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The Truth About Income Inequality

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Abstract

Until recently, sustaining high economic growth was thought to be the ultimate goal of development. Unfortunately, economic growth does not necessarily imply an improvement in the standards of living of all of the country's citizens, due to the unequal distribution of income. Income inequality is a problem for both developing and developed nations across the globe, but it is most evident in the great metropolises of the developing world. Much research has been done to determine the true relationship between growth and income inequality and recently, emphasis has shifted to ascertaining exactly what social and economic determinants affect the level income inequality in a country. This paper focuses on determining the effects that the level of income, structure of output, structure of employment, population growth and the level of human capital have on the unequal distribution of income. Based on Kuznets' inverted-U hypothesis and the two sector labor surplus model, this study uses two ordinary least squares regression models in order to establish the relationship between income inequality and each of these determinants. The results for this research provide some evidence on the existence on the inverted-U hypothesis. Furthermore, it is determined that the most important factors affecting income inequality are the extent of high levels of human capital, the distribution of population between urban and rural areas and the rates of population growth.

I. Introduction

For many years, maintaining relatively high gross domestic product growth was considered to be the ultimate goal for economic development. Nowadays, it is recognized that economic growth does not necessarily imply an improvement in the standard of living for all of the people in a determined country. One of the factors responsible for this phenomenon is income inequality. Income inequality exists when the share of income going to the rich is higher than the share going to the poor. As income inequality worsens, the rich get richer and the poor become poorer.

It is commonplace to see enormous wealth coexisting with great poverty, and nowhere is this more evident than on the streets of Bombay, Rio de Janeiro, Manila, Mexico City, and the other great urban conglomerates of the developing world (Ray 1998). In Brazil, for example, in 1994 the income share of the richest twenty percent of the population is thirty-two times that of the poorest twenty percent. Thus, for every dollar of income gained by the poor, the rich have gotten $32 (Fields 2001). Income inequality is a problem not only within countries themselves, but it is also a global problem affecting both developed and developing countries. It is reported that the top 1% of income recipients receive 15% of worldwide income, and the top 5% receive 40% of all income (Braun 1990). These facts are very disturbing if we consider that the world has 1.2 billion poor people who subsist on less than one dollar per person a day, and another 2.8 billion who live on between one and two U.S. dollars per person per day (World Bank 2002).

The issue of whether income inequality is affected positively or negatively by economic growth has always been of great interest to economists and, as a result, there

have been numerous studies conducted in order to find the true relationship between these two concepts. Due to the fact that results have not been consistent amongst economists, there is great controversy over whether there is a relationship between economic growth and income inequality and whether this relationship is significant or not. Unfortunately, economists have not been able to reach a consensus on the issue and recently, they have shifted their focus to ascertaining exactly what determinants affect income inequality.

The purpose of this study is to examine the effects that different social and economic factors such as the structure of output, structure of employment, level of human capital and population growth have on income inequality. In order to do, this study uses an empirical approach based on Kuznets' inverted-U hypothesis and the two-sector labor surplus model. Specifically, it utilizes two simple ordinary least-squares regression analyses on cross-sectional data. Results show that there is some evidence for the inverted-U hypothesis and that the most important factors affecting income inequality are the levels of secondary enrollment, urbanization, and population growth.

This paper is divided into six different sections. The first section introduces the problem of income inequality and emphasizes its importance. The second section states the theory from which this research is based and reviews the most important literature on the issue of income inequality. The third section presents the empirical model and explains the different variables used to characterize income inequality. The data source is described in section four. Section five explains the results obtained from the ordinary least-squares regressions. Finally, the last section describes the conclusions for this research and presents avenues for future studies.

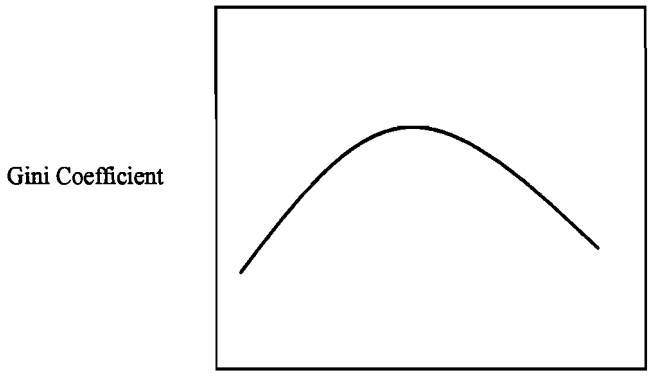
II. Theory and Literature Review

Much of the work done on income inequality is based on the research of Simon Kuznets. In 1963, a cross-sectional study of 18 countries led Kuznets to believe that there was a relationship between income inequality and growth. His results state that:

> It seems plausible to assume that in the process of growth, the earlier periods are characterized by a balance of counteracting forces that may have widened the inequality in the size distribution of total income for a while... It is even more plausible to argue that [there was a] recent narrowing in income inequality observed in the developed countries. (Kuznets 1963, p.67)

In other words, Kuznets believed that the distribution of income would tend to worsen at early stages of economic growth and then improve at later ones. This idea eventually became to be known as "the Kuznets' curve" or "the inverted-U hypothesis." Figure 1 shows Kuznets' relationship between the Gini coefficient, an aggregate numerical measure of income inequality ranging from 0 (perfect equality) to 100 (perfect inequality), and gross national product per capita. Kuznets' hypothesis became very famous because he was the first person to describe what he thought was the primary mechanism through which growth affects income inequality.

Figure 1 - The "Inverted-U" Kuznets' Curve



Kuznets' inverted-U, though, is to be interpreted as a pattern rather than a theory. The difference between a pattern and a theory is that a pattern shows a relationship between two variables while a theory asserts that changes in one variable are the cause of a change in another variable (Banya 1995). According to Hollis Chenery (1975), patterns are often used in development economics because they provide a basis for comparative analysis by which researchers are able to make generalizations about the development process of an individual country and thus, compare it to that of other countries.

The model supporting the reasoning behind the inverted-U hypothesis is the two-sector labor surplus model. Before a country starts to develop, its economy is agrarian and a surplus of labor exists in this sector, so that wages are equal to subsistence wages. Since the amount of land available is fixed, as more labor is added to the agricultural sector, workers' productivity decreases. After a certain point, additional workers will not increase output and hence, there is an excess supply of labor.

As a country starts to industrialize, there is a greater demand for workers in factories. In order to attract the excess supply of labor in the agricultural sector, the manufacturing sector has to offer a wage slightly higher than subsistence wage. As long as there is still a surplus of labor in the agricultural sector, income inequality will increase as workers move to the manufacturing sector. This is due to the fact that the increasing amount of labor at low cost in the industrial sector raises output in this sector, causing capital owners to realize huge profits, thus increasing their incomes, while wages remain constant (Gillis 1992). This will continue until there is no longer a surplus of labor in the agricultural sector and labor becomes scarce.

As the demand for labor in the industrial sector keeps increasing wages rise and at the same time, workers in the agricultural sector become better off because the supply of agricultural labor is decreasing (Banya 1995). As more workers move away from the agricultural sector, the available land per worker and the marginal productivity of labor start to increase and as a result, wages in the agricultural sector increase as well. This way, in order to attract more workers from the agricultural sector, the manufacturing sector has to increase its wages higher than those in agriculture. Moreover, as wages rise, income inequality falls because as workers earn higher wages, they are taking more money away from the wealthy, reducing wage differentials. In this manner, as wages rise in both the agricultural and manufacturing sectors, income inequality decreases.

A number of studies have tried to recreate Simon Kuznets' research in order to determine whether the inverted-U hypothesis truly holds. The results of these studies have been quite split. For every study that says that the Kuznets' curve holds there is another one that claims that there is no such relationship between income inequality and growth. Early economic studies such as those by Ahluwalia (1976), Paukert (1973), and Williamson (1985) support the notion of the inverted-U, whereas others such as those by Fields (1989, 2001), Ravallion (1995), and Aghion, Caroli and Garica-Peñalosa (1999) question the notion of the inverted-U. It has been hypothesized, though, that the reason why recent studies have yielded different results is because data have become more available throughout time. Regardless, there is still great disagreement on whether the inverted-U really exists or not.

In recent studies, researchers have shifted their focus towards ascertaining what exactly are the factors that affect income inequality. According to Chenery (1975), Fields

(2001), and Bruno, Ravallion and Squire (1996), per capita income levels and the rate of economic growth are not the only determinants of income inequality. Additional factors, such as the nature of the economic system, structure of output, structure of employment, population growth, and human capital, also affect the distribution of income.

First of all, the nature of the economic system itself is very important. Empirical research, such as that from Ahluwalia (1974, 1976) and Anand and Kahbur (1993), has determined that income inequality in socialist countries, *ceteris paribus*, is lower than that of non-socialist economies due to their patterns of asset ownership and government spending. The fact that many sectors of the economy are regulated by the government in socialist countries facilitates the equal distribution of resources amongst the population and thus, income inequality is low.

Another determinant of income inequality is the structure of output, which refers to the configuration of total production in a country as produced by different economic sectors. The two-sector labor surplus model, which depicts the notion of modern sector enlargement, supports this concept. As the modern industrial sector expands, it absorbs a greater percentage of the population, whereas backwards sectors, like agriculture, diminish in importance (Fields 1980). Ahluwalia (1976, p. 321) suggests that:

> As the relative size of the agricultural activity diminishes, compared to nonagricultural activity, there is a shift towards greater concentration of income and wealth because the nonagricultural sector typically promotes larger size production units for both institutional and technological reasons.

Thus, the more important agriculture is in the economy, *ceteris paribus*, the lower the income inequality.

The structure of employment, an additional determinant of income inequality that goes hand in hand with the structure of output, reflects how employment is dispersed throughout the different economic sectors. As the structure of output varies, either the amount of employment or the productivity of workers in each sector has to change. In addition, since most people in the developing world derive most of their income from self-employment on family farms or family businesses, the structure of employment plays a critical role in the distribution of assets with which they have to work (Fields 2001). Several economists have hypothesized that, holding everything else constant, as the population shifts to the urban sector, income inequality falls. This is due to the fact that as urbanization rates increase there is greater access to productive employment opportunities in the expanding nontraditional sector and a correspondingly lower pressure of population in the rural areas (Ahluwalia 1976).

Population growth plays a crucial role in determining income inequality because it presents demographic pressures on the economy. According to Banya (1995) and following from the two-sector labor surplus model, the higher the population growth in a country, the longer labor costs will remain low as workers move from the agricultural sector to the manufacturing sector, enabling industry owners to make greater profits and worsen inequality. High population growth rates will then shift the country's inverted-U curve upwards, increasing inequality at any given level of per capita income.

The level and inequality of human capital, otherwise known as education, is another very important factor affecting the distribution of income. According to human capital theory, education augments cognitive and individual skills, increasing worker's productivity and thus, leading to higher labor income (Seligson 1998). Through the

acquisition of education, workers shift from low paid, unskilled employment to high paid, skilled employment. This shift produces higher labor incomes, a reduction in skill differentials and an increase in the share of wages in total output (Ahluwalia 1976). This creates a virtuous cycle where as education expands, *ceteris paribus,* income inequality improves and as people have more money they will have greater to access to education. George Psacharpoulos (1991) believes that education significantly contributes to growth because it reduces both poverty and income inequality.

Following from the preceding theory, this paper will try to determine, through empirical research, how each of the above determinants affect the level of income inequality.

III. Empirical Model

There are numerous ways through which one can measure income inequality. Moreover, previous studies on income inequality have used different proxies for each of the five different categories affecting income inequality mentioned above. Thus, before presenting the empirical model, it is necessary to specify exactly how each of these concepts is measured in this research.

In order to measure the level of income inequality, this study uses the Gini coefficient because it is the most common inequality measure (Clarke 1992) and the one for which the most data are available. The Gini index measures the extent to which the distribution of income amongst individuals or households within an economy deviate from a perfectly equal distribution. Gini coefficients have values ranging between 0 and 100, where 0 implies perfect equality and 100 implies perfect inequality.

This study uses two different measures to represent the structure of the economy, which includes both the structure of output and the structure of employment. The first proxy consists of the following two measures: agriculture as a percentage of GDP and the percentage of urbanization in a country. The reason why both measures are used together is because agriculture as a percentage of GDP captures the proportion of total output produced by the agricultural sector, whereas the percentage of urbanization looks at the number of people who live in cities as opposed to rural areas. The second proxy, instead, includes a measure for productivity in the agricultural sector and the percentage of urbanization. Productivity in the agricultural sector simply refers to output per worker and is calculated by dividing the total amount of output in dollars by the total amount of workers in the agricultural sector. Both proxies try to quantify, through different means, exactly how productive agricultural workers truly are and thus, this study uses both as substitute measures for the structure of the economy.

Education is measured in this study by two variables: the illiteracy rate and the rate of secondary enrollment. These two variables are considered because they focus on two slightly different aspects of education. The illiteracy rate measures a relatively low level of education, whereas the rate of secondary enrollment measures a higher level of education. It is important to note that it is crucial to include both measures of education because in many developing countries getting secondary education is rather unfeasible and simply knowing how to read and write can give a worker a competitive advantage over other less educated individuals. Thus, by using both variables together one is able to account for the extent and effect of two different levels of education.

Even though the nature of the economic system is an important determinant of the distribution of income, it is excluded in this study. The reason for this is that simply including a proxy for whether a country is socialist or not might underestimate its true effect due to the fact that some countries are not necessarily set up as socialist governments, but have adopted some of their policies. In addition, no good measurement exists as to how "socialist" a country really is. Therefore, further study needs to be conducted before such a variable can be included.

As stated previously, this study examines the effect that the structure of the economy, the level of human capital, population growth and per capita GDP levels have on income inequality. This is accomplished empirically through ordinary least-squares regression analysis. Specifically, the following two models are considered:

$$\text{(Model 1) } Gini = \alpha + \beta_1 YPC + \beta_2 YPC^2 + \beta_3 Agriculture + \beta_4 Urbanization + \beta_5 Secondary\ Enrollment + \beta_6 Illiteracy + \beta_7 PopGrowth$$

$$\text{(Model 2) } Gini = \alpha + \beta_1 YPC + \beta_2 YPC^2 + \beta_3 Productivity + \beta_4 Urbanization + \beta_5 Secondary\ Enrollment + \beta_6 Illiteracy + \beta_7 PopGrowth$$

In the above models, YPC stands for the real gross domestic product per capita. The agriculture variable represents the percentage of total output (GDP) coming from the agricultural sector in the economy. On the other hand, Productivity refers to how much total agricultural output is produced by each worker in this sector. The urbanization variable stands for the percentage of total population living in urban areas. Secondary Enrollment and Illiteracy stand for two different levels of education. In particular,

Secondary Enrollment refers to the ratio of total enrollment, regardless of age, to the population of the age group corresponding to the secondary level of education, while Illiteracy refers to the percentage of adults who cannot read and write (World Bank 2002). The last variable, Popgrowth, refers to the rate of population growth.

Based on the nature of the Kuznets' curve, there could be a nonlinear relationship between income inequality and gross domestic product per capita and thus, the variable YPC^2 is included in the model. Specifically, the coefficient for YPC should be positive and the coefficient for YPC^2 should be negative. This is because for low levels of GDP per capita, on the increasing side of the Kuznets' curve, the coefficient for YPC dominates, increasing income inequality. For higher levels of GDP, though, on the decreasing side of the Kuznets' curve, the coefficient for YPC^2 dominates, decreasing income inequality.

The coefficient for the agriculture variable is expected to be negative because as agriculture as a percentage of GDP falls, compared to other sectors of the economy, the distribution of wealth becomes unequal due to the larger production units in other sectors. In other words, as the agricultural sector shrinks while holding everything else constant, less money is being made overall in this traditional sector compared to the modern sector and thus, the rich get richer while the poor get poorer. Similarly, in Model 2, the coefficient for the productivity variable is expected to be negative. This is due to the fact that as agricultural workers become more productive, their wages should increase and income inequality should fall. The coefficient for the urbanization variable is expected to have a negative coefficient at all times because urban areas provide greater access to

more productive employment opportunities and higher paying jobs. Thus, the greater the number of people migrating to urban areas, the less unequal income distribution will be.

The variable measuring secondary enrollment is expected to have a negative coefficient while the variable measuring illiteracy is expected to have a positive coefficient. Accordingly, as the amount of people enrolled in secondary education increases, both skill and wage differentials fall causing income inequality to improve. On the other hand, as illiteracy rates become greater, so will the inequality in the distribution of income. Lastly, the coefficient for the population growth variable is expected to be positive at all times because as the rate of population growth increases, the longer labor costs will remain low as workers shift from the agricultural to the manufacturing sector. Table 1 below presents the definitions and expected signs for the coefficients of each of the variables used.

Table 1 – Dependent and Independent Variables

Variable	Definition	Expected Sign
Dependent		
Gini	Measures the extent to which the distribution of income among individuals or households within an economy deviate from a perfectly equal distribution	
Independent		
YPC	Gross domestic product divided by midyear population. Estimates are in constant 1995 US dollars.	+
YPC^2	Gross domestic product per capita squared. Estimates are in constant 1995 dollars.	-
Agriculture	Net output of the agricultural sector[1] as a percentage of total output.	-
Productivity	Net output of the agricultural sector as a percentage of total output in a country divided by the proportion of total employment recorded as working in the agricultural sector.	-
Urbanization	Share of the total population living in areas defined as urban in each country.	-
Secondary Enrollment	Ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education shown. Estimates are based on UNESCO's classification of education levels.	-
Illiteracy	Percentage of people ages 15 and above who cannot, with understanding, read and write a short, simple statement on their everyday life.	+
Popgrowth	Annual population growth rate.	+

Source: World Development Reports 1978-2002 and World Development Indicators 2002

IV. Data

Since income inequality did not become a major concern until the seventies, much of the data available are very limited and changes over time have not been recorded. Although there is extensive research on the topic, much of the data used have been criticized for being inadequate and for not fulfilling the minimum criteria of acceptability. Fields (1991) and Deninger and Squire (1997) present similar criteria.

[1] Includes forestry, hunting and fishing, as well as the cultivation of crops and livestock production.

According to Fields, data should be based on a household survey or census, be national in coverage, have constant income concepts and recipient units, and must be present in enough categories to permit reasonable calculations of inequality and poverty measures to be adequate for research. For Deninger and Squire, data should be based on nationally representative surveys, cover the entire population, and encompass all types of income such as non-wage income and that from household production. Keeping these criteria in mind, this study will use data collected from different publications from the World Bank Organization.

In particular, the data for this empirical study are collected from the World Development Reports (from 1978 through 2002) as well as the 2002 World Bank Development Indicators. The World Development Reports have been published annually by the World Bank since 1978. Every year, the reports focus on a specific aspect of development such as the role of the state, transition economies, labor, infrastructure, health, the environment, and poverty. In addition, each report contains a selection of World Development Indicators, ranging from environmental to economic data. The 2002 World Bank Development Indicators is a database containing the most detailed information on human welfare in order to provide a picture of the social effects of economic development on different countries. Data for over 550 development indicators and time series data from 1960-2001 for over 200 countries and 18 country groups are complied into this single source. Data include social, economic, financial, natural resources, and environmental indicators. The primary sources for the data included in both publications are the files and periodicals of specialized international agencies such as the Food and Agriculture Organization, the Educational, Scientific and Cultural

Organization, the United Nations Statistical Office, and the World Health Organization. Supplementary sources include the Population Council, the United Nations Research Institute for Social Development, and World Bank data files[2].

Due to limitations on the availability of dependable information, this research uses cross-country data from 79 different nations located in the following regions of the world: Africa, Central and South America, Europe, Asia and the Middle East. The 79 different countries include both developed and developing nations for which valid data are available for all variables. Due to data limitations it is not possible to look at the pattern of growth over time of different countries. However, in order to generate as large a sample size as possible, whenever data were available for all variables for a country in multiple years, all years were included. It must be clarified, though, that each nation at a specific point in time is considered to be a different case rather than the same country over a specific time period. In other words, the data for Jamaica in 1981 and 1995 are considered as two different cases representing two different countries. An advantage of using this type of data is that "it can mimic precisely what is difficult to do for a single country; that is, data can be obtained for (different countries at) widely different stages of development" (Ray 1998, p. 202). A list of all the countries considered in this study, along with the years for which data were available, can be found in Appendix I.

All of the data collected for each of the variables included in the regression models vary greatly. It is interesting to note that even though some countries may be very similar in one aspect, they can be totally different in some other aspect. For example, two countries with comparable income per capita levels can have very dissimilar levels of

[2] Some demographic and labor force indicators are estimated by interpolating census observations.

income inequality as well urbanization rates. Table 2 below summarizes the demographics of the data collected.

Table 2 – Variable Statistics

Variable	Minimum Value	Maximum Value	Average
Dependent			
Gini	16.2	61.3	40.13
Independent			
YPC*	$1.02	$191.80	$22.16
Agriculture	3.03%	58%	19.6%
Urbanization	4.9%	85.8%	48.6%
Productivity**	0.2	19.58	1.46
Secondary Enrollment	5.33%	108.48%	55.72%
Illiteracy	0.2%	87.8%	23.7%
Popgrowth	-1.8%	11.2%	1.5%

Note: * YPC data is measured in hundreds of dollars. ** Productivity measures the total quantity of output in dollars per worker.

It is noteworthy to point out some of the different observations found in the data. First of all, the Gini coefficients in the sample range from 16.2 to 61.3 with Zambia (1993) experiencing the lowest income inequality and Central African Republic (1993) experiencing the highest level of income inequality. This is quite intriguing for both African countries have relatively low income per capita. The variance in income level is also very great with Italy (1995) having the highest income per capita at $19,180. This value is somewhat of an outlier, though, for 43% of all countries in the sample have income per capita of less than $1,000. Only Korea and the European countries have income per capita values greater than $8,000.

As expected from the theory, agriculture as a percentage of GDP is lower in wealthier countries. Moreover, these percentages are the highest in Asian and African nations. Surprisingly, both the highest and lowest agricultural productivities can be found in Latin American countries with Mexico (1995) being the least productive and Colombia

(1991, 1995, 1996), Bolivia (1990) and Peru (1994) being the most productive. It is important to point out that these productivity values are all higher than 11.0 (dollars of output per worker), whereas 88% of all cases have productivity values of less than 1.0. The percentage of urbanization is the highest in Latin America. For example, Venezuela (1990, 1995, 1996), Brazil (1995, 1996), and Chile (1994, 1996) have urbanization values of over 78%. On the other hand, the lowest urbanization levels can be found in Burundi (1992), Rwanda (1983-1985) and Nepal (1984-1985) in which less than 10% of their total population live in urban areas.

Also, following from the data, secondary enrollment rates are the lowest in the poorer African nations and higher in European nations. Accordingly, illiteracy rates run very low for European countries and are the highest in countries with per capita incomes of less than $1,000. Niger (1992) has the highest illiteracy rate with 87% of its adult population not being able to read and write. Around 26.4% of all countries in the sample had illiteracy rates of less than 3.0% whereas 14.3% had illiteracy rates greater than 60%.

The data on population growth rates are also quite varied and interesting, with European countries exhibiting negative rates. It is noteworthy that 27.0% of all cases have population growth rates less than 0.5% and that 19.3% of all cases have negative population growth rates. The population of Jordan (1991) has the highest rate of growth at 11.2%, but this value is clearly an outlier because the second highest rate of population growth is that of Niger (1995) with a value of 3.5%.

V. Results

The results for both ordinary-least squares regressions, Model 1 and Model 2, are presented in Table 3.

Table 3 – Regression Results

Variable	Model 1	Model 2
Constant	38.978**	35.080**
	(6.333)	(6.208)
YPC	0.168	0.131
	(1.939)	(1.803)
YPC^2	-1.115E-03*	-8.928E-04*
	(-2.287)	(-2.200)
Agriculture	-6.789E-03	
	(-0.071)	
Urbanization	0.186**	0.198**
	(3.241)	(3.769)
Productivity		0.114
		(0.534)
Secondary Enrollment	-0.200**	-0.165**
	(-3.886)	(-0.395)
Illiteracy	-4.084E-02	-0.144*
	(-0.793)	(-2.287)
Popgrowth	1.512*	3.981**
	(2.269)	(4.324)
Adjusted R^2	0.311	0.531
Sample Size	140	92

Note: ** Significant at the 0.01 level. *Significant at the 0.05 level. The numbers in parenthesis represent the two-tailed T values corresponding to each coefficient.

The results are quite similar for both models and, thus, are quite robust. Changing the way the structure of the economy is measured does not drastically change any of the other results for the other variables. According to the adjusted R^2 values, the first model explains around 31.1% of the total variation in the Gini Coefficients whereas the second model is able to explain around 53.1%. Such adjusted R^2 values indicate that there is still some variability in the Gini Coefficients that was not accounted for. In both models, the coefficients for the variables have the expected signs, except for illiteracy, urbanization, and productivity.

The YPC variable coefficients, which showed the correct positive signs in both models, are not significant at the 0.01 level, but are relatively close to being significant at the 0.05 level of significance. On the other hand, the coefficients for YPC^2 not only had the correct signs in both models, but they are both significant at the 0.05 level. This shows that for small levels of income per capita the positive income effect outweighs the negative effect whereas for higher levels of income per capita the negative effect of GDP per capita squared on income inequality outweighs the positive effect of GDP per capita. Since the signs of the coefficients for both income variables are as expected, and they are both somewhat significant, the regressions results do yield evidence for an inverted-U relationship between income per capita levels and income inequality.

Given the inverted-U, it is interesting to note exactly where the turning point for each of these curves occurs. For Model 1, the turning point for the inverted-U is found at an income per capita level of $7,547 whereas for Model 2, the turning point is found at an income per capita level of $7,330[3]. There are no countries in the data used in this research that are remotely close to either side of the turning point for either Model 1 or Model 2. The closest income per capita values on both sides of the turning point are Croatia (1998) at $4,961 and Slovenia (1993) at $8,693. Thus, 93.57% of all cases included in the regression analysis have income per capita levels corresponding to the upward sloping half of the inverted-U in Model 1, whereas only 6.43% of all cases have income per capita levels on the downward sloping part of the curve. Similarly, for Model 2, 90.21% of all cases have income per capita levels corresponding to the upward sloping half of the inverted-U, whereas 9.79% of all cases have income per capita levels corresponding to

[3] Turning points are calculated by finding the partial derivative of each equation with respect to YPC and setting it equal to zero.

the downward sloping part on the curve. Note that these percentages differ due to the fact that Model 1 has 140 cases, whereas Model 2 only has only 92 observations.

The measure for agriculture as a percentage of GDP, which was used solely in Model 1, had a coefficient value of –0.00679. Although the coefficient for this variable was not significant, it did have the expected negative sign. On the other hand, in Model 2, the results for the productivity variable turned out to be insignificant and had the wrong sign. Following from these results, as productivity increases by one point income inequality should increase by 0.114, which is counterintuitive. Moreover, the coefficients for the urbanization variable were each significant at the 0.01 level, but showed the incorrect signs in both regressions. The values for the urbanization variable, in Models 1 and 2 suggest that as the percentage of people living in urban areas increases by one percent, income inequality should increase by 0.186 and 0.198, respectively. Regardless, the structure of the economy definitely influences income inequality, though a better measure for this category must be determined.

Even though these results seem to be counterintuitive it is possible to offer some explanation as to why the urbanization coefficients turned out to be positive rather than negative. In Model 1, as urbanization increases more people are moving from the agricultural sector to the manufacturing while agricultural output is staying constant. Thus, agricultural productivity and wages must be increasing. However, there is a possibility that manufacturing wages could be increasing at a much faster rate in order to attract more workers and thus, income inequality might actually be worsening. Similarly, in Model 2, as urbanization rates increase while agricultural productivity and wages stay constant, the agricultural sector shrinks. Since wages are relatively low in the

manufacturing sector, as people move over, capital owners get richer while everybody else's economic situation remains unchanged.

It follows from these results that the extent of inequality in asset ownership, whether it be land or capital, is also very important. It could be plausible that since this research did not control for asset ownership, this effect might be captured by the urbanization variable and thus, it could be distorting the results. If only a small amount of the population in a country own the vast majority of the land and capital, such as in the large latifundios in Latin America, income inequality has to be greater in these areas. Furthermore, if agricultural productivity and wages are held constant, as people move over from the traditional agricultural sector to the manufacturing sector only those select individuals who actually own land or capital are getting wealthier and thus, the disparity between the income levels of these two groups widens. Accordingly, there is no doubt that the extent and inequality of asset ownership is crucial to understanding the levels of inequality in each country.

The results for the education variables were also very similar in both models. The coefficients for the secondary enrollment variables were significant at the 0.01 level and had the expected negative signs. The results for Models 1 and 2, show that as secondary enrollment increases by one percentage point, income inequality should decrease by 0.20 and 0.165, respectively. The other proxy for education, illiteracy, showed rather interesting results for they are counterintuitive. The coefficients for the illiteracy variable were found to be negative rather than positive. Following from the results, income inequality should decrease when illiteracy rates increase. What is even more surprising, though, is the fact that in the second model the coefficient for illiteracy was found to be

significant at the 0.05 level. Since the illiteracy variable was only found to be significant in Model 2 when the measure for agriculture as a percentage of GDP was substituted by agricultural productivity, there seems to be some kind of collinearity between these three variables. Even though the results for illiteracy were counterintuitive, the strength of the results for the secondary enrollment variable support the cyclical relationship between education and income inequality.

Finally, the coefficients for the population growth variable not only had the expected signs, but they were found to be significant. In Model 1, the population growth coefficient had a value of 1.512 and was significant at the 0.05 level. This means that as the rate of population growth increases by one percentage point, income inequality should increase by 1.512 points. Similarly, in Model 2, the coefficient for the population growth variable had a value of 3.981 and was significant at the 0.01 level. Thus, as population growth increases by one percentage point income inequality should increase by 3.981 points. These results support the idea that holding everything else constant, as population growth increases, income inequality worsens.

VI. Conclusions

Regardless of the fact that this research is based on less than ideal data, the results for both regressions turned out to be rather robust because changing that way in which the structure of the economy is measured did not radically change the results for the other variables. Following from the regression results, since both income variables were closely significant at the 0.05 level and had the expected signs and thus, there is some evidence of the inverted-U when other determinants are taken into account.

Since secondary enrollment, urbanization, and population growth appeared to be the most significant variables affecting the distribution of income, it can be concluded that the most important determinants of income inequality are the extent of high levels of human capital, the distribution of population between urban and rural areas and the rates of population growth. Thus, in order to improve the distribution of income, governments should increase the access to education, especially to higher levels such as high school and college. In addition, they should try to control urbanization rates by maybe providing people who live in rural areas with higher wage employment opportunities in those areas, as well as maintain low population growth rates by disseminating information on family planning.

Unfortunately, since no clear inferences can be made regarding the agriculture, productivity and illiteracy variables, due to the existing collinearity between these measures, it is impossible to make any substantial conclusions regarding the effect that the structure of output and extent of lower levels of human capital have on the distribution of income. Regardless, it is vital to point out that these variables are utterly important to understanding the levels of income inequality in any country and thus, they should not be discarded. As a result, further research must be conducted to identify a better proxy for the structure of the economy.

The adjusted R^2 values of both models imply that there are certainly other factors that influence income inequality. As mentioned previously, the nature of the economic system is very important and should be included in future research. Moreover, it must be pointed out that countries with the same levels of per capita income can be very different. Thus, it would be interesting to include other political and socio-economic variables such

as the size of the country and its geographical location. The actual composition of agricultural output, that is the percentage of products that are produced by mining, forestry, and crop cultivation, could also affect income inequality. As previously stated, including a measure for the extent and inequality of asset ownership, is crucial since it captures the way in which property, in the form of land or capital, is distributed amongst the population. In addition, data-gathering methods must become more standardized in order to make data, for both time-series and cross-country studies, more available and dependable.

Income inequality is a very extensive problem that plagues both developed and developing countries around the globe. This research was able to find that, after taking into account other determinants of income inequality, there seems to be an inverted-U relationship between income per capita levels and Gini coefficients. In addition, the most important determinants of income inequality are high levels of human capital, urbanization rates and population growth rates. Regardless, there is still much more to be discovered about income inequality and thus, this problem should be researched further. Only by doing so, will researchers be able to come up with an answer as to what factors truly influence income inequality and consequently, develop the appropriate policy implications to improve the unequal distribution of income both within and amongst countries.

APPENDIX I – Countries Used in the Research

Algeria (1995)
Armenia (1996)
Bangladesh (1992, 1995-1996)
Belarus (1993, 1995, 1998)
Bolivia (1990)
Brazil (1995, 1996)
Bulgaria (1992, 1995, 1997)
Burkina Faso (1994)
Burundi (1992)
Cambodia (1997)
Central African Republic (1993)
Chile (1994, 1996)
China (1992, 1995, 1998)
Colombia ((1991, 1995, 1996)
Costa Rica (1996, 1997)
Cote d'Ivoire (1995)
Croatia (1998)
Dominican Republic (1996, 1998)
Ecuador (1994, 1995)
Egypt (1991, 1995)
El Salvador (1995, 1996)
Estonia (1993, 1995, 1998)
Ethiopia (1995)
Ghana (1992, 1998)
Greece (1993)
Guinea-Bissau (1991)
Honduras (1992, 1996)
Hungary (1993, 1996, 1998)
India (1992, 1994, 1997)
Indonesia (1993, 1996, 1999)
Italy (1991, 1995)
Jamaica (1991, 1996)
Jordan (1991)
Kenya (1992, 1994)
Korea, Republic of (1993)
Lao (1992, 1997)
Latvia (1993, 1995, 1998)
Lithuania (1993, 1996)
Madagascar (1993)
Malaysia (1995)
Mali (1994)
Mauritania (1995)
Mexico (1992, 1995, 1996)
Moldova (1992)
Mongolia (1995)
Morocco (1990-1991, 1998-1999)
Mozambique (1996-1997)
Nepal (1984-1985, 1995-1996)
Nicaragua (1993)
Niger (1992, 1995)
Nigeria (1993, 1996-1997)
Pakistan (1991, 1996)
Panama (1995)
Papau New Guinea (1996)
Paraguay (1995, 1998)
Peru (1994, 1996)
Philippines (1994)
Poland (1992, 1996)
Portugal (1994-1995)
Romania (1992, 1994)
Russian Federation (1993, 1996, 1998)
Rwanda (1983-1985)
Senegal (1991, 1995)
Slovenia (1993, 1995, 1998)
South Africa (1993-1994)
Spain (1990)
Sri Lanka (1990, 1995)
Tanzania (1993)
Thailand (1992, 1998)
Tunisia (1990, 1995)
Turkey (1994)
Uganda (1992-1993, 1996)
Ukraine (1992, 1995, 1996)
Uzbekistan (1993)
Venezuela (1990, 1995, 1996)
Vietnam (1993, 1998)
Yemen (1992, 1998)
Zambia (1993, 1996, 1998)
Zimbabwe (1990)

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