the rich and increase the disparity between rich and poor.

The R-squared of the regressions for the subsample are slightly lower than those for the complete sample. Still, we cannot conclude that the complete sample leads to a better fit of the model, since the regression for the complete sample also contains the variables education and FDI. As mentioned before, R-squared usually increases when more variables are added to the regression.

Even though the sample was divided into subsamples to prove the existence of a Kuznets curve within developing countries, the results do not show sufficient support for an inverted U-curve.

VI: CONCLUSION

This paper aims to contribute to the existing literature on the Kuznets curve by investigating the effect of the level of real GDP per capita on poverty and income inequality. This set-up is different from previous studies which have focused on the reverse relationship. The sample of countries examined contains only developing nations, mainly due to a high poverty and inequality in these countries. According to theory, this group of countries is located on the left side of the Kuznets curve, which indicates that the effect of income per capita on inequality must be consistently positive.

The expected relationship between economic growth and income inequality seems to not hold in reality. The regression results for the complete sample of developing countries are consistent in terms of sign of the GDP coefficient and confirm the Kuznets curve, but the observed relationship is insignificant. When re-estimating the relationship for subsamples, the coefficient for GDP keeps its positive sign within the sample where education is a significant driver for economic growth, while it has a negative sign when only analyzing countries where FDI inflows affect income per capita. Still, the variable remains insignificant in both subsamples. The estimated results for the interaction between economic growth and poverty can be in line with the expectations of the Kuznets hypothesis. The positive relationship holds for both the complete sample and the subsamples, but the coefficient is insignificant in all estimations. Hence, the sample of developing countries does not show sufficient evidence for the existence of the Kuznets curve. The level of income seems to have no explanatory power for changes in inequality or poverty. Thus, economic growth in developing countries will not reduce the disparity between rich and poor. Still, this does not invalidate the Kuznets hypothesis on a world scale in general, because the sample contains only developing nations.

Since the results are insignificant, it is not possible to draw conclusions and give suggestions about how policies must be tailored to countries' specificities in order to make the income distribution more even. Nevertheless, this paper has some undoubted merits, such as its focus on developing countries only. While the Kuznets curve as such has substantial theoretical and, perhaps less often, empirical evidence, its validity has not been explored much on a sample of developing countries only. Furthermore, the research considers very recent data (1990-2010).

There are some drawbacks in this research and these may have influenced the rigorousness of the results. There was missing data for many countries and this forced the selection of only a subset of developing countries. A larger and relatively more homogeneous sample may be able to display a Kuznets curve or at least provide evidence of a significant positive relationship between the main variables. In addition, the regression can be expanded by the inclusion of more explanatory variables, for instance accounting for political climate and social unrest. These shortcomings provide sufficient room for further research.

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