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Structural Change and the Kuznets Hypothesis

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Abstract:
This study takes a fresh look at how the structural changes within developing economies lead to an inverted U relationship between income per capita and income inequality. In lower income countries, economic growth raises income inequality because the gains of growth are restricted to a small group of households due to the urban-rural, formal-informal divides and existing skill gaps. In the latter phases of development, the labor markets become more homogenous; labor becomes mainly medium/higher-skilled and moves towards the urban formal sector. Thereafter, the benefits of economic growth spread to the wider population, and the income Gini coefficient declines. This paper first theoretically discusses how these changes are mediated by a) urbanization; b) changes in the level of informality; and c) changes in education inequality.

The paper then tests the validity of the Kuznets hypothesis using panel data techniques and a cross-country dataset. The results show that an inverted U relationship between income per capita and income inequality only exists in the developing economies. The empirical findings also support the claim that income per capita affects income inequality through sectoral shares and informal employment. However, the evidence is weaker on income per capita's influence through education inequality.

Keywords: inequality; urbanization; education; informality; economic development.

JEL Codes: O15, O11, I24, I25.

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1. Introduction

Beginning in the second half of the 20th century, the Kuznets Curve has been considered one of the most groundbreaking ideas in the economic development literature[1]. Many important scholars, including Acemoğlu, Williamson, Barro, Agnion, Bourguignon, Piketty, Fields, Anand, Kanbur, and Robinson, have performed their academic work within the borders of the Kuznetsian framework.

The original version of the Kuznets Curve argument relies mainly on Kuznets (1955)'s AER paper called "Economic Growth and Inequality". In this article, Kuznets (1955) claims that economic growth initially raises income inequality in the lower income countries for two reasons. First, the population weight of the urban sector, which Kuznets assumes to be relatively unequal, increases. Second, the gap between the average urban and rural incomes widens. In the later phases of development, the income inequality declines as a larger share of the urban population becomes "native" urban dwellers, and some of them pursue entrepreneurial opportunities and enroll in the political process. Following the assumption that the service sector is more equal than the industrial sector, Kuznets also claims that the growing employment share of the service sector is also an important factor in reducing inequality.

A large number of studies have examined the relevance of the Kuznets hypothesis by empirical analysis. Some of the empirical works, such as Paukert (1973); Ahluwalia (1976); Jha (1996); Mbaku (1997); Barro (2000); Chang and Ram (2000); and Thornton (2001), have accepted the Kuznets hypothesis. Many other studies (e.g., Deininger and Squire, 1998; Cook and Ushida, 2008; Frazer, 2006; Angeles, 2010; Desbordes and Verardi, 2012) have refuted it. Several studies (Tribble, 1999; List and Gallet, 2000) have suggested an S-curve relationship between income per capita and income inequality; that is, the Kuznets hypothesis holds for lower and middle income countries, but economic growth increases income inequality as the

[1]In 2011, American Economic Review named Kuznets (1955)'s "Economic Growth and Inequality" as one of the top 20 articles published in AER during its first 100 years.

level of per capita income rises further.

Most of the empirical work on the Kuznets hypothesis has simply tested the existence of the Kuznets Curve using various methodologies. However, the papers cited above do not examine the mechanisms behind the inverted U relationship between income inequality and income per capita. The main contribution of this paper is to explore empirically the channels that create a Kuznets Curve in developing economies. Following Kuznets (1955, 1963, 1972) and several other influential theoretical works in the literature (Robinson, 1976; Knight and Sabot, 1983; Anand and Kanbur, 1993; Galor and Zeira, 1993), this paper focuses on the influence of structural changes on income inequality. The structural changes might be highly crucial for explaining income inequality in developing countries; for instance, Young (2013) shows that the urban-rural gap on average accounts for 40% of income inequality in developing economies. In this paper, I specifically scrutinize the influence of the urbanization process, urban informal and/or subsistence employment and education inequality on the overall income inequality.

The paper first distinguishes between developed and developing countries and claims that the Kuznets hypothesis is valid only for developing economies because developing economies have very distinct characteristics compared to mature economies. The extent of urbanization, changes in the shares of urban informal sector and expansion/reduction of the education frontier are noticeably greater in developing economies.

Next, the paper discusses the factors explaining the Kuznets Curve. The changing population weights of the urban and rural sectors partially explain the inverted-U relationship between income per capita and income inequality. Nevertheless, the changing population weights argument relies on the assumption of constant urban and rural inequalities, which might be unrealistic in many cases. Moreover, the empirical analyses decomposing the income inequality mostly indicate that the increase in the urban sector's population weight is not always the main factor behind the changes in overall income inequalities (Eastwood and Lipton, 2004; Kanbur and Zhung, 2013; Oyvat, 2010).

This paper prefers an approach that acknowledges the influence of changes in urban inequality alongside changes in the ratio of average nonagricultural and agricultural incomes. Contrary to the claim by Kuznets (1955), the statistics show that the sectoral ratios between value added and employment shares tend to converge with economic growth (Table 3). This convergence may be due to the acceleration of the urbanization process through ongoing industrialization. The reduction in transportation costs and expansion of education in rural areas might stimulate further urbanization and lead to convergence between sectors.

Nonetheless, in the early phases of development, economic growth together with urbanization expand the urban informal employment (Rauch, 1993; Elgin and Oyvat, 2013). Hence, a part of the poverty in the rural sector is transmitted to the urban informal sector, while a limited group of households in the urban formal sector prosper significantly. Moreover, the evidence in the empirical section of this paper shows that economic growth makes access to education more restricted in very low-income countries. Therefore, in the early phase of development, a group of individuals in the more privileged activities benefit more from economic growth, which increases the overall income inequality. In the later phases of development, the gains from economic growth spread to a larger part of population due to several factors. First, the average nonagricultural and agricultural incomes continue to converge in middle-income countries (Table 3). Second, the employment share of informal and subsistence activities decreases in the nonagricultural sector (Rauch, 1993; Elgin and Oyvat, 2013). This decrease contributes to the reduction in income inequality, as empirically shown in the next sections. Third, education inequality declines (Table 4), which also can reduce income inequality (Acemoğlu and Autor, 2012). Hence, the economic growth in the later phases of development leads to structural changes that reduce the overall inequality.

This paper proceeds as follows. The next section discusses the characteristics specific to developing economies and identifies factors that theoretically might lead to the inverted-U relationship between per capita income and income inequality. The third section presents a cross-country econometric analysis to test the theory, and the last section presents the

conclusions.

2. Theoretical framework

2.1. Defining the Developing Economies

It is often overlooked that Kuznets's (1955, 1963) original hypothesis is only applicable to developing economies. Several empirical studies have presented their results for a sample of countries including both developing and developed countries (Paukert, 1973; Mbaku, 1997; Frazer; 2006; Huang et al., 2007), while others also present results both for samples including only developing and all countries (Ahluwalia, 1976; Anand and Kanbur, 1993; Jha, 1996; Angeles, 2010). Nevertheless, these works still do not emphasize that the Kuznets Curve is not applicable to mature economies. In fact, there is a growing literature pointing to the existence of a S-curve between GDP per capita and income inequality. Income inequality increases at lower levels of per capita income, declines in middle and upper-middle income countries, and increases again at high levels of per capita incomes (List and Gallet, 1999; Tribble, 2000; Galbraith, 2011). Milanovic (1994) calls this the "augmented Kuznets Curve". There might be reasons explaining the second rise of inequality in developed countries, including skilled-biased technical change (Autor, Katz and Kearney, 2008) and an increasing share of financial incomes (Krippner, 2005) in the higher income countries. The increasing inequality in the developed world might also be the outcome of a historical process. The outcomes of neoliberalism might start to dominate the inequality-reducing mechanisms suggested in the inverted-U literature as the country converts into a mature economy.

Table 1 here

Whichever factor increases the inequality, the S-curve hypothesis is different from the Kuznets hypothesis, at least the hypothesis in his own work (1955, 1963). The developing economies in the Kuznets hypothesis have four characteristics that distinguish them from mature economies. These characteristics might lead to an inverted U-shaped relationship between per capita income and inequality:

1) The developing economies experience higher rates of urbanization (Table 1).

2) Along with faster urbanization, the employment share of the agricultural sector declines faster in the developing economies (Table 2).

3) The differences between labor productivities in the agriculture and non-agriculture sectors are larger, especially in the lower income economies (Table 3).

4) The education frontier expands, and the inequality of years of schooling declines as the developing economies grow. The decline in the education Gini coefficient slows down in the higher income economies (Table 4).

Tables 1-4 support the developing-developed divide above. The tables exhibit characteristics for the developed countries and developing economies grouped according to their per capita income levels. For each decade, the countries are classified according to their per capita incomes and levels of development at the midpoint of the decade (1985, 1995, 2005)[2]. For the "developed" and "developing" classification, I used Human Development Index, which relies on Sen (1999)'s capabilities approach measuring development by capabilities-freedom of people to decide on what to do and what to be. Although HDI cannot measure the unlimited aspects of development that can be derived from Sen's approach, compared to income per capita, it can define development from a broader perspective[3].

Table 2 here

For this study, the Human Development Index (HDI) values of each country are calculated for each 5 years. UNDP's Human Development Reports classify the countries with HDI scores over 0.800 in the "very high human development" group. Following this categorization, I

[2]The tables do not include the values for 1965 and 1975 because for 1975, only 5 countries and for 1965, only New Zealand qualified as "developed".

[3]Sen writes about cases where economic growth is not sufficient to improve every aspect of human welfare. In his book "Poverty and Famines", Sen (1981) claims that increasing agricultural prices are the reason for the Bengal famine of 1943, although the higher agricultural prices resulted from the war-induced economic growth in India. Similarly, in "Development as Freedom", Sen (1999) shows that Kerala, a low-income state in India, achieved great success in healthcare and education. He shows that the average life expectancy in Kerala exceeded the average life expectancy of the black population in the US, although the income per capita for the black population in the US was significantly higher.

classify these countries as "developed". One possible problem with the developing-developed divide is that many countries that used to show the characteristics of a developing economy are developed today. An example would be Korea, a developed economy that in 1960, according to the HDI scores, was less developed than today's Uganda, Nepal and Mauritania[4]. Therefore, countries are reclassified as developed according to their HDIs in each period. The estimation of HDI is detailed in Appendix A.

Table 1 shows that the rate of urbanization is significantly higher in developing countries than in developed economies during these three decades[5]. Similarly, the average changes in the employment shares of agriculture are higher for the developing economies during the given periods (Table 2). Table 3 shows the ratio between the sectoral shares of value added to total employment in agriculture, industry and services as a measure of the relative average income in these sectors. Although agriculture's ratio of the shares of value added to the share of total employment is usually higher for the developed economies, we cannot observe a consistent trend for the convergence of agricultural incomes towards mean incomes. Nevertheless, the incomes in both the industry and service sectors converge to the mean incomes as the countries develop. Hence, it is difficult to claim that the industry and service sectors are "privileged" in the developed economies.

Table 3 here

Table 4 here

Finally, Table 4 shows that the decline in the education Gini coefficient for years of schooling is usually less for the developed economies because the years of schooling have an upper limit for the majority of the population. The years of schooling begin to converge at

[4]The HDI values calculated for this study are 0.457, 0.446 and 0.435 for 2010's Mauritania, Nepal and Uganda respectively, whereas Korea's HDI score in 1960 is 0.423.

[5]The average changes for the 1960s and 1970s are not reported, as for 1965 only New Zealand was classified as a developed economy, and for 1975, only 5 countries were classified as developed.

the top as a greater number of people obtain a university degree. Therefore, the education inequalities are very stable for some of the developed economies[6].

In the next section, we will examine why characteristics specific to developing economies affect inequality. Our first focus is the influence of the sectoral composition. We will first examine the impact of changing shares in the agricultural, nonagricultural, urban formal and urban informal sectors. Then, we will discuss how the education frontier changes with economic growth and whether changing education inequality also affects income inequality.

2.2. Changing shares of employment in nonagricultural and agricultural sectors

The first set of arguments on the Kuznets hypothesis centers on the direct impact of changing sectoral composition. In his paper "Economic Growth and Inequality", Kuznets (1955) relies on a two-sector model involving the urban and rural sectors. Like Lewis (1954), Kuznets takes industrialization to be the main feature of economic development. He assumes that enlargement of the urban sector is the natural result of industrialization, and indeed, urbanization is the determinant factor on the formation of the inverted-U curve between per capita income and inequality. In developing his argument, Kuznets makes two important assumptions: "a) the average per capita income of the rural population is usually lower than that of the urban; b) inequality in the percentage shares within the distribution for the rural population is somewhat narrower than in that for the urban population - even based on annual income; and this difference would probably be wider for distributions by secular income levels."

Based on these assumptions, Kuznets claims that the overall inequality within a country increases due to two reasons. First, urbanization followed by migration enlarges the share of the relatively unequal component, the urban sector. The increasing weight of the more unequal sector leads to greater overall inequality. Second, the emergence of industrialization

[6]The education Gini coefficient in the UK remained approximately 0.24 between 1985-2010. Similarly, Australia's education Gini coefficient declined from 0.13 to 0.12 between 1980-2010, and the education Gini coefficient in the US increased slightly from 0.10 to 0.11 between 2000-2010.

raises the per capita income gap between the urban and rural population, until the benefits of industrialization are also shared by the rural population.

There have been some attempts to model and depict the Kuznets hypothesis by decomposing it to its income components. Using log variance as a measure of inequality, Robinson(1976) decomposes the urban and rural sectors into intrasectoral (within-sector) and intersectoral (between-sector) components and examines how the distribution would change over time. By using this abstract model, Robinson concludes that the inverted U curve hypothesis holds regardless of Kuznets' assumption of a richer and more unequal urban sector. The reasoning here is that the urban-rural gap's contribution to overall inequality is zero when a society is either entirely urban or entirely rural. Hence, the urban-rural gap's contribution to inequality is maximized somewhere in the middle.

Anand and Kanbur (1993) also report a similar analysis for six different measures of inequality[7]. They show that the inverted-U hypothesis holds for all six indices when given conditions are satisfied under the assumption that the urban and rural inequalities and urban-rural income ratio are constant. For their analysis on Theil's T index, Anand and Kanbur decompose Theil's T to its within (T_W) and between (T_B) components:

$$T = T_B + T_W \tag{1}$$

Following that, they conclude that a turning point is guaranteed under certain conditions[8]. If Anand and Kanbur's conditions hold, then the within-sector and between-sector

[7]The indices are Theil's T, Theil's L, the squared coefficient of variation, the decomposable transform of the Atkinson Index, the Gini coefficient and the variance of log-income.

[8]Anand and Kanbur(1993) conclude that a turning point is guaranteed if:

$$\left[\frac{\partial T}{\partial x}\right] = \left[\frac{\partial T_B}{\partial x}\right] + \left[\frac{\partial T_W}{\partial x}\right] < 0 \tag{2}$$

at x=1, and

$$(T_1 - T_2) < (\theta - 1 - log\theta) \tag{3}$$

Here, T_1 and T_2 are the Theil indices for sector 1 and sector 2, respectively; x is the population share in sector 2; and θ is the ratio of the sectoral mean incomes (μ_1/μ_2).

inequalities will have a relationship with population share (x), which is similar to the shape in Figure 1. As Figure 1 shows, the between urban-rural sector inequality does not contribute to the overall inequality in societies that are either fully urban or fully rural.

Figure 1 here

Nevertheless, there aren't good reasons to assume that the urban-rural income ratio or the within-urban and within-rural inequalities are constant. Indeed, the majority of rural-to-urban migrants do not join the urban sector as a median agent but begin working in inferior informal activities (Banerjee, 1983; Joshi and Joshi, 1976). Hence, rural-to-urban migration itself increases the urban inequality unless there are forces counteracting it. Indeed, there are good reasons to believe that urban inequality is affected by economic development. Several studies have already shown that GDP per capita and/or the level of urbanization affects both the employment and the output shares of the informal sector (Rauch, 1993; Porta and Shleifer, 2008; Elgin and Oyvat, 2013), which is an important factor in urban income inequality. Moreover, Timmer and Akkuş (2008) and McMillan, Rodrik and Verduzco-Gallo (2014) show that income per capita affects the ratio between the labor productivities in the nonagricultural and agricultural sectors.

There are several studies (Eastwood and Lipton, 2004; Kanbur and Zhuang, 2013; Oyvat, 2010) examining the factors that affect changes in income inequality by decomposing inequality into the contribution of intrasectoral inequality within and intersectoral inequality between the urban and rural sectors. Eastwood and Lipton examine eleven incidences of changes in inequality from 7 countries: China, Indonesia, Thailand, Philippines, Chile, Brazil and Ghana. They report that the changing weight of the urban population is a major factor explaining the change of inequality only in Indonesia between the years 1987-1993. Indeed, in seven of the eleven cases the decline in intrasectoral inequalities is the major factor affecting overall inequality. In a similar analysis on more recent data for four countries, Kanbur and Zhuang (2013) show that the changing population weight is the major driver of rising inequality in Indonesia and Philippines but fails to explain the changes of inequality

in China and India. Additionally, Oyvat (2010) shows that in Turkey, the intrasectoral inequalities contribute significantly more to the changes in overall inequality than the increases in urban population share.

In summary, although the changing weight of employment might partially explain the Kuznets hypothesis, we may require a more complete approach considering the changing sectoral weights of both employment and output along with changes in intrasectoral inequalities.

2.3. Enriching vs. enlarging growth

Releasing the assumption of a constant urban-rural income ratio would allow a different understanding of the impact of economic growth on income inequality. Following Fields's (2005) terminology, economic growth could be enabled either by the "enrichment" or the "enlargement" of sectors. The enrichment of sectors would limit the benefits of growth to a portion of society and might not create sufficient employment due to barriers to entry, if the enrichment is in the higher income sector. The enlargement of sectors is the case in which the growing sectors create significant employment and spread the benefits of growth to a larger part of society. Naturally, we would expect the enrichment of the higher income sectors to increase income inequality, whereas the enlargement of the higher income sectors might lead to a decline in inequality if sufficient employment is created in these sectors.

Table 3 clearly shows that in the lower income countries, the industry and services are the sectors with significantly greater average returns than to the agricultural sector. The higher incomes in the nonagricultural sectors might be due to two reasons: 1) costs of rural-to-urban migration 2) skill requirements in some of the nonagricultural activities. These factors would put a barrier for entering the higher income sectors and keep the premium in the higher income sectors at higher levels

Harris-Todaro (1970) type of models (also Todaro, 1969; Cole and Sanders, 1985; Fields, 1975; 2005) propose that migration between urban and rural sectors is determined by the

expected urban and rural incomes[9]. A simplified equilibrium of the Harris-Todaro model would be

$$E(W_U) = E(W_F)\frac{L_F}{L_U} + E(W_S)\frac{L_S}{L_U} = S_R + C \tag{4}$$

where $E(W_U)$, $E(W_F)$ and $E(W_S)$ are the expected incomes in the urban, urban formal and urban informal sectors, respectively. L_F and L_S are the volume of urban employment in the formal sector and the volume of urban underemployment in the urban informal sectors; L_U is the urban labor force; S_R is the peasant income; and C is the cost of rural-to-urban migration.

The model predicts that even when the highly productive urban sector cannot produce enough jobs, the rural dwellers move to the urban informal sector while waiting to be employed in the formal urban activities. Thus, the expected urban-rural incomes should converge unless there are high costs of rural-to-urban sector migration. As the costs of rural-to-urban migration widen, the gap between the expected urban and rural incomes should increase.

The conventional form of the Harris-Todaro model follows the assumption that the skill levels of the individuals in each sector are similar. Indeed, the skill gaps might be another important factor limiting the migration of rural dwellers. If the skill gaps in a society are high, the rural dwellers with lower skills would have lower opportunities, even in informal urban activities, which would limit the migration of lower skilled workers and create an extra premium for the urban activities. Indeed, a number of studies examining migration behavior show that education is an important factor increasing the probability of rural-to-urban migration (e.g., Agesa, 2000; Tunalı, 1996).

Depending on the costs of migration and skill gaps, the urban sector might either "enrich"

[9]The empirical work for different countries (e.g. Agesa, 2000; Tunalı, 1996; Bowles, 1970; Fields, 1982; Schultz, 1982) has also found that the average urban and rural incomes significantly affect the migration between the rural and urban sectors.

or "enlarge", which would affect the overall income inequality differently. Lorenz Curves in Figure 2 show how the urban sector's growth might affect income inequality by changing the average incomes in the urban and rural sectors. In Figure 1, only two types of individuals, urban and rural dwellers, are assumed to exist, with urban individuals having greater incomes. In the first path, shown with black lines, the urban sector is enriching without creating sufficient urban employment due to the barriers to entering urban activities. This situation would lead to the expansion the of Lorenz curve. We can observe that inequality increases in this case, although the slope of the line representing urban dwellers is constant, implying that the ratio between per capita urban income over per capita overall income does not change.

Figure 2 here

If the growth of the urban sector leads to the enlargement of the urban sector, as shown in red lines in Figure 2, employment is created in the urban sector, which can spread the benefits of the urban sector to a large portion of society. In this case, inequality is reduced even when the ratio between the rural and overall per capita incomes are constant. The empirical work of Timmer and Akkuş (2008) and McMillan, Rodrik and Verduzco-Gallo (2014) find a U-shaped relationship between the ratio of agricultural labor productivity to nonagricultural labor productivity and income per capita. That is, economic growth leads to divergence between the labor productivities in the nonagricultural and agricultural sectors in the lower income countries. After a turning point[10], the relative incomes of the agricultural and nonagricultural sectors converge as a result of economic growth.

There might be two reasons for this convergence. First, improvements in the transportation facilities and infrastructure are expected outcomes of economic growth and might lead to a decline in the rural-to-urban migration costs, which could leads to convergence between

[10]McMillan, Rodrik and Verduzco-Gallo (2014) find that the turning point for the U-shaped relationship between the ratio of agricultural labor productivity to nonagricultural labor productivity and income per capita is approximately $9000. Similarly, Timmer and Akkuş (2008) identify a turning point near $5000-9000.

the expected urban and rural incomes. Second, Table 4 shows that the skill differentials decline in developing economies following economic growth. This factor would also relieve the barriers to rural-to-urban migration (Agesa, 2000; Tunalı, 1996) and close the gap between the average incomes in agricultural and nonagricultural activities.

2.4. Considering the formal/informal sector

The analysis of Figure 1 is incomplete, as the growth in the population share of the urban sector does not necessarily lead to a spillover of benefits into the growing urban sector. Indeed, the growth in the urban sector is also unbalanced. The impact of unbalanced growth in the urban formal sector on inequality can be observed by considering the informal/formal sector divide. The urban informal sector includes activities with lower labor productivity (Shleifer and Porta, 2008) and/or subsistence activities with marginal productivity of labor, similar to zero (Lewis, 1954; Fields 1975), as discussed in the previous chapter. Therefore, it is reasonable to assume that the growth in the urban formal sector is the main driver of the growth in the urban sector. Still, many rural dwellers decide to migrate with the expectation of finding a job in the formal sector and hold an informal job while seeking alternative employment (Banerjee, 1983).

Nevertheless, if the growth in the urban formal sector cannot create sufficient jobs, the move towards the urban informal sector might create a "Todaro Paradox" (Todaro, 1969), where economic growth increases urban underemployment in the urban informal sector[11]. Capitalist development might also pauperize the small peasants and create the following factors that raise the Todaro paradox: 1) improvement in labor-saving technologies reduces the demand for labor on large farms (Harris, 1978; De Janvry, 1981); 2) investments and subsidies favoring large landlords reduce prices for agricultural goods (Boyce, 1993) and lower the revenues of small farmers; 3) the spread of new goods damages the production

[11]The growth of the informal sector was observed in all Asian (Moser, 1978), African (Wuyts, 2001) and Latin American (Portes, 1994; de Janvry, 1981; Furtado, 1976) countries in their early phases of development. The informal sector has also recently been growing in China (Hart-Landsberg and Burkett, 2007), which is a lower income country transforming to a medium income one.

of non-agricultural rural goods, called "z-goods" (Hymer and Resnick, 1969); and 4) many governments implement pricing policies that support industrialization by changing the terms of trade against the agricultural sector (Kay, 2002; Lipton, 1977).

Nevertheless, there are also factors that might counteract the growing employment share of the informal sector within the urban sector. According to many works in the Marxian literature (e.g., Marx, 1867; Baran and Sweezy, 1966; Gordon, Edwards and Reich, 1994; Aglietta, 2000), capitalist accumulation increases the size of corporations and concentrates capital in fewer hands. We often observe the increasing concentration of capital together with the collapse of the traditional activities that are attached to the informal sector. The argument in these studies is that the concentration of capital is a result of the capitalists' desire to eliminate the other firms and seek monopoly power. Monopoly power increases profits and reduces risks - very appealing for a capitalist. Once a monopolistic or oligopolistic structure is achieved in an industry, the capitalist creates and maintains barriers against new, smaller enterprises. Therefore, we observe an asymmetric structure in capitalist development. Structural changes in an industry that would lead to the destruction of traditional informal activities and to the concentration of capital in fewer hands are likely. However, a structural change that would destroy oligopolies in favor of the traditional sector is less likely. This asymmetric tendency leads to the reduction of traditional informal activities over time.

In addition to the influence of the concentration of capital, as urbanization continues, pressure on the land decreases and agricultural income rises, making the remaining rural dwellers less willing to move to the urban informal sector (Rauch, 1993). It can also be observed from Table 1 that the rate of urbanization declines as the country reaches a mature economy. Hence, combined with the growing centralization of capital, the slowdown in the rural-to-urban migration might create a greater tendency for the urban informal sector to shrink in more developed countries. Indeed, for different sets of countries, Rauch (1993) and Elgin and Oyvat (2013) empirically show that the share of informal activities in nonagricultural employment increases during the early phases of urbanization and declines as the

countries converge further to an urban society.

The growth of the urban informal sector can influence income inequality both positively and negatively through different mechanisms. The obvious influence of the informal sector on inequality is its impact through changing weights. When the urban inequality is decomposed into formal and informal sectors, the between component has an inverted U relationship with the employment share of the informal sector, where it is minimized for either fully informal or fully formal urban sectors. The between component of urban inequality will be maximized at a point where the informal and formal sectors both exist.

Nevertheless, the changing weights approach is very incomplete, as it assumes that people who lose their informal jobs or cannot be employed in the informal sector due to the penetration of formal activities will find better paying formal jobs. However, if the concentration of activities in the formal sector cannot create sufficient employment, then the inequality in a country might increase even as the informal sector shrinks[12].

Another factor that might increase inequality is that the vanishing of small informal enterprises might lead to a more oligopolistic structure, which would increase the rates of profits and also income inequality among households. Nevertheless, we should also note that the mechanisms creating monopoly rents are also available in sectors where informal enterprises significantly exist. In urban retailing activities, larger formal enterprises use their monopoly power on small informal retailers/street vendors, and in outsourcing activities, they use their monopsony power on informal subcontractors to exact a surplus from them (Portes, 1994). Hence, formal enterprises' penetration into informal activities might increase the rates of profit, but it is not clear whether this increase will occur by a significant amount.

There are also reasons to believe that informality increases income inequality. First,

[12]Also, even when the increase in the employment share of formal activities reduces income inequality, this reduction might not be desirable for some of the individuals whose incomes are relatively improving. The wages in formal activities are mainly better than the informal wages or the incomes of the informally self-employed (Maloney, 2004). Therefore, some of the informally self-employed are waiting to be employed in formal wage jobs. However, some of the informally self-employed prefer their own business to formal wage jobs, as they prefer to work in more flexible conditions.

subsistence activities constitute an important part of the informal sector and function as a reserve army of labor for the urban capitalist sector. Hence, a large employment share of subsistence activities reduces labor's share of income in the urban capitalist sector by improving the bargaining power of urban capitalist employees. This issue might lead to an increase in overall inequality among households. Second, higher levels of informality naturally lead to tax evasion and lower tax revenues (Rosser, Rosser and Ahmed; 2000, 2003, 2007). States with limited resources cannot implement the effective redistributive welfare policies that can be implemented through high tax revenues. In addition, progressive income tax policies can only be implemented to a significant degree in countries where incomes are accurately reported. The governments in countries with large unofficial economies tend to collect revenues by consumption taxes that are conceived as regressive (Todaro and Smith, 2009). Hence, the existence of a large informal sector leaves less space for redistributive policies and has a negative impact on inequality.

2.5. Education and inequality

Education inequality is also a factor that can explain the mechanism behind the Kuznets Curve in developing economies[13]. In the earlier phases of development, the poor cannot invest in education due to credit constraints (Galor and Zeira, 1993). Even if they have access credit, education investment would be very costly for the poor, as most of it is financed by borrowing capital rather than intrinsic family incomes (Galor and Tsiddon, 1996). In addition, extra years of education will not be significantly high for very low levels of education. Therefore, educational investment becomes beneficial only for the rich; for people with lower income levels, the returns of education are lower than its costs. As a result, lower income people are trapped in an inferior education equilibrium. Only the rich benefit from technical change, and therefore, inequality increases.

[13]In "Economic Growth and Inequality", Kuznets (1955) did not thoroughly analyze the impact of education and changing skills and only briefly mentioned education's role in "Quantitative aspects of the economic growth of nations, VIII: The distribution of income by size" (Kuznets, 1963)

In the later phase of development, a larger portion of the society can and will invest in education, for two reasons. First, as the credit constraint for the poor declines, a larger segment of the population becomes able to finance their education. Second, as labor productivity (and hence wages) increases with improving technology, the lower-income individuals prefer to benefit from these improvements and seek to obtain a similar amount of education to the higher-income classes. As a result, the gap between rich and poor would be reduced.

The institutions in developing economies can change the tendencies above, and inequality could be reduced earlier by implementing public support for the education of the poor. However, the political structure might not allow this process. According to Galor, Moav and Vollrath(2009), in underdeveloped agrarian societies the landlords would block the education reforms that would extend the education frontier to a larger portion of society due to the landlords' unwillingness to finance the education of society, as landlords at most benefit indirectly from the formation of human capita. The political restrictions on extending education services increase not only urban but also overall inequality. The negative impact of landowners becomes greater in underdeveloped societies with larger land inequality, where the self-financing opportunities of peasants are more restricted.

The negative impact of land inequality is reduced by capital accumulation followed by industrialization. The landlords trade with the urban sector, so they also benefit from the rising productivity in non-agricultural sectors. As capital stock rises relative to the land, the landowners' gains from the non-agricultural sectors increase further. After a threshold, the landlords' benefit from rising inequality would exceed their costs from financing education; thus, landlords would lose their incentives for blocking education reforms and investments. Moreover, both capitalists and workers would benefit immediately from rising urban labor productivity; therefore, they would ally for education reform at any level of development. Thus, education reform would be implemented once the landlords are convinced to extend the education frontier(Galor, Moav and Vollrath, 2009). In summary, there is a tendency for greater development to lead the political authority to be more willing to provide education

to their citizens, and thus the education inequality would be reduced. Hence, education inequality rises in the early phases of development and begins to decline past a certain income threshold.

The changes in education inequality have also been examined empirically by several studies. The outcomes of these empirical analyses depend very much on the methodology implemented for measuring the education inequality. Gregorio and Lee (2002), Thomas, Wang and Fan (2001) and Benaabdelaali, Hanchane, and Kamal (2012) measure the educational gaps using the standard deviation of years of schooling and find an inverted-U relationship between the standard deviation (SD) of schooling and the average years of education. In countries with lower average years of education, the SD of schooling initially rises and the SD of schooling starts to decline following a threshold turning point. Castello and Domenech (2002), Thomas, Wang and Fan (2001) and Benaabdelaali, Hanchane, and Kamal (2012) measure inequality by the Gini coefficient of years of schooling. They find that the years of schooling variable is positively correlated with the Gini coefficient of years of schooling. Finally, Morrisson and Murtin (2013) and Lim and Tang (2008) attribute different rates of return to each year of primary, secondary and tertiary education and calculate "human capital Gini coefficients" that measure the inequality in the education premium. Both Morrisson and Murtin (2013) and Lim and Tang (2008) find an inverted-U relationship between years of schooling and human capital Gini coefficients. The marginal returns for years of schooling in these studies come from Psacharopoulos and Patrinos (2004). However, both studies treat the returns for primary, secondary and tertiary education as constant and do not consider the changes in the education premium.

In Figure 3, the average Gini coefficient for years of schooling is presented for different groups of countries: Middle East and North Africa (MENA), Latin America, Europe, South Asia, East Asia, Subsaharan Africa and other developed (USA, Canada, Australia, New Zealand). In Figure 3, we can see that education inequality declined in all groups of countries between years 1960-2010. Among the countries with lower education inequalities, e.g., in the

European countries, the decline in the education gap is very limited between 1960-2010; in the other developed countries group, the average education inequality ceases to decline after 1980. For the given period, the decline in the education inequality is higher in the Middle East and North Africa and East Asia compared to the other regions. We will examine the relationship between income per capita and the education Gini coefficients in greater detail in the following sections.

Figure 3 here

The literature on the relationship between education and income inequalities is inconclusive and presents mixed evidence on the impact of the education frontier on income inequality. In a cross-country analysis, Sylwester (2003) finds that the greater enrollment in higher education in 1970 reduced the income inequality between the years 1970-1990. Using the coefficient of variation and standard deviation of education, Park (1996) and Gregorio and Lee (2002) respectively show that education inequality also reduces income inequality[14].

However, Castello and Domenech (2002) find a very weak correlation (0.27) between the income and education Gini coefficients. In a separate cross-country analysis, Castello-Climent and Domenech (2012) test the influence of changes in the education Gini coefficient and, surprisingly, find that the change in education inequality between years 1960-1980 did not have any significant positive influence on the change in income inequality between the years 1980-2005. Indeed, at the 10% significance level, they find that the decrease in the rate of illiteracy increased income inequality in the higher income OECD countries, and the decline in the education Gini among the literate increased income inequality both in higher income OECD and in less developed countries.

The cross-country studies on the education-income inequality relationship do not completely explain the influence of changing skills possible Kuznets Curves. Indeed, growth

[14]The problem in Sylwester (2003), Park (1996) and Gregorio and Lee (2002) is that they do not control for the country fixed effects and prefer OLS regressions. Gregorio and Lee (2002) and Sylwester (2003) use regional dummies.

in income per capita can also generate technological change, which would increase the demand for skill. According to Goldin and Katz (2008), on one hand, technological progress increases the demand for human capital; on the other hand, education investment reduces the skill premium by satisfying the demand for skilled workers. Goldin and Katz call this phenomenon "the race between education and technology", meaning that the difference between the influence of skilled biased technical change and expansion of the education frontier will determine the ratio of the earnings of the skilled and unskilled.

Acemoğlu and Autor (2012) criticize Goldin and Katz's approach and note that improving technology might not necessarily reduce the incomes of the lower skilled. Although technological improvements might be labor-saving in many tasks that do not require highly skill analytical capabilities, some of the manual tasks in the services sector cannot be replaced by machines[15], which would maintain the demand for lower skilled labor at higher levels.

Because a good cross-country proxy for measuring "labor-saving technologies" is not available, this study's scope is limited to the influence of education inequality. Hence, this study does not examine the impact of economic growth on income inequality through changing technology. Nevertheless, as there is a rising supply of relatively skilled labor, the relative incomes of skilled labor are more likely to fall in the countries where the education frontier expands. Hence, I expect "the skilled biased technical change" to be a greater issue in the countries where the expansion of education frontier has stopped (Goldin and Katz, 2008).

3. Empirical analysis

This section will empirically examine the validity of the Kuznets hypothesis and the factors that might lead to an inverted U-shaped relationship between income per capita and income inequality. Panel regressions are used to gain a deeper understanding between income per

[15]Acemoğlu and Autor (2012) explain this point by Moravac's Paradox, which can be summarized as "It is comparatively easy to make computers exhibit adult-level performance on intelligence tests or playing checkers, but difficult or impossible to give them the skills of a one-year-old when it comes to perception and mobility".

capita and income inequality.

3.1. Variable selection

For this paper, I selected the Gini coefficient as a measure of income inequality. I constructed a dataset of Gini coefficients based on different sources, which will be listed in the following section. The Gini coefficient is the most widely used measure of income inequality; therefore, it allows the construction of a larger dataset on the income inequality among households. Nevertheless, the dataset for this study includes Gini data measuring both income and expenditure inequalities; income Gini coefficient data are not available for every year and every country. For the purpose of having a larger dataset, the expenditure Gini coefficients are used as a proxy for the income Gini coefficients for the years where income Gini coefficient data are not available. However, the estimations in which the Gini coefficient is the dependent variable include a dummy variable controlling whether the dependent variable is income or expenditure inequality. Considering that the marginal propensities of consumption are usually smaller for the lower income groups, the expenditure inequalities are lower for the majority of countries (Deininger and Squire, 1996). Hence, the expenditure dummy is expected to be negative.

In this study, I control for the impact of income per capita by using the logarithm of income per capita and its square as independent variables. These two variables are commonly used in a number of empirical studies on the Kuznets hypothesis (Ahluwalia, 1976; Jha, 1996; Mbaku, 1997; Tribble, 1999; Barro, 2000; Huang et. al., 2006). Several studies applying nonparametric and semiparametric analyses (Frazer, 2006; Desbordes and Verardi, 2012) also control for the logarithms of income per capita. The logarithm of income per capita helps to demonstrate the impact of percentage changes in per capita income rather than its levels.

The regressions in this study also control for several other measures. The impact of trade liberalization on inequality is an important discussion in the trade literature. Although the majority of studies confirm that increasing trade openness decreases wage shares (Harrison,

2002; Breuss, 2010; Guscina, 2006; Onaran, 2009; Jayadev, 2007; Oyvat, 2011), there is no strong perception on the impact of trade openness on the income inequality among individuals. Among the studies on individual income distribution, Milanovic (2005) finds that trade openness increases income inequality in lower income states, and Weller and Hersh (2004) show trade to have a negative impact on the income shares of the poor. However, both Dollar and Kraay (2003, 2004) and Edwards (1997) find that trade openness does not have a negative effect on the individual income distribution. In this study, trade openness is controlled for by (volume of exports + volume of imports)/GDP ratio.

The regressions also control for the impact of economic recessions on the distribution using an economic recession dummy. In a New York Times article, Shiskin (1975) suggested the definition of a recession as a case in which GDP falls for two consecutive quarters. Many economists have used this as a rule of thumb for defining economic recessions (Claessens and Kose, 2009). Following this rule of thumb, I define years of negative growth as years of recession. Several studies show that (Gezici, 2010; Diwan, 2001; Harrison, 2002; Jayadev, 2007; Onaran, 2009) economic recessions have a negative impact on distribution.

In separate regressions, I include several other variables to explore the factors that might help to explain the inverted-U relationship between per capita income and income inequality. The share of nonagricultural employment in total employment (*Nonagri Emp*) and the nonagricultural sector's share of total value added (*Nonagri VA*) allow us to test whether the "enriching" or "enlarging" growth of the urban sector has an impact on income inequality. Following Figure 2, we expect that an increase in the nonagricultural sector's value added should increase income inequality, while the income Gini coefficient should be reduced if the nonagricultural sector creates employment. Another way of measuring the impact of the growth of urban sectors would be to control for the gap between the value added and employment shares of the nonagricultural sectors. The decline of the nonagricultural sector's share in total value added minus its share in total employment (*Nonagri VA - Nonagri Employment*) is expected to reduce income inequality by spreading the benefits of growth in

the urban sector.

To test the informal sector's influence on income distribution, I used the nonagricultural employment share of the informal sector derived from the household employment surveys. In addition, I check for the impact of the nonagricultural self-employment share as a proxy for the share of the traditional sector in the urban economy. In countries where the informal sector and self-employment are dominant, the urban population can also meet at the bottom and reduce income inequality[16]. Hence, the empirical analysis also controls the squares of the nonagricultural employment share of the informal sector and the nonagricultural self-employment share.

Another variable that might be crucial for the Kuznets hypothesis is the education Gini coefficient. The education Gini coefficient in this study is measured as the inequality in years of schooling between individuals. The decline in the education Gini coefficient is also expected to reduce the income inequality by reducing the skill gaps (Goldin and Katz, 2008; Acemoğlu and Autor, 2012). Because the influence of education inequality is expected to be realized at a longer time interval, I used 10-year lags for the education Gini coefficients in the regressions.

The analysis also includes regressions examining the factors that influence the share of nonagricultural informal employment, nonagricultural self-employment and the education Gini coefficient. I also tested the impact of per capita income on the gap between the nonagricultural sector's share in total value added and its share in total employment (*Nonagri Gap*). These regressions aim to clarify the mechanisms that lead to the potential Kuznets Curves. *Nonagri Gap* might change due to changes in the (nonagricultural sector's value added share)/(nonagricultural sector's employment share) ratio, which I call the *Nonagri*

[16]For the informal sector, I did not choose other alternatives such as Schneider, Buehn and Montenegro (2010) or Elgin and Oztunalı (2012), as both are constructed data, and the employment share of informality is more central to our analysis of the impact of the informal sector on inequality. For nonagricultural self-employment, I did not choose Key Indicators For the Labour Market's (ILO, 2013) data, as it is very limited with respect to developing economies. Also, KILM's data is a mix of self-employment's share in the whole economy and its share only in the nonagricultural sector, which might lead to inconsistencies.

Ratio. Nevertheless, *Nonagri Gap* can also change due to changing employment weights, even when the *Nonagri Ratio* is constant. Therefore, *Nonagri Ratio* is also estimated in separate regressions to determine whether the reason behind the changes in *Nonagri Gap* are merely changing employment weights or the convergence/divergence between per capita incomes in the nonagricultural or agricultural sectors.

3.2. Data sources

This article mainly uses the UNU-WIDER (2008)'s World Income Inequality Database V2.0c to measure the income and expenditure inequality. UNU-WIDER classifies the income/expenditure Gini coefficients from 1 to 4, in which 1 and 4 are the observations with the best and the worst quality, respectively. Following Deininger and Squire (1996), the observations with the quality of 3 and 4 are first excluded. Later, to increase the number of countries in the analysis, data with a quality rate of 3 are also included for the countries with fewer than two observations. The UNU-WIDER dataset continues until the year 2006. Hence, I expanded the dataset through different sources including the sources Cepal for the Latin American, PovcalNet for the Asian, Eurostat for the European, and OECD for the non-European developed countries.

For the GDP per capita, I used the Penn World Tables 7.1 database. Imports/GDP, exports/GDP, government expenditures/GDP and the value added share of the nonagricultural sector come from the World Development Indicators. The employment share of the nonagricultural sector comes from ILO's Key Indicators of Labor Market (KILM) database. In the KILM database, changes in the methodology led to an increase/decrease in the employment shares approximately 10 times. Hence, I only chose one type of series and excluded the data from different series. For the self-employment and informal employment data, I used Charmes (2009)'s dataset from the labor force surveys. In the case of informal employment, the data spans from 1975 to 2007 in five-year intervals. However, in the case of self-employment, the time span is from the 1970s to the 2000s in ten-year intervals. For the period after 2007, I used the dataset of ILO/WIEGO (2012) for the informal employment. This dataset is also

formed by country-wise labor force surveys. Charmes's and ILO/WIEGO (2012)'s informal employment estimations are consistent with each other. Both define informal employment as non-coverage by social protection.

The education Gini coefficients are taken from Benaabdelaali, Hanchane, and Kamal (2012)'s dataset on education inequality. Benaabdelaali, Hanchane, and Kamal calculate the education Gini coefficient of years of schooling using Barro and Lee (2012)'s cross-country dataset of educational attainment.

3.3. Empirical results

I first tested the validity of the Kuznets hypothesis. The relationship between income inequality and income per capita might be subject to problems of endogeneity and reverse causality. Therefore, I instrumented the logarithms of GDP per capita and its square with their 10-year lags using 2SLS methodology. Table 5 presents results for the datasets including only developing and all countries. For the first two regressions, with 10-year lags of GDP per capita, its square and cube are strong instruments according to the Kleibergen Paap rk Wald F values[17]. The estimates support the S-curve hypothesis (List and Gallet, 1999; Tribble, 2000; Galbraith, 2011) with turning points at approximately \$1950 and \$23000-26000. This result also supports this paper's claim that the Kuznets hypothesis only holds for developing economies, as only two countries, Kuwait and Trinidad and Tobago, are classified as developing and had income per capita above \$23199.

Table 5 here

Next, the logarithms of the GDP per capita and its square are instrumented with 10-year lags using 2SLS methodology. Consistent with this paper's claim, the inverted-U relationship between income per capita and income inequality holds only for the sample with only developing countries (Table 5). The turning point for the inverted-U is at approximately \$2500-

[17]Moreover, all of Kleibergen-Paap rk LM tests in this chapter reject the null hypothesis at 0.1% significance level. This shows that the instruments used in this chapter are not underidentified.

2700, which is slightly higher than the turning point estimated for all countries. Kleibergen Paap rk Wald F values again show that the 10-year lags of GDP per capita and its square are strong instruments[18]. Among the control variables in Table 5, Government Expenditures/GDP has a significant negative impact on income inequality in all of the regressions. Hence, according to the estimates, government expenditures have a redistributive character. Trade openness has a positive but insignificant sign in all of the regressions. Economic recessions significantly increase the income Gini coefficient only in the developing countries. Finally, the expenditure Gini coefficient dummy has a significant negative sign, which shows that estimating the Gini coefficient through expenditure inequality gives lower values than the income Gini coefficients.

Next, I estimate the factors leading to the possible inverted-U relationship between GDP per capita and income inequality using country fixed effects. Table 6 presents the results for the sample including only developing countries. The first two regressions show that education inequality has a positive impact; however, its coefficient is significant only at the 10% level. Next, I controlled for the impact of the nonagricultural sector's value added and employment shares. As expected, the signs for *Nonagri Emp*, *Nonagri VA* and *Nonagri Gap* are positive, negative and positive at the 5% significance level, respectively. These results are consistent with the predictions of the previous section that growth in nonagricultural value added increases income inequality if it cannot create sufficient employment. Hence, in contrast to the predictions of Kuznets (1955) and Robinson (1976), rising nonagricultural employment reduces income inequality.

Table 6 here

[18]In the first-stage estimations, the square of GDP per capita has a negative sign. This point might seem counterintuitive at the first sight; however, the 10-year lags of GDP per capita and its square do not have a negative impact when the influence of the two variables are combined. In the first stages of regressions (3) and (4) in Table 5, the smallest turning point for GDP per capita is at approximately 30 million $. For the first stages of (5) and (6), the smallest turning point is $34571. However, Kuwait is the only "developing" country whose income per capita exceeded $34571.

The last two regressions in Table 6 also control for the logarithm of GDP per capita and its square. I controlled these variables to examine whether the effect of the changing sectoral shares and education inequality on income distribution is an outcome of changing the GDP per capita. The estimates show that the coefficients for the education Gini, *Nonagri Emp*, *Nonagri VA* and *Nonagri Gap* variables lose their significance and mostly significantly decrease when income per capita and its square are controlled[19]. Moreover, the signs for GDP per capita and its square significantly support the Kuznets hypothesis, which shows that income per capita is an important driving force behind the influence of sectoral shares and education inequality on income inequality.

The relationship between value added and the employment shares of the nonagricultural sector, education inequality and income inequality might suffer from endogeneity problems. Therefore, I also instrumented the *Nonagri Gap* with its 3-year lag and education inequality's 10-year lag with its 20-year lag using 2SLS methodology. The dataset for *Nonagri Gap* is very discrete, which does not allow us to instrument *Nonagri Gap* with its further previous lags.

Table 7 presents results for the dataset including only developing countries. For all four regressions, the Kleibergen Paap rk Wald F values show that the lags of variables are strong instruments. The first two regressions show that education inequality significantly reduces income inequality. The sign for the education Gini coefficient loses its significance when *Nonagri Gap* is also controlled. Nevertheless, these results should be interpreted cautiously because the decline in the number of countries might also have reduced the significance of the education inequality's coefficients. Last, similar to Table 6, the education Gini coefficient and *Nonagri Gap* lose their significance when the GDP per capita and its square are controlled. Moreover, the estimates support the inverted-U relationship between income per capita and

[19]According to the t-tests, the coefficients in regression (5) for education Gini, *Nonagri Emp* and *Nonagri VA* are significantly smaller at the 1, 5 and 15% significance levels, respectively, than the coefficients in (3). Similarly, when the coefficients in (4) and (6) are compared, the coefficients in (6) for *Nonagri Gap* and education Gini are significantly smaller at the 5 and 20% significance levels, respectively.

income inequality, which again shows that the income per capita affects income inequality through the channels of sectoral shares and education inequality.

Table 7 here

The regressions on the nonagricultural sector's value added and employment shares do not capture the influence of structural changes within the nonagricultural sector. Hence, the impact of changes in the nonagricultural informal employment and self-employment are also tested in separate regressions. Charmes (2009) dataset reports observations for periods rather than exact years. Therefore, for Charmes's data, I selected the median years of the periods as observations[20]. When countries do not have observations of the Gini coefficient in the median years, I selected the years with Gini coefficients within the given period and took the nearest to the median of periods. The existence of nonlinear relationships between informal/self-employment and income inequality is also tested, based on the concerns discussed in the theoretical section.

Table 8 demonstrates that nonagricultural informal employment affects the income Gini coefficient positively in a linear relationship rather than an inverted-U relationship. Along with the changing weights of the informal and formal sectors, the higher rates of tax collection in countries with a larger formal sector might have reduced the inequality, as in Rosser, Rosser and Ahmed (2000, 2003, 2007). Moreover, similar to the arguments discussed in the previous chapters, a larger share of informal employment might have reduced the labor shares in the formal nonagricultural formal sector and contributed negatively to the overall income inequality.

The rising gap between the nonagricultural sector's value added and employment shares has a significant positive effect on income inequality, as in Table 6 and Table 7. Moreover, the *Nonagri Gap*'s coefficient loses its significance when the GDP per capita and its square

[20]I selected the years 1975, 1982, 1987, 1992 and 2004 for informal employment and 1975, 1985, 1995 and 2005 for self-employment.

are controlled. The education Gini coefficient is only significant at 10% in one of the regressions. Nevertheless, these results should be interpreted cautiously, as we are left with only 27 country groups when the education Gini coefficient, *Nonagri Gap*, and nonagricultural informal employment shares are controlled for in the same regressions[21]. Finally, the coefficients for informal employment do not change when the GDP per capita and its square are controlled. Hence, we cannot interpret the GDP per capita's impact on income inequality through informal employment merely by using Table 8.

Table 8 here

Table 9 here

Table 9 shows the influence of nonagricultural self-employment on income inequality. In the regressions for self-employment, I use a sample including both developed and developing countries due to lack of data for the developing economies[22]. Nonagricultural self-employment's positive impact on income inequality is significant at 5%, when *Nonagri Gap* is controlled. However, we cannot observe an inverted-U relationship between self-employment and income inequality. Similar to the previous estimations, *Nonagri Gap* has a significant positive impact. Nevertheless, the influence of education inequality is significant only at the 10% significance level. Similar to Table 9, nonagricultural self-employment's coefficient is not significantly different when the GDP per capita and its square and cube are controlled[23][24]. Hence, Table 9 also cannot suggest anything on regarding the impact of GDP per capita on income inequality through self-employment. The impact of income per capita on informal employment and self-employment is examined further in this section.

[21]Indeed, the values of the education Gini coefficient are insignificant even at the 10% level when we run regressions (4)-(7) using the same observations without controlling for nonagricultural informal employment.

[22]The number of country groups drops to 23 when nonagricultural self-employment, *Nonagri Gap*, and the education Gini coefficient are controlled in the same regression.

[23]I also control for the cube of GDP per capita, as we use the data for both developed and developing economies.

[24]According to the t-test, there is no significant difference between self-employment's coefficients in regressions (5) and (7).

Next, I tested whether the factors that affect income inequality are influenced by income per capita. First, income inequality's effect on *Nonagri Gap* and its influence on the ratio between the nonagricultural sector's value added and employment shares (*Nonagri Ratio*) are tested. Due to possible endogeneity problems, I instrumented GDP per capita with its 10-year lag when the linear effect of income per capita was being tested. Moreover, the existence of a nonlinear relationship between variables was also considered in the regressions. Hence, I instrumented GDP per capita and its square with their 10-year lags to test whether there is an inverted-U relationship between income per capita and *Nonagri Emp* or between income per capita and *Nonagri Ratio*.

According to the estimates in Table 10, there is an inverted-U relationship between income per capita and *Nonagri Gap*. That is, economic growth increases *Nonagri Gap* in the lower income countries and reduces *Nonagri Gap* in the countries with GDP per capita over \$732-840. This result is consistent with the estimates of Timmer and Akkuş (2008); however, the turning points that I estimated are smaller[25] than the ones in either study. However, the estimates show that rising GDP per capita reduces the *Nonagri Ratio* linearly, which is different from Timmer and Akkuş (2008) and from McMillan, Rodrik and Verduzco-Gallo (2014). This result suggests that the per capita incomes in the nonagricultural and agricultural sectors converge to each other with economic growth. Nevertheless, rising income per capita in the lower income countries increases *Nonagri Gap* due to the changing employment weights of the nonagricultural and agricultural sectors.

Table 10 here

Table 11 here

Next, I tested the impact of income per capita on the education inequality. For this purpose, I again instrumented GDP per capita and its square with their 10-year lags using

[25]Timmer and Akkuş (2008) find that the turning point for the gap between the value added and the employment shares of the agricultural sector is at approximately \$5063-9255.

2SLS methodology. The estimates are reported in Table 11. The results suggest an inverted-U relationship between GDP per capita and education inequality for developing countries. Hence, economic growth increases education inequality only in very low-income countries; however, it expands the education frontier in the developing economies with GDP per capita above $445-576.

Last, I estimate the effect of GDP per capita on nonagricultural informal employment and self-employment[26]. Similar to the previous estimations, for Charmes's data, I used the median years of the periods as observations. Controlling for other variables, the results suggest an inverted-U relationship between the informal employment share and per capita income and between the self-employment share and per capita income (Table 12). These results are consistent with the estimations of Rauch (1993) and Elgin and Oyvat (2013) that use a relatively smaller dataset of informal/self-employment shares. Nevertheless, the evidence is weaker for the nonagricultural self-employment rate, as the coefficients for GDP per capita and its square are only significant at 10% significance level.

Table 12 here

3.4. Summary of results

Table 13 summarizes the results of the panel regressions. The overall results are consistent with the Kuznets hypothesis. In the very low-income countries, the gap between the value added and employment shares of the agricultural and nonagricultural sectors increases with economic growth. Moreover, economic growth expands informal employment/self-employment within the nonagricultural sector and also increases education inequality. These two processes also increase the income inequality in lower income countries. In countries with per capita income between $445/576-$1897/2388, economic growth reduces education inequality; however, income inequality still rises, due partially to the influence of growing

[26]Due to data limitations, 2SLS methodology is not implemented in the regressions for nonagricultural informal employment and nonagricultural self-employment.

informal employment and self-employment. Hence, urbanization following economic growth is not itself sufficient to reduce the income inequality in lower income countries. In these countries, the poverty in the rural sector is merely transmitted to the urban informal sector, whereas a limited group of households get richer.

In countries with per capita incomes between \$1948/2695 - \$5131/5283, growing per capita incomes continue to reduce the gap between nonagricultural and agricultural incomes and education inequality. The influence of economic growth through these channels transcends the impact of growing informal employment on income inequality. Hence, the income inequality begins to decline at approximately \$1948/2695.

Lastly, for per capita incomes between \$8982/10277 - \$23199/26152, all types of structural changes listed promote a more egalitarian income distribution. In this phase of growth, the barriers between different income groups are relieved, which spreads the benefits of economic growth to a larger segment of society and reduces income inequality.

Table 13 here

4. Conclusion

This chapter empirically tests the Kuznets hypothesis and examines the factors that might lead to the Kuznets Curve. The analysis first shows that the Kuznets hypothesis is valid only for developing economies in which we observe a noticeable trend of urbanization, expansion of the education frontier and a large share of informal employment. The reasoning behind the existence of the Kuznets Curve is slightly different from Kuznets's (1955) own reasoning. The analysis finds that unlike Kuznets's own argument, the income per capita in the nonagricultural and agricultural sectors tend to converge following economic growth even in the lower income developing economies. Nevertheless, increasing the income per capita still increases income inequality through the urbanization channel due to the changing population weights effect, as in Robinson (1976) and Anand and Kanbur (1993).

Another important reason behind rising income inequality in the developing countries is the increasing intrasectoral inequality. During the earlier phases of industrialization, the shares of informal and subsistence employment in the nonagricultural sector grow, which also increases overall income inequality. Therefore, urbanization followed by economic growth does not immediately reduce income inequality. The trend of urbanization possibly feeds the growth of informal and subsistence employment in the urban sector, which leads to higher income inequality until the income per capita reaches approximately $1950.

In the latter phases of industrialization, economic growth reduces income inequality as the labor markets become more homogeneous, the impact of the gap between the nonagricultural and agricultural sectors on overall inequality declines, and the informal-formal and subsistence-modern sector divides shrink. The analysis also finds weak evidence for the effect of income per capita on income inequality through the education channel. I find that economic growth raises education inequality in very low-income countries and expands the education frontier following a turning point. Nevertheless, the evidence for the impact of education inequality is weaker than of the other mechanisms identified above, and not significant in all of the regressions.

The Kuznets hypothesis is useful for understanding the general tendencies of the changes in income distribution in developing economies, which might be crucial for correctly interpreting the effects of policies on distribution. Economic growth might lead to structural changes that would reduce income inequality in the middle and upper-middle income countries. Nevertheless, policymakers cannot entirely rely on economic growth, as other factors such as the size of redistributive government expenditures also determine income inequality. Moreover, the equalizing effects of economic growth on income Gini distribution tend to disappear as the developing economies converge to a mature economy.

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Table 1: Average yearly rates of urbanization in developed and developing economies for different per capita income groups

	Developing					Developed
	$0-2500	**$2500-5000**	**$5000-10000**	**$10000<**	**All**	
1980s	0.447	0.636	0.720	0.292	0.547	0.272
1990s	0.353	0.537	0.538	0.621	0.448	0.190
2000s	0.423	0.351	0.407	0.390	0.404	0.234

Sources: World Development Indicators (2013), Penn World Tables 7.1 (2013)

Table 2: Average yearly point (%) changes in the employment shares of agriculture, industry and services in developed and developing economies for different per capita income groups

		Developing					Developed
		$0-2500	**$2500-5000**	**$5000-10000**	**$10000<**	**All**	
1980s	*Agriculture*	-0.538	-0.843	-0.358	-0.276	-0.469	-0.166
	Industry	0.122	0.380	0.089	-0.462	-0.054	-0.433
	Services	0.383	0.530	0.175	0.728	0.509	0.616
1990s	*Agriculture*	-0.706	-0.441	-0.659	-0.301	-0.566	-0.213
	Industry	0.097	-0.259	0.000	-0.100	-0.054	-0.437
	Services	0.634	0.698	0.720	0.398	0.651	0.630
2000s	*Agriculture*	-0.627	-0.779	-0.606	-0.332	-0.620	-0.142
	Industry	0.972	0.217	-0.061	-0.272	0.174	-0.481
	Services	0.391	0.576	0.610	0.592	0.558	0.582

Sources: Key Indicators of the Labour Market (2013), Penn World Tables 7.1 (2013)

Table 3: Ratio of value added to employment shares of agriculture, industry and services in developed and developing economies for different per capita income groups

		Developing					Developed
		$0-2500	**$2500-5000**	**$5000-10000**	**$10000<**	**All**	
1980s	*Agriculture*	0.46	0.61	0.39	0.53	0.50	0.72
	Industry	2.94	1.65	1.47	1.25	1.78	1.13
	Services	2.33	1.27	1.16	0.97	1.39	0.97
1990s	*Agriculture*	0.57	0.72	0.42	0.31	0.52	0.61
	Industry	3.60	1.45	1.56	1.96	2.47	1.16
	Services	2.61	1.11	1.11	0.93	1.74	0.99
2000s	*Agriculture*	0.59	0.51	0.41	0.31	0.49	0.58
	Industry	3.18	1.60	1.52	2.12	2.30	1.15
	Services	1.86	1.19	1.07	0.85	1.40	0.98

Sources: Key Indicators of the Labour Market (2013), World Development Indicators (2013), Penn World Tables 7.1 (2013)

Table 4: Point change in the education Gini coefficient in developed and developing economies for different per capita income groups

	Developing					Developed
	$0-2500	**$2500-5000**	**$5000-10000**	**$10000<**	**All**	
1980s	-0.068	-0.074	-0.059	-0.031	-0.062	0.003
1990s	-0.061	-0.082	-0.055	-0.075	-0.065	-0.031
2000s	-0.069	-0.056	-0.053	-0.054	-0.060	-0.033

Sources: Benaabdelaali, Hanchane, and Kamal (2012), Penn World Tables 7.1 (2013)

Table 5: The impact of per capita income on income inequality: Only developing countries and all countries. (*Fixed Effects IV regressions (2SLS)- Dependent Variable: Income Gini coefficient*)

	All countries				*Developing countries*	
	(1)	(2)	(3)	(4)	(5)	(6)
Expenditure	-6.622***	-6.326***	-6.069***	-5.782***	-7.391***	-7.222***
	(1.258)	(1.214)	(1.282)	(1.235)	(1.434)	(1.386)
$Log(GDP)$	215.573***	215.593***	-2.857	0.663	31.023***	32.373***
	(42.463)	(41.888)	(4.286)	(4.691)	(12.069)	(12.041)
$(Log(GDP))^2$	-24.972***	-24.810***	0.091	-0.128	-1.964***	-2.061***
	(4.812)	(4.720)	(0.230)	(0.251)	(0.762)	(0.759)
$(Log(GDP))^3$	0.945***	0.932***				
	(0.180)	(0.176)				
Log (Trade openness)	0.618	0.583	1.055	0.984	0.079	0.350
	(0.739)	(0.779)	(0.774)	(0.814)	(1.047)	(1.078)
Government Exp/GDP		-0.444***		-0.450***		-0.277**
		(0.105)		(0.104)		(0.121)
Recession		0.321		0.366		0.716***
		(0.272)		(0.276)		(0.396)
First-stage for Log(GDP)						
$Log(GDP)$ - 10y lag	5.399***	5.637***	1.252***	1.455***	2.775***	2.795***
	(1.308)	(1.185)	(0.170)	(0.170)	(0.332)	(0.306)
$(Log(GDP))^2$ - 10y lag	-0.520***	-0.538***	-0.030***	-0.042***	-0.133***	-0.133***
	(0.155)	(0.140)	(0.009)	(0.009)	(0.021)	(0.019)
$(Log(GDP))^3$ - 10y lag	0.019***	0.019***				
	(0.006)	(0.005)				
First-stage for $(Log(GDP))^2$						
$Log(GDP)$ - 10y lag	69.203***	73.676***	7.521***	11.290***	33.916***	34.265***
	(21.745)	(19.728)	(2.755)	(2.730)	(5.484)	(5.025)
$(Log(GDP))^2$ - 10y lag	-6.968***	-7.294***	0.333**	0.103	-1.458***	-1.471***
	(2.616)	(2.360)	(0.146)	(0.148)	(0.353)	(0.323)
$(Log(GDP))^3$ - 10y lag	0.284***	0.288***				
	(0.103)	(0.093)				
First-stage for $(Log(GDP))^3$						
$Log(GDP)$ - 10y lag	753.973***	818.758***				
	(285.975)	(262.508)				
$(Log(GDP))^2$ - 10y lag	-84.223**	-89.008***				
	(34.728)	(31.619)				
$(Log(GDP))^3$ - 10y lag	3.884***	3.950***				
	(1.376)	(1.248)				
Kleibergen-Paap rk Wald F values	43.59	43.43	224.52	225.93	26.44	31.83
No. of Observations	1021	974	1021	974	502	498
No. of Groups	95	92	95	92	70	69
Turning Points	1948, 23199	1967, 26152			2695	2572

Notes: All panel regressions include a country fixed effect and robust standard errors clustered by country. The symbols ***,**, * denote the 1, 5 and 10% confidence levels, respectively. The developing countries in the regressions are countries that are not classified as having a very high human development level in the 2010 HDI rankings.

Table 6: The impact of education inequality, nonagricultural sector's value added and employment shares on income inequality: Only developing countries (*Fixed Effects regressions - Dependent Variable: Income Gini coefficient*)

	(1)	(2)	(3)	(4)	(5)	(6)
Expenditure	-5.627**	-5.503**	1.942***	2.247***	1.412	1.118
	(2.274)	(2.247)	(0.607)	(0.601)	(1.135)	(0.994)
Education Gini - 10y lag	9.922*	9.901*	7.395	3.931	2.138	0.417
	(5.844)	(5.915)	(7.410)	(6.089)	(7.052)	(6.095)
Nonagri VA			0.245**		0.187	
			(0.102)		(0.113)	
Nonagri Emp			-0.155**		-0.099	
			(0.075)		(0.070)	
Nonagri Gap				0.171***		0.122**
				(0.059)		(0.048)
Log(Trade openness)	1.094	1.183	1.806	1.958	1.638	1.584
	(1.441)	(1.453)	(2.030)	(1.739)	(2.215)	(2.130)
Government Exp/GDP		-0.214	-0.035	-0.066	-0.274	-0.286
		(0.135)	(0.223)	(0.239)	(0.233)	(0.251)
Recession		0.599	0.268	0.301	0.299	0.320
		(0.416)	(0.459)	(0.430)	(0.452)	(0.433)
$Log(GDP)$					42.993***	48.382***
					(15.079)	(17.221)
$(Log(GDP))^2$					-2.658***	-2.924***
					(0.865)	(0.984)
Constant	39.640***	40.930***	27.305**	36.052***	-138.566**	-156.647**
	(7.492)	(7.197)	(11.601)	(9.185)	(61.986)	(68.840)
R-squared	0.14	0.16	0.09	0.08	0.15	0.15
No. of Observations	495	491	273	273	273	273
No. of Groups	71	70	51	51	51	51

Notes: Robust standard errors are reported in parentheses. *, **, *** denote 10%, 5% and 1% confidence levels, respectively. The developing countries in the regressions are countries that are not classified as having a very high human development level in the 2010 HDI rankings.

Table 7: The impact of education inequality and nonagricultural sectors' value added-employment gap on income inequality: Only developing countries (*Fixed Effects IV regressions (2SLS)- Dependent Variable: Income Gini coefficient)*

	(1)	(2)	(3)	(4)
Expenditure	-6.098***	-5.853***	2.630**	1.012
	(1.554)	(1.516)	(1.311)	(1.578)
Education Gini - 10y lag	9.406**	10.004**	10.375*	8.658
	(4.220)	(4.288)	(5.965)	(8.685)
Nonagri Gap			0.244***	0.149
			(0.085)	(0.091)
Log(Trade openness)	0.977	1.118	2.327*	1.710
	(0.815)	(0.817)	(1.226)	(1.279)
Government Exp/GDP		-0.196*	-0.228	-0.439**
		(0.106)	(0.153)	(0.174)
Recession		0.576	0.211	0.154
		(0.398)	(0.434)	(0.428)
$Log(GDP)$				52.145***
				(15.254)
$(Log(GDP))^2$				-3.100***
				(0.892)
First-stage for Education Gini - 10y lag				
Education Gini - 20y lag	0.891***	0.890***	0.716***	0.653***
	(0.043)	(0.042)	(0.072)	(0.112)
Nonagri Gap - 3y lag			0.000	0.000
			(0.001)	(0.001)
First-stage for Nonagri Gap				
Education Gini - 20y lag			-4.946	-14.200**
			(4.913)	(5.841)
Nonagri Gap - 3y lag			0.632***	0.571***
			(0.080)	(0.075)
Kleibergen-Paap rk Wald F values	426.31	446.54	25.73	30.29
No. of Observations	467	463	220	220
No. of Groups	65	64	27	27

Notes: All panel regressions include a country fixed effect and robust standard errors clustered by country. *, **, *** denote 10%, 5% and 1% confidence levels, respectively. Stock-Yogo weak ID critical test values are 16.38 for a 10% maximal IV size, 8.96 for a 15% maximal IV size, 6.66 for a 20% maximal IV size, and 5.53 for 25% maximal IV size for (1) and (2); 7.03 for a 10% maximal IV size, 4.58 for a 15% maximal IV size, 3.95 for a 20% maximal IV size, and 3.63 for 25% maximal IV size for (3) and (4). The developing countries in the regressions are countries that are not classified as having a very high human development level in the 2010 HDI rankings.

Table 8: The impact of nonagricultural informal employment, education inequality and nonagricultural sectors' value added-employment gap on income inequality: Only developing countries (*Fixed Effects Regressions - Dependent Variable: Income Gini coefficient*)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Expenditure	-14.084***	-14.314***	-14.310***	-12.296***	-	-	-
	(0.924)	(0.901)	(0.846)	(1.566)			
$InformalEmp$	0.104**	-0.159	0.092**	0.113**	0.121***	0.341	0.135**
	(0.043)	(0.261)	(0.043)	(0.044)	(0.041)	(0.353)	(0.057)
$InformalEmp^2$		0.002				-0.002	
		(0.002)				(0.003)	
Log(Trade openness)	-1.140	-1.497	0.593	0.333	2.688	2.975	3.195
	(2.228)	(2.202)	(2.333)	(2.364)	(1.960)	(2.147)	(2.265)
Education Gini - 10y lag				13.293*	-3.048	-2.912	-6.200
				(7.544)	(12.018)	(11.798)	(13.069)
Nonagri Gap					0.227**	0.222**	0.188
					(0.096)	(0.097)	(0.121)
$Log(GDP)$			43.674				-2.191
			(30.619)				(55.200)
$(Log(GDP))^2$			-2.878				0.021
			(1.892)				(3.351)
Constant	50.422***	58.637***	-117.901	36.630***	27.297**	20.390	43.773
	(9.123)	(12.545)	(120.828)	(10.796)	(11.653)	(18.590)	(225.431)
R-squared	0.22	0.23	0.28	0.27	0.26	0.27	0.27
No. of Observations	86	86	86	82	55	55	55
No. of Groups	41	41	41	37	27	27	27

Notes: Robust standard errors are reported in parentheses. *, **, *** denote 10%, 5% and 1% confidence levels, respectively. The developing countries in the regressions are countries that are not classified as having a very high human development level in the 2010 HDI rankings.

Table 9: The impact of nonagricultural self-employment, education inequality and nonagricultural sectors' value added-employment gap on income inequality: All countries (*Fixed Effects Regressions - Dependent Variable: Income Gini coefficient*)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Expenditure	-5.258***	-5.500*	-5.916*	-4.889	-	-	-
	(3.141)	(2.972)	(3.251)	(3.135)			
$Self - Employment$	0.093	0.007	0.058	0.123	0.151**	0.136	0.121**
	(0.090)	(0.184)	(0.075)	(0.088)	(0.061)	(0.155)	(0.052)
$(Self - Employment)^2$		0.001				0.000	
		(0.003)				(0.002)	
Log(Trade openness)	-2.832*	-2.905**	-2.022	-1.185	3.163*	3.132*	2.469
	(1.116)	(1.107)	(1.478)	(1.340)	(1.630)	(1.701)	(1.610)
Education Gini - 10y lag				9.692	16.841*	17.135	17.222
				(6.755)	(8.962)	(8.981)	(10.314)
Nonagri Gap					0.320***	0.315***	0.232**
					(0.098)	(0.112)	(0.107)
$Log(GDP)$			157.560				243.695***
			(118.431)				(59.712)
$(Log(GDP))^2$			-18.168				-27.658***
			(13.178)				(6.860)
$(Log(GDP))^3$			0.684				1.033***
			(0.485)				(0.265)
Constant	48.710***	50.122***	-397.942	36.945***	11.343	11.587	-690.011***
	(5.278)	(4.823)	(351.638)	(8.230)	(9.579)	(10.292)	(177.368)
R-squared	0.16	0.16	0.21	0.18	0.32	0.32	0.41
No. of Observations	162	162	162	155	90	90	90
No. of Groups	67	67	67	61	41	41	41

Notes: Robust standard errors are reported in parentheses. *, **, *** denote 10%, 5% and 1% confidence levels, respectively.

Table 10: The impact of per capita income on nonagricultural sectors' value added-employment gap and ratio: Only developing countries (*Fixed Effects IV (2SLS) regressions - Dependent Variables: Nonagri Gap and Nonagri Ratio*)

	Nonagri Gap				*Nonagri Ratio*	
	(1)	(2)	(3)	(4)	(5)	(6)
$Log(GDP)$	-6.803***	-5.991***	28.877***	29.534***	-0.240***	-0.136
	(0.714)	(0.872)	(7.873)	(7.818)	(0.034)	(0.274)
$(Log(GDP))^2$			-2.189***	-2.193***		-0.006
			(0.501)	(0.506)		(0.017)
Log(Trade openness)		-1.658		-1.229	-0.139***	-0.138***
		(0.862)		(0.913)	(0.043)	(0.042)
First-stage for $Log(GDP)$						
$Log(GDP)$	0.856***	0.742***	2.522	2.233***	0.742***	2.233***
	(0.030)	(0.031)	(0.245)	(0.230)	(0.031)	(0.230)
$(Log(GDP))^2$			-0.106***	-0.095***		-0.095***
			(0.016)	(0.015)		(0.015)
First-stage for $(Log(GDP))^2$						
$Log(GDP)$			31.649***	26.570***		26.570***
			(4.294)	(3.990)		(3.990)
$(Log(GDP))^2$			-1.129**	-0.923***		-0.923***
			(0.283)	(0.263)		(0.263)
Kleibergen-Paap rk Wald F values	815.96	475.19	59.28	50.13	475.19	50.13
Turning Points			732	840		
No. of Observations	754	748	754	748	748	748
No. of Groups	56	56	56	56	56	56

Notes: All panel regressions include a country fixed effect and robust standard errors clustered by country. *, **, *** denote 10%, 5% and 1% confidence levels, respectively. Stock-Yogo weak ID critical test values are 16.38 for a 10% maximal IV size, 8.96 for a 15% maximal IV size, 6.66 for a 20% maximal IV size, and 5.53 for 25% maximal IV size for (1),(2) and (5); 7.03 for a 10% maximal IV size, 4.58 for a 15% maximal IV size, 3.95 for a 20% maximal IV size, and 3.63 for 25% maximal IV size for (3),(4) and (6). The developing countries in the regressions are countries that are not classified as having a very high human development level in the 2010 HDI rankings.

Table 11: The impact of per capita income on education inequality: Only developing countries (*Fixed Effects IV (2SLS) regressions - Dependent Variable: Education Gini coefficient*)

	(1)	(2)	(3)	(4)
$Log(GDP)$	-0.207***	-0.190***	0.720***	0.792***
	(0.015)	(0.019)	(0.161)	(0.152)
$(Log(GDP))^2$			-0.059***	-0.062***
			(0.010)	(0.010)
Log(Trade openness)		-0.027*		-0.031*
		(0.015)		(0.013)
Government Exp./GDP		-0.002*		-0.003*
		(0.001)		(0.001)
First-stage for $Log(GDP)$				
$Log(GDP)$	0.777***	0.704***	1.351***	1.474***
	(0.036)	(0.030)	(0.475)	(0.313)
$(Log(GDP))^2$			-0.038	-0.051**
			(0.030)	(0.020)
First-stage for $(Log(GDP))^2$				
$Log(GDP)$			11.835*	13.430***
			(6.836)	(4.745)
$(Log(GDP))^2$			0.024	-0.154
			(0.436)	(0.306)
Kleibergen-Paap rk Wald F values	475.22	557.49	31.06	64.92
Turning Points			445	576
No. of Observations	696	642	696	642
No. of Groups	72	70	72	70

Notes: All panel regressions include a country fixed effect and robust standard errors clustered by country. *, **, *** denote 10%, 5% and 1% confidence levels, respectively. Stock-Yogo weak ID critical test values are 16.38 for a 10% maximal IV size, 8.96 for a 15% maximal IV size, 6.66 for a 20% maximal IV size, and 5.53 for 25% maximal IV size for (1) and (2); 7.03 for a 10% maximal IV size, 4.58 for a 15% maximal IV size, 3.95 for a 20% maximal IV size, and 3.63 for 25% maximal IV size for (3) and (4). The developing countries in the regressions are countries that are not classified as having a very high human development level in the 2010 HDI rankings.

Table 12: The impact of GDP per capita on nonagricultural informal employment and nonagricultural self-employment: Only developing countries (*Fixed effects regressions - Dependent Variables: Nonagricultural informal and nonagricultural self-employment rates*)

	Informal		*Self-Employment*	
	(1)	(2)	(3)	(4)
$Log(GDP)$	129.734**	130.307**	27.209*	25.385*
	(61.187)	(63.648)	(16.392)	(15.083)
$(Log(GDP))^2$	-7.593**	-7.601**	-1.466*	-1.394*
	(3.542)	(3.720)	(0.862)	(0.797)
Log (Trade openness)	1.533	1.319	4.816*	3.747
	(5.129)	(5.189)	(2.677)	(2.678)
Government Exp./GDP		0.115		-0.429
		(0.637)		(0.331)
Recession		0.051		-0.436
		(2.015)		(1.297)
Constant	-495.027*	-499.446**	-113.561	-95.021
	(251.970)	(260.164)	(77.529)	(72.746)
R-squared	0.11	0.11	0.09	0.10
Turning Point	5131	5283	10277	8982
No. of Observations	115	115	238	230
No. of Groups	50	50	89	86

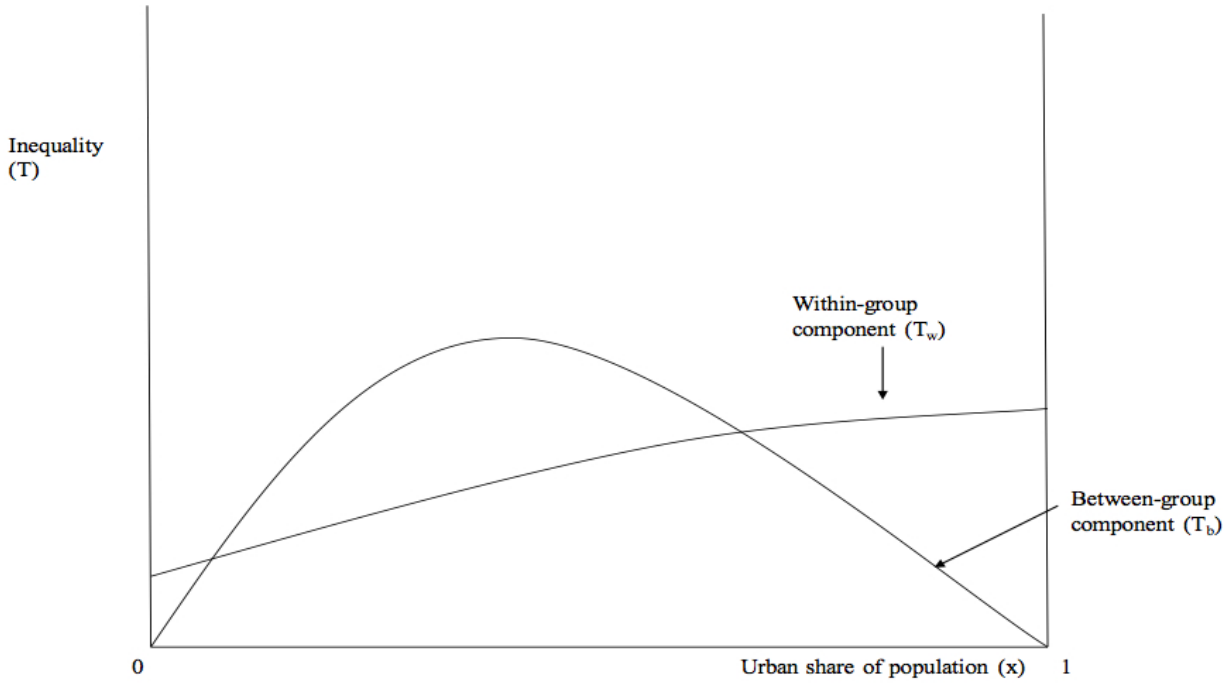
Notes: All panel regressions include a country fixed effect and robust standard errors clustered by country. *, **, *** denote 10%, 5% and 1% confidence levels, respectively.

Table 13: Summary of estimates: Impact of income per capita on different variables in developing countries

	$0 - $455/576	**$455/576 - $732/840**	**$732/840 - $1948/2695**	**$1948/2695 - $5131/5283**	**$5131/5283 - $8982/10273**	**$8982/10277 -**
Income inequality	+	+	+	**-**	**-**	**-**
Gap between nonagricultural and agricultural incomes	+	+	-	-	-	-
Informal employment in the nonagricultural sector	+	+	+	+	-	-
Self-employment in the nonagricultural sector	+	+	+	+	+	-
Education inequality	+	-	-	-	-	-

Notes: The first row shows the range of GDP per capita in which the economic growth's predicted effects are observed. (+) and (-) denote that increasing GDP per capita respectively have positive and negative impacts on the variables

Figure 1: Change in inequality in the Kuznets Process



Source: Anand and Kanbur(1993)

Figure 2: The impact of urban sector enrichment and enlargement on the overall income inequality

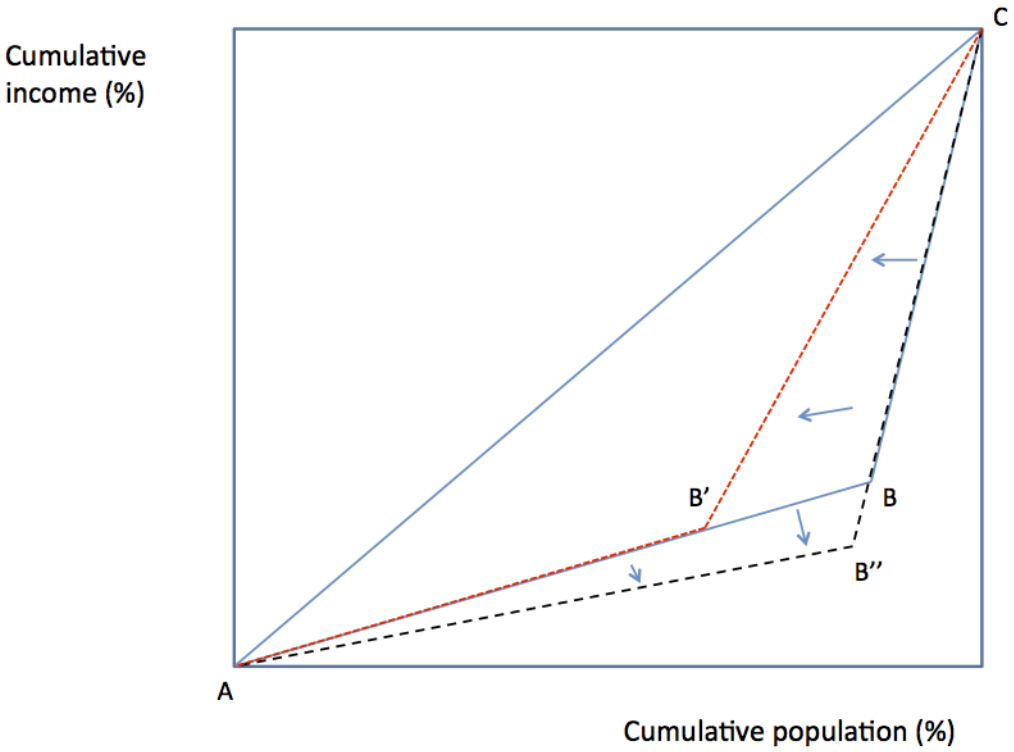
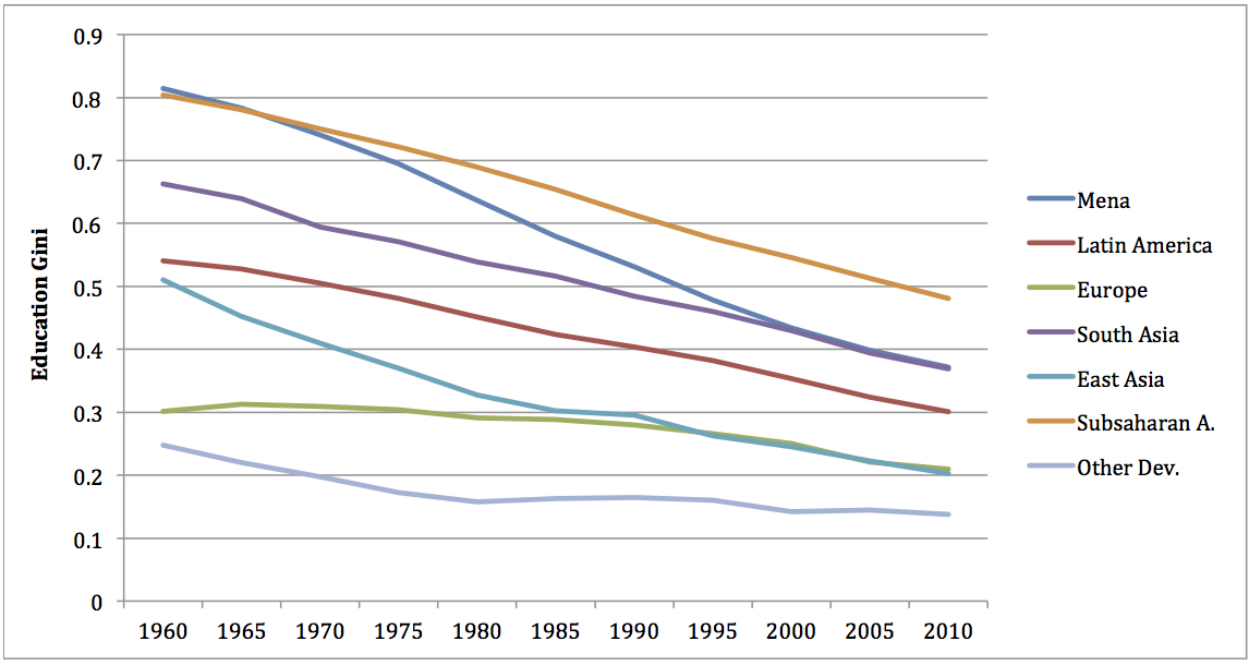


Figure 3: Average education Gini coefficients in different groups of countries (1960-2010)



Source: Benaabdelaali, Hanchane, and Kamal (2012)
Note: The education Gini coefficients measure the inequality in years of schooling.

Appendix A: Calculating Human Development Index

HDIs are calculated using the methodology explained in the Human Development Report - 2010 (2011). The HDI's in the HDR were calculated based on life expectancy, expected and mean years of schooling, and the GNP per capita. The calculations are based on UNDESA (2011), Barro and Lee (2011) and the Penn World Tables 7.1 (2013) databases. First, separate dimension indices are formed for education, life expectancy and GDP per capita using the estimated and assumed minimum and maximum values of variables. The dimension indices are estimated using the following formula:

$$dimension\,index = \frac{actual\,value - minimum\,value}{maximum\,value - minimum\,value} \tag{5}$$

Following the HDR's methodology, I used the logarithms of GDP per capita to estimate the GDP index. The maximum and minimum values were the lowest and highest values between 1960-2010. I relied on UNDESA (2011), Barro and Lee (2011) and Penn World Tables 7.1 (2013) databases for the minimum values. Following the HDR, the minimum values for life expectancy and the expected and mean years of schooling were assumed to be 20, 0, 0, respectively. The minimum and maximum values are reported in Table A1.

Two separate indices were estimated for the mean years of schooling and expected years of schooling. The geometrical mean of these two indices gives the combined education index. The combined education index over the observed maximum combined education index (0.951) is the education index. Using the geometrical mean of life expectancy, education and GDP per capita indices, I generated the Human Development Index for each year and country:

$$HDI = L_{Life}^{1/3} + L_{Income}^{1/3} + L_{Education}^{1/3} \tag{6}$$

The HDI values that I estimated are different from the HDI values that UNDP estimated in each HDR, as the maximum and minimum values used might change every year. The HDR report classifies the countries with HDI above 0.800 as being at the "very high human

development" level. These countries are classified as "developed" in this paper. The number of countries that are classified as "developed" and "developing" in the years 1985, 1995, and 2005 are shown in Table A2.

Table A1: The minimum and maximum values of variables

Dimension	Observed Maximum	Minimum
Life expectancy	85.6 (Israel, 2006)	20
Mean years of schooling	13.3 (United States, 2010)	0
Expected years of schooling	20.8 (Australia, 2002)	0
Combined education index	0.951 (New Zealand, 2010)	0
Per capita income (PPP, $)	52502 (Kuwait, 2008)	161 (Liberia, 1995)

Table A2: Number of countries classified as developing and developed for each year

	Developing	Developed
1985	96	10
1995	84	22
2005	83	23