Income Redistributive Effects (IREs) on Poverty and Inequality in Latin America: A Cross-Country Analysis

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

Original Research Article

ABSTRACT

This paper analysed the effects of taxes and benefits on income inequality and poverty in Latin America. The study used an exploratory research design, with both linear and nonlinear regression models. The paper found that both direct and indirect taxes have no direct influence on income inequality and poverty in a short-term. Significantly, the social spending is found to reduce both poverty and inequality. The paper concluded that, taxes –benefits system in Latin America is effective to eradicate income inequality and poverty, but it is ineffective to reduce the poverty rate and income inequality amongst the countries. The paper recommended that the countries in Latin America should set the policy priority on increasing the social spending in term of direct benefits, in-kind benefits and contributory pensions and subsidies as found to have a linear relationship with the income inequality and poverty.

Keywords: Poverty; income inequality; taxes-benefits; income redistributive effects; Latin America

1. INTRODUCTION

The use of taxes –benefit system as the means of reducing poverty and income inequality in developing countries is now hotly debated. The effects of taxes and benefits on income inequality and poverty in Latin America are still questionable as declared by some researchers

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[1,2]. Furthermore, it is not well known the effectiveness of taxes and benefits (transfers) on reducing the income inequality and poverty rate in Latin America [3,4]. Ferreira and Ravallion [5] contented that Latin America is a region with the highest degree of income inequality. Moreover, IDB [6] confirmed that, poverty rates – although not the highest by far – are too high for its level of development. Given these two facts, this study aimed to analyse the effects of taxes and benefits on income inequality and poverty eradication in Latin America. Specifically, the paper examined the influence of direct taxes, indirect taxes and social security contributions on income inequality and poverty eradication. On the other hand, the paper determined the income redistributive-effects (IREs) of taxes and benefits and its influences on the income inequality and poverty eradication. Furthermore, the paper examined the effectiveness of taxes-benefits systems in the region, by using a national taxes absolute gain or loss (NTAG/L) and its influences on the income inequality and poverty eradication.

2. THE CONCEPTUAL FRAMEWORK

Let, the income redistributive effects (IREs) measured in the change of income inequality (G) and poverty (headcount rate) – (P), due to taxes –benefits trade off in a fiscal year.

Assumed that,

(i) $\text{IREs}(G, P) =$
$\quad f(\text{direct taxes}, \text{indirect taxes}, \text{social security}$
$\quad \text{contribution})$

Thus, $(G, P) = k(DT, IDT, SSC)$

$(G, P) = \alpha + \beta_1 DT + \beta_2 IDT + \beta_3 SSC$

Taking the partial derivative of the equation

$$\frac{\Delta(G, P)}{\Delta(DT, IDT, SSC)} = k \text{ (taxes sensitivity)}$$

(ii) $\text{IREs}(G) =$
$\quad \text{Gini Index at final income} (-) \text{Gini}$
$\quad \text{index at market income}$

This means that, difference between inequality due to the market income and inequality due to the final income.

If we let a Lorenz curve has a function $Y_0 = \text{L}(X_0)$ at pre-tax income (market income) and $Y_n = \text{L}(X_n)$ at the post-taxes post benefits income. Therefore, the difference of their areas is equal to income redistributive effects on income inequality.

$$G_n - G_0 = \left(1 - 2\int_0^1 L(X_n)\,dX_n\right) - \left(1 - 2\int_0^1 L(X_0)\,dX_0\right)$$

$$G_n - G_0 = 2\left(\int_0^1 L(X_0)\,dX_0 - \int_0^1 L(X_n)\,dX_n\right)$$

Where, G_n, G_0 is a Gini coefficient (ratio of areas in a Lorenz Curve diagram) at the final income and market income respectively.

Y_n, Y_0 is the cumulative share of post-taxes post benefits income(final income), and pre-taxes income (market income) respectively.

X_n, X_0 is the cumulative share of people from the post-taxes post benefits income(final income), and pre-taxes income (market income) respectively.

(iii) $IREs(P) = Poverty\ at\ market\ income -$
$\quad Poverty\ at\ final\ income$

$$\text{IRE}_h = \left(\frac{1}{N}\sum_{i-1}^N I(0.0357y_i < z)\right)$$
$$- \left(\frac{1}{N}\sum_{i-1}^N I\left(0.0357y_{0_i} < z\right)\right)$$

$$y_i = x - \left(T(x) + B(x)\right), y_{0_i} = x$$

Where y_i, y_0 ; is the post-taxes post benefits income (final income) and pre-taxes income (pre-taxes income) respectively.

$x, T(x), B(x), z$; is the pre-taxes income (market income), personal taxes liability at market income, and benefits at market income and the poverty line respectively. Clearly, 0.0357 is a monthly divisor of the pre-taxes income and post taxes post benefit income is equal to the reciprocal of 28 days.

(iv) National Taxes Absolute Gain/Loss (NTAG/L) aimed to measure how much the government earns from taxes and how much the government spends on social services in relation to the taxes collection. This is given by:-

$$\text{NTAG/L} = \left[n.\left(\sum_{i-1}^N T(x_i)\right) - \left(n.\sum_{i-1}^N B(x_i)\right)\right] x \frac{100}{\text{GDP}}$$

Where by $N, n, T(x_i), B(x_i)$ are number of tax payers, number of taxes or benefits bases, taxes liability and benefits of an individual respectively.

3. METHODOLOGY OF STUDY

The paper used the exploratory research design, with both linear and nonlinear regression models

(Polynomial Regression Analysis). The data sampled from 17 countries in Latin America. The simple random sampling technique is used to obtain the sample size from sampling frame of 26 countries of Latin America. The study primarily used secondary data from World Bank Group, Commitment to Equity (CEQ) Institute. The coefficient variable analysis (CVA) of polynomial regression model is used to establish the sensitivity of the taxes on their influences on income inequality and poverty. The data methodology is obtained from Commitment to Equity (CEQ) Institute and the concept of the income. The modified Lambert [7,8,9,10,12] redistributive effect model was used by this study to determine the redistributive effects.

4. FINDINGS AND DISCUSSION

4.1 Income Inequality, Poverty in Latin America

The study evidenced the income inequality in Latin America at the market income is averaged to 0.5031 (gini coefficients) ranged from 0.4010 to 0.5766 gini coefficients. This indicates a less disparity of the income inequality in the region, with a range (disparity) of 0.1756 gini coefficients. The income inequality at the final income is averaged to 0.4324 gini coefficient, ranged from 0.2987 to 0.5381 gini coefficients. This means the income inequality is reduce by14 percent from 0.5031 to 0.4324 gini coefficients at the final income, but the range of the income inequality increases by 36.3 percent from 0.1756 to 0.2394 gini coefficients at the final income. Therefore, it is evidenced that the effects of taxes and benefits on reducing the income inequality of the individual in granted but on the other hand, they increase the country –income inequality.

The poverty in Latin America at the market income is averaged to 0.04770 headcount rate, ranged from 0.00762 to 0.10244 headcount rates. This indicates that the richest country is 13 times as the country that has the highest poverty headcount rate (poorest country). The poverty at final income is averaged to 0.03807, ranged from 0.00230 to 0.09730 headcount rates. This means that the taxes and benefits system reduce the poverty by 0.00963, equal 20.19 percent. But the country poverty status disparity increases, as the richest country headcount rate is 42 times as much as the headcount rate of poorest country in the region. The lesson to learn, even the taxes and benefits reduce the poverty and inequality in individual country, they highly increase the inequality (disparities) of income and poverty status with the region.

4.2 The Influences of Direct and Indirect Taxes, Total Benefits (Transfers) and Social Security Contributions on Income Inequality and Poverty in Latin America

The paper evidences that direct taxes, indirect taxes and social security contributions have no direct influence on the income inequality and poverty in the short-term; the nonlinear relationship exists. This study implicates that the income inequality and poverty depends on some other factors in the country rather than direct taxes, indirect taxes and social security contributions. But, this will be technically interpreted! The taxes increase the total transfers or benefits, and the transfers have direct influence on the poverty and income eradication in Latin America. This means, even the taxes have no direct impact on poverty and income inequality eradication, have a significant indirect impact on the poverty and inequality level as improving the total social spending.

Empirically, the paper evidenced that total benefits have a direct influence on the poverty and income inequality eradication. The income inequality and poverty rate are negatively related to total benefits or total social spending by the government. This means, the high social spending by the government reduces both the income inequality and poverty in the Latin America.

4.3 The National Taxes Advantage Gain or Loss (NTAG/L) in the Fiscal System in Latin American Countries

The NTAG/L is the difference between the summation of social spending, contributory pensions, subsidies and total taxes revenues in percent of GDP of the individual countries. It aimed to measure how much a *taxpayer gain or loss* from taxes –benefit system in a country. It accounts how much the taxpayer pays on taxes and how much the taxpayer's gains from government social spending, contributory pensions and subsidies in sharing to GDP. The *positive value* means the taxes or taxpayers contribute more in the GDP than the government social spending and subsidies. The negative values of NTAG/L means the government spends more on social services than it contributes from taxes. The zero score means

the taxes contributions and government social spending are equals, i.e., a break-even point of taxes –benefits system. The national taxes advantage gain or loss is established (Table 1)

Table 1 shows statistics on national taxes advantage gain or loss (NTAG/L in % of GDP) in the fiscal system in Latin American countries. It is evidenced that an average NTAG/L scores/values in Latin American countries is 0.077165 that is about 7.72 percent of their respectively GDP. Clearly, each (average) country in Latin America is retaining about 7.72 of its GDP after the tax benefit redistribution. However these values significantly vary across the region. For example, Argentina has NTAG/L score of -0.007514 with a mean deviation value (differences from a region mean value) of -0.08468, and a range deviation value (differences from a maximum value) of -0.15451. This means, Argentina gets a loss of 0.75 percent of its GDP for tax –benefit schemes. Clearly, tax payers are compensated more than that they pay. The country (Argentina) scored NTAG/L about 16.2 percent below the region mean value of tax gains. Moreover, Argentina is the least country in ranking of NTAG/L scores from Peru which has a maximum score of 0.14700. Argentina has range deviation score of -0.15451, means that the country's NTAG/L score is about 15.45 percent below the maximum score (Peru's NTAG/L score). Hence, Argentina spends more on social spending than its taxes collections (revenues).

Fig. 1 shows a graphical representation of descriptive statistics of NTAG/L scores of 17 Latin America countries. The graph shows how scores of NTAG/L of each country vary across the region's NTAG/L mean value of 0.077165.

On the other hand, countries such as Bolivia, Brazil, Ecuador, Mexico, Nicaragua, Paraguay, and Peru have NTAG/L scores above the region mean value of 0.077165. However, they differ in scoring. Peru has a maximum score of 0.14700 with the mean deviation score/value of 0.069835, which means the country has NTAG/L score about 6.98 percent above the region mean value, while Paraguay has NTAG/L score of 0.083897 that is 8.4 percent above the region mean value. The countries which have positive NTAG/L scores also vary significantly across the region. For example, countries such as Chile, Colombia, Costa Rica, Uruguay, Venezuela, Dominican Republic, Honduras and Mexico have positive NTAG/L scores but Colombia has the smallest positive NTAG/L score of 0.023537 with mean deviation value of -0.05363 and range deviation value of -0.12346, which indicates that country scored about 12.35 percent below the maximum value of NTAG/L score in a sample. Moreover, Venezuela has NTAG/L score of 0.081155, with mean deviation value of 0.00399, and range deviation value of -0.0658, that is the country scores about 6.58 percent below the maximum score of NTAG/L. In general, countries in Latin America have large variation of NTAG/L scores/values; this is due to implementation of different fiscal policies across the region.

Table 1. The statistics on national taxes advantage gain or loss (NTAG/L in % of GDP) in the fiscal system in Latin American countries

Variable	Country	Score	Mean	Mean-dev	Range-dev
NTAG/L	Argentina	-0.007514	0.077165	-0.08468	-0.15451
	Bolivia	0.12661	0.077165	0.049445	-0.02039
	Brazil	0.11546	0.077165	0.038295	-0.03154
	Chile	0.065069	0.077165	-0.01210	-0.08193
	Colombia	0.023537	0.077165	-0.05363	-0.12346
	Costa Rica	0.034467	0.077165	-0.04270	-0.11253
	Dominican Republic	0.043146	0.077165	-0.03402	-0.10385
	Ecuador	0.12237	0.077165	0.045205	-0.02463
	El Salvador	0.081887	0.077165	0.004722	-0.06511
	Guatemala	0.053011	0.077165	-0.02415	-0.09399
	Honduras	0.045210	0.077165	-0.03196	-0.10179
	Mexico	0.088221	0.077165	0.011056	-0.05878
	Nicaragua	0.12785	0.077165	0.050685	-0.01915
	Paraguay	0.083897	0.077165	0.006732	-0.06310
	Peru	0.14700	0.077165	0.069835	0.00000
	Uruguay	0.080423	0.077165	0.003258	-0.06658
	Venezuela	0.081155	0.077165	0.003990	-0.06585

Source: Field data (2018)
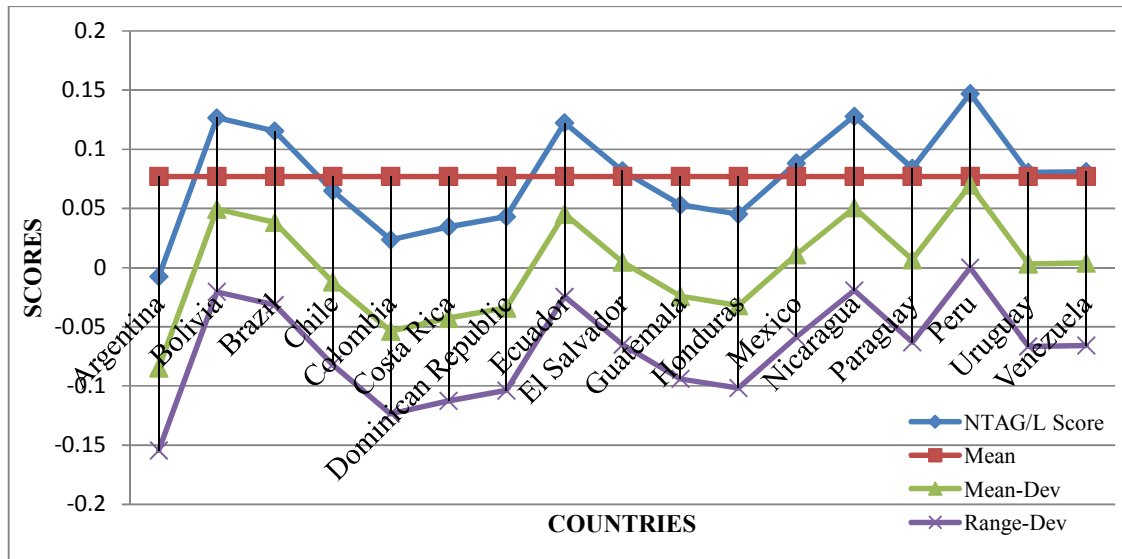
Fig. 1. Descriptive statistics for NTAG/L scores of the sampled countries in Latin America
Source: Author (2018)

Moreover, we evidenced that Peru, Mexico, Venezuela, Paraguay, Colombia, Chile, Brazil, and others gain more from their taxes collections and contribute less on social spending than their taxes collections. This implies that the country spends less on social spending than its taxes collections. The general implication, taxes collections in Latin America has little contributions on the final incomes of the individuals; i.e. slightly reduces the final income of the individual. The lesson drawn is that the presence of inefficiency of income redistribution system in many countries as the paper evidenced the high income inequalities across the region.

The positive or negative value/score of NTAG/L cannot be interpreted direct from mathematical standings, for example the positive value of NTAG/L cannot be always interpreted as individuals (taxpayers) loss from a taxes system, and that government gain a lot from taxation practices. In other aspect, positive values of NTAG/L can indicate the presence of an effective taxation administration system that enables the country to collect much diversifiable revenues (optimal taxation system). Even by considering the two alternatives of interpreting NTAG/L still its meaning and importance remain undistorted. On the other hand, a negative value, cannot be always interpreted that country –tax payers gain more from the taxes system (government

supports) than their taxes paid. Alternatively it may the government collects less taxes and compensates more or the taxation administration is poor.

4.4 The Influences of NTAG/L on Income Inequality and Poverty in Latin America

The state of either the country gain or loss from the taxes system does not direct influences the poverty and income inequality in a country. The paper evidenced poverty and income inequality to be determined by NTAG/L in long term as shown by the nonlinear relations (Figs. 2&3).

Fig. 2& 3 show polynomial models of NTAG/L scores and income inequality, and poverty rate respectively at the final income. The minima and maxima analysis of a poverty rate and income inequality level at final income evidence a minimal value of income inequality is at 10.8 percent of NTAG/L and the maxima value is at 4.1 percent of NTAG/L. The minima value of the poverty rate at the final income is at 9.2 percent of NTAG/L and maxima value is at 2.9 percent of NTAG/L. Technical interpretation of values of minima and maxima, imply that in a long run NTAG/L reduces the poverty rate and income inequality at the final income if it is a positive and vice versa if it is a negative value.

(2). Inequality versus NTAG/L

(3) Poverty versus NTAG/L
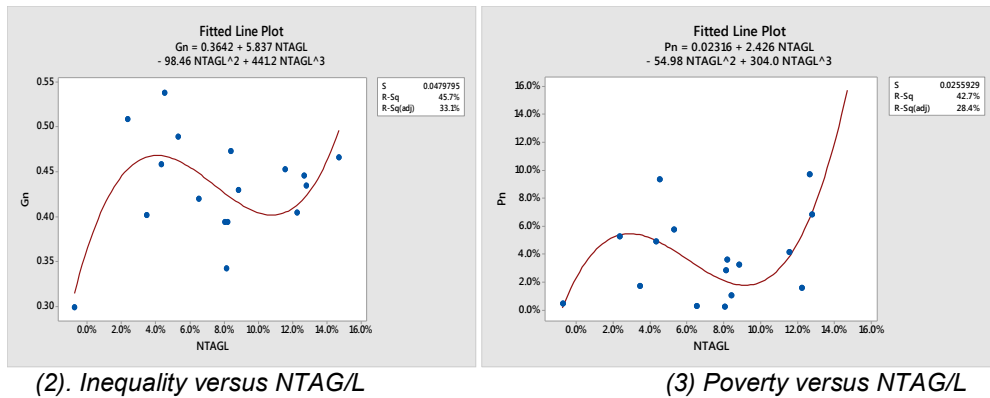
Figs. 2 & 3. Fitted Line of final income - income inequality and poverty versus NTAGL
Source: Field data (2018)

4.5 Redistributive-Effects (REs) of Taxes and Benefits on Income Inequality and Poverty in Latin America

The REs is the difference between the poverty or income inequality at market income and the poverty or income inequality at final income. The study found that redistributive effects of taxes and benefits on poverty rate in Guatemala increased by 0.14 percent in 2011, Nicaragua by 0.17 percent and Peru break even in 2009. On the other hand, poverty rate significantly reduced in Brazil by 2.36 percent in 2009, Mexico by 1.74 percent in 2010, Uruguay by 1.10 percent in 2009, Venezuela by 1.59 percent in 2012, Ecuador by 1.86 percent in 2012, and Colombia by 1.71 percent in 2010. The study evidenced that Argentina reduced its income inequality (gini coefficient) by 17.629 percent in 2013, Brazil by 12.21 percent in 2009, Costa Rica by 10.60 percent in 2010, Guatemala 2.35 percent in 2011 and Honduras 2.6045 percent in 2011.

5. CONCLUSIONS AND POLICY IMPLICATION

Basically the paper aimed to explore the effects of the taxes and benefits (transfers) on the income inequality and poverty. The paper finds the direct taxes; indirect taxes and social security contributory have no direct influences on income inequality and poverty rate in Latin America. The social spending has directly found to influence the poverty rate and income inequality in Latin America. The paper evidenced, for long run, the increases of NTAG/L is most favourable for poverty and income inequality reduction in Latin America. The paper evidenced the poverty and income inequality to be reduced at the final income; this implies that, the taxes benefits system in Latin is the effective means of reduction of poverty and income inequality. On the other hand, the country inequality (disparities) in poverty and inequality status increases at final income. The technical interpretation on these increases of the income inequality and poverty rate at the final income amongst the countries in Latin America is due to disparities of taxes-benefits systems. This includes the disparities of taxes structures and administration and its effectiveness, taxes rate (margin), number of taxes payers, economic level, and others.

The study concluded that, the taxes –benefits system in Latin America is effective to eradicate income inequality and poverty but ineffective to reduce the poverty and income inequality amongst the countries, it increases the poverty rate and income inequality amongst the countries at the final income. The study drawn a one policy implication that the countries in Latin America should set a policy priority on increases the social spending in term of direct and in-kind benefits, and contributory pensions and subsidies as found to have a linear relationship with income inequality and poverty.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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