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Analysis of Trade Reforms, Income Inequality and Poverty Using Microsimulation Approach: The Case of the Philippines

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Philippine Institute for Development Studies
Surian sa mga Pag-aaral Pangkaunlaran ng Pilipinas

Analysis of Trade Reforms, Income Inequality and Poverty Using Microsimulation Approach: The Case of the Philippines

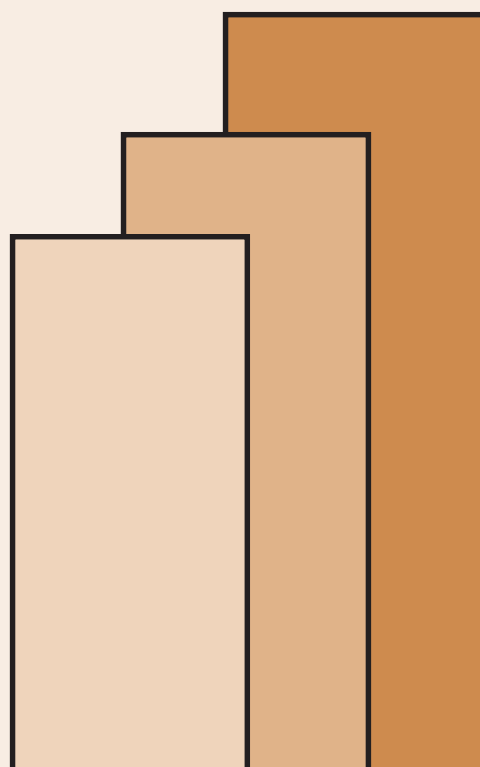
Caesar B. Cororaton

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**Analysis of Trade Reforms, Income Inequality and Poverty
Using Microsimulation Approach:
The Case of the Philippines**

Caesar B. Cororaton

Abstract

This paper uses a CGE microsimulation approach to analyze the effects of tariff reduction on poverty and income inequality. The approach relaxes the representative household assumption in the traditional CGE modeling by replacing household groups with individual households. As such the approach allows one to model the link between trade reforms and individual households and their feedback to the general equilibrium of the economy. The present paper incorporates the whole 24,797 households of the 1994 Family Income and Expenditure Survey and simulates the tariff reduction from 1994 to 2000.

Tariff reduction leads to higher imports and exports. Although domestic production for the local market declines, the overall production improves. These are due to substitution and scale effects of tariff reduction.

Resource reallocation and factor movements favor the non-food manufacturing sector. Agriculture wages, as well the rate of return to capital in agriculture, decline as a result of the drop in agriculture output and value added. Income of rural households in the different regions declines, while income of urban households in the various regions (including the NCR) improves.

Tariff reduction results in poverty reduction in all areas not because of the improvement in household income, but because of the drop in consumer prices. Income inequality however worsens, except in the NCR.

Keywords: Computable General Equilibrium Model, Poverty, Inequality, Micro-simulation, Trade reforms

**Analysis of Trade Reforms, Income Inequality and Poverty
Using Microsimulation Approach:
The Case of the Philippines¹**

Caesar B. Cororaton²

This paper extends the analysis of another paper (Cororaton, 2003) to look into the impacts of trade reforms on income inequality and poverty both at the national and regional level by relaxing the representative household assumption and by replacing it with a microsimulation approach (Cockburn, 2001) wherein the whole 24,797 households in the 1994 Family Income and Expenditure Survey (FIES) were incorporated in PCGEM³. This microsimulation approach allows one to model the link between trade reforms and the individual households and their feedback to the general equilibrium of the economy.

There are two major channels through which individual households may be affected by trade reforms (in the present case tariff reduction): household income through changes in factor prices (which trigger factor substitution in production), and domestic and consumer prices (which trigger commodity substitution and changes in consumption pattern). The paper examines these channels and computes various FGT poverty indices and Gini and Atkinson income inequality indices before and after the tariff reduction. The tariff reduction simulated in the exercise is the actual tariff change between 1994 and 2000.

Trade Reforms⁴

The trade reform program has three major components: the 1981-1985 Tariff Reform Program (TRP); the Import Liberalization Program (ILP); and the complimentary realignment of the indirect taxes. In TRP, there was a narrowing of the tariff rate structure from a range of 100-0 percent to 50-10 percent. During the period 1983-1985 sales taxes on imports and locally produced goods were equalized. Also, the mark-up applied on the value of imports (for sales tax valuation) was reduced and eventually eliminated.

However, because of the balance of payments, economic, and political crises during the mid-1980s the import liberalization program was suspended. In fact, some of the items that were deregulated earlier were re-regulated during this period. When the Aquino government took over the administration in 1986 the trade reform program of the early 1980s was resumed, which resulted in the reduction of the

¹Funded by the International Development Research Center (IDRC) of Canada.

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³Philippine Computable General Equilibrium Model

⁴Taken directly from Cororaton (2003)

number of regulated items from 1,802 in 1985 to 609 in 1988. Furthermore, export taxes on all products except logs were abolished.

The government launched a major program in 1991 with the issuance of the Executive Order (EO) 470, which is called the TRP-II and an extension of the previous program, in which tariff rates were realigned over a five-year period. The realignment involved the narrowing of the tariff rates through a series of reduction of the number of commodity lines with high tariffs, and an increase in the commodity lines with low tariffs. In particular, the program was aimed at clustering the commodities with tariffs within the 10–30 range by 1995. Despite the programmed narrowing of the tariff rates, about 10 percent of the total number of commodity lines were still subjected to 0-5 percent tariff and 50 percent tariff rates by the end of the program in 1995.

“Tariffication” of quantitative restrictions (QRs) (i.e., converting QRs into tariff equivalent) started in 1992 with the implementation of EO 8. There were 153 commodities whose QRs were converted into tariff equivalent rates. In a number of cases, tariff rates were raised over 100 percent, especially during the initial years of the conversion. However, a built-in program for phase-down of the “tariffied” rates over a five-year period was also put into effect. Furthermore, in the same EO, tariff rates on 48 commodities were further re-aligned.

De-regulation continued on the next 286 items under the tariffication program. At the end of 1992, only 164 commodities were covered under the QRs. However, the implementation of the Memorandum Order (MO) 95 in 1993 reversed the de-regulation process. In fact, QRs were re-imposed on 93 items, bringing up the number of regulated items under the QR to 257. This re-regulation came largely as the result of the Magna Carta for Small Farmers in 1991.

Major reforms were implemented under the TRP-III. The program embodied in the following EOs: (i) EO 189 implemented in January 1, 1994 which provided reduced tariff rates on capital equipment and machinery; (ii) EO 204 in September 30, 1994 which mandated tariff reduction in textiles, garments, and chemical inputs; (iii) EO 264 in July 22, 1995 which reduced tariffs on 4,142 harmonized lines in the manufacturing sector; and (iv) EO 288 in January 1, 1996 which reduced tariffs on “non-sensitive” components of the agricultural sector. The restructuring of tariff under these various EOs refers to reduction in both the number of tariff tiers and the maximum tariff rates. In particular, the program was aimed at establishing a four-tier tariff schedule, namely, 3 percent for raw materials and capital equipment that are not available locally; 10 percent for raw materials and capital equipment that are available from local sources; 20 percent for intermediate goods; and 30 percent for finished goods.

Another major component of the tariff program is the uniform tariff rate, which is scheduled to be implemented starting 2004. Policy discussions on the issue, however, are still ongoing. At what level shall the tariff rate be made uniform eventually across sectors is still an unsettled issue at present.

Table 1 shows the weighted average tariff rates in 1994 and in 2000 across various sectors. The average weighted tariff rate declined over these years by –65

percent: from 23.9 percent in 1994 to 7.9 percent 2000. The decline of the tariff rate in industry is much higher than in agriculture: -65.3 percent and -48.8 percent, respectively.

In terms of specific sectors, the largest drop in tariff rates is in mining, -88.9 percent, while the lowest decline is in other agriculture, -19.9 percent. In terms of tariff rate level in 2000, food manufacturing still has the highest rate of 16.6 percent. Other agriculture has the lowest tariff rate of 0.2 percent.

Revenue from import tariff is one of the major sources of government funds as shown in Table 2, which shows the structure of the sources of revenue of the government. In 1990, the share of revenue from import duties and taxes to the total revenue was 26.4 percent. This increased marginally to 27.7 percent in 1995. However, the share dropped significantly to 17.1 percent in 2001. One of the major factors behind the decline was the tariff reduction program.

The share of direct taxes (income and profit direct taxes combined) increased consistently from 27.3 percent in 1990 to 30.7 percent in 1995 and to 39.6 percent in 2001. On the other hand, the share of government revenue from excise and sales taxes dropped from 27.2 percent share in 1990 to 23.4 percent in 1995. It however recovered to 29.3 percent share in 2001.

Since tariff revenue is a major source of government funds, a tariff reduction program could therefore have substantial government budget implications especially if it is not accompanied by compensatory tax financing. In fact, it could pose a major policy challenge especially in a situation where government budget deficit is growing.

The last three years saw widening government budget deficit. From a budget surplus of 0.6 percent of GNP in 1995, the budget balance flipped to a deficit of -3.6 percent in 1999 and another -3.8 percent in 2000. In 2001, the deficit was still at -3.8 percent of GNP. This persistent government imbalance, if remained unchecked could not only create a host undesirable macroeconomic effects, but could also put into question the viability of a continued implementation of the tariff reduction program, unless other compensatory tax financing measures are implemented such as income tax and other excise and indirect taxes.

Table 3 presents the calibrated tariff rates and indirect tax rates from the constructed SAM⁵, which is used in the base simulation.

Poverty and Inequality Profile

To put the poverty situation in the Philippines in perspective, Figure 1 presents the official poverty incidence based on head count ratio from 1985 to 2000. Poverty incidence declined by some 10 basis points in the last 15 years from 49.3 percent in 1985 to 39.4 percent in 2000. However, through the years the gap between urban (particularly the National Capital Region, NCR) and rural poverty incidence widened.

⁵Cororaton (2003) provides a more detailed discussion of the structure of the economy in the 1994 SAM.

While urban areas saw significant decline in poverty incidence from 37.9 percent in 1985 to 24.3 percent in 2000, rural places witnessed generally stable incidence of more than 50 percent. The largest improvement in the poverty situation is in the NCR, with incidence dropping from 27.2 percent in 1985 to 11.4 percent in 2000. Its poverty incidence even dropped to single digit in 1997 (8.5 percent).

Focus on 1994, the base year of the analysis. Figures 2 to 4 compare the head count ratio, the poverty gap, and the poverty severity indices for urban and rural areas and for the Philippines⁶. One can observe that in all poverty measures computed, rural has the highest ratios.

The breakdown of the poverty measures for the NCR and the rest of the urban areas of the 14 regions are shown in Figures 5 to 7. In terms of the head count ratio, Region 14 has the highest incidence of 76 percent, followed by Region 12 (56 percent) and Region 1 (54 percent). NCR has the lowest head count ratio of 10 percent in 1994. In terms of poverty gap, the same structure emerges. However, in terms of poverty severity Region 12 has the highest ratio of 11.7 percent, followed by Region 14 (11 percent) and Region 1 (9.4 percent). NCR has the smallest ratio of 0.6 percent.

The poverty profile of the rural areas of the different regions is presented in Figures 8 to 10. In terms of head count, rural of Region 14 has the highest ratio of 80 percent, followed by rural of Region 5 with 67 percent. One can observe that 6 out of 14 rural regions have poverty incidence of above 50 percent. Generally, the same structure is observed for the poverty gap and for the poverty severity.

There are large differences in intra-regional poverty. Figures 11 to 13 show the difference between urban and rural poverty of the 14 regions. A positive percentage difference indicates higher poverty in urban than in rural areas. One can observe that in terms of the head count ratio, only Region 1 shows higher poverty incidence in urban as compared to rural, while the rest of the 13 regions show negative percentage, which indicate higher poverty incidence in rural than in urban. The highest difference is observed in Region 11, followed by Region 6, Region 4 and Region 13. However, in terms of poverty gap and poverty severity ratios, the highest difference emerges in Region 5 (-11.0 percent and -6.4 percent, respectively) and Region 13 (-10.4 percent and -5.8 percent, respectively).

In terms of income inequality, it is the reverse: it is more pronounced in urban than in rural areas. The Gini ratio for the urban is 44.9, while for the rural 38.8 percent (Figure 14). For the whole Philippines the Gini is 46.4 percent.⁷

Figure 15 presents the Gini income inequality index for the urban areas of the different regions. Region 6 has the highest ratio of 45 percent, while region 9 has the lowest ratio of 39 percent. On the other hand, for rural areas Regions 12, 8 and 2

⁶See section below for brief definition of each of these poverty incidence measures. Poverty and income inequality indices were computed using the DAD 4.2 software (Duclos, Araar, and Fortin, 2002)

⁷ The results of the Atkinson inequality index for $\epsilon = 0.5$ and 0.75 were computed are not discussed in the section. They are presented in Tables 7e to 7f.

have the highest Gini ratios of 40 percent, while Region 14 has the lowest of 30 percent (Figure 16).

Similar to the poverty situation, there are large differences in the intra-regional income inequality. Figure 17 presents the urban-rural difference in the Gini ratio. Except for Region 9, all regions have higher income inequality in urban than in rural areas. The largest difference is observed in Region 7 (9.5 percent) and in Region 6 (9.3 percent).

Model Description

A computable general equilibrium (CGE) model calibrated to the 1994 SAM was employed to analyze the effects of tariff reforms on poverty and income inequality. The equations of the model are presented in the Appendix. The model is called MICRO-PCGEM.

MIRCO-PCGEM has 12 production sectors, 4 of which comprise agriculture, fishing and forestry. There 5 sectors in industry, including utilities and construction. The service sector is composed of 3 sectors, including government service sector. The model distinguishes two factor inputs, labor and capital, which determines sectoral value added using CES production function. The model incorporates 4 types of labor: skilled agriculture labor, unskilled agriculture labor, skilled production labor, and unskilled production labor. Agriculture labor is devoted only to agriculture sector, while production labor works both for non-agriculture and agriculture sector. As such, agriculture labor movement is only limited to agriculture sector, while production workers move across all sectors. Furthermore, skilled production workers include professionals, managerial, and other related workers. Skilled worker is defined as those with at least high school diploma, while unskilled worker refers to those with no education up to third year high school.

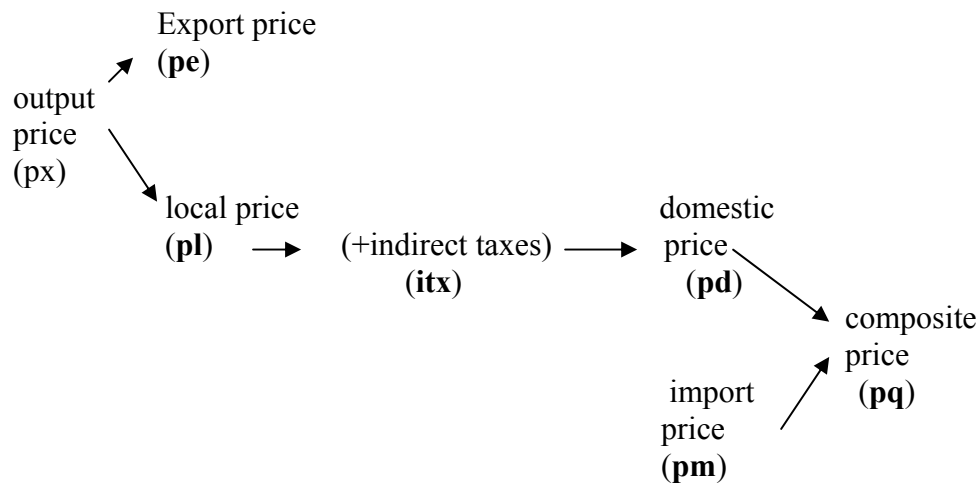
Sectoral capital however is fixed. Value added, together with sectoral intermediate input, which is determined using fixed coefficients, determine total output per sector. In both product and factor market, prices adjust to clear all markets.

The flowchart below shows the basic price relationships in the model. Output price, p_x , affects export price, p_e , and local prices, p_l . Indirect taxes are added to the local price to determine domestic prices, p_d , which together with import price, p_m , will determine the composite price, p_q . The composite price is the price paid by the consumers.

Import price, p_m , is in domestic currency, which is affected by world price of imports, exchange rate, e_r , tariff rate, t_m , and indirect tax rate, itx . Therefore, the direct effect of tariff reduction is a reduction in p_m . If the reduction in p_m is significant enough, the composite price, p_q , will also decline.

Consumer demand is based on Cobb-Douglas utility functions. Armington-CES (constant elasticity substitution) function is assumed between local and imported goods, while a CET (constant elasticity of transformation) is imposed between exports and local sales. The Armington and the CET elasticities are presented in Table 4.

Flowchart: Basic Price Relationships in MICRO-PCGEM



where $\mathbf{pm} = \mathbf{pwm} * \mathbf{er} * (1 + \mathbf{tm}) * (1 + \mathbf{itx})$; pwm is world price of imports; er exchange rate; tm tariff rate; itx indirect tax

Instead of the 12 household groups used in the previous analysis, the present analysis extends model to incorporate the structure of income and expenditure of households of the entire 1994 FIES, which consisted of 24,797 households. Thus, the representative household assumption in the previous analysis is replaced with the behavior of individual households, while retaining the structure of the rest of the model. This approach, which is known as microsimulation, allows one to model the link between trade reforms and individual households, and the feedback to the general equilibrium of the economy.

The model closure used has the following features:

Government Budget Balance. Nominal government consumption varies, while real government consumption is held fixed. This rationale behind this is to take out any possible effects of variations in government spending on poverty. Its price however is flexible.

Total government income is held fixed as well. Any reduction in government income from tariff reduction is compensated endogenously either by (i) additional indirect tax on output, (ii) direct income tax on households, or (iii) direct tax on firm income.

Government budget balance is flexible due to the endogenously determined price of total real government consumption.

Government transfers to households are held fixed in real terms, while nominal government transfers received by households vary with consumer prices.

Total investment. Total nominal investment is flexible, while its real value is fixed. Holding total real investment fixed avoids intertemporal welfare effects in the simulation, thereby isolating the analysis from the interaction between trade policies and growth issues via changes in the level of real investment. The price of total real investment however is flexible.

Foreign Savings. Current account balance is held fixed. It therefore avoids any influence of international resources financing domestic policy changes. Nominal exchange rate is fixed, since the model does not have any monetary variables. The foreign trade sector is therefore cleared by the real exchange rate, which in effect is the ratio of the nominal exchange rate and domestic prices. Thus exports and imports respond to movements in the real exchange rate.

Private Savings. The propensities to save of the various household groups in the model adjust proportionately to accommodate the fixed total real investment assumption. Introducing a factor in the household saving function that adjusts endogenously to a policy shock does this⁸.

Simulation Results

There is only one experiment conducted in the present paper: the simulation of the actual tariff changes between 1994 and 2000 under a compensatory tax on household income⁹. This experiment attempts to capture the actual tariff reform program during the period wherein, as observed in Table 2, the significant decline in the share of government revenue from import duties and other import taxes is offset by the improvement in the share from taxes on income and profits. Below is a separate discussion of the sectoral results of the simulation and the effects on poverty and income inequality at the national and regional level.

1. Sectoral Results

The sectoral results shown in Table 4 are similar to the results of experiment S2 of the previous paper which indicate that, as a result of the –65 percent reduction in tariff rates, the overall domestic price of imports (pm) declines by –10.4 percent. Domestic prices of local goods (pd) drop by –3.2 percent, while local prices, net of indirect taxes, (pl) decline by –2.6 percent. The reduction in these prices translates into lower composite prices (pq) by –4.1 percent. Furthermore, output prices (px) decline by –2 percent.

Indeed, the reduction in tariff results in changes in the relative import-domestic price ratios, triggering substitution effects between imports and domestically produced goods. For example, import volume (m) increases by +5.2 percent, while domestic production declines by –0.5 percent. These changes taken together however result in a marginal improvement in the total supply of goods available in the market as shown by the increase in the composite goods (q) of +0.5 percent.

⁸That is, introducing the variable *adj* in Equation (39) in the Appendix.

⁹Formulated as: (Base direct tax rate on household income - compensatory tax rate on household income). Thus households share equally the burden of the additional income tax.

The overall decline in domestic prices creates an effective real exchange depreciation¹⁰, which increases export competitiveness. Thus, overall exports (e) increases by +5.4 percent, which increases total output (x) marginally by +0.4 percent.

Industry realizes the largest drop in import prices (-11.7 percent) as compared to agriculture's import prices drop of -3.1 percent. In terms of specific sectors, the largest drop in import prices is observed in mining (-25.8 percent), in fishing (-18.5 percent), in food manufacturing (-13.6 percent), and in non-food manufacturing (-10.4 percent). These differentiated effects are due to the different levels of initial tariff rate.

The sectoral effects on import volume are due to the differentiated effects on import prices and on the differences in the armington elasticities. The large increase in the import volume in fishing (+20.5 percent), in food manufacturing (+12.7 percent) and in mining (+10.4 percent) is due to all these factors. Import volume of the non-food manufacturing sector registers an increase of +5.4 percent only. However, since the non-food manufacturing sector is the largest importer (76.1 percent of total imports, Table 6), the increase in the overall import volume largely comes from this sector.

One set of results that need further elaboration is the effect on non-food manufacturing sector's imports (m), domestic production (d) and the composite (q), since this sector is a major contributor to the total. One may observe that the decline in its import prices is a lot higher than the drop in domestic prices, i.e., -10.4 percent versus -6.2 percent. Thus, the relative price change favoring imports should lead to reduction in domestic production, and yet the result on domestic production indicates an increase of +1.0 percent. There are no inconsistencies in the results because the composite good (q) for the sector registers an increase of +4.7 percent¹¹.

Except for livestock, all sectors register positive export growth. The increase is largely attributed to the improvement in the export competitiveness of the sectors as discussed earlier. The highest export growth is observed in non-food manufacturing sector (+10.1 percent). Being the dominant export sector, its high export growth makes it the main contributor to the overall export growth effect. This export growth, together with the increase in domestic production for non-food manufacturing, brings about an overall increase in total production of +4.2 percent. This is the only sector that registers a relatively high increase in output. Marginal increases are observed in other agriculture (+0.1 percent) and in utilities¹² (+0.4 percent).

Thus far it is quite clear from the results that tariff reduction brings about reallocation effects in production that favor the non-food manufacturing sector.

¹⁰Since the domestic price of exports remains the same because of fixed nominal exchange rate and zero tax on exports, the decline in local prices p_l leads to depreciation of the real exchange rate.

¹¹If one puts these results in the framework of production theory where imports and domestic production are factor inputs and one isoquant indicates one level of output, the results would indicate an outward shift in the isoquant since q is higher together with higher imports and domestic production.

¹²Electricity, gas and water.

What happens to the flow of resources across sectors? Since all sectoral capital is fixed, this pertains to the sectoral movement of labor. The results on factor prices are relevant in assessing labor movements. The results are presented in Table 5.

Given fixed labor supply for each labor type, the reduction in agriculture output (x) of -1.4 percent and in value added (va) of -1.6 percent as a result of the drop in tariffs lowers agricultural wages by -2.0 percent. Wages for production workers, however, increase by +1.3 percent for L3 and +2.8 percent for L4. These effects are largely due to the positive output and value added growth of the non-food manufacturing sector that pulls up labor demand by +9.2 percent for L3 and +7.7 percent for L4. Similar chain of effects can be observed behind the positive increase in the overall return to capital of +0.9 percent. The increase comes largely from the +10.7 increase in the return to capital in the non-food manufacturing sector.

In sum, the results of the experiment indicate that the non-food manufacturing sector benefits from both the effects of output reallocation and labor movement. Furthermore, as a result of the shifts in the output and factor price ratios, factor substitution favors skilled production workers (L3) in non-food manufacturing and to a much lesser extent in utilities. Also, the results show declining agriculture wages and improving production wages. All these will have important implications on income of households.

2. Poverty Indices

The paper computes poverty measures based on the Foster-Greer-Thorbecke (FGT) poverty index, which in its general form is given by¹³

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

where n is population size, q number of people below poverty line, y_i is income, z is poverty line or poverty threshold. Poverty threshold is equal to the food threshold plus the non-food threshold, where threshold refers to the cost of basic food and non-food requirements. The parameter α can have three possible values, each one indicating a measure of poverty.

- a. Head count index of poverty ($\alpha = 0$). This is the common index of poverty which measure the proportion of the population whose income (or consumption) is below the poverty line
- b. Poverty gap ($\alpha = 1$). This index measures the depth of poverty. That is, it depends on the distance of the poor below the poverty line.
- c. Poverty Severity ($\alpha = 2$). This index measures the severity of poverty

¹³See Ravallion (1992) for detailed discussion. The poverty and income inequality indices were computed using the DAD 4.2 software of Duclos, Araar, Fortin (2002).

The following adjustments were done to carry out the computation of these indices:

(i) Convert all results on households to individuals by utilizing the household family size and the household adjusted weighing factor of the 1994 FIES. This converts the 24,797 households in the FIES to 67,430,864 individuals.

(ii) Adjust all official poverty thresholds in 1994 by deflating them with the results on the consumer price index derived from the simulation. Poverty thresholds are available for the whole Philippines, for the whole urban and rural, and for the 14 regions, broken into urban and rural areas. The consumer price index is derived as the weighted composite price (pq_i), the weights being the consumption basket of households of the different areas and regions.

(iii) The results on nominal household income were used in the computation of the various poverty indices. Results on nominal household income were used instead of the nominal disposal household income because of the compensatory tax that was imposed on household income.

Detailed results of poverty and income inequality, including the standard deviation, are presented in Tables 7a to 7f. However, for clearer analysis major results are summarized in various Figures.

A closer look at the structure of the sources of household income would greatly facilitate the reading of the results. Table 8 shows the various sources of household income in the model. Labor income is a major source of household income as a whole. In particular, income from labor type L3 (skilled production labor) accounts for almost 40 percent of urban household income and 22 percent of rural household income. Furthermore, income from labor type L2 (unskilled agriculture labor) accounts 19.5 percent of rural household income.

Sources of household income vary greatly across urban and rural areas of the different regions. Households in regional urban areas rely on income from skilled production labor, while households in regional rural areas depend heavily on both income from unskilled agriculture labor and skilled production labor. Rural households also depend on capital income in agriculture.

Tariff reduction reduces poverty as shown in Figure 18. For the whole Philippines the head count index declines by -3.1 percent, poverty gap by -3.7 percent and poverty severity by -4.0 percent. The improvement in the poverty situation is relatively larger in urban areas than in rural. The variance largely comes from the differences in the change in the consumer prices and household income. Table 9 shows that while the average consumer prices declines by -2.88 percent for urban households, their average household income improves by +0.72 percent. On the other hand, while the average consumer prices declines by -2.96 percent for rural households, their average household declines as well by -0.37 percent. The decline in the average household income for the latter is largely due to the drop in agriculture wages and the decline in the return to capital in agriculture, both of which are major sources of income for rural households. However, in the case of the former, the

improvement in household income is due to the increase in production wages and in the return to capital in industry, particular in the non-food manufacturing sector.

The improvement in poverty varies greatly across urban and rural areas of the different regions. For example, Figure 19 shows that among the regional urban areas, the largest drop in poverty is observed in the NCR. The head count ratio decreases by -13 percent, poverty gap by -15.7 percent, and poverty severity by -17.3 percent. Far next to the NCR are Region 3 and Region 13. On the other hand, for the regional rural areas the improvement in poverty is observed in Region 3, followed by Region 7 (Figure 20). Generally, the difference in effects on poverty across different areas can be traced through the sources of household income, the changes in factor prices, and the changes in the weighted consumer prices.

On the whole, tariff reduction improves the poverty situation. The favorable effects come largely from the reduction in consumer prices than from the improvement in household income. Across regions, the effects vary greatly, with the largest improvement in the NCR (Figure 21). Households in urban areas enjoy relatively higher household income than their rural counterpart because of the favorable effects on production wages (Figure 22). As seen earlier, because of the reallocation effects favoring non-food manufacturing sector, agriculture wages as well as the return to capital in agriculture drop, triggering differentiated effects across regions.

3. Inequality Indices

The paper computes two commonly used measures of income inequality: the Gini income inequality index and the Atkinson income inequality index.

(a) The Gini Index is given by

$$I = \sum_{i=1}^n \frac{1}{2\mu \cdot n} \left(\sum_{j=1}^n \frac{|y_i - y_j|}{n} \right)$$

where y_i is income and n population.

(b) Atkinson Index of Inequality is given by

$$I(k; \varepsilon) = \frac{\mu(k) - \xi(k; \varepsilon)}{\mu(k)}$$

where $\mu(k) = \frac{\sum_{i=1}^n w_i^k y_i}{\sum_{i=1}^n w_i^k}$ is given by

$$\xi(k; \varepsilon) = \left[\frac{1}{\sum_{i=1}^n w_i^k} \sum_{i=1}^n w_i^k (y_i)^{1-\varepsilon} \right]^{\frac{1}{1-\varepsilon}} \rightarrow \text{if } \varepsilon \neq 1 \text{ and } \varepsilon \geq 0$$

or

$$\xi(k; \varepsilon) = \text{Exp} \left[\frac{1}{\sum_{i=1}^n w_i^k} \sum_{i=1}^n w_i^k \ln(y_i) \right] \rightarrow \text{if } \varepsilon = 1$$

where y_i is income. The Atkinson inequality index is computed for two values of $\varepsilon = 0.5$ and 0.75

The results indicate that income inequality worsens in the Philippines as a whole and in all regions (urban and rural), except in the NCR. For the whole economy, the Gini index increases by +0.6 percent (Figure 23). The increase in income inequality is higher in rural places than in urban areas (+0.8 percent and +0.2 percent, respectively). This is largely due to the decline in agriculture wages and the decrease in rate to capital in agriculture.

Across urban areas, the results on income inequality vary. For example, while the NCR sees improvement in the Gini index by -0.14 percent, the rest of the regional urban areas have positive change in the Gini (Figure 24). The worst income inequality effects are observed in Region 14, with the index increasing by +0.91 percent.

On the other hand, all regional rural places see worsening income inequality after the tariff change. The highest increase in the Gini index is also observed in Region 14 (Figure 25).

Summary and Conclusions

The following insights can be drawn from the exercise:

1. Imports and exports increase as a result of tariff reduction. The former is due to lower import prices, while the latter to improved export competitiveness. Although production for the domestic market declines, the total supply of goods available in the market improves, largely because of higher imports. Overall production however improves because of higher exports. All these are the substitution and scale effects of the reduction in tariff rates.
2. The non-food manufacturing sector benefits from both the effects of output reallocation and labor movement. Also, as a result of the changes in the output and factor price ratios, factor substitution favors skilled production workers in non-food manufacturing and utilities.

3. Agriculture wages decline as a result of the drop in the output of agriculture. The drop in agriculture output also results in lower rate of return to capital in agriculture. These two effects translate into lower income for rural households in the different regions. On the other hand, the resource reallocation effects towards industry, particularly the non-food manufacturing sector, improve wages for production workers and the rate of return to capital in industry. These effects improve income of urban households in the different regions, including the NCR.

4. Tariff reduction improves the poverty situation. All poverty indices decline for the whole Philippines and for all urban and rural areas of the different regions. The improvement in poverty is not so much from the effects on income but from the reduction in consumer prices. However, income inequality deteriorates, except in the NCR.

5. The favorable poverty effects of tariff reduction come not so much from the income effects but from the reduction in consumer prices. However, one should note that these sets of results were arrived at from model simulation that uses a competitive equilibrium model. As such there are no oligopolistic market structures built into it, so that any tariff reduction should in principle translates into lower domestic and consumer prices. Are the results realistic considering the fact that the sector that benefits the most in terms of resource reallocation and factor movement is the non-food manufacturing sector, which is believed to have strong oligopolistic structure in the Philippines? This issue can be addressed quantitatively if the model is extended to accommodate non-competitive market structure, but that is beyond the scope of the present paper. However, in the absence of such an extended model, at this juncture it would be fitting to look at the trend of the rate of inflation in the 1990s and onwards, the period when reforms intensified (Figure 24). From a high of 18.7 percent in 1991, inflation rate declined slowly but surely to reach 3.1 percent in 2002. There was a short bleep though of 9.7 percent in 1998, which was caused largely by a severe drought brought about by the El Nino effect¹⁴. For sure, inflation is caused by a host of factors including supply pressures, but the competition brought in by the lowering of tariff rates in the 1990s has certainly put a strong downward pressure on inflation rate in recent years.

¹⁴ Agriculture production registered the highest drop in output in 30 years.

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Table 1: Tariff Rates

	Tariff Rates (%)		
	1994	2000	% Change
Crops	15.9 %	8.7 %	-45.6
Livestock	0.7 %	0.3 %	-57.6
Fishing	34.1 %	8.0 %	-76.4
Other Agriculture	0.3 %	0.2 %	-19.9
AGRICULTURE	8.8 %	4.5 %	-48.8
Mining	44.1 %	4.9 %	-88.9
Food Manufacturing	37.3 %	16.6 %	-55.4
Non-food Manufacturing	21.1 %	7.6 %	-64.0
Construction			
Electricity, Gas and Water			
INDUSTRY	24.1 %	8.4 %	-65.3
Wholesale trade & retail			
Other Services			
Government services			
SERVICES			
TOTAL	23.9 %	7.9 %	-65.0

Source of basic data: Manasan & Querubin, 1997

Table 2: National Government Balances

Percent of Gross National Product

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
REVENUES	16.9	17.6	17.7	17.3	19.4	18.4	18.2	18.7	16.4	15.3	14.5
<i>Tax Revenues</i>	14.2	14.5	15.2	15.2	15.6	15.9	16.3	16.3	14.8	13.8	12.9
Bureau of Internal Revenue	9.7	9.3	9.7	9.7	10.8	10.7	11.5	12.4	12.0	10.9	10.1
Bureau of Customs	4.3	5.1	5.3	5.4	4.7	5.0	4.6	3.7	2.7	2.8	2.7
Other Offices	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
<i>Non-Tax Revenues</i>	2.5	2.8	2.3	1.9	3.7	2.6	1.9	2.4	1.6	1.5	1.5
<i>Grants</i>	0.2	0.2	0.2	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0
EXPENDITURES	20.4	19.7	18.8	18.7	18.4	17.9	17.9	18.6	18.2	18.8	18.4
DEFICIT	-3.5	-2.1	-1.2	-1.5	0.9	0.6	0.3	0.1	-1.8	-3.6	-3.9

Sources: Bangko Sentral ng Pilipinas: COR(FPAD-RS)

¹ Bureau of Treasury: Statistical Data Analysis Division - Research Service

Table 3: Average Tax Rates (1994 Calibrated SAM value)

	Tariff Rates (%)	Indirect Tax Rates (%)
Crops	14.9	1.9
Livestock	0.6	1.8
Fishing	31.9	2.9
Other Agriculture	0.3	2.2
AGRICULTURE	8.1	2.1
Mining	40.9	1.2
Food Manufacturing	33.6	3.7
Non-food Manufacturing	19.5	1.6
Construction	-	1.6
Electricity, Gas and Water	-	2.2
INDUSTRY	22.1	2.4
Wholesale trade & retail	-	5.5
Other Services	-	3.7
Government services	-	-
SERVICES	-	4.3
TOTAL	21.4	3.0

Source: 1994 Social Accounting Matrix estimated by the author.

Table 4: Effects on Prices and Volume

	Trade Elasticities		Price Changes (%)					Volume Changes (%)				
	Armington	CET	δp_{mi}	δp_{di}	δp_{qi}	δp_{li}	δp_{xi}	δm_i	δe_i	δd_i	δq_i	δx_i
Crops	1.95	1.27	-5.9	-1.3	-1.4	-1.3	-1.2	7.9	0.0	-1.7	-1.5	-1.6
Livestock	1.40	0.40	-0.4	-1.7	-1.7	-1.7	-1.7	-3.8	-1.3	-1.9	-2.0	-1.9
Fishing	1.10	1.50	-18.5	-2.1	-2.1	-2.1	-1.6	20.5	1.6	-1.5	-1.5	-0.9
Other Agriculture	0.85	0.40	-0.1	0.2	0.2	0.2	0.2	0.3		0.1	0.1	0.1
AGRICULTURE			-3.1	-1.4	-1.5	-1.4	-1.3	2.3	0.8	-1.6	-1.5	-1.4
Mining	1.10	1.50	-25.8	-9.4	-21.8	-9.4	-5.0	10.4	2.6	-11.4	4.2	-5.2
Food Manufacturing	1.08	1.20	-13.9	-2.3	-3.3	-2.3	-1.5	12.7	1.1	-1.7	-0.6	-1.4
Non-food Manufacturing	0.92	1.37	-10.4	-6.2	-8.3	-6.2	6.2	5.4	10.1	1.0	3.1	4.2
Construction	1.20	1.20		-3.4	-3.4	-3.4	-0.7	-5.4	2.9	-1.3	-1.4	-1.3
Electricity, Gas and Water	1.20	1.20		-2.0	-2.0	-2.0	2.1		2.8	0.3	0.3	0.4
INDUSTRY			-11.7	-4.1	-6.5	-4.1	-3.2	6.1	8.4	-0.6	1.5	1.4
Wholesale trade & retail	1.20	1.20		-0.5	-0.5	-0.5	-0.4		0.3	-0.2	-0.2	-0.1
Other Services	1.20	1.20		-1.4	-1.3	-1.4	-1.2	-2.0	1.2	-0.4	-0.5	-0.2
Government services	-	-					-0.4					
SERVICES				-1.1	-1.0	-1.1	-0.9	-2.0	0.8	-0.4	-0.2	-0.2
TOTAL			-10.4	-3.2	-4.1	-2.6	-2.0	5.2	5.4	-0.7	0.5	0.4

where

 m_i : imports e_i : exports d_i : domestic sales p_{li} : local prices p_{mi} : import (local) prices p_{ei} : export (local) prices p_{di} : domestic prices x_i : total output p_{xi} : output prices q_i : composite commodity p_{qi} : composite commodity pricesTable 5: Imports and Exports Shares
(1994 Social Accounting Matrix)

	Shares (%)	
	Imports	Exports
Crops	0.7	3.1
Livestock	0.6	0.0
Fishing	0.0	3.4
Other Agriculture	0.1	0.0
AGRICULTURE	1.5	6.5
Mining	6.5	2.5
Food Manufacturing	5.4	8.6
Non-food Manufacturing	76.1	48.2
Construction	0.9	0.3
Electricity, Gas and Water	0.0	0.2
INDUSTRY	88.8	59.7
Wholesale trade & retail	0.0	14.3
Other Services	9.7	19.5
Government services	0.0	0.0
SERVICES	9.7	33.8
TOTAL	100.0	100.0
Total Value (Pb)	530.1	535.5
Current Account Balance (P billion)		99.9

Source: Official 1994 Input-Output Table

Table 6: Effects on factors

	Value Added Changes (%)		Return to Capital (%)	Change in Labor Demand, %				
	δp_{vai}	δvai	δr_i	Aggregate	L1*	L2*	L3*	L4*
Crops	-0.6	-1.6	-2.1	-3.1	-0.2	-0.2	-3.4	-4.8
Livestock	-1.0	-1.9	-2.9	-3.8	-0.9	-0.9	-4.2	-5.5
Fishing	-0.6	-0.9	-1.4	-2.4	0.6	0.6	-2.7	-4.1
Other Agriculture	1.1	0.1	1.1	0.2	3.2	3.2	-0.2	-1.6
AGRICULTURE	-0.5	-1.6	-1.9	-2.9			-3.2	-4.7
Mining	-5.0	-5.2	-10.0	-10.9			-11.2	-12.4
Food Manufacturing	-1.5	-1.4	-2.9	-3.8			-4.2	-5.6
Non-food Manufacturing	6.2	4.2	10.7	9.6			9.2	7.7
Construction	-0.7	-1.3	-2.0	-2.9			-3.3	-4.6
Electricity, Gas and Water	2.1	0.4	2.4	1.4			1.1	-0.4
INDUSTRY	2.1	-0.6	3.0	2.7			2.1	1.1
Wholesale trade & retail	0.7	-0.1	0.6	-0.4			-0.7	-2.1
Other Services	0.7	-0.2	0.5	-0.5			-0.8	-2.2
Government services	1.0	0.0		-0.4			-0.4	
SERVICES	0.7	-0.4		-0.4			-0.6	-2.2
TOTAL	0.9	-0.021	0.9					
Average Wage ---->				1.0	-2.0	-2.0	1.3	2.8

where

vai : value added

pvai : value added prices

r_i : price of capital

*L1, L2, L3, & L4: Labor type 1, 2, 3, & 4

Table 7a : 1994 Normalized FGT Poverty Indices

	Head Count Ratio ($\alpha = 0$)			Poverty Gap ($\alpha = 1$)			Poverty Severity ($\alpha = 2$)		
	Before	After	% change	Before	After	% change	Before	After	% change
Philippines	42.878%	41.566%	-3.06%	15.564%	14.994%	-3.67%	7.446%	7.146%	-4.03%
Std Dev.	0.00359	0.00359		4.28780	4.15656		3.11289	2.99874	
Urban	29.246%	27.824%	-4.86%	9.890%	9.355%	-5.41%	4.578%	4.319%	-5.66%
Std Dev.	0.00419	0.00413		2.92459	2.78237		1.97794	1.87091	
Rural	53.808%	52.648%	-2.16%	18.959%	18.327%	-3.33%	8.824%	8.487%	-3.81%
Std Dev.	0.00544	0.00546		5.38083	5.26475		3.79185	3.66543	

Table 7b : 1994 Inequality Indices

	Atkinson index ($\epsilon = 0.5$)			Atkinson index ($\epsilon = 0.75$)			Gni index		
	Before	After	% change	Before	After	% change	Before	After	% change
Philippines	17.765%	17.966%	1.13%	24.656%	24.942%	1.16%	46.443%	46.721%	0.60%
Std Dev.	0.00251	0.00252		0.00299	0.00300		0.00288	0.00287	
Urban	16.770%	16.848%	0.46%	23.404%	23.526%	0.52%	44.886%	44.985%	0.22%
Std Dev.	0.00319	0.00320		0.00384	0.00384		0.00380	0.00380	
Rural	12.289%	12.474%	1.50%	17.404%	17.662%	1.48%	38.814%	39.123%	0.79%
Std Dev.	0.00258	0.00260		0.00332	0.00334		0.00379	0.00380	

Table 7c : 1994 Normalized FGT Poverty Indices (Urban)

	Head Count Ratio ($\alpha = 0$)			Poverty Gap ($\alpha = 1$)			Poverty Severity ($\alpha = 2$)			Population
	Before	After	% change	Before	After	% change	Before	After	% change	
NCR	10.400%	9.051%	-12.97%	2.012%	1.696%	-15.70%	0.601%	0.496%	-17.34%	9,321,037
Std Dev.	0.005850	0.005527		1.04000	0.90506		0.40237	0.339182		
Region 1	53.656%	51.878%	-3.31%	19.412%	18.471%	-4.85%	9.430%	8.960%	-4.99%	1,452,402
Std Dev.	0.021056	0.02117		5.36564	5.18780		3.88242	3.69412		
Region 2	37.308%	35.130%	-5.84%	12.405%	11.898%	-4.09%	5.502%	5.242%	-4.72%	646,015
Std Dev.	0.030869	0.03053		3.73085	3.51305		2.48098	2.37958		
Region 3	27.348%	25.366%	-7.25%	7.958%	7.364%	-7.47%	3.342%	3.076%	-7.95%	4,126,523
Std Dev.	0.01194	0.01169		2.73481	2.53661		1.59169	1.47283		
Region 4	24.014%	22.486%	-6.36%	7.246%	6.760%	-6.72%	3.106%	2.890%	-6.95%	4,539,656
Std Dev.	0.01045	0.01023		2.40143	2.24860		1.44929	1.35191		
Region 5	46.420%	44.891%	-3.29%	15.450%	14.630%	-5.31%	7.030%	6.646%	-5.45%	1,427,778
Std Dev.	0.02270	0.02272		4.64204	4.48910		3.09010	2.92602		
Region 6	35.318%	33.075%	-6.35%	11.581%	10.907%	-5.82%	5.050%	4.704%	-6.84%	2,309,525
Std Dev.	0.01692	0.01849		3.53177	0.00818		2.31628	0.00579		
Region 7	29.385%	27.847%	-5.23%	9.416%	8.857%	-5.94%	4.221%	3.974%	-5.85%	2,181,465
Std Dev.	0.01662	0.01638		2.93847	2.78474		1.88328	1.77137		
Region 8	33.472%	32.239%	-3.68%	9.946%	9.334%	-6.16%	4.129%	3.861%	-6.47%	1,022,806
Std Dev.	0.02494	0.02472		3.34719	3.22390		1.98929	1.86680		
Region 9	39.101%	36.619%	-6.35%	12.807%	12.080%	-5.68%	6.026%	5.711%	-5.22%	927,371
Std Dev.	0.02625	0.02588		3.91009	3.66192		2.56135	2.41600		
Region 10	44.802%	43.342%	-3.26%	17.255%	16.503%	-4.36%	8.651%	8.257%	-4.56%	1,786,689
Std Dev.	0.01965	0.01960		4.48021	4.33416		3.45110	3.30054		
Region 11	31.991%	30.664%	-4.15%	10.017%	9.519%	-4.97%	4.234%	3.994%	-5.65%	2,239,530
Std Dev.	0.01633	0.01618		3.19915	3.06640		2.00335	1.90373		
Region 12	55.589%	55.114%	-0.85%	23.011%	22.335%	-2.94%	11.661%	11.255%	-3.49%	774,963
Std Dev.	0.02846	0.02850		5.55896	5.51147		4.60218	4.46702		
Region 13	26.773%	24.669%	-7.86%	8.483%	7.928%	-6.54%	3.577%	3.308%	-7.54%	398,127
Std Dev.	0.03354	0.03233		2.67733	2.46695		1.69668	1.58568		
Region 14	75.915%	72.624%	-4.33%	25.491%	24.534%	-3.76%	10.781%	10.221%	-5.19%	415,573
Std Dev.	0.03042	0.03210		7.59150	7.26244		5.09822	4.90675		

Table 7d: 1994 Normalized FGT Poverty Indices (Rural)

	Head Count Ratio ($\alpha = 0$)			Poverty Gap ($\alpha = 1$)			Poverty Severity ($\alpha = 2$)			Population
	Before	After	% change	Before	After	% change	Before	After	% change	
Region 1	53.328%	52.087%	-2.33%	18.501%	17.790%	-3.84%	8.533%	8.188%	-4.03%	2,215,945
Std Dev.	0.02053	0.02059		5.33281	5.20868		3.70015	3.55805		
Region 2	43.471%	42.524%	-2.18%	13.566%	13.116%	-3.32%	5.801%	5.587%	-3.68%	1,961,412
Std Dev.	0.02250	0.02249		4.34712	4.25240		2.71321	2.62311		
Region 3	31.853%	29.544%	-7.25%	9.625%	9.159%	-4.84%	4.189%	3.974%	-5.12%	2,940,204
Std Dev.	0.01767	0.01727		3.18531	2.95443		1.92507	1.83184		
Region 4	46.883%	45.389%	-3.19%	15.521%	14.879%	-4.13%	6.792%	6.470%	-4.74%	4,212,689
Std Dev.	0.01506	0.01507		4.68831	4.53892		3.10415	2.97582		
Region 5	66.963%	65.775%	-1.77%	26.443%	25.668%	-2.93%	13.396%	12.943%	-3.38%	3,346,027
Std Dev.	0.01721	0.01743		6.69628	6.57752		5.28860	5.13360		
Region 6	58.656%	57.349%	-2.23%	19.209%	18.525%	-3.56%	8.315%	7.958%	-4.29%	3,750,808
Std Dev.	0.01638	0.01650		5.86558	5.73486		3.84180	3.70490		
Region 7	44.063%	41.696%	-5.37%	12.704%	12.138%	-4.46%	5.138%	4.883%	-4.95%	2,654,264
Std Dev.	0.01898	0.01893		4.40635	4.16965		2.54083	2.42753		
Region 8	49.159%	48.722%	-0.89%	17.011%	16.530%	-2.83%	7.879%	7.628%	-3.19%	2,502,420
Std Dev.	0.02091	0.02093		4.91587	4.87224		3.40224	3.30597		
Region 9	56.445%	55.923%	-0.93%	19.808%	19.149%	-3.33%	9.161%	8.811%	-3.82%	1,795,348
Std Dev.	0.02299	0.02304		5.64454	5.59230		3.96170	3.82981		
Region 10	61.869%	61.154%	-1.16%	23.372%	22.575%	-3.41%	10.976%	10.515%	-4.20%	2,196,025
Std Dev.	0.02060	0.02069		6.18687	6.11539		4.67443	4.51506		
Region 11	56.979%	55.142%	-3.22%	18.437%	17.790%	-3.51%	8.009%	7.692%	-3.96%	2,605,444
Std Dev.	0.01929	0.01949		5.69794	5.51424		3.68735	3.55810		
Region 12	60.090%	58.887%	-2.00%	23.129%	22.498%	-2.73%	11.319%	10.954%	-3.22%	1,405,500
Std Dev.	0.02648	0.02662		6.00898	5.88870		4.62588	4.49967		
Region 13	49.222%	47.776%	-2.94%	18.884%	18.472%	-2.18%	9.367%	9.134%	-2.49%	919,590
Std Dev.	0.03446	0.03449		4.92224	4.77762		3.77677	3.69443		
Region 14	79.993%	79.030%	-1.20%	29.833%	29.177%	-2.20%	13.601%	13.209%	-2.88%	1,355,730
Std Dev.	0.01902	0.01936		7.99930	7.90305		5.96654	5.83531		

Table 7e : 1994 Inequality Indices (Urban)

	Atkinson index ($\epsilon = 0.5$)			Atkinson index ($\epsilon = 0.75$)			Gni index			Population
	Before	After	% change	Before	After	% change	Before	After	% change	
NCR	14.648%	14.616%	-0.21%	20.099%	20.053%	-0.23%	41.414%	41.356%	-0.14%	9,321,037
Std Dev.	0.00550	0.00551		0.00663	0.00663		0.00691	0.00692		
Region 1	11.968%	12.061%	0.78%	17.207%	17.349%	0.83%	38.721%	38.866%	0.37%	1,452,402
Std Dev.	0.00674	0.00682		0.00924	0.00935		0.01120	0.01133		
Region 2	15.267%	15.417%	0.98%	21.812%	22.031%	1.00%	44.025%	44.239%	0.49%	646,015
Std Dev.	0.01087	0.01091		0.01475	0.01481		0.01620	0.01623		
Region 3	11.101%	11.139%	0.34%	15.831%	15.890%	0.37%	36.595%	36.654%	0.16%	4,126,523
Std Dev.	0.00620	0.00624		0.00793	0.00797		0.00921	0.00925		
Region 4	13.616%	13.655%	0.29%	19.241%	19.311%	0.36%	40.511%	40.569%	0.14%	4,539,656
Std Dev.	0.00669	0.00668		0.00827	0.00827		0.00878	0.00877		
Region 5	15.485%	15.621%	0.88%	21.737%	21.934%	0.91%	43.557%	43.758%	0.46%	1,427,778
Std Dev.	0.01099	0.01106		0.01434	0.01442		0.01550	0.01557		
Region 6	16.195%	16.315%	0.74%	22.652%	22.832%	0.79%	44.703%	44.885%	0.41%	2,309,525
Std Dev.	0.01053	0.01052		0.01309	0.01308		0.01344	0.01341		
Region 7	15.751%	15.845%	0.60%	22.152%	22.298%	0.66%	43.682%	43.815%	0.31%	2,181,465
Std Dev.	0.01441	0.01438		0.01738	0.01735		0.01718	0.01716		
Region 8	14.647%	14.757%	0.75%	20.355%	20.519%	0.80%	41.835%	42.018%	0.44%	1,022,806
Std Dev.	0.01923	0.01917		0.02354	0.02347		0.02458	0.02446		
Region 9	9.950%	10.048%	0.98%	14.548%	14.704%	1.08%	34.887%	35.055%	0.48%	927,371
Std Dev.	0.00934	0.00938		0.01279	0.01286		0.01639	0.01635		
Region 10	16.284%	16.394%	0.68%	22.772%	22.939%	0.74%	44.370%	44.528%	0.36%	1,786,689
Std Dev.	0.01665	0.01668		0.02009	0.02012		0.02005	0.02005		
Region 11	15.028%	15.120%	0.61%	20.940%	21.083%	0.68%	42.515%	42.663%	0.35%	2,239,530
Std Dev.	0.01276	0.01279		0.01554	0.01556		0.01581	0.01578		
Region 12	16.046%	16.313%	1.66%	22.509%	22.876%	1.63%	44.605%	44.966%	0.81%	774,963
Std Dev.	0.01768	0.01812		0.02173	0.02219		0.02174	0.02199		
Region 13	14.236%	14.265%	0.20%	20.316%	20.368%	0.26%	42.329%	42.362%	0.08%	398,127
Std Dev.	0.01277	0.01273		0.01727	0.01724		0.01958	0.01964		
Region 14	13.227%	13.425%	1.50%	17.641%	17.896%	1.45%	37.112%	37.450%	0.91%	415,573
Std Dev.	0.03991	0.04019		0.04970	0.05001		0.05652	0.05669		

Table 7f : 1994 Inequality Indices (Rural)

	Atkinson index ($\epsilon = 0.5$)			Atkinson index ($\epsilon = 0.75$)			Gni index			Population
	Before	After	% change	Before	After	% change	Before	After	% change	
Region 1	11.517%	11.647%	1.13%	16.440%	16.631%	1.16%	37.779%	38.001%	0.59%	2,215,945
Std Dev.	0.00727	0.00734		0.00972	0.00981		0.01188	0.01197		
Region 2	13.181%	13.379%	1.50%	18.582%	18.856%	1.48%	40.320%	40.644%	0.80%	1,961,412
Std Dev.	0.01098	0.01092		0.01413	0.01408		0.01586	0.01581		
Region 3	10.841%	10.940%	0.91%	15.418%	15.561%	0.93%	35.844%	36.023%	0.50%	2,940,204
Std Dev.	0.00990	0.00996		0.01271	0.01277		0.01495	0.01500		
Region 4	11.696%	11.880%	1.58%	16.692%	16.961%	1.61%	38.156%	38.484%	0.86%	4,212,689
Std Dev.	0.00578	0.00577		0.00759	0.00758		0.00889	0.00883		
Region 5	11.939%	12.139%	1.67%	16.824%	17.102%	1.65%	37.791%	38.136%	0.91%	3,346,027
Std Dev.	0.00934	0.00946		0.01191	0.01205		0.01374	0.01378		
Region 6	10.352%	10.493%	1.36%	14.623%	14.814%	1.31%	35.364%	35.606%	0.69%	3,750,808
Std Dev.	0.00703	0.00714		0.00902	0.00915		0.01092	0.01103		
Region 7	9.676%	9.765%	0.92%	13.727%	13.862%	0.99%	34.166%	34.360%	0.57%	2,654,264
Std Dev.	0.00824	0.00810		0.01034	0.01020		0.01214	0.01204		
Region 8	12.984%	13.234%	1.92%	18.304%	18.639%	1.83%	39.672%	40.057%	0.97%	2,502,420
Std Dev.	0.01104	0.01132		0.01454	0.01487		0.01735	0.01762		
Region 9	12.756%	12.974%	1.71%	17.967%	18.259%	1.63%	39.479%	39.812%	0.84%	1,795,348
Std Dev.	0.01050	0.01070		0.01345	0.01368		0.01506	0.01525		
Region 10	11.503%	11.683%	1.57%	16.277%	16.524%	1.52%	37.699%	37.989%	0.77%	2,196,025
Std Dev.	0.00881	0.00899		0.01149	0.01171		0.01354	0.01366		
Region 11	11.234%	11.420%	1.65%	15.887%	16.139%	1.59%	37.101%	37.411%	0.84%	2,605,444
Std Dev.	0.00854	0.00870		0.01115	0.01134		0.01346	0.01360		
Region 12	13.248%	13.463%	1.62%	18.627%	18.926%	1.61%	40.269%	40.626%	0.89%	1,405,500
Std Dev.	0.01171	0.01175		0.01552	0.01558		0.01838	0.01826		
Region 13	10.828%	11.051%	2.06%	15.676%	15.991%	2.01%	36.621%	37.013%	1.07%	919,590
Std Dev.	0.01067	0.01080		0.01452	0.01468		0.01759	0.01764		
Region 14	7.564%	7.760%	2.59%	10.687%	10.957%	2.53%	29.538%	29.941%	1.37%	1,355,730
Std Dev.	0.00983	0.00991		0.01282	0.01293		0.01727	0.01733		

Table 8: Sources of Household Income

	Labor Income				Capital Income				Others			
	agriculture		Industry		Agriculture	Industry	Service (trade)	Service (others)	Dividends	Government Transfers	Foreign Income	
	skilled	unskilled	skilled	unskilled								
Philippines	1.7%	7.4%	35.1%	7.5%	6.2%	11.2%	5.6%	9.9%	6.7%	5.6%	3.1%	100%
Urban	1.2%	3.0%	39.8%	6.8%	2.4%	11.3%	6.1%	11.8%	9.2%	5.2%	3.2%	100%
Rural	2.9%	19.5%	22.2%	9.4%	16.8%	10.9%	4.2%	4.6%	0.0%	6.8%	2.7%	100%
Regional (Urban)												
NCR	0.2%	0.1%	40.7%	4.9%	0.2%	9.5%	5.4%	14.2%	18.3%	3.6%	2.9%	100%
r1	1.1%	4.7%	35.7%	7.2%	5.1%	15.0%	5.0%	9.1%	0.0%	11.6%	5.4%	100%
r2	2.7%	7.1%	45.8%	4.6%	7.8%	4.9%	4.9%	10.3%	0.0%	8.6%	3.2%	100%
r3	1.4%	4.5%	34.4%	11.6%	4.3%	13.5%	6.8%	10.1%	0.8%	6.8%	5.7%	100%
r4	1.4%	3.2%	42.9%	10.0%	3.0%	14.1%	6.2%	10.1%	0.0%	5.2%	3.8%	100%
r5	0.8%	6.0%	41.4%	5.8%	5.2%	15.2%	6.9%	8.0%	0.0%	8.1%	2.6%	100%
r6	2.0%	9.8%	39.0%	6.4%	3.9%	10.5%	6.8%	9.8%	0.0%	7.5%	4.5%	100%
r7	0.4%	3.2%	40.6%	10.7%	2.4%	16.6%	6.9%	9.3%	1.0%	6.8%	2.0%	100%
r8	0.2%	4.3%	35.8%	9.5%	5.8%	8.8%	16.5%	6.5%	3.4%	7.2%	2.0%	100%
r9	0.6%	6.1%	42.5%	8.9%	5.8%	11.4%	7.4%	8.9%	0.0%	6.4%	1.9%	100%
r10	5.9%	13.1%	42.1%	7.6%	4.1%	6.2%	5.8%	7.2%	0.0%	6.8%	1.3%	100%
r11	7.5%	8.6%	33.2%	5.9%	5.3%	16.0%	7.2%	8.5%	0.0%	5.9%	1.9%	100%
r12	3.8%	9.9%	35.5%	4.0%	9.0%	18.4%	5.4%	8.1%	0.0%	4.6%	1.3%	100%
r13	0.3%	1.3%	46.1%	6.2%	3.2%	9.5%	3.6%	17.2%	0.0%	9.5%	3.1%	100%
r14	0.0%	0.0%	24.3%	1.9%	25.0%	9.7%	19.9%	8.9%	3.5%	5.5%	1.2%	100%
Regional (rural)												
r1	1.6%	10.3%	26.3%	9.0%	14.0%	13.9%	3.4%	4.6%	0.0%	10.2%	6.8%	100%
r2	1.5%	20.0%	21.8%	5.5%	21.7%	14.9%	2.5%	3.9%	0.0%	5.7%	2.5%	100%
r3	2.0%	17.3%	19.7%	13.2%	14.4%	11.9%	4.2%	8.0%	0.0%	5.6%	3.7%	100%
r4	2.7%	15.6%	25.9%	12.8%	11.9%	10.9%	4.5%	6.0%	0.0%	5.8%	3.9%	100%
r5	2.1%	18.5%	27.5%	8.4%	14.7%	14.0%	4.1%	3.4%	0.0%	6.3%	0.8%	100%
r6	5.8%	34.9%	14.5%	6.5%	12.2%	8.1%	4.0%	3.7%	0.4%	7.7%	2.3%	100%
r7	1.0%	20.6%	14.2%	15.4%	15.5%	11.9%	4.3%	3.9%	0.0%	11.1%	2.2%	100%
r8	1.0%	19.7%	22.3%	8.9%	20.7%	10.2%	4.6%	2.9%	0.0%	6.9%	2.8%	100%
r9	1.4%	15.2%	24.9%	8.5%	24.2%	9.3%	6.5%	3.7%	0.0%	5.3%	0.9%	100%
r10	1.9%	22.2%	23.0%	8.5%	17.4%	12.5%	3.7%	3.5%	0.0%	6.3%	0.9%	100%
r11	8.2%	28.5%	18.6%	7.0%	16.2%	5.6%	5.1%	3.9%	0.0%	5.6%	1.2%	100%
r12	3.1%	17.6%	25.4%	6.6%	20.2%	11.4%	5.2%	3.9%	0.0%	5.2%	1.3%	100%
r13	2.1%	4.3%	30.3%	10.2%	24.8%	8.8%	2.6%	5.8%	0.0%	8.5%	2.7%	100%
r14	0.2%	0.8%	28.8%	2.5%	46.0%	4.5%	5.7%	4.3%	0.0%	6.1%	1.2%	100%

Table 9 : Change in consumer prices and household income

	Change in Weighted Consumer Prices	Change in Nominal Household Income		Change in Weighted Consumer Prices	Change in Nominal Household Income
Phil	-2.91	0.47%			
Urban			Rural		
All	-2.88	0.72%	All	-2.96	-0.37%
NCR	-2.85	0.94%	---	---	---
Region 1	-2.91	0.16%	Region 1	-2.98	-0.40%
Region 2	-2.91	0.22%	Region 2	-2.96	-0.66%
Region 3	-2.90	0.15%	Region 3	-2.94	0.11%
Region 4	-2.89	0.91%	Region 4	-2.99	-0.35%
Region 5	-2.95	0.20%	Region 5	-2.93	-0.51%
Region 6	-2.92	0.25%	Region 6	-3.02	-0.83%
Region 7	-2.87	0.24%	Region 7	-2.87	-0.82%
Region 8	-2.93	0.43%	Region 8	-2.93	-0.96%
Region 9	-2.92	0.54%	Region 9	-2.93	-0.54%
Region 10	-2.98	0.70%	Region 10	-3.01	-0.47%
Region 11	-2.89	0.25%	Region 11	-2.96	-0.92%
Region 12	-2.96	0.32%	Region 12	-3.02	-0.62%
Region 13	-2.93	0.63%	Region 13	-2.94	-0.48%
Region 14	-2.91	-0.32%	Region 14	-2.95	-1.21%

**Figure 1 :Official Poverty Incidence Estimates - Population
(in percent)**

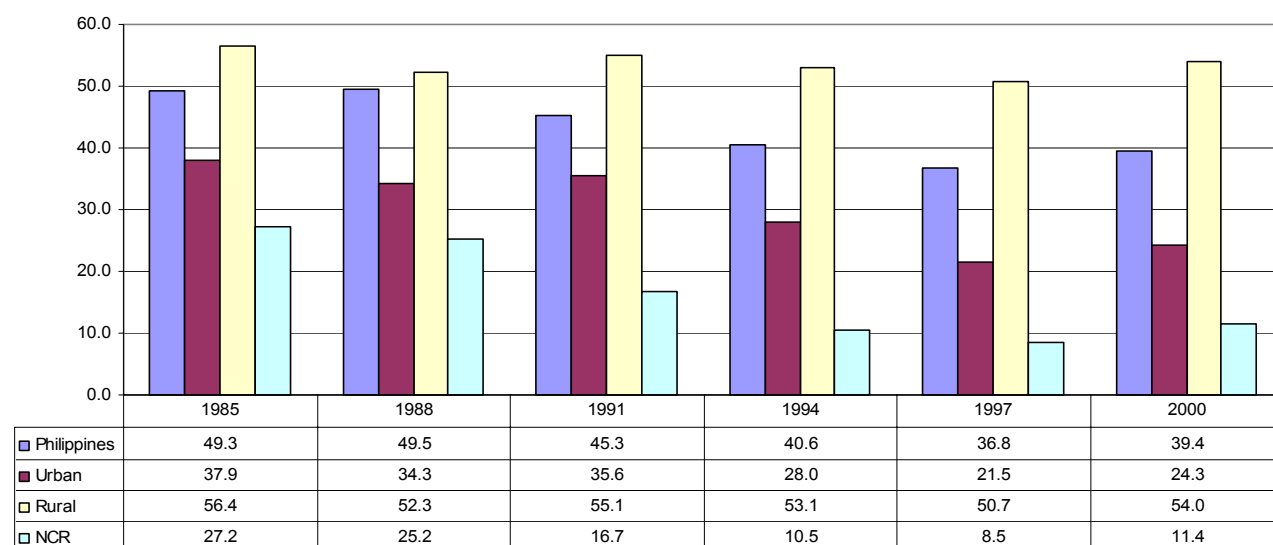


Figure 2: 1994 Poverty Head Count Ratio (%)

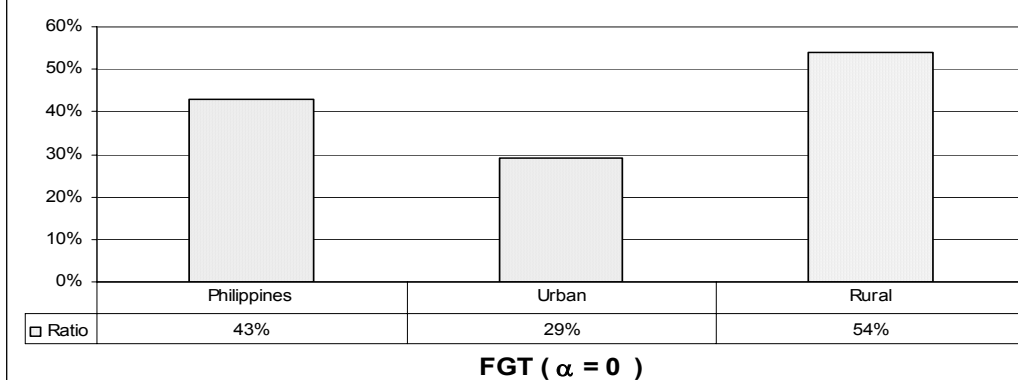


Figure 3 : 1994 Poverty Gap (%)

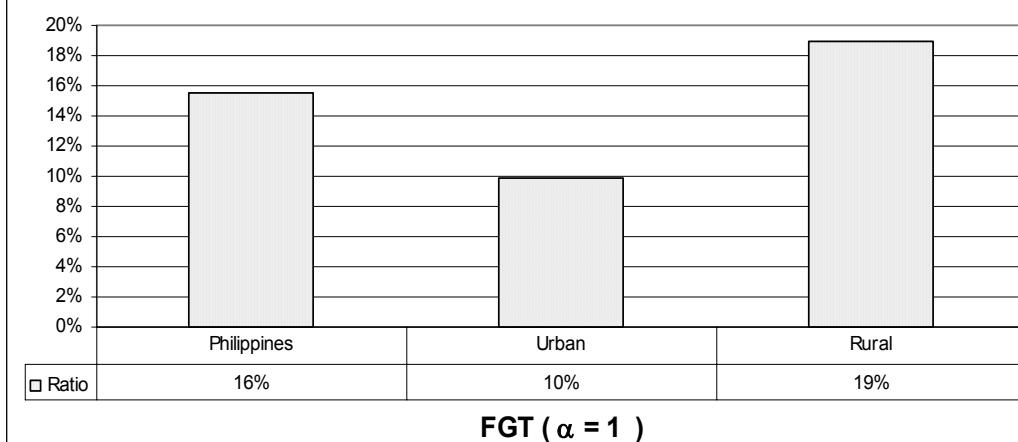


Figure 4: 1994 Poverty Severity (%)

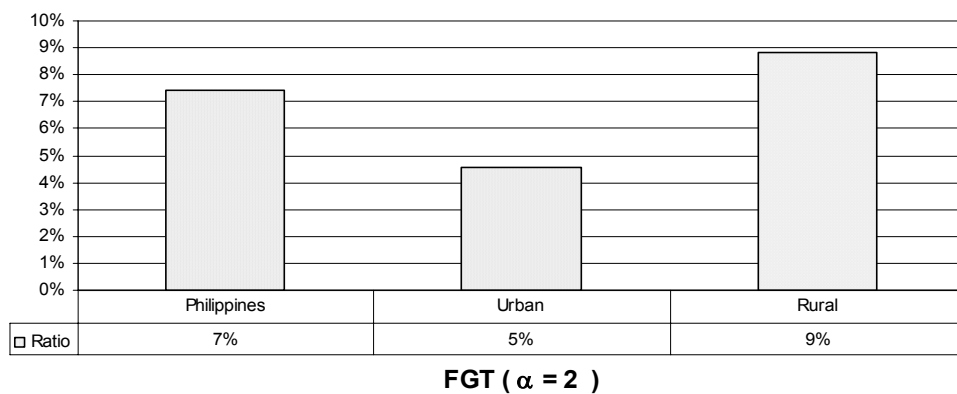


Figure 5 : 1994 Poverty Head Count Ratio (%)
Regional Urban

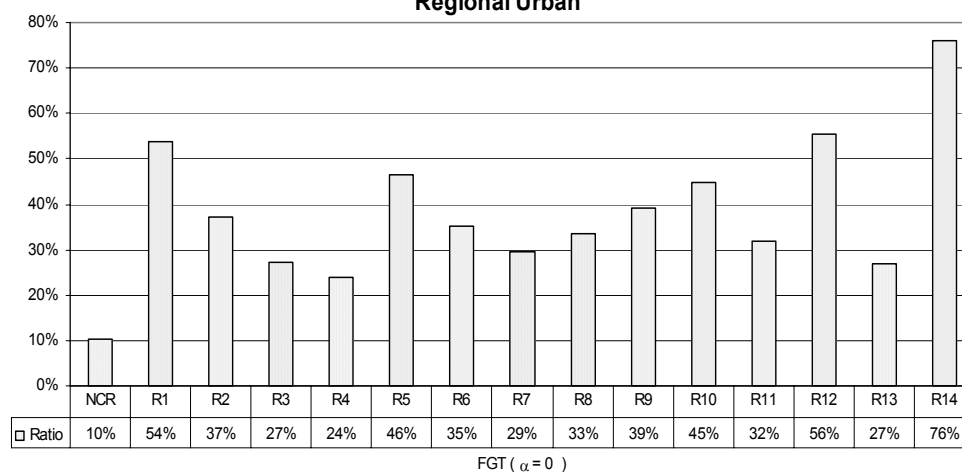


Figure 6 : 1994 Poverty Gap (%)
Regional Urban

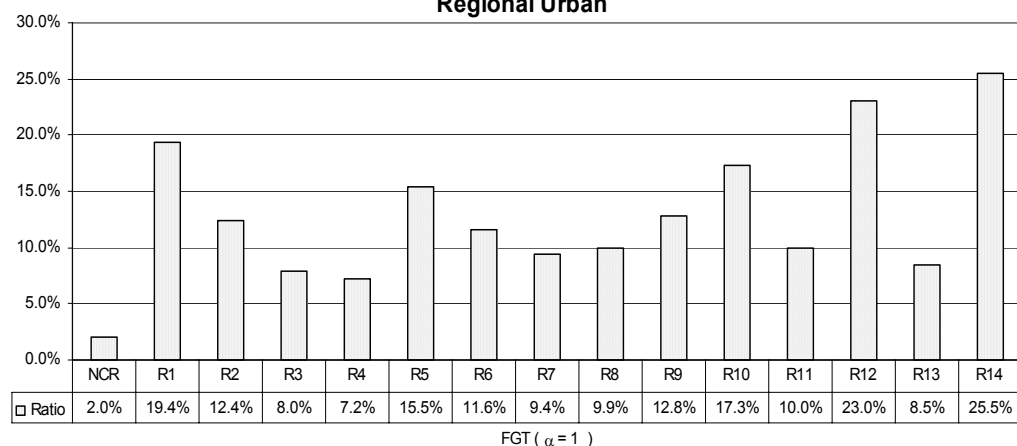


Figure 7: 1994 Poverty Severity (%)
Regional Urban

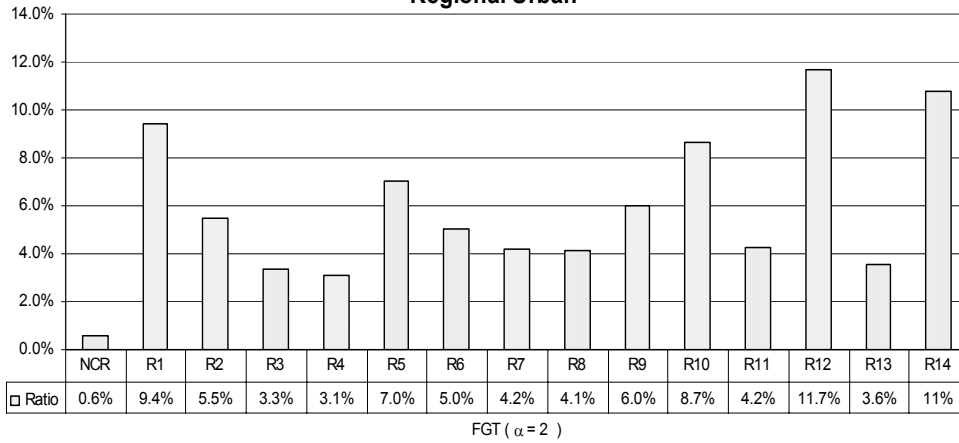


Figure 8 : 1994 Poverty Head Count Ratio (%)
Regional Rural

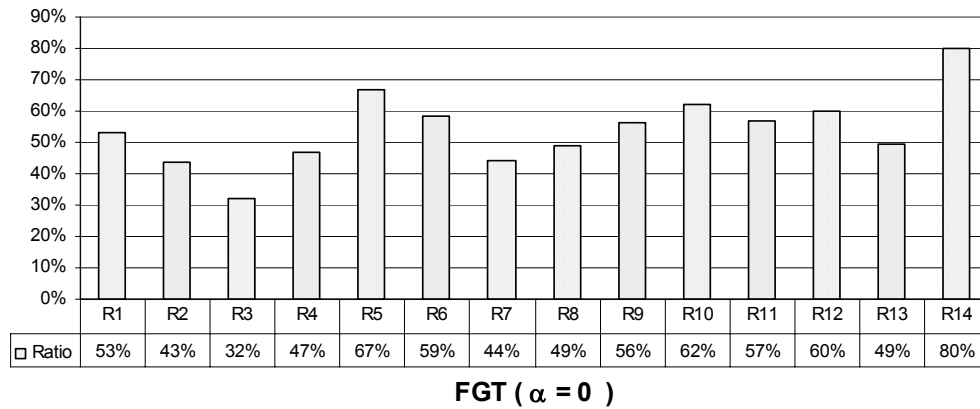


Figure 9: 1994 Poverty Gap (%)
Regional Rural

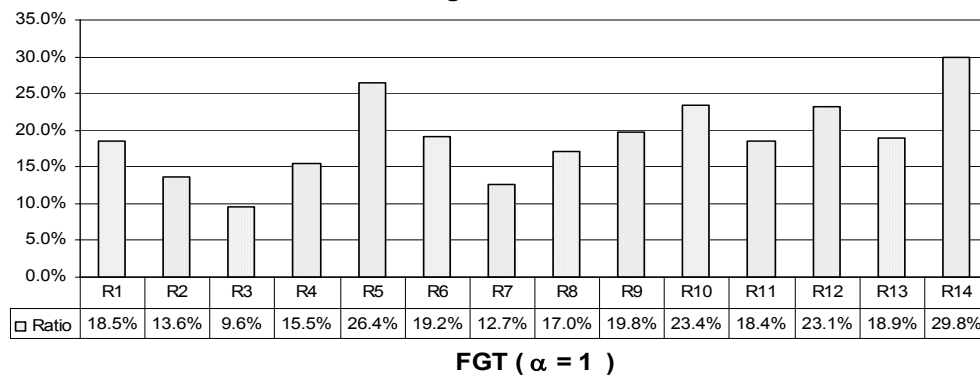


Figure 10 : 1994 Poverty Severity (%)
Regional Rural

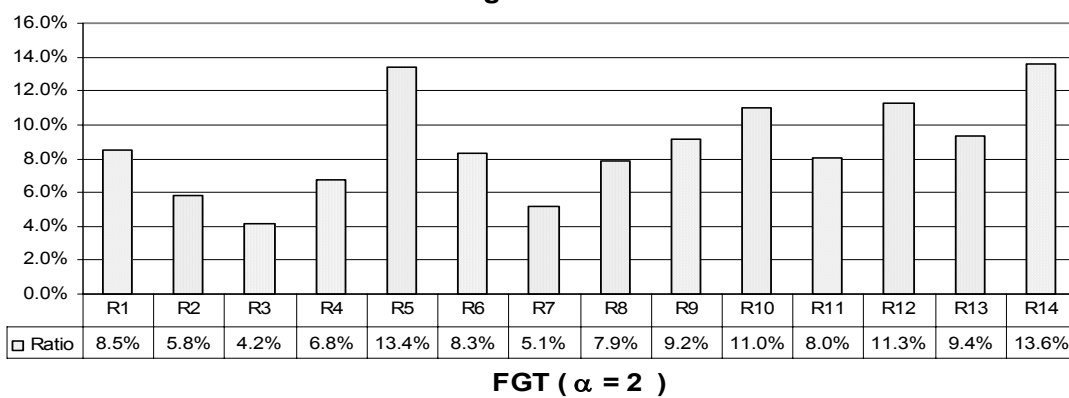


Figure 11 : 1994 Poverty Head Count Ratio (%)
Urban-Rural Difference

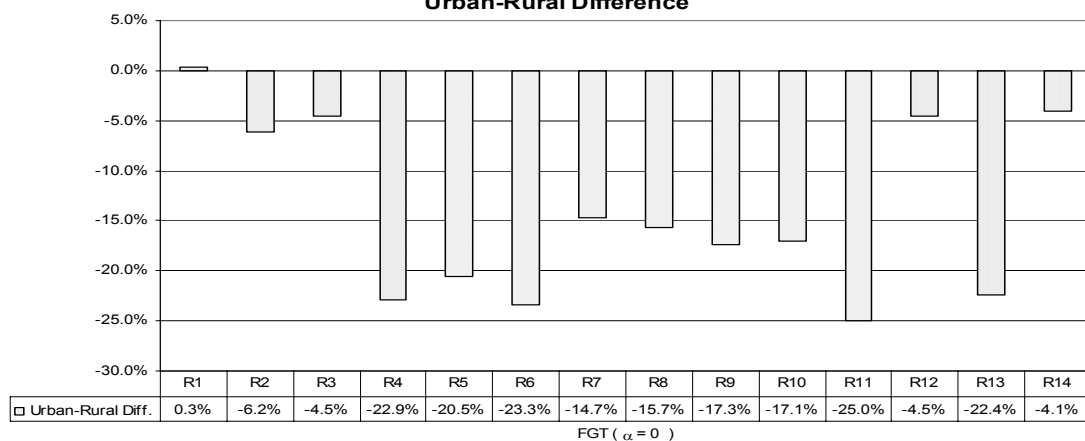


Figure 12 : 1994 Poverty Gap Ratio (%)
Urban-Rural Difference

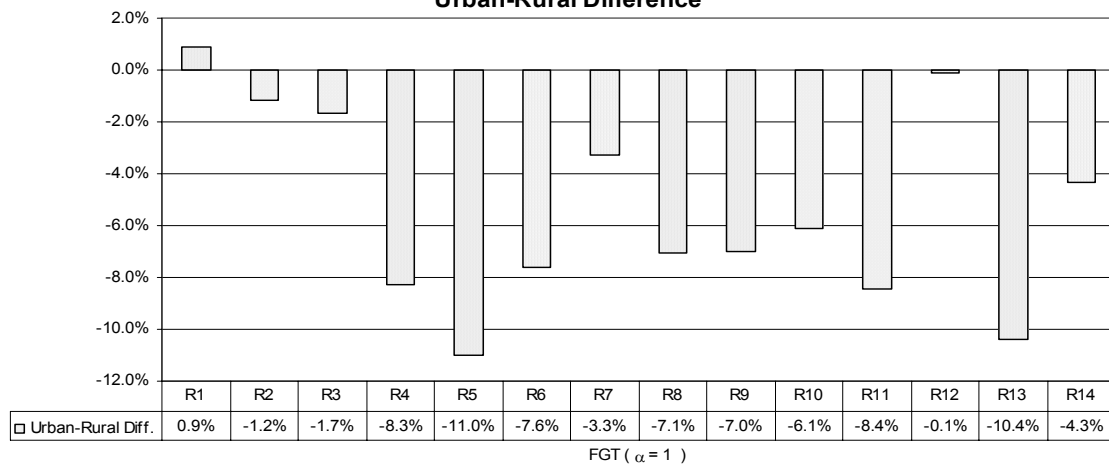


Figure 13 : 1994 Poverty Severity Ratio (%)

Difference: Urban-Rural

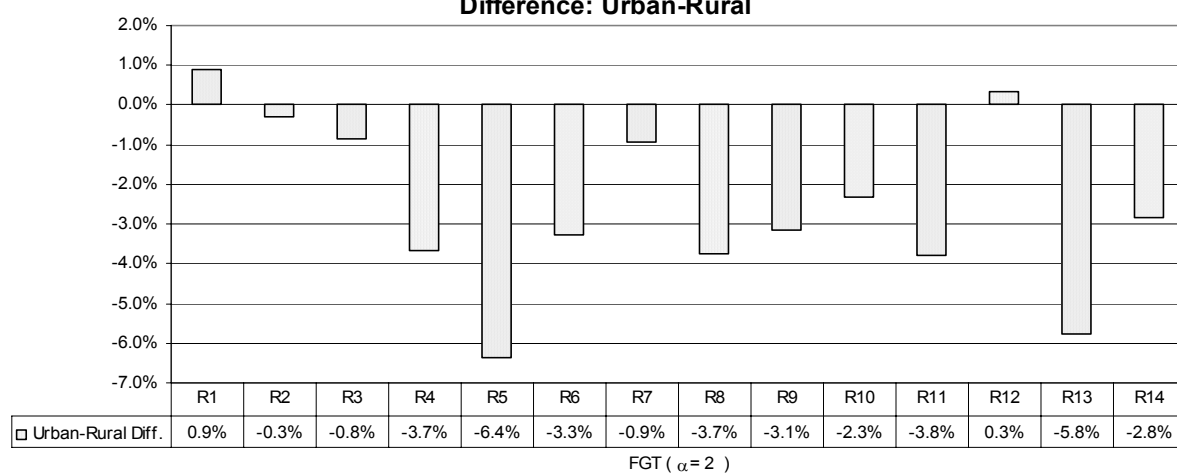


Figure 14 : 1994 Income Inequality (Gini)

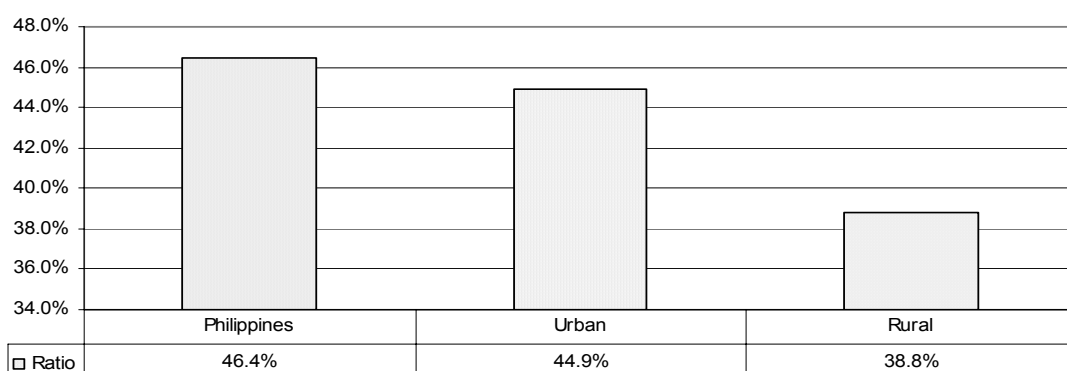
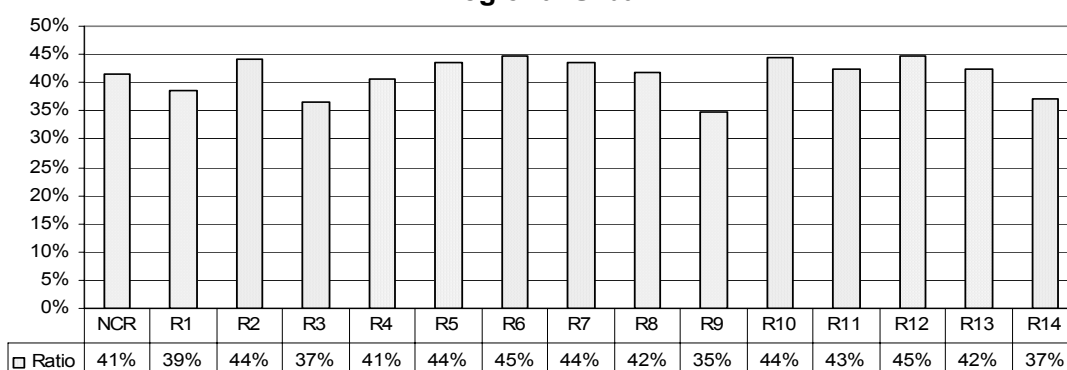
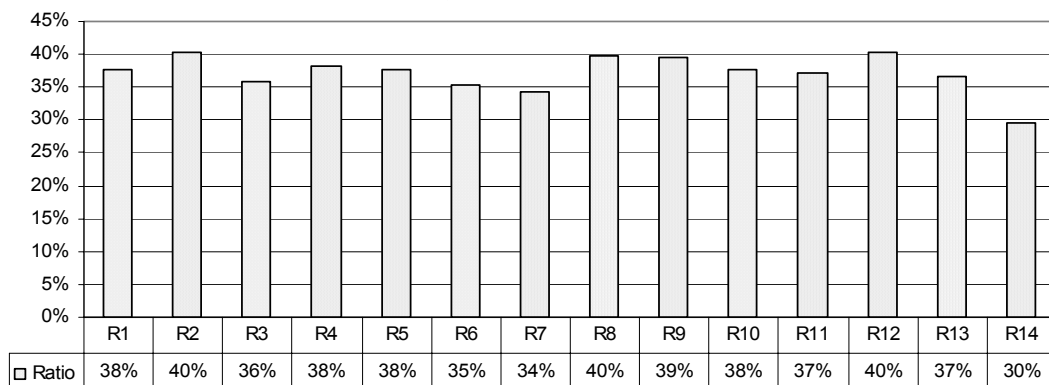


Figure 15 : 1994 Income Inequality (Gini)

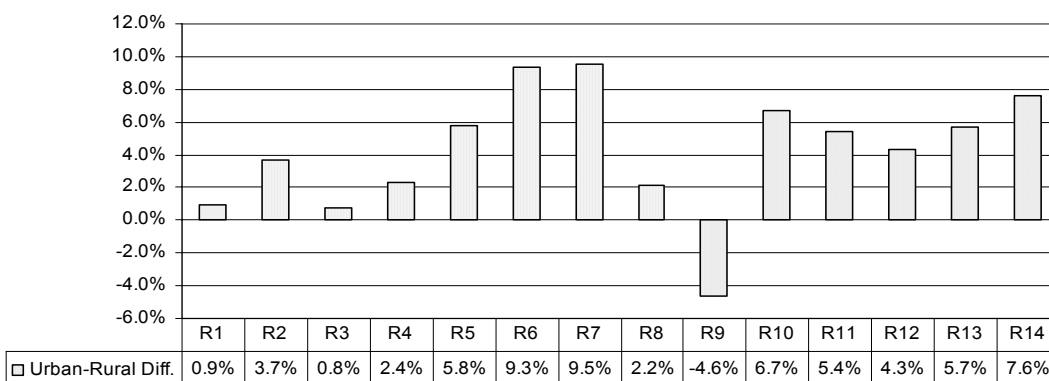
Regional Urban



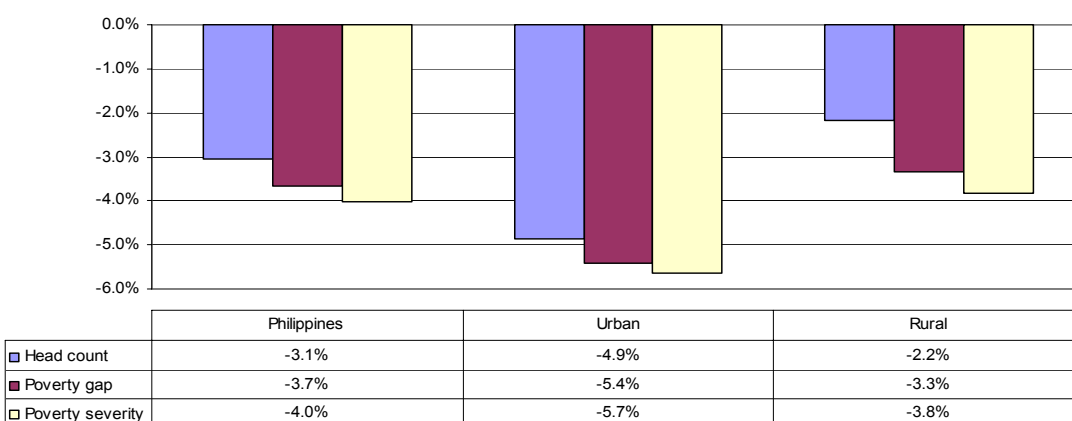
**Figure 16 : 1994 Income Inequality (Gini)
Regional Rural**



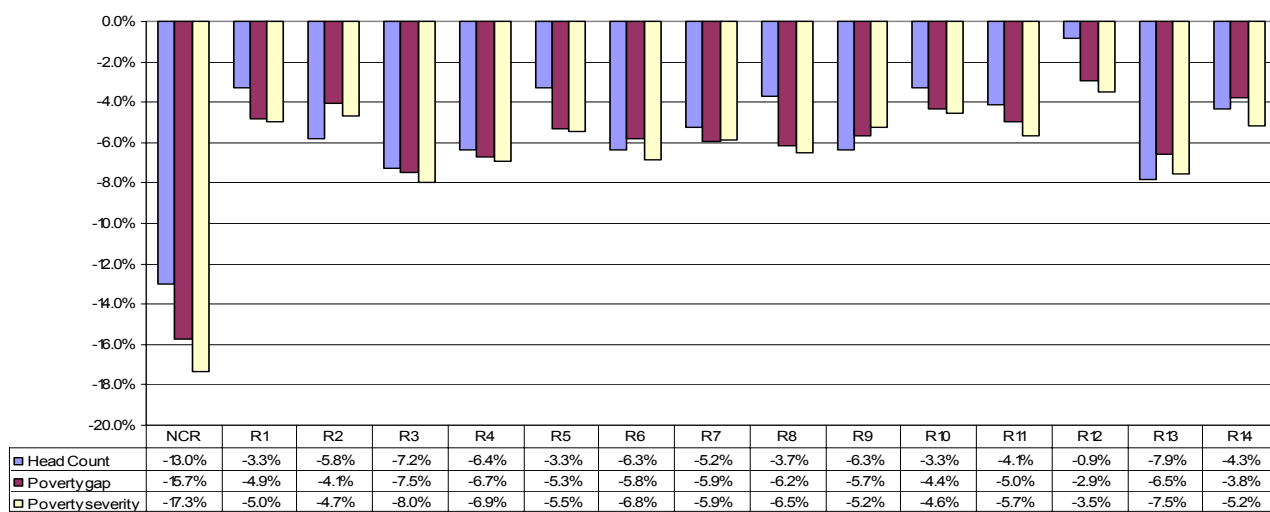
**Figure 17: 1994 Income Inequality (Gini)
Difference : Urban - Rural**



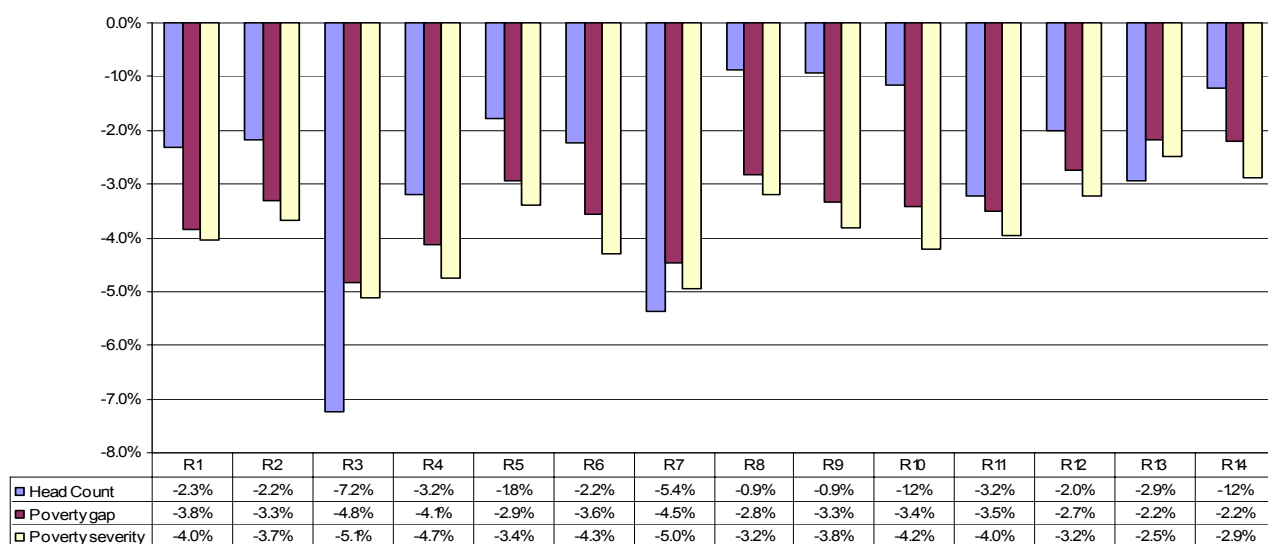
**Figure 18: Effects of Tariff Reduction on Poverty
(% change in index before and after experiment)**



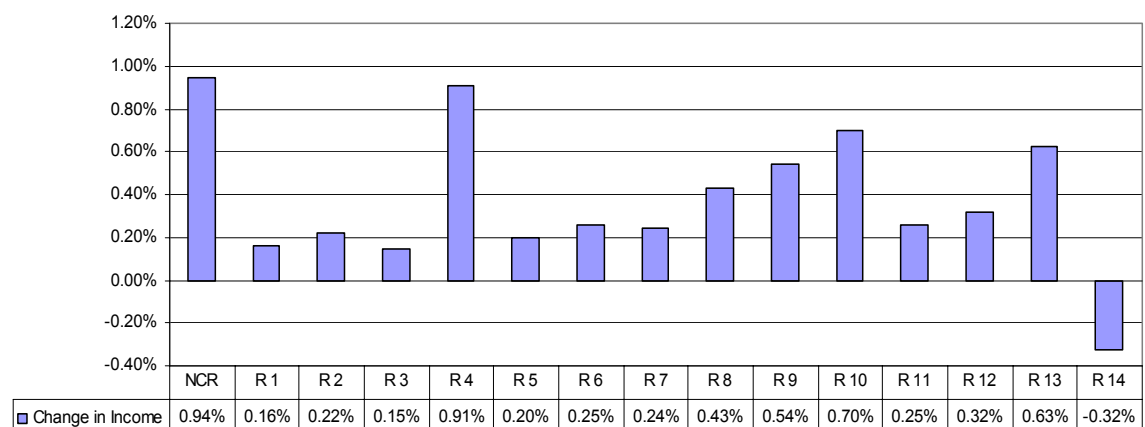
**Figure 19: Effects of Tariff Reduction on Poverty
(% change in index before and after experiment)
(Regional Urban)**



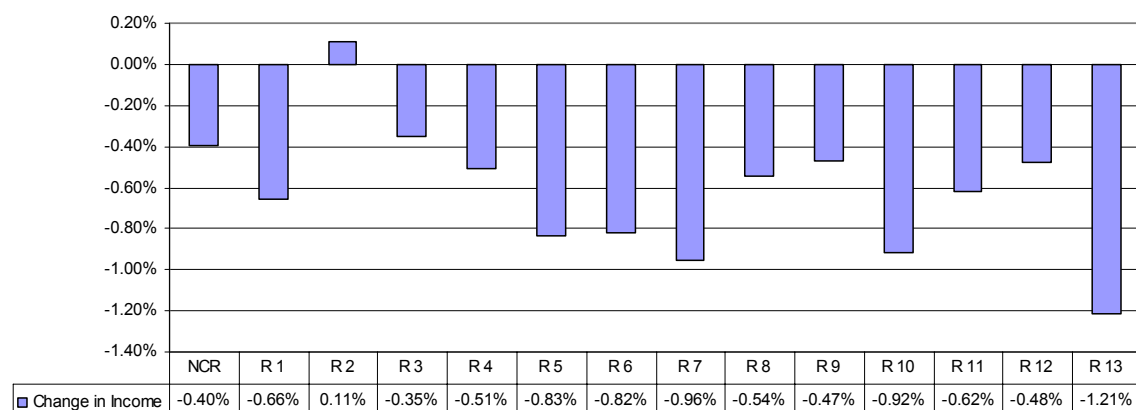
**Figure 20 : Effects of Tariff Reduction on Poverty
(% change in index before and after experiment)
(Regional Rural)**



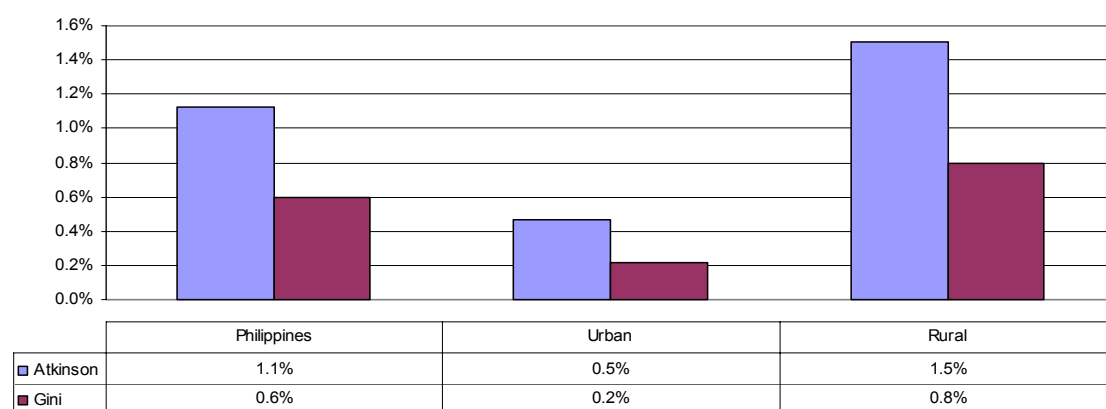
**Figure 21: Change in Nominal Household Income
Regional Urban**



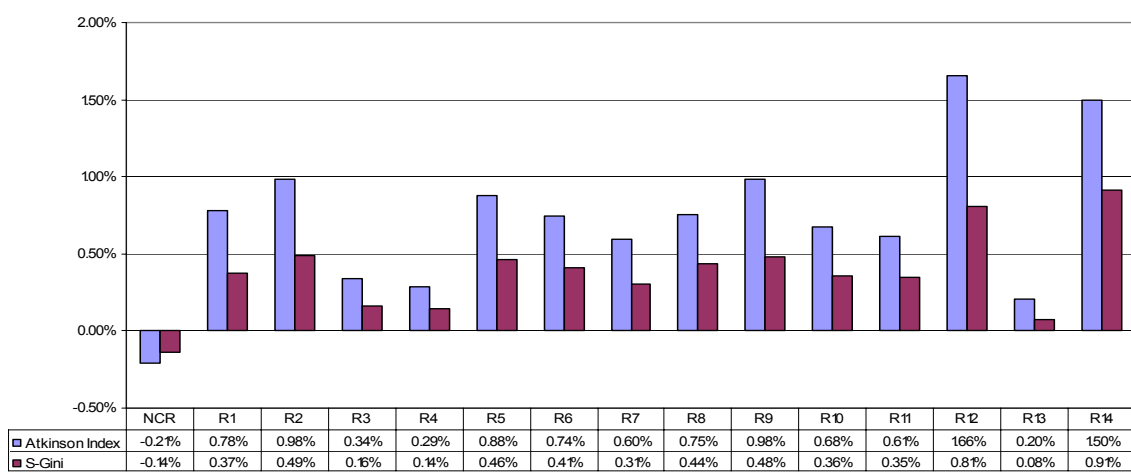
**Figure 22: Change in Nominal Household Income
Regional Rural**



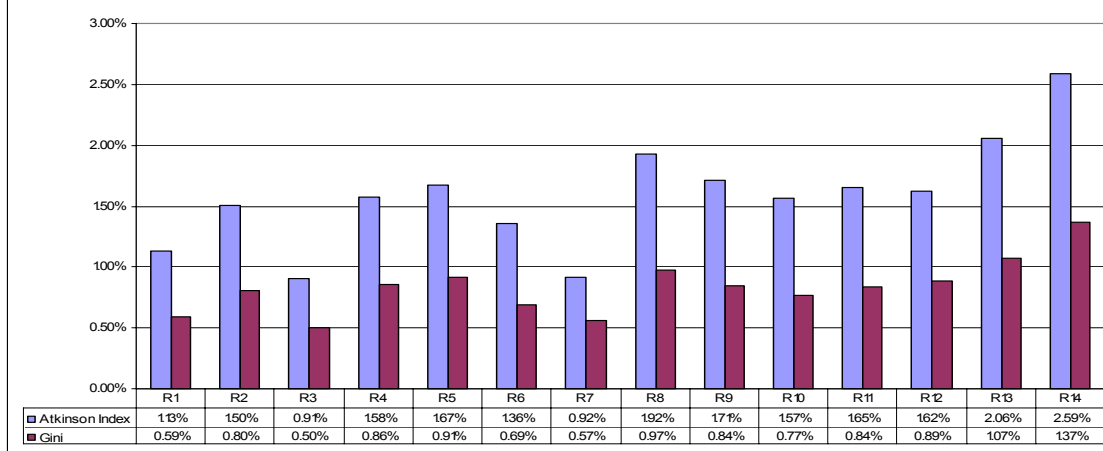
**Figure 23 : Effects of Tariff Reduction on Income Inequality
(% change in index before and after experiment)
Atkinson ($\epsilon=0.5$) and Gini**

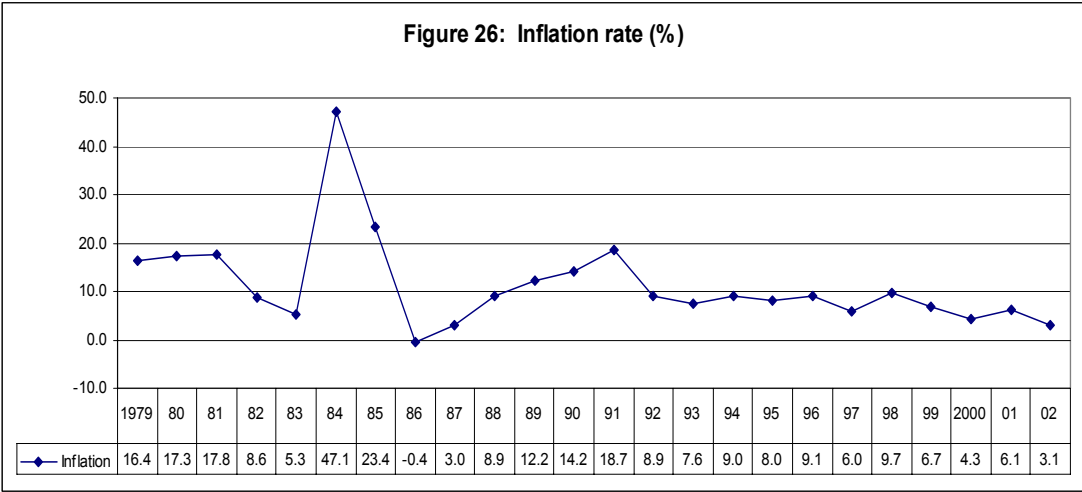


**Figure 24 : Effects of Tariff Reduction on Income Inequality
(% change in index before and after experiment)
Regional Urban; Atkinson ($\epsilon=0.5$) and Gini**



**Figure 25 : Effects of Tariff Reduction on Income Inequality
(% change in index before and after experiment)
Regional Rural; Atkinson ($\epsilon=0.5$) and Gini**





Appendix
Micro-Philippine Computable General Equilibrium Model
(MICRO-PCGEM)

- (1) $x_i = va_i \cdot kt_in_i$ 12
- (2) $va_{td} = kt_va_{td} \cdot \left[sh_va_{td} \cdot k_{td}^{-rh_va_{td}} + (1 - sh_va_{td}) \cdot l_{td}^{-rh_va_{td}} \right]^{\frac{-1}{rh_va_{td}}}$ 11
- (3) $va_{ntd} = l_{ntd}$ 1
- (4) $inp_i = kt_inp_i \cdot x_i$ 12
- (5) $mat_{td,i} = aij_{td,i} \cdot inp_i$ 132
- (6) $l_{td} = va_{td} \cdot \left[\frac{pva_{td} \cdot (1 - sh_va_{td})}{w \cdot kt_va_{td}^{rh_va_{td}}} \right]^{\frac{1}{1+rh_va_{td}}}$ 11
- (7) $l_{ntd} = \frac{px_{ntd} \cdot x_{ntd} - \sum_{td} mat_{td,ntd} \cdot pd_{td}}{w}$ 1
- (8) $l1_i = \left(\frac{w}{w1} \right) \cdot sh_l1_i \cdot l_i$ 12
- (9) $l2_i = \left(\frac{w}{w2} \right) \cdot sh_l2_i \cdot l_i$ 12
- (10) $l3_i = \left(\frac{w}{w3} \right) \cdot sh_l3_i \cdot l_i$ 12
- (11) $l4_i = \left(\frac{w}{w4} \right) \cdot sh_l4_i \cdot l_i$ 12
- (12) $x_{td_1e} = kt_x_{td_1e} \cdot \left[sh_x_{td_1e} \cdot e_{td_1e}^{rh_e_{td_1e}} + (1 - sh_x_{td_1e}) \cdot d_{td_1e}^{rh_e_{td_1e}} \right]^{\frac{1}{rh_e_{td_1e}}}$ 10
- (13) $x_{td_0e} = d_{td_0e}$ 1
- (14) $e_{td_1e} = d_{td_1e} \cdot \left[\left(\frac{pe_{td_1e}}{pl_{td_1e}} \right) \cdot \left(\frac{1 - sh_x_{td_1e}}{sh_x_{td_1e}} \right) \right]^{sig_e_{td_1e}}$ 10
- (15) $q_{td_1m} = kt_q_{td_1m} \cdot \left[sh_q_{td_1m} \cdot m_{td_1m}^{rh_m_{td_1m}} + (1 - sh_q_{td_1m}) \cdot d_{td_1m}^{rh_m_{td_1m}} \right]^{\frac{1}{rh_m_{td_1m}}}$ 9
- (16) $q_{td_0m} = d_{td_0m}$ 2
- (17) $m_{td_1m} = d_{td_1m} \cdot \left[\left(\frac{pd_{td_1m}}{pm_{td_1m}} \right) \cdot \left(\frac{sh_q_{td_1m}}{1 - sh_q_{td_1m}} \right) \right]^{sig_m_{td_1m}}$ 9
- (18) $ct_h = dyh_h - savh_h$ 24797
- (19) $ch_{td,h} = \frac{kt_ch_{td,h} \cdot ct_h}{pq_{td}}$ 272767
- (20) $g = px_{s12} \cdot x_{s12}$ 1
- (21) $inv_{td} = \frac{kt_inv_{td} \cdot tin_n}{pq_{td}}$ 11

$$\begin{aligned}
(22) \quad y l 1 &= \sum_i w 1 \cdot l 1_i & 1 \\
(23) \quad y l 2 &= \sum_i w 2 \cdot l 2_i & 1 \\
(24) \quad y l 3 &= \sum_i w 3 \cdot l 3_i & 1 \\
(25) \quad y l 4 &= \sum_i w 4 \cdot l 4_i & 1 \\
(26) \quad y k _ a g &= \sum_{a g} r_{a g} \cdot k_{a g} & 1 \\
(27) \quad y k _ i n d &= \sum_{i n d} r_{i n d} \cdot k_{i n d} & 1 \\
(28) \quad y k _ s e r _ t r a &= r_{s 10^n} \cdot k_{s 10^n} & 1 \\
(29) \quad y k _ s e r _ o t h &= r_{s 11^n} \cdot k_{s 11^n} & 1 \\
(30) \quad & & 24797 \\
y h_h &= w 1 \cdot e n d w _ l 1_h + w 2 \cdot e n d w _ l 2_h + w 3 \cdot e n d w _ l 3_h + w 4 \cdot e n d w _ l 4_h \\
&+ k _ y k _ a g_h \cdot l m d a _ a g \cdot y k _ a g + k _ y k _ i n d_h \cdot l m d a _ i n d \cdot y k _ i n d \\
&+ k _ y k _ s e r _ t r a_h \cdot l m d a _ s e r _ t r a \cdot y k _ s e r _ t r a \\
&+ k _ y k _ s e r _ o t h_h \cdot l m d a _ s e r _ o t h \cdot y k _ s e r _ o t h \\
&+ k t _ d i v_h \cdot d i v + t r g o v_h \cdot p i n d e x + y f o r_h \\
(31) \quad d y h_h &= y h_h \cdot (1 - d t x r h_h - n t a x r) & 24797 \\
(32) \quad & & 1 \\
y f &= [(1 - l m d a _ a g - l m d a _ a g _ f) \cdot y k _ a g \\
&+ (1 - l m d a _ i n d - l m d a _ i n d _ f) \cdot y k _ i n d \\
&+ (1 - l m d a _ s e r _ t r a - l m d a _ s e r _ t r a) \cdot y k _ s e r _ t r a \\
&+ (1 - l m d a _ s e r _ o t h - l m d a _ s e r _ o t h) \cdot y k _ s e r _ o t h] \cdot (1 - d t x r f) \\
(33) \quad y g &= t m r e v + d t x r e v + i t x r e v + g r a n t _ f o r & 1 \\
(34) \quad t m r e v &= \sum_{t d _ 1 m} t m_{t d _ 1 m} \cdot m_{t d _ 1 m} & 1 \\
(35) \quad & & 1 \\
d t x r e v &= \sum_h (d t x r h_h + n t a x r) \cdot y h_h + [(1 - l m d a _ a g - l m d a _ a g _ f) \cdot y k _ a g \\
&+ (1 - l m d a _ i n d - l m d a _ i n d _ f) \cdot y k _ i n d \\
&+ (1 - l m d a _ s e r _ t r a - l m d a _ s e r _ t r a) \cdot y k _ s e r _ t r a \\
&+ (1 - l m d a _ s e r _ o t h - l m d a _ s e r _ o t h) \cdot y k _ s e r _ o t h] \cdot d t x r f \\
(36) \quad & & 1 \\
i t x r e v &= \sum_{t d} i t x r_{t d} \cdot d_{t d} \cdot p l_{t d} + \sum_{t d _ 1 m} i t x r_{t d _ 1 m} \cdot m_{t d _ 1 m} \cdot p w m_{t d _ 1 m} \cdot e r \cdot (1 + t m_{t d _ 1 m}) \\
(37) \quad i n _ t d_{t d} &= \sum_i m a t_{t d, i} & 11 \\
(38) \quad t i n v _ n &= p i n v \cdot t i n v _ r & 1 \\
(39) \quad s a v h_h &= a d j \cdot a p s_h \cdot d y h_h & 24797 \\
(40) \quad s a v f &= y f - d i v - d i v \cdot f o r & 1 \\
(41) \quad s a v g &= y g - g - \sum_h t r g o v_h \cdot p i n d e x - p a y g v _ f o r & 1 \\
(42) \quad p i n d e x &= \sum_{t d} s h _ q 1_{t d} \cdot p q_{t d} & 1 \\
(43) \quad p i n v &= \prod_{t d} \left(\frac{p q_{t d}}{k t _ i n v_{t d}} \right)^{k t _ i n v_{t d}} & 1
\end{aligned}$$

(44)	$pm_{td_1m} = pwm_{td_1m} \cdot er \cdot (1 + tm_{td_1m}) \cdot (1 + itxr_{td_1m})$	9
(45)	$pe_{td_1e} = pwe_{td_1e} \cdot er$	10
(46)	$pq_{td_1m} = \frac{pd_{td_1m} \cdot d_{td_1m} + pm_{td_1m} \cdot m_{td_1m}}{q_{td_1m}}$	9
(47)	$pq_{td_0m} = pd_{td_0m}$	2
(48)	$px_{td_1e} = \frac{pl_{td_1e} \cdot d_{td_1e} + pe_{td_1e} \cdot e_{td_1e}}{x_{td_1e}}$	10
(49)	$px_{td_0e} = pl_{td_0e}$	1
(50)	$pd_{td} = pl_{td} \cdot [1 + itxr_{td}]$	11
(51)	$pva_i = \frac{px_i \cdot x_i - \sum_{td} mat_{td,i} \cdot pq_{td}}{va_i}$	12
(52)	$r_{td} = \frac{pva_{td} \cdot va_{td} - w \cdot l_{td}}{k_{td}}$	11
(53)	$q_{td_0s11} = \sum_h ch_{td_0s11,h} + inv_{td_0s11} + in_td_{td_0s11}$	10
(54)	$tin_n = \sum_h savh_h + savf + savg + cab$	1
(55)	$cab = [\sum_{td_1m} pwm_{td_1m} \cdot m_{td_1m} + lmda_ag_f \cdot yk_ag$ $+ lmda_ind_f \cdot yk_ind + lmda_ser_tra_f \cdot yk_ser_tra$ $+ lmda_ser_oth \cdot yk_ser_oth + div_for + paygv_for -$ $\sum_{td_1e} pwe_{td_1e} \cdot e_{td_1e} - \sum_h yfor_h - grant_for] \cdot er$	1
(56)	$ls = \sum_i l_i$	1
(57)	$ls1 = \sum_i l1_i$	1
(58)	$ls2 = \sum_i l2_i$	1
(59)	$ls3 = \sum_i l3_i$	1
(60)	$ls4 = \sum_i l4_i$	1
(61)	$leon = q_{s11''} - \sum_h ch_{s11'',h} + inv_{s11''} + in_td_{s11''}$	1

Total Number of Equations

372358

Micro-Philippine Computable General Equilibrium Model (MICRO-PCGEM)

Equations				Variables			
Name*	Equation No.	Equation Index	Number of Equations	Variables		Type of Variable	
				Name	Index	Endogenous	Exogenous
						No. of Variables	No. of Variables
xeq	1	i	12	x	td	11	
vaeq1	2	td	11	va	i	12	
vaeq2	3	ntd	1				
intpeq	4	i	12	intp	i	12	
mateq	5	td,i	132	mat	td,i	132	
leq1	6	td	11	l	i	12	
leq2	7	ntd	1				
foc_l1eq	8	i	12	l1	i	12	
foc_l2eq	9	i	12	l2	i	12	
foc_l3eq	10	i	12	l3	i	12	
foc_l4eq	11	i	12	l4	i	12	
ceteq1	12	td_1e	10				
ceteq2	13	td_0e	1				
eeq	14	td_1e	10	e	td_1e	10	
qeq1	15	td_1m	9	q	td	11	
qeq2	16	td_0m	2				
meq	17	td_1m	9	m	td_1m	9	
cteq	18	h	24,797	ct	h	24,797	
cheq	19	td,h	272,767	ch	td,h	272,767	
geq	20		1	g			1
inveq	21	td	11	inv	td	11	
yl1eq	22		1	yl1		1	
yl2eq	23		1	yl2		1	
yl3eq	24		1	yl3		1	
yl4eq	25		1	yl4		1	
ykeq_ag	26		1	yk_ag		1	
ykeq_ind	27		1	yk_ind		1	
ykeq_ser_t	28		1	yk_ser_tra		1	
ykeq_ser_o	29		1	yk_ser_oth		1	
yheq	30	h	24,797	yh	h	24,797	
dyheq	31	h	24,797	dyh	h	24,797	
yfeq	32		1	yf		1	
ygeq	33		1	yg			1
tmreveq	34		1	tmrev		1	
dtxreveq	35		1	itxrev		1	
itxreveq	36		1	dtxrev		1	
intdeq	37	td	11	intd	td	11	
tinveq	38		1	tinveq		1	
savheq	39	h	24,797	savh	h	24,797	
savfeq	40		1	savf		1	
savgeq	41		1	savg		1	
pindexeq	42		1	pindex		1	
pinveq	43		1	pinveq		1	
pmeq	44	td_1m	9	pm	td_1m	9	
peepeq	45	td_1e	10	pe	td_1e	10	

MICRO-PCGEM (Cont'd)

Equations				Variables			
Name*	Equation No.	Equation Index	Number of Equations	Variables		Type of Variable	
				Name	Index	Endogenous No. of Variables	Exogenous No. of Variables
ppeq1	46	td_1m	9	pq	td	11	
ppeq2	47	td_0m	2				
pxeq1	48	td_1e	10	px	i	12	
pxeq2	49	td_0e	1				
pdeq	50	td	11	pd	td	11	
pvaeq	51	i	12	pva	i	12	
req	52	td	11	r	td	11	
eq1eq	53	td_0s11	10	q	"td_0s11" **	1	
eq2eq	54		1				
eq3eq	55		1	cab			1
eq4eq	56		1	w		1	
eq5_11eq	57		1	w1		1	
eq5_12eq	58		1	w2		1	
eq5_13eq	59		1	w3		1	
eq5_14eq	60		1	w4		1	
walras	61		1	leon		1	
				pl	td	11	
				d	td	11	
				ntaxr		1	
				adj		1	
				x	"s12"***		1
				er			1
				pwe	td_1e		11
				pwm	td_1m		9
				k	td		11
				ls			1
				ls1			1
				ls2			1
				ls3			1
				ls4			1
				endow_11	h		24,797
				endow_12	h		24,797
				endow_13	h		24,797
				endow_14	h		24,797
				div-for			1
				grant-for			1
				paygv-for			1
				yfor	h		24,797
				div			1
				trgov	h		24,797
				dtxrf			1
				dtxrh	h		24,797
				itxr	td		11
				tm	td_1m		9
TOTAL						372358	173643

*Equation names in the GAMS code

***output of government sector is fixed

**"td_0s11": the 11th sector

Variable Definition

er	: exchange rate
pd _{td}	: domestic price of td including tax
pet _{d_1e}	: domestic price of exports of td_1e
pl _{td}	: local price of td excluding tax
pm _{td_1m}	: domestic price of imports of td_1m
pq _{td}	: composite price of td
pva _i	: price of value added of i
pwe _{td_1e}	: world price of exports of td_1e
pwm _{td_1m}	: world price of imports of td_1m
px _i	: price of output of i
pindex	: general price
pinv	: price of investment
r _{td}	: price of capital in td
mat _{td,i}	: interindustry matrix
w	: average wage rate
w1	: wage rate of type 1 labor
w2	: wage rate of type 2 labor
w3	: wage rate of type 3 labor
w4	: wage rate of type 4 labor
x _i	: output of i
va _i	: value added of i
intp _i	: intermediate input
k _{td}	: capital in td
l(i)	: aggregate labor demand in i
l1(i)	: type 1 labor
l2(i)	: type 2 labor
l3(i)	: type 3 labor
l4(i)	: type 4 labor
ls	: total supply of labor
ls1	: total supply of type 1 labor
ls2	: total supply of type 2 labor
ls3	: total supply of type 3 labor
ls4	: total supply of type 4 labor
endw_11 _h	: household labor endowment of type 1 labor
endw_12 _h	: household labor endowment of type 2 labor
endw_13 _h	: household labor endowment of type 3 labor
endw_14 _h	: household labor endowment of type 4 labor
ct _h	: total consumption of household h
ch _{td,h}	: household h consumption of td
d _{td}	: domestic demand for td
g	: total government consumption
intd _{td}	: intermediate demand for td
inv _{td}	: investment demand for td
tin _v	: total investment
q _{td}	: composite demand for td
e _{td_1e}	: exports of td_1e
m _{td_1m}	: imports of td_1m
cab	: current account balance

div_for	: dividends paid to foreigners
grant_for	: foreign grant to government
paygv_for	: debt service payment of government
yfor _h	: foreign income of household h
yl1	: type 1 labor income
yl2	: type 2 labor income
yl3	: type 3 labor income
yl4	: type 4 labor income
yk_ag	: capital income in agriculture
yk_ind	: capital income in industry
yk_ser_tra	: capital income in service trade
yk_ser_oth	: capital income in service others
yh _h	: income of household h
yf	: income of firms
yg	: income of government
div	: dividends
trgov _h	: government transfer in real terms to household h
dyh _h	: disposable income of household h
tmrev	: tariff revenue of government
dtxrev	: direct income tax revenue of government
itxrev	: indirect income tax revenue of government
dtxrf	: direct income tax rate on firms
dtxrh _h	: direct income tax rate on household h
itxr _{td}	: indirect tax rate on td
tm _{td_1m}	: tariff rate on td_1m
ntaxr	: additional compensatory tax rate
adj	: adjustment factor
savf	: savings of firms
savg	: savings of government
savh _h	: savings of household
leon	: “walras law” variable

Index of Variables

sectors

s1	: crops
s2	: livestock
s3	fishing
s4	other agriculture
s5	mining
s6	food manufacturing
s7	non-food manufacturing
s8	construction
s9	utilities
s10	wholesale and retail trade
s11	other services
s12	government services /

Special index

td	tradable	{s1,s2,s3,s4,s5,s6,s7,s8,s9,s10,s11}
ntd	nontradable	{s12}
td_1e	with exports	{ s1,s2,s3,s5,s6,s7,s8,s9,s10,s11 }
td_0e	no exports	{s4 }
td_1m	with imports 1	{s1,s2,s3,s4,s5,s6,s7,s8,s11}
td_0m	no imports	{ s9,s10 }
td_0s11	with imports expect “s11”	{s1,s2,s3,s4,s5,s6,s7,s8,s9,s10}
ag	agriculture	{s1,s2,s3,s4 }
ind	industry	{ s5,s6,s7,s8,s9 }

Factors

f factors {l, l1, l2, l3, l4,k}

Households

h h1,...,h24797

Other Institutions

inst {firms, government}