Poverty Decomposition By Growth And Income Redistribution Under Government Regulation

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Abstract: *Using a Shapley value decomposition approach, this work analyzed the contribution of growth, incomes redistribution and poverty level to the poverty changes in both emerging and advanced economies from 1990 to 2011. The analysis used the income data for 24 emerging economies and 32 advanced economies to calculate poverty indices.*
The result of the Shapley value decomposition of poverty changes into growth redistribution and poverty line components revealed that the economic growth component dominates the redistribution and poverty line component in poverty reduction.
Key Words*: poverty decomposition, Shapely value, economic growth, incomes redistribution.*

Résumé : *En utilisant une approche de décomposition de valeur de Shapley, ce travail analyse la contribution de la croissance, la redistribution des revenus et les niveaux de pauvreté dans l'évolution de la pauvreté dans les économies développées ainsi que les économies émergentes de 1990 à 2011. L'analyse utilise les données sur les revenus pour les 24 économies émergentes et 32 économies avancées pour calculer les indices de pauvreté.*
Les résultats de la décomposition de la valeur de Shapley selon la composante de la une redistribution et celle de la ligne de pauvreté ont révélé que la composante de la croissance économique domine les composantes de la redistribution ainsi que la ligne de pauvreté dans la réduction de la pauvreté.
Mots clés *: décomposition de la pauvreté, valeur de Shapley, croissance économique, distributions des revenus.*

I. Introduction

The literature review on poverty reduction has always been a growing importance during the last decade. Many studies have tried to reveal the most significant factors that were considered as major determinants in poverty and economic analysis. As a result, many crucial questions have been addressed in this context, like the role of labor incomes or economic growth in poverty reduction, and what is the main contribution of social policies, improvement in labor market, etc. in the poverty changes.

This paper focus on a sample of emerging and advanced economies countries where there was a substantial decline or rise in poverty in order to study the trends and evolution of poverty changes. The basic motivation behind this study is to understand the impact of growth, inequality and poverty levels on poverty change by using a three-way Shapely decomposition value analysis. This approach is based on the idea of average growth, inequality and poverty line effects, the sum of which is equal to total change in poverty. It yields an exact decomposition of poverty into growth, redistribution and poverty line components. However, Shapley value approach is a simple descriptive tool that allows for exact decomposition of poverty changes into its components.

Furthermore, the objective of this paper is to quantify the contribution of economic growth, incomes inequality and poverty line in poverty across countries and gives some comparison between emerging and advanced economies.

The rest of the paper is organized as follows: section 2 describes a brief literature review of poverty decomposition, highlighting the links to growth, redistribution and poverty line components. Section 3 describes the decomposition methodology used to quantify the contributions of the considered

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components in poverty changes. Section 4 presents the results, highlighting similarities and differences between emerging and advanced economies. Section 5 concludes.

II. Brief Literature Review

The literature review on economic growth, incomes inequality, poverty and welfare is characterized by a number of diversified studies. The increasing importance devoted to these research topics was often motivated by the existence of the Kutznet hypothesis (1956), which claims that growth and inequality are related in an inverted U-shape curve.

Among the most important works analyzing the decomposition of poverty change into growth and inequality components we can find the work of Datt and Ravallion (1992) where the decomposition framework include growth, redistribution and a residual component. This proposed decomposition procedure was not an exact decomposition because the residual component was considered as way of capturing the interaction between growth and redistribution components.

Kakwani (1997) applied an approach of poverty changes decomposition into growth and inequality effects. Proposed as an alternative approach against the residual component, this approach provided an exact decomposition in which the sum of average growth and inequality effects is equal to the total change in poverty. This approach was later confirmed by Shorrocks (1999) method that applied the Shapley (1953) rule to a range of poverty decompositions. Kakwani (1997) observed that the growth effect contributed more than the redistribution effect while analyzing poverty change.

Shorrocks and Kolenikov (2005) applied a decomposition technique to explain the variations in poverty across the regions of Russia, in terms of difference in three sources of poverty variations, namely income per capita, inequality and price levels.

Baye (2006) argue that growth effect is more pronounced than redistribution effect in reducing poverty in the majority of the studies and that both economic growth and redistribution components are essential in reducing poverty in developing and transition economy.

Even if the results of the different studies and research works are relatively different, we can certify certainly that the literature on poverty, economic growth and inequality points to the fact that both economic growth and inequality components are significant factors influencing poverty changes.

III. Data and Methodology

III.1. Data and variables description

The main source of data for the analysis in this study is the 2013 World Development indicators report published by the World Bank. The IMF countries classification is used in this study in order to distinguish emerging and advanced economies. Data are filtered for 56 countries, 24 emerging economies and 32 advanced economies. The considered emerging economies are Argentina, Brazil, Bulgaria, Chile, China, Estonia, Hungary, India, Indonesia, Latvia, Lithuania, Malaysia, Mexico, Pakistan, Peru, Philippines, Poland Romania, Russian Federation, South Africa, Thailand, Turkey, Ukraine and Venezuela. Advanced economies are Australia, Austria, Belgium, Canada, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Greece, Hong Kong, China, Iceland, Ireland, Israel, Japan, Luxembourg, Malta, Netherlands, New Zealand, Norway, Portugal, Singapore, Slovak Republic, Slovenia, Korea, Spain, Sweden, Switzerland, United Kingdom and United States.

The covered time period is from 1990 to 2011. In order to detect the effect of the time dimension on poverty change, the period is spilled into two sub-periods, 1990-2000 and 2001-2011.

Since the decomposition framework is used in two contexts, we consider in the analysis the gross national income per capita (gnipc) as a variable used for the decomposition framework in order to detect the growth effect, the redistribution effect and the poverty line effect. On the other hand, we consider the gross national income (gni) as a second variable used in the decomposition analysis in order to determine the contribution of GDP, the net income from abroad and foreign and domestic income from labor in the change in incomes.

In a first stage of the analysis, we assess the change in the welfare measure by implementing the Shapley value of Kolenikov and Shorrocks (2003) decomposition of changes in a welfare indicator into growth, distribution and poverty level by introducing the FGT indices considered as the most important ones used in the literature review. Our objective is to compare welfare evolution between emerging and advanced economies over time.

In a second stage, we used a Shapley decomposition of changes in a welfare indicator as proposed by Azevedo, Sanfelicce and Minh (2012) in order to develop another part of the analysis witch aim to study the relationship between welfare measures and other macroeconomic aggregates. This method takes advantage of the *additivity* property of a welfare aggregate to construct a counterfactual unconditional distribution of the welfare aggregate by changing each component at a time to calculate their contribution to the observed changes in poverty and inequality (Barros et al, 2006).
As GNI is an add-up of net income from abroad and the GDP, we can decompose the GNI by the following formula:

$$GNI = GDP + NIFAB + (FL - DL)$$

Where FL and DL are respectively the foreign and domestic income from labor, and NIFAB[1] the net incomes from abroad.

III.2. Poverty measures

Usually, the poverty changes and analysis is assessed by the Foster-Greer-Thorbecke (FGT) index. The index captures the *number* of the poor, the *depth* and *severity* of poverty. The FGT index is defined as:

$$P_\alpha = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{z - y_i}{z}\right)^\alpha$$

Where n is the total number of units (individuals, households, countries, etc.), z is the poverty line, y_i is the mean income of the i^{th} unit, q the total number of units with income below the poverty line and α is the poverty aversion parameter. The larger value of the parameter α indicates that a greater weight is attached to the poverty gap of the poorest unit.
By definition, the poverty measures, P_α to be used are estimates of the distance between per capita income and the poverty line. Therefore, the poverty aversion parameter α is very important in determining the values of indexes. If $\alpha = 0$, the FGT index is defined as the headcount index (HI). For $\alpha = 1$, the FGT index is called the poverty gap index (PGI). Finally, when α takes a value of 2, the index is reduced to the squared poverty gap index (SPGI), (Foster et al, 1984).

III.2.1. Headcount Index

The headcount index is expressed as an estimation of the proportion of the population whose per capita income is less than a given poverty line z and this is a measure of poverty incidence. The headcount index is calculated as:

$$P_0 = HI = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{z - y_i}{z}\right)^0 = \frac{q}{n}$$

The headcount index is easy to analyze and to understand. However, even if it is considered as the simplest measure of poverty, its main drawback is that it gives no indication of the intensity and severity of poverty, even though poor units (persons or households) may be close to the poverty line or far below it. In addition, the HI is not sensitive to the distribution of income amongst the poor.

III.2.2. Poverty Gap Index

The poverty gap index measures the depth of poverty. In other words, it expresses the average income shortfall from the poverty line. The poverty gap index can be calculated as:

$$P_1 = PGI = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{z - y_i}{z}\right)$$

The poverty gap index tends to measure the magnitude of poverty by considering the number of poor units below the poverty line and also determines their level of poverty. However, the poverty gap

[1] Net income includes the net labor income and net property and entrepreneurial income components of the System of National Accounts. Labor income covers compensation of employees paid to nonresident workers. Property and entrepreneurial income covers investment income from the ownership of foreign financial claims (interest, dividends, rent, etc.) and nonfinancial property income (patents, copyrights, etc.).

index is insensitive to transfers between two units on the same side of poverty line. It ignores the differences in the severity of the poverty among the poor units.

III.2.3. Squared Poverty Gap Index

The squared poverty gap index is the sum of the proportional poverty gaps weighted by themselves. This indicator is a measure of severity of poverty. The squared poverty gap index can be calculated as:

$$P_2 = SPGI = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{z - y_i}{z}\right)^2$$

This measure implies that a transfer of income or any other measure of living standard from a unit close to the poverty line to a unit far below the line has the effect of reducing measured poverty.

III.2.4. Poverty Line

The procedure to derive poverty line for this study is based on the relative poverty line approach. The relative poverty line is defined on the basis of three poverty threshold set at 40 percent, 50 percent and 60 percent of median household income, and this is used to examine the trends in poverty incidence over time. For the poverty decomposition analysis, a fixed relative poverty line is considered, and this is based on the 60 percent of the income's median.

III.2.5. Gini coefficient

The Gini coefficient has a simple interpretation since it is based on the Lorenz curve. The Gini coefficient is defined as the ratio of twice the area between the Lorenz curve and the line of absolute equality (the 45-degree line) to the area of the box as a whole:

$$I_{Gini} = \frac{2}{n^2\bar{y}}\sum_{i=1}^{n} i(y_i - \bar{y})$$

Where the y_i are individual incomes arranged in ascending order in a population of size n, and $\bar{y}$ is the mean of incomes.

The Gini coefficient ranges from a minimum value of zero (perfect equality) when the Lorenz curve coincides with the line of to a maximum value of one (perfect equality).

III.2.6. Theil's T index

The basic Theil index T is the same as redundancy in information theory, which is the maximum possible entropy of the data minus the observed entropy. It is a special case of the generalized entropy index which incorporates a sensitivity parameter α that varies in the weight given to inequalities in differing parts of the income spectrum (Cowell and Kuga, 1981). Usually, we can find values of the sensitivity parameter: -1, 0, 1 and 2. The more positive α is, the more sensitive GE(α) is to inequalities at the top of the income distribution.

The Theil index can be viewed as a measure of redundancy, lack of diversity, isolation, segregation, inequality, non-randomness, and compressibility.

The Theil's T coefficient (T) with GE(1) can be calculated as follow:

$$T_{\alpha=1} = \frac{1}{n}\sum_{i=1}^{n}\frac{y_i}{\bar{y}} ln\left(\frac{y_i}{\bar{y}}\right)$$

III.3. Shapley Value decomposition analysis

The framework of analysis used in this paper has its origins in the decomposition of changes in poverty into growth, redistribution components and poverty line proposed by Datt and Ravallion (1992). Given a poverty line z, the initial income distribution represented by the distribution function F_0 generates the poverty rate p_0, which falls to p_1 when the distribution changes to F_1. The move from F_0 to F_1 can be regarded as the combination of two effects: a pure proportionate growth effect captured by the rightward shift of the distribution function from F_0 to F (since the horizontal axis has a logarithmic scale); and a pure redistribution effect (holding mean income constant) corresponding to the shift from F to F_1. This allows the total change in poverty, $p_1 - p_0$, to be decomposed in a similar

fashion, with $p - p_0$ representing the contribution of income growth p_1–p and indicating the redistribution component.

III.3.1. Shapley value of growth, redistribution and poverty line

Given that the poverty line varies, let ΔP denote a change in poverty index P between the initial period 0 and final period 1. Then a change in poverty between period 0 and period 1 can be written as:

$$\Delta P = P(\mu_1, L_1, Z_1) - P(\mu_0, L_0, Z_0)$$

Where μ is the mean income, L is the Lorenz curve and Z is the poverty line.

By definition, the growth effect is the change in poverty due to a change in the mean income while holding its distribution (characterized by Lorenz curve) and poverty line constant. The distribution effect is the change in poverty due to a change in the distribution of income while holding its mean income and poverty line constant while the poverty line effect is the change in poverty due to a change in poverty line while holding its mean income and distribution constant.

Then, the change in poverty, ΔP to be decomposed into a growth effect G; a redistribution component R and a poverty line effect Z can thus be expressed by:

$$G = P(\mu_1, L_0, Z_0) - P(\mu_0, L_0, Z_0)$$
$$R = P(\mu_1, L_1, Z_0) - P(\mu_1, L_0, Z_0)$$
$$Z = P(\mu_1, L_1, Z_1) - P(\mu_1, L_0, Z_0)$$

Following Shorrocks and Kolenikov (2005), the growth, inequality and the poverty line components of change in poverty ΔP between period 0 and 1 is obtained by taking the average of the three components.

Thus, the growth component is denoted by:

$$G = \frac{1}{2}[P(\mu_1, L_0, Z_0) - P(\mu_0, L_0, Z_0)] + \frac{1}{2}[P(\mu_1, L_1, Z_1) - P(\mu_0, L_1, Z_1)]$$

The redistribution component by:

$$R = \frac{1}{2}[P(\mu_0, L_1, Z_0) - P(\mu_0, L_0, Z_0)] + \frac{1}{2}[P(\mu_1, L_1, Z_1) - P(\mu_1, L_0, Z_1)]$$

And the poverty line component by:

$$Z = \frac{1}{2}[P(\mu_0, L_0, Z_1) - P(\mu_0, L_0, Z_0)] + \frac{1}{2}[P(\mu_1, L_1, Z_1) - P(\mu_1, L_1, Z_1)]$$

The Shapley decomposition is inspired by the classic co-operative game theory problem of dividing a pie fairly, the Shapley solution to which assigns to each player its marginal contribution averaged over all possible coalitions of agents. The reinterpretation described in Shorrocks (1999) considers the various n factors which together determine an indicator such as the overall level of poverty, and assigns to each factor the average marginal contribution taken over all the $n!$ possible ways in which the factors may be removed in sequence. The particular attractions of this technique are that the decomposition is always exact and that the factors are treated symmetrically.

III.3.2. Shapley decomposition by components of a welfare measure

Given that the distribution of a observable welfare measure (income or consumption) for period 0 and period 1 are known, we can construct counterfactual distributions for period 1 by substituting the observed level of the considered indicators in period 0, one at a time. For each counterfactual distribution, we can compute the poverty or inequality measures, and interpret those counterfactuals as the poverty or inequality level that would have prevailed in the absence of a change in that indicator.

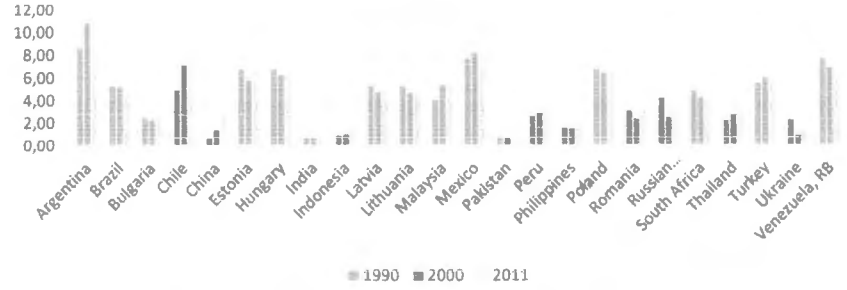
As much of the micro-decomposition literature, approaches of this nature traditionally suffer from path-dependence (Essama-Nssah, 2012; Fortin et al., 2011; Ferreira, 2010). In other words, the order in which the cumulative effects are calculated matters. One of the major contributions of Azevedo, Sanfelicce and Minh (2012) is the implementation of the best-known remedy for path-dependence which is to calculate the decomposition across all possible paths and then take the average between them. These averages are also known as the Shapley-Shorrocks estimates of each component, implying that we estimate every possible path to decompose these components and then take the average of these estimates (Shapley, 1953; Shorrocks, 1999).

IV. Results

Before presenting the main obtained results, it would be wiser to have an idea about the contribution of each economy in its group. In other words, if this study did not give a country-level analysis, we must at least determine countries characterized by an important contribution in the macroeconomic aggregate used for the analysis. The following figures (figure 1 and 2) represent the proportional contribution of GNI per capita for all countries in the two groups, emerging economies and advanced markets.

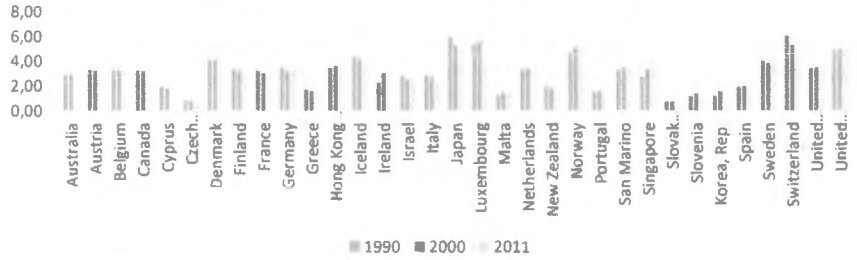
As we can see, in the emerging economies the main parts of contribution are those presented by the following countries: Argentina, Mexico, Venezuela and Chile. Estonia, Hungary, Poland, and Turkey can present a second group of countries with less contribution. The rest of the countries, mainly, Brazil, Malaysia, Lithuania and Latvia form the third group.

Figure. propotionnal GNI per capita - emering economies



In figure 2, we can see more homogenous economies with some leader countries like Japan, Luxembourg, and Switzerland. Other economies can be set together like Unites States, Norway, Sweden, Iceland and Hong Kong.

Figure 2. propotionnal GNI per capita - advanced economies



In general, economic growth and redistribution components do effect a change in poverty measures. However, it is not yet clear by how much the fall in absolute poverty is due to changes in mean income and inequality. Therefore, for purpose of policy formulation, it becomes necessary to identify the relative contribution of economic growth, redistribution and also the poverty level components to poverty changes.

Tables 1 and 2 present the result of Shapley value decomposition of poverty changes into growth, redistribution and poverty line components for emerging and advanced economies over the period of twenty years. It is observed that for the emerging economies there is a rise in the poverty in the first decade and a decline in the second. The most important result is that in the first decade the rise in all

the three poverty measures HI, PGI and SPGI was accounted for by the change redistribution rather than by the change in economic growth and poverty line. The redistribution component dominates the economic growth component in the first sub-period. As we can see, the situation is quite different in the second sub-period, and all the changes in poverty are widely dominated by the growth component.

Table 1. Emerging economies

1990 - 2000				2001 - 2011			
	Poverty Indicators				Poverty Indicators		
Poverty rates	FGT0	FGT1	FGT2	Poverty rates	FGT0	FGT1	FGT2
Rate in year 1990	37.50	16.53	9.76	Rate in year 2001	41.67	18.18	10.19
Rate in year 2000	45.83	19.28	11.55	Rate in year 2011	33.33	13.67	7.97
Total change in p.p.	8.33	2.75	1.78	Total change in p.p.	-8.33	-4.51	-2.22
Poverty Decomp - Growth, Distribution and Line				**Poverty Decomp - Growth, Distribution and Line**			
	Poverty Indicators				Poverty Indicators		
Effect	FGT0	FGT1	FGT2	Effect	FGT0	FGT1	FGT2
Growth	0.00	-1.23	-0.76	Growth	-10.42	-5.52	-3.28
Redistribution	8.33	3.70	2.36	Redistribution	-4.17	-2.78	-1.48
Line	0.00	0.29	0.18	Line	6.25	3.79	2.53
Total change in p.p.	8.33	2.75	1.78	Total change in p.p.	-8.33	-4.51	-2.22

Table 2. Advanced economies

1990 - 2000				2001 - 2011			
	Poverty Indicators				Poverty Indicators		
Poverty rates	FGT0	FGT1	FGT2	Poverty rates	FGT0	FGT1	FGT2
Rate in year 1990	30.30	11.05	5.15	Rate in year 2001	30.30	9.11	3.77
Rate in year 2000	30.30	9.60	4.03	Rate in year 2011	30.30	12.40	7.89
Total change in p.p.	0.00	-1.44	-1.12	Total change in p.p.	0.00	3.29	4.11
Poverty Decomp - Growth, Distribution and Line				**Poverty Decomp - Growth, Distribution and Line**			
	Poverty Indicators				Poverty Indicators		
Effect	FGT0	FGT1	FGT2	Effect	FGT0	FGT1	FGT2
Growth	-5.05	-4.31	-2.51	Growth	-1.01	-1.38	-0.75
Redistribution	1.01	-0.56	-0.55	Redistribution	-2.53	2.91	3.86
Line	4.04	3.43	1.94	Line	3.54	1.77	1.01
Total change in p.p.	0.00	-1.44	-1.12	Total change in p.p.	0.00	3.29	4.11

Between 1990 and 2000, both the economic growth and redistribution components contributed to reduction in poverty in emerging economies, which is not the case of advanced economies. For example, the economic growth accounted for 0.00 percentage point change in poverty headcount index while redistribution components accounted for 8.33 percentage point rise in poverty headcount index. From the other side, in the case of advanced economies, the economic growth accounted for 5.05 percentage point decline in poverty headcount index while redistribution accounted for a marginal 1.01 percentage point and 4.04 point increase in poverty headcount index.

The same trend was not observed between 2001 and 2011 for both emerging and advanced economies, in which both the economic growth and redistribution components also contributed to decline in poverty. For the emerging economies, economic growth component contributed to the decrease in poverty with 10.42 percentage point, against 4.17 percentage point for the redistribution component. However, in the case of advanced economies, redistribution component have a more important contribution in reducing poverty with 2.53 percentage point against 1.01 for the economic growth component.

These results can be explained as follow: the tremendous decline in absolute poverty in emerging economies was attributed to the unprecedented increase in economic growth experienced by emerging

economies in the second sub-period. In the same period, the redistribution effect had a negative impact on poverty reduction reflecting increased income inequality at the lower end of income distribution over the survey period.

While the fall in absolute poverty over the considered period was attributed to economic growth component, in certain sub-periods the contribution of income redistribution to poverty changes was also important. For instance, for both emerging and advanced economies, the redistribution component contributed to the increase in poverty and, as a result, the contribution of economic growth was much less. These findings confirm the important role of redistribution in poverty changes over the periods.

In addition, the second part of our results also show that the Shapley decomposition value of the GNI is widely dominated by the evolution of the GDP. Tables 3 and 4 show the estimate of the decomposition of changes in the GNI (considered as a welfare measure) by the gross national product (GDP), the net income from abroad (nifab) and foreign (fl) and domestic (dl) income from labor. Results show that the GDP is an important macroeconomic characteristic in the sense that it contributes heavily in the changes of GNI. The overall changes in all three measures of poverty was because of the change in GDP rather than NIFAB or FLDL. For emerging economies, the GDP component dominates the other variables with 16.32 percentage point in reducing GNI against 4.51 and 3.47 for NIFAB and FLDL respectively in the HI index.

Table 3. GNI Shapley decomposition with Poverty Indicator (emerging economies)

1990 - 2000						2001 - 2011					
	Poverty Indicator						Poverty Indicator				
Effect	FGT(0)	FGT(1)	FGT(2)	Gini	Theil	**Effect**	FGT(0)	FGT(1)	FGT(2)	Gini	Theil
gdp	-16.32	-2.71	-0.26	0.03	0.08	gdp	-20.49	-15.32	-11.88	0.06	0.21
nifab	4.51	3.34	2.14	0.00	0.00	nifab	10.76	6.83	5.44	0.01	0.01
fldl	3.47	3.08	2.12	0.00	0.00	fldl	9.72	5.83	4.63	0.00	0.00
total change	-8.33	3.71	4.01	0.03	0.08	total change	0.00	-2.66	-1.81	0.06	0.23

Table 4. GNI Shapley decomposition with Poverty Indicator (advanced economies)

1990 - 2000						2001 - 2011					
	Poverty Indicator						Poverty Indicator				
Effect	FGT(0)	FGT(1)	FGT(2)	Gini	Theil	**Effect**	FGT(0)	FGT(1)	FGT(2)	Gini	Theil
gdp	-11.87	-7.12	-5.23	0.02	0.12	gdp	-14.39	-10.15	-7.94	-0.06	-0.26
nifab	1.77	1.44	1.00	0.00	-0.01	nifab	5.30	4.01	3.38	0.00	0.01
fldl	1.01	1.13	0.95	0.00	0.00	fldl	6.06	3.11	2.28	0.00	0.00
total change	-9.09	-4.55	-3.28	0.02	0.11	total change	-3.03	-3.03	-2.27	-0.05	-0.25

V. Summary and conclusion

In this paper, we have found that absolute poverty level in emerging economies has declined over the period and that economic growth component overwhelmingly dominates the redistribution component in bringing about this decline in poverty level. The situation in advanced economies was completely different. For the purpose of policy formulation, these results emphasize the importance of sustained economic growth to reduce the incidence of poverty. However, despite the overwhelming dominance of economic growth component in the case of emerging economies, it was observed that inequality as well was poverty reducing in certain periods. This finding thereby highlights the fact that the economic growth alone should not be the only priority of reducing poverty. It is essential that an effective income distribution policy, which targets mainly the poor in the society, is equally undertaken.

From a policy formulation perspective, this methodology is very useful as it provides policy maker detailed information about the relative contribution of economic growth and inequality to poverty changes.

However, one important limitation of this decomposition analysis is that there are complex interactions between growth and inequality that are not captured by this technique, which might result in small changes in inequality, that are uncorrelated with growth. Furthermore, when analyzing

poverty changes with respect to growth and redistribution effect, it might be misleading to assume that it is easier to reduce income inequality by certain percentage, as it is to achieve economic growth (Deininger and Squire, 1998).

The possibilities for future research are many for this methodology. One of such is the poverty decomposition analysis when the poverty line changes. In this case, the mean income, inequality and poverty line are treated as three separate factors in determining poverty changes. The procedure considers the marginal effect on poverty of varying one factor between initial and final period, and then compute the average of the marginal effect over all possible ways in which each of the three factors are interchanged in sequence from the base period (Shorrocks and Kolenikov, 2005).

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