Searching for Equitable Energy Price Reform for Indonesia

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Abstract

Economic structure, households energy consumption pattern, and household's pattern of factor income in developing countries may typically be different with those of the developed countries, hence the distributional impact of energy price reforms could be. This may be portrayed using a Computable General Equilibrium (CGE) model with disaggregated households that allows for rich and accurate distributional story. Using this method, counter-factual scenarios analysis of recent energy price reform in Indonesia is carried out. The result suggests that vehicle fuels subsidy is regressive but increasing the price of domestic fuel (such as kerosene) tends to increase inequality, unless accompanied by a proper and effective compensation scheme. Distributional impact does depend on compensation scheme, its form and its effectiveness. Cash transfers to the poor with moderate ineffectiveness, for example, could not even prevent the increase in poverty nation-wide. Giving more cash to urban poor than to rural poor might have been better than a simple uniform cash transfers, due to urban poor's dependence on kerosene. The result also suggests that non-cash compensation, by subsidizing the poor's education and health spending may not be effective to mitigate the reform despite its desirability as longer-term poverty alleviation programs.

Keywords: Energy price reform, Distribution, CGE, Indonesia
JEL Classification: D30; D50

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1 Introduction

Global fuel subsidy could amount to between 250 and 300 billion dollar a year, which could "comfortably" pay off sub-Saharan Africa's entire international debt burden, leaving billions of dollars to spare (NEF 2004). Fuel subsidy creates distortion in the economy by disregarding the economic value of the fuel, creating excess consumption, and preventing energy substitution in the long-run. Since, Indonesia started to become a net oil importer since 2004, energy switch is very crucial in the future direction of the country's energy mix. Fuel subsidy has been a constraint to this important agenda.

Fossil fuel subsidy is also regarded as the main cause of environmental problems, not only pollution created by fossil fuel combustion by industry and vehicles, but also excessive traffic and the inconvenience it caused, as well as discourage the development of more traffic-free public transport infrastructure. In most big cities in Indonesia, this has already been a major public concern.

In addition to the above efficiency-related problem, fuel subsidy is also regarded as inequitable (although not necessary so). Vehicle owners benefit greatly from fuel subsidy, and fuel price reform had been widely advocated as the means of promoting efficiency but also equity.

The biggest concern, among all of those, however, is the fiscal burden of the subsidy. Fuel subsidy has been the main part of the central government budget. In the year 2000 for example (see table 1), fuel subsidy was amount to 40.9 trillion rupiahs, which was almost a third of the total government spending. Since government always has political constraint with regard to reducing this subsidy, government spending then heavily constrained by the fluctuation of the world oil price, especially after the year 2004 when Indonesia become net oil importer.

When world oil price started to rise rapidly since 2004, the government saw no option but to radically reform its fuel price policy. In October 2005 the government made a big adjustment in the fuel prices following rapid rise of the world crude oil price. At the end, it is not efficiency argument, or the voices from energy-price reformist, that urged the government to implement the reform, but international market.

For the last few years, actually, the reduction of fuel subsidy had been one of the main agenda of Indonesian government. Indonesian government had made gradual reform in its fuel policy as well as adjustment in the fuel prices since the year 1999 (see Box 1 and figure 1).

However, what made the reform went slowly was mainly strong opposition from the people and the parliament. Most of the opposition come from the concern that increase in fuel prices will translate into higher of other prices, reduce purchasing power, and exacerbate poverty. The oppositions of fuel price reform had been concerned that the fuel price rise would create big chain reaction to other prices such as transportation and other important commodity, and finally will hurt the economy, and eventually will affect the least vulnerable such as the poor. Among many economists, however, the voices was almost unanimous that fuel price reform will not only be efficient but also equitable.

Table 1: Fuel Subsidy, Government Budget, and Oil Price, 1999 - 2006

	1999	2000	2001	2002	2003	2004	2005	2006
Fuel Subsidy (Rp Trillion)	40.9	53.8	68.4	31.2	30.0	59.2	89.2	62.7
Government Spending (Rp Trillion)	201.9	188.4	260.5	322.2	376.5	430.0	411.6	470.2
Percent	20.26	28.56	26.25	9.68	7.97	13.77	21.67	13.34
World crude oil price ($/barrel)	17.12	27.07	22.72	23.47	27.1	34.62	49.86	60.32

Source: Ministry of Finance, and U.S. IEA

Box 1. Timeline of Indonesian Fuel Pricing Policy

1 January 1999

Before 1999, all fuel prices were heavily subsidised. Since January 1999, GOI started to let aviation fuel price free according to market mechanism. At that time the price of Avtur was Rp. 1,700 and the price of Avgas was Rp. 1,080.

1 April 2001

Fuel prices was set according to three categories. (a) Fuels consumed by general public were still subsidised; (b) Fuels for industry was set to be 50% of the market price (mean of Platts Singapore of the previous month plus 5 percent), and would be increased gradually; (3) Fuels for international business activities was 100% of market price.

16 June 2001

Another adjustment in the administered fuel prices with a statement that fuel prices for industry could be increased or decreased depending on the international prices.

6 January 2002

Gasoline price was adjusted to follow fully (100%) international price, kerosene price for general public was increased to Rp. 600. Other fuels (for industry) price were set to be 75% of the market prices. GOI also set price ceiling system (maximum and minimum retail price) depending on the international crude oil prices

1 March 2002

GOI delegated monthly retail prices to PERTAMINA (state-owned oil company) to be able to fluctuate according to average market prices. Fuel prices (except kerosene) started to fluctuate relatively more often during 2002 (see figure 1). Adjustment to fuel prices was made in April, May, June, July, August, September, October, November, and December 2002.

1 January 2003

Price of Kerosene was increased from Rp. 600 to Rp. 700. With usual adjustment in other fuel prices. Adjustment in the price of fuels (except kerosene) was made almost every month since then. GOI increased diesel price by 21.9% but then reduced it 6.5% due to public protest. Figure 1 shows a rare case where diesel price drop in February 2003.

1 October 2005

GOI release Presidential Decree (Perpres) no. 55/2005 declaring huge increase in the price of gasoline from Rp. 2400 to 4500 (87.5%), diesel from Rp. 2100 to Rp. 4300 (104.7%) and kerosene from Rp. 700 to Rp 2000 (185.7%).

By the time was perfect due to what happened in the world crude oil price market in the mid 2000's, the government made a big adjustment in the subsidised fuel prices. The reform package was announced in 1 October, 2005 consisting of increasing retail fuel prices for gasoline, kerosene, and diesel. The price of gasoline was increased by 87.5%, diesel by 104.7%, and surprisingly kerosene by 185.7%. The huge increase in kerosene price start to doubt many economists about the distributional direction of this reform[1] despite its compensation scheme.

In this case study, the CGE model will be used to simulate the economy-wide and distributional impact of the October 2005 package. Moreover, the experiment will be

[1] Among others are Azis (2006), Oktaviani et al. (2005), and many others comentators in media.

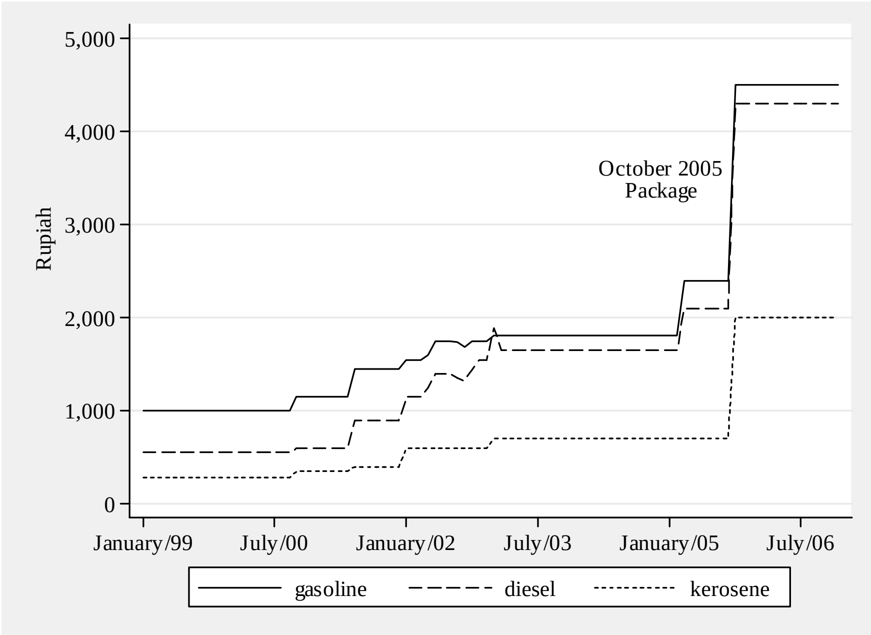

Figure 1: Price of gasoline, diesel, and kerosene, 1999 - 2006

able to answer in greater detail whether or not and by how much poverty will be affected, is the reform progressive ore regressive, as well as what kind of compensation that may be the most effective.

This simulation not only provide an estimate of the poverty and inequality impact of this reform, but also provide lessons learned, and alternative better scenarios that might have been possible, for further reform in the future. Even after the last "shocking" fuel price increase in October 2005, currently the price of gasoline still 70% of the market price, and the price of kerosene is even still 31% of the market price. The government plans to totally remove this subsidy in the next one or two years. Hence, this is still a big issue that will remain in the near future, especially because kerosene is consumed more proportionally by the urban poor.

This paper is organised as follows. The next section discussed briefly the previous studies that analyse the impact of reducing fuel subsidy in Indonesia, followed by discussion on methodology in the next section. On the methodology, first the Social Accounting Matrix used as the data for the analysis is discussed, and after that the structure of the CGE model will be discussed in greater detail, such as the production structure, household's demand, as well as the method on analyzing distributional impact, the important feature of the model, will be discussed. Later on scenarios, and discussion on the simulation results will be discussed before the final section concludes.

2 Previous studies

World Bank (2006) is the only available study that asses the distributional impact of October 2005 Package. However, other studies that analyse the impact of fuel subsidy reduction or fuel price rice for Indonesia do exist, although are not explicitly on this specific reform. They are Clements et al. (2003), Sugema et al. (2005), and Ikhsan et al. (2005), which were published before October 2005 package was implemented.

The method used by World Bank (2006) is a simulation using SUSENAS 2004 household survey data, from the increase in various fuel prices on household expenditure, assuming no mitigating substitution effects. The total impact is disaggregated into the impacts on household expenditure of fuel prices; public transport prices (assuming 25 percent pass-through of the diesel price); and the general impact of residual inflation on the rest of the consumption bundle. The overall incremental inflation (due to the fuel price increase) assumption is based on time-series analysis of the overall elasticity of inflation to fuel price increases (0.06 percent for 10 percent increase in fuel prices). The residual (non-fuel; non-transport) incremental inflation rate is computed at about 1.9 percent for the October fuel price increases.

The result suggests that in the absence of any compensatory measures, it is estimated that the October 2005 package would have led to a 5.6 percentage point increase in the poverty incidence. Compensation in the form of unconditional cash transfer to poor and near-poor households, more than offset, on average, the negative impact of the fuel price increase for the poor. Hence, the impact of the combined effects of the fuel price increase and the compensation point to a net positive income gain, overall, for the poorest 20 percent of the population. Even with greater mistargeting of random cash benefit to bottom 60% still lead to positive net impact on the bottom 40%.[2]

It is not clear, however, how household behaviour in this study[3] is modelled. Although the mechanism from fuel prices to inflation seems to be based on historical data, other price transmission, such as transport price from diesel price seems to be ad-hoc. This simulation do not take into account economy-wide effect of the fuel price rises on the supply side, and their likely impact on households factor income through factor market. In this simulation, in seems that household income is assumed to be fixed, only changed by cash compensation.

With regards to distributional story, World Bank (2006) does not distinguish urban and rural households, it only distinguishes household by deciles. Urban and rural distinction may be important since urban poor is the biggest consumers of kerosene (not rural poor), hence poverty impact can not be separated. From SUSENAS 2002, it is calculated that 82.74% of the poorest 20% population are rural, under-represent what could happen to urban poverty.

Ikhsan et al. (2005) analyses the distributional impact of March 2005 fuel price adjustment. The fuel price adjustment are increase in the price of kerosene to industry by 22.22%, gasoline by 32.60%, diesel for transportation by 27.27%, diesel for industry by 33.33, diesel oil and fuel oil by 39.39%. In this price adjustment kerosene for domestic household use was not increased.

The method used by Ikhsan et al. (2005) is a combination of CGE model (INDOCEEM[4]) and household survey data simulation. Hence, it is more or less similar to World Bank (2006) but the price or inflation numbers are taken out from CGE model simulation. In the literature this approach is in the class of top-down micro-simulation, where CGE model and distribution part are separate entity, starting from simulation in CGE and transfered the price result to micro-simulation data. The household survey data used was SUSENAS 2002 consumption module.

The policies examined are March 2005 fuel price rise with various compensation

[2]From Figure 6.1 of World Bank (2006)

[3]Since the description of the methodology is not explained in detail, only briefly at the footnote.

[4]INDOCEEM model is Indonesian CGE model based on ORANI-G developed initially by Monash University and Ministry of Energy.

schemes i.e, subsidy to rice and education spending of poor (targeted) households which is the bottom 20%, with various assumption of effectiveness. The fuel price rises was simulated in INDOCEEM model and produce increase in all commodities prices with CPI increase by 0.9718%. The price rises then transferred to the SUSENAS simulation. The results suggests that without compensation poverty rises by 0.24%, whereas with compensation poverty falls by 2.6% if the compensation is 100% effective 100%, and poverty fall by 1.89 if compensaton is only 75% effective (table 9 in Ikhsan et al. (2005)).The policies simulated reduce inequality slightly.

The advantage of Ikhsan et al. (2005) is the use of INDOCEEM model where different various fuel commodity is distinguished hence the model allows for different shocks to different type of fuels[5]. However, in INDOCEEM model, there is only one single representative households, hence to see distributional impact it has to rely on other method and this is actually one of the methodological caveat of the approach. First, the use of CGE model only to predict nominal price changes is always questionable, since in nature CGE model is a real variable model. CGE model can not solve absolute price level, and there always have to be one price that hold fixed, where all price are relative to that numeraire. Changing numeraire will not change the real solution. Usually in the class of ORANI-G model like INDOCEEM, when CPI is made endogenous, exchange rate is the numeraire, hence all nominal price change are relative to exchange rate. It often the case, that in the CGE model, the magnitude of the price incrase is sensitive to changing numeraire. Many CGE modelers avoid direct interpretation of nominal variables results.

Secondly, when the price change is tranferred to the SUSENAS-based micro-simulation model, the price change become exogenous, whereas in reality the structure of demand of various households determine new equilibrium prices. This price changes is only determined in single household CGE model in this top-down approach. Thirdly, there is no connection between factor market (which is actually represented in the CGE model) with the micro-simulation, hence households factor income is not affected by the simulation, because there is no direct link between supply side and household income.

In Clements et al. (2003), the CGE model used Social Accounting Matrix with multi households, hence households heterogeneity is integrated[6] directly into the CGE model. In the simulation, the scenario is increasing the price of petroleum product by 25%. This model however has only one type of aggregated fuel commodity, where for distributional story to be relevant, at least kerosene is better to be distinguished. The households however has only 10 categories, and grouped by socio-economic class, not by income size, hence direct progressivity or regressivity as well as poverty incidence is not easy to be assessed.

Clements et al. (2003) study suggests that real household consumption fall from 2.1% to 2.7%, where urban and high income suffer the most indicating the progressivity of fuel subsidy removal. It should be noted however that high income category indicated in SAM is not necessarily the highest income size, but based on socio-economic characteristics which mainly household type of occupation. Clements et al. (2003) argues that high income groups suffer more because they are endowed with relatively more capital and sectors where production declines most significantly are capital intensive. Higher-income groups also consume more petroleum products and utilities. The study

[5] Not many CGE models can do this because even with 175 sectors I-O table petroleum product sector is not disaggregated. INDOCEEM used specifically designed I-O table built with the help of Indonesian Statistics office (BPS).

[6] As opposed to top-down approach as in Ikhsan et al. (2005)

also report increase in poverty but by assuming certain value of elasticity of poverty to mean consumption.

Another study is conducted by Sugema et al. (2005) where they analyse the impact of March 2005 fuel price rises. In this study, the poverty impact analysis is carried out using SUSENAS based simulation, and more macro-impact is carried out using ORANI-based CGE model. Both method is conducted separately or not related.

In the CGE approach, the model use 10 SAM households categories, where 29% increase in petroleum price is simulated. Since there is only one single petroleum product in this model, it is not really represent the March 2005 price adjustment that is tried to be simulated because kerosene did not rise in the March package therefore the impact on households will be over-estimated. The result suggests that petroleum product consumption by households fall from 17.51% to 22.86%. Again, however, it should be noted, that especially in urban area household fuel consumption is mainly kerosene, where its price is not changing, hence this results is a very rough if not inaccurate aproximation. The impact on welfare (measured by utility) fall from -0.09% to 1.48%, and not much different whether compensated or not. Aggregate household real consumption fall by -.99 (without compensation), and by -0.91 (with compensation).

Distributional story in Sugema et al. (2005) is analysed using SUSENAS 2004 data. March 2005 fuel price is *assumed* to lead to inflation of 12.5%. Assumption on effectiveness of compensation is based on previous compensation scheme. With the assumption that fuel price rise of March 2005 will lead to inflation of 12.5%,poverty line will rise (with the assumption that elasticity is 1.3). As a result, poverty will rise by 1.95%. With petroleum price rice of only 29% this poverty impact is considered very big. This may be mainly due to the assumed high elasticity of inflation with respect to fuel price rise which is 0.43, as well as the elasticity of inflation with respect to poverty line (1.3). For comparison World Bank (2006), only assume that 0.06 percent inflation for 10 percent increase in fuel prices, which is based on historical data. Again this many assumption made are among the caveats of these studies.

3 Social Accounting Matrix (SAM)

The distributional impact of policies analyzed in the CGE modelling framework have been constrained in part by the absence of a Social Accounting Matrix (SAM) with disaggregated households. Since Indonesian official SAM does not distinguish households by income or expenditure size, it has prevented accurate assesment for the distributional impact, such as calculation of inequality or poverty incidence. The SAM used in this paper, is a specially-constructed SAM representing Indonesian economy for the year 2003, with 181 industries, 181 commodities, and 200 households (100 urban and 100 rural households grouped by expenditure per capita centiles) was constructed. The SAM (with the size of 768x768 accounts) constitutes the the most disaggregated SAM for Indonesia at both the sectoral and household level.

The construction of the SAM is among a lengthty process and consumed a lot of research resources, such as fieldwork and data collection, hence it will not covered in this paper. The nature of constructing specifically-designed SAM with distributional emphasis not only require large-scale household survey data but also involved reconciliation of various different data sources. Interested readers can refer to Yusuf (2006). The structure of the SAM can be seen from table 2.

Table 2: Structure of 768×768 Indonesian SAM

			Commodity		Factor									
		Activities 1···181	Domestic 1···181	Imported 1···181	labour 1···16	Capital	Ind. Tax	S-I	Households 1···200	Transfers	Enterprises	Gov't	ROW	TOTAL
Activities	1 ··· 181		MAKE Matrix											Industry Sales
Domestic Commo-dities	1 ··· 181	Domestic Intermedi-ate Input						Domestic Invest-ment	Domestic Hou. Con-sumption			Domestic Gov't Con-sumption	Export	Total Dom. Demand
Imported Commo-dities	1 ··· 181	Imported Intermedi-ate Input						Imported Invest-ment	Imported Hou. Con-sumption			Imported Gov't Con-sumption		Total Import
labour	1 ··· 16	Salary and Wages											labour used abroad	Total labour Demand
Capital		Non-labour											Cap. used abroad	Capital Demand
Ind. Tax		Tax/ Subsidy		Tariff										Ind. Tax Reven.
Urban HH	1 ··· 100				labour Income: Urban	Capital Income: Urban				Inter-Hous. Transfer			ROW transfer to HH	Total Hous. Income
Rural HH	1 ··· 100				labour Income: Rural	Capital Income: Rural				Inter-House. Transfer			ROW transfer to HH	Total Hous. Income
Transfer									Transfer to HH					Int. Hou. Transfer
S-I									Household Saving		Enterprise Saving	Gov't Saving		Total Saving
Govern-ment							Ind.Tax Revenue		Direct Tax		Ent. Trans. to Gov't	Inter G Transfer	ROW Tans. to Gov't	Govt Revenue
Enter-prises						Enter-Capital					Inter Ent. Trans.		ROW Trans. to Enter.	Ente. Income
ROW				Import	Foreign labour	Foreign Capital			HH Transfer to abroad		Ent Trans. to abroad	G. Transfer to abroad		Forex Outflow
TOTAL		Industry Costs	Dom. Supply	Import Supply	labour Supply	Capital Supply	Ind. Tax Revenue	Total Invest.	Household Spending	Int. Hou. Transfer	Enter. Spending	Govern. Spending	Forex Inflow	

Table 2 is the structure of the Social Accounting Matrix to be constructed. It has 768 rows and 768 columns in all. It distinguishes industries from commodities to allow for industries producing multiple commodities, or the same commodity produced by several industries. 181 sectoral classifications are distinguished, and 200 households (100 urban and 100 rural classified by centile of expenditure per capita) are classified by centile of expenditure per capita.

The data sources used in this SAM construction are (1) Official BPS SAM 2003 (102×102 accounts); (2) 181 sectors Input-Output table 2003; (3) SUSENAS Core Module 2003, with 894,427 individual observations; (4) SUSENAS Core Module 2002, with 862,210 individual observations; (5) SUSENAS Consumption Module 2002, with 64,441 household observations; and (6) SUSENAS Income Module 2002, with 64,441 households observations.

4 CGE Model

The CGE model is built based on ORANI-G model, an applied general equilibrium (AGE) model of the Australian economy. Its theoretical structure is typical of a static AGE model which consists of equations describing (1) producers' demands for produced inputs and primary factors; (2) producers' supplies of commodities; (3) demands for inputs to capital formation; (4) household's demand system; (5) export demands; (6) government demands; (7) the relationship of basic values to production costs and to purchasers' prices; (8) market-clearing conditions for commodities and primary factors; and (9) numerous macroeconomic variables and price indices (Horridge 2000).

Demand and supply equations for private-sector agents are derived from the solutions to the optimisation problems (cost minimisation, utility maximisation, etc.) which are assumed to underlie the behaviour of the agents in conventional neoclassical microeconomics. The agents are assumed to be price-takers, with producers operating in competitive markets with zero profit conditions.

To the standard ORANI-G model, the following modifications in the model structure[7] are carried out.

1. ORANI-G model treats energy commodity as among intermediate inputs under Leontief production function. Therefore, it does not allow price-induced energy substitution. The first modification is to allow substitution among energy commodities, and also between primary factors (capital, labor, and land) and energy. This modification is more or less similar to the modification in the INDOCEEM[8] model, another ORANI-G based model built by Monash University and Indonesian Ministry of Energy.

2. ORANI-G has only single household. Adding multi-household feature, then, is another important modification to the model. The multi-household feature is not only added to the expenditure or demand side of the model[9], but also from the income side of the households[10].

[7] To be distinguished from modification to the model's database.

[8] which stands for Indonesian Comprehensive Economy and Energy Model.

[9] Such as done for some of other ORANI-G version.

[10] More or less similar modification to ORANI-G model has been made to the very popular WAYANG model, an ORANI-G based Indonesian CGE model.

3. ORANI-G model is almost purely based on Input-Output table, whereas for this research many information require information from Social Accounting Matrix. In a SAM, for example, corporate sector or enterprises own a great deal of undistributed earning, and the value of transfers among institution such as from government to households are recorded. Those important feature which is crucial for this model can not be captured form simply I-O based model. The model is then modified to incorporate transfers inter-institutions, most importantly from government to households.

4.1 Production Sectors

The structure of the nested production function for each industry is illustrated in figure 2. At the very bottom part of the figure, industry choose how many each type of labor demanded and determine the number of labor composite according to Constant Elasticity of Substitution aggregation function. Or more formally, every industry solve the following optimisation problem,

$$\min \sum_{o} w_o L_o \text{ s.t. } \tilde{L} = \text{ CES}\left(L_1, L_2, \ldots, L_O\right)$$

where w_o is wage of each of the occupational type, L_o is the number of labor for each occupation type, and $\tilde{L}$ is labor composite, and $o = 1, \ldots, O$. List of skill-type of labor can be seen in table 8 at the Appendix. In this model, the classificiation of the labor type is fairly detail and also represent the higher degree of dualistic nature of informality in the labor market, typical in developing countries. This typical informality is often neglected in many others CGE model.

At the next stage, the optimisation problem for each of the industry is,

$$\min P^K K + P^N N + \tilde{w}\tilde{L} \text{ s.t. } V = \text{ CES}\left(K, N, \tilde{L}\right)$$

where K and P^K are capital and price of capital respectively, N and P^N are land and price of land respectively, and $\tilde{L}$ and $\tilde{w}$ are labor composite and its price respectively, whereas V is value added or primary factor composite.

At the other end, for every energy commodity, each industry optimise to choose the source of the commodity from either local or imported commodity, or

$$\min P_e^D E_e^D + P_e^M E_e^M \text{ s.t. } \tilde{E}_e = \text{ CES}\left(E_e^D, E_e^M\right)$$

where P_e^D and E_e^D are price of domestic energy e and quantity of domestic energy e respectively, where P_e^M and E_e^M are price of imported energy e and quantity of imported energy e respectively, whereas $\tilde{E}_e$ is domestic-imported composite of energy e.

The industry, then, choose the composition of energy type for every energy composite that they need,

$$\min \sum_{e} \tilde{P}_e \tilde{E}_e \text{ s.t. } E^C = \text{ CES}\left(\tilde{E}_1, \tilde{E}_2, \ldots, \tilde{E}_E\right)$$

where $\tilde{P}_e$ and $\tilde{X}_e$ are price and quantity of domestic-imported composite energy e, respectively, while E^C is the energy composite.

Industries are allowed to substitute between energy and primary factors, so they are

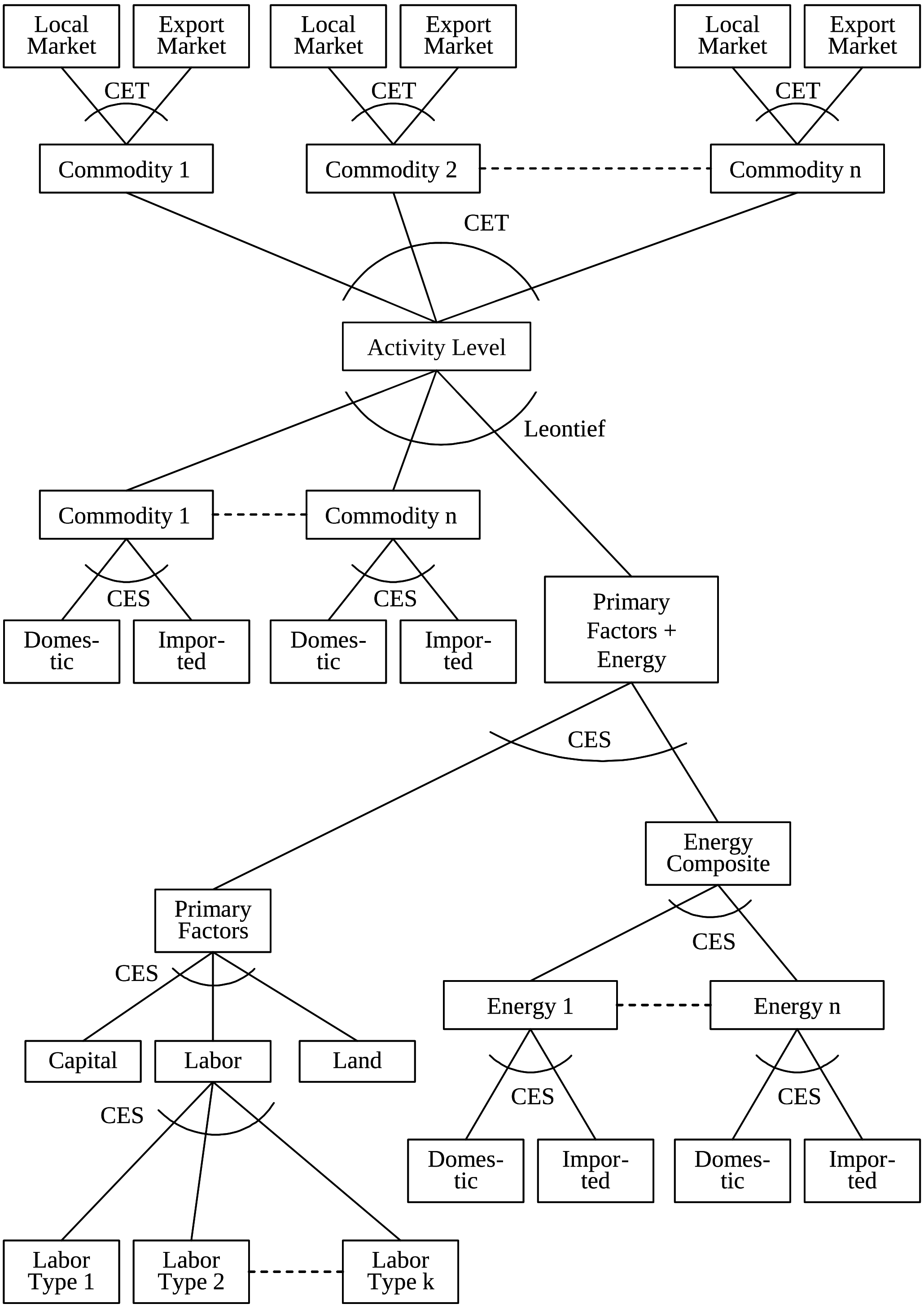

Figure 2: Structure of Production

solving the following optimization problem

$$\min P^E E^C + P^V V \text{ s.t. } VE = \text{ CES}\left(V, E^C\right)$$

where P^E is the price of energy composite, and P^V is the price of primary factor composite, while VE is value-added and energy composite.

At the top of the production nest, each industry minimize cost of purchasing intermediate costs and primary-factor-energy composite to produce output of the activity level using Leontief production function, or

$$\min \sum_c P_c X_c + P^{VE} VE \text{ s.t. } A = \min\left(X_1, X_2, \ldots, X_C, VE\right).$$

where P_c and X_c are price and quantity of intermediate commodity c respectively, where A is activity level or total output of industry.

In this model, each industry is allowed to produce multiple commodities[11], such that

$$\max \sum_c P_c X_c \text{ s.t. } A = \text{ CET}\left(X_1, X_2, \ldots, X_C\right)$$

where CET refer to Constant Elasticity of Transformation function. And finally, industry can choose to sell either in local or export market such that the optimisation problem is

$$\max \sum P_c^D X_c^D + P_c^E X_c^D \text{ s.t. } X_c = \text{ CET}\left(X_c^D, X_c^E\right)$$

where P_c^D and X_c^D are price and quantity of commodity sold to local/domestic market, whereas where P_c^E and X_c^E are price and quantity of commodity supplied to export market.

The model has 38 number of sectors and 43 number of commodities. All industry producing single commodity except petroleum refinery sector where it produces 6 type of commodities i.e., gasoline, kerosene, automotive diesel oil, industrial diesel oil, other fuels, and LPG. This is the aggregation from 181 sectors/commodities from the Social Accounting Matrix, as discussed in the earlier section. Since fuel commodities is disaggregated in detail, it can capture acurately how the October 2005 package was implemented, because the rise in the fuel prices are diferents across fuel commodities.

4.2 Households

Household optimisation problem is illustrated in figure 3, where each household maximize Stone-Geary Utility function (in log form),

$$U = \sum_i \beta_i \log\left(x_i - \gamma_i\right)$$

where x_i is consumption of good i, γ_i is subsistence consumption of good i, $x_i > \gamma_i$, $0 \leq \beta_i \leq 1$, and $\sum_i \beta_i = 1$,

subject to

$$y = \sum_i p_i x_i.$$

[11]Although in the model, it will only applies to a single refinery industry that allow to produce multiple type of fuels.

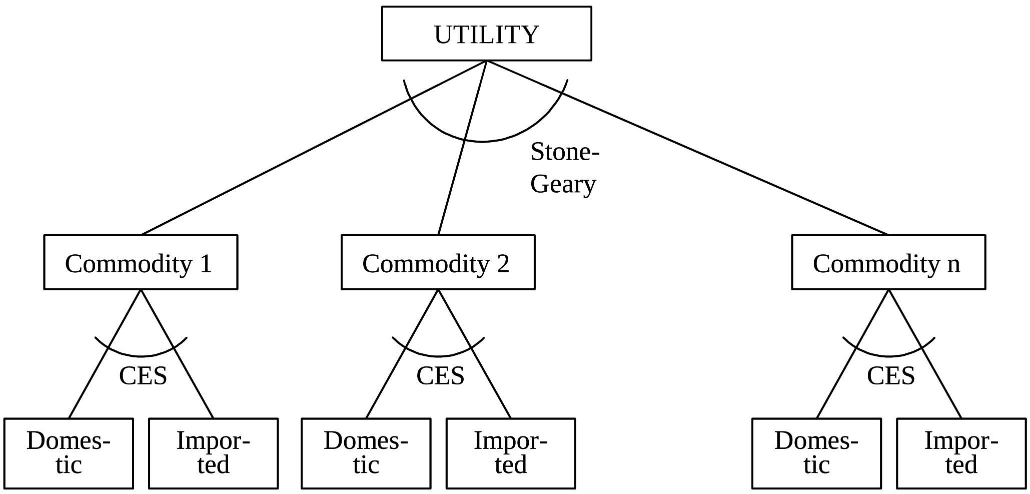

Figure 3: Structure of Household's Demand

This will yield the following demand system in expenditure form, which is called Linear Expenditure System (LES).

$$p_i x_i = p_i \gamma_i + \beta_i \left(y - \sum_j p_j \gamma_j \right)$$

Compared to Cobb-Douglas and CES demand system, LES is richer for distributional effect analysis, because income elasticity is not constant, hence the impact on the same percentage shock on each household income, would generate different behavioral responses by each households. The natural reason that income elasticity of households are different is that marginal utility of income vary with level of income. Poor households will have higher marginal utility of income, while rich household will have lower. In the LES, this is captured by Frisch parameter that varies with income level.

4.3 Model Database and Parameters

The database for the model is built based on the Social Accounting Matrix 2003 specifically constructed for this research, as described in detail in the earlier section. For the purpose of the case studies the industry is aggregated into 38 sectors and the commodity is aggregated into 43 sectors.

There are some sets of parameters of which their values have to be estimated or borrowed from literature or other models. Those set of parameters are,

1. Armington elasticity between domestic and imported commodities, σ_c^{ARM}.
2. Export elasticity, ε_c^{EXP}.
3. Elasticity of substitution among labor types (or skills), σ_i^{LAB}.
4. Elasticity of substitution among primary factors, σ_i^{PRIM}.
5. CET transformation for industries with multiple commodities, σ_i^{CET}.

6. Elasticity of substitution among energy types, σ_i^{EN}.

7. Elasticity of substitution between energy composite and primary factor, σ_i^{VE}.

8. Expenditure elasticity for LES household demand system, ε_{ih}, and

9. Frisch parameter, elasticity of marginal utility of income, ϕ_h.

Parameter 1 to 5, σ_c^{ARM}, ε_c^{EXP}, σ_i^{LAB}, σ_i^{PRIM}, σ_i^{CET}, are taken from GTAP database. Parameter 6 and 7, σ_i^{EN} and σ_i^{VE}, is borrowed from INDOCEEM model. Parameter ε_{ih} are estimated econometrically, and Frisch parameter ϕ_h is calculated based on the study by Lluch et al. (1977).

It can be shown that all parameters of the LES household demand can be written as function of only expenditure elasticity and Frisch parameter, the elasticity of marginal utility of income. Hence parameter of the demand system that are supplied to the model are those two parameters, expenditure elasticity for specific commodity and specific household, ε_{ih}, and Frisch parameter for each households, ϕ_h.

The best approach to estimate the parameter of the LES is using a demand system estimation model. However, the household survey data (SUSENAS) does not have data on most prices and obtaining prices from data on value and volume of consumption is not possible. The alternative is to estimate the expenditure elasticities by the regression of the Engel curves. Following Deaton and Case (1988), The Engel curve is specified for 44 broad commodity classification i for urban and rural sample, specified as,

$$w_i = \alpha_i + \beta_i \ln(y) + \gamma_i \ln(s) + \sum_j \theta_{ij} R_j + e_i$$

where w_i is expenditure share of commodity i, y is total expenditure, s is household size, R_j is regional (provincial) dummy variables, and e_i is error term. The engel curves are estimated using OLS method with robust (Hubber-White) standard error. Expenditure elasticity for commodity i, ε_i is calculated as

$$\varepsilon_i = 1 + \frac{\beta_i}{w_i}$$

Table 3 shows the regression result and the calculated expenditure elasticities using mean of expenditure share over the samples.

Frisch parameter is calculated based on the widely-known study by Lluch et al. (1977) that estimated the relationship between Frisch parameter and income per capita. The conjecture from the study is used to calculate the Frisch parameter for each household, that is

$$\phi_h = -36 \cdot y^{-0.36}$$

where y is income per capita in 1970 US Dollar.

Table 3: Estimation Result of the Engel Curve and Expenditure Elasticity

	Urban				Rural			
Commodity	β_i	s.e		ε_i	β_i	s.e.		ε_i
Automotive diesel oil	0.00061	0.00007	**	3.397	0.00074	0.00029	*	5.604
Food (agriculture)	-0.00794	0.00021	**	0.614	-0.01880	0.00060	**	0.551
Appliances	0.00234	0.00013	**	1.561	0.00540	0.00020	**	2.082
Beverages	0.00512	0.00020	**	1.559	0.00466	0.00024	**	1.776
Chemical products	-0.00849	0.00022	**	0.799	-0.00517	0.00026	**	0.874
Clothes	0.00118	0.00010	**	1.123	0.00282	0.00013	**	1.291
Coffee and tea	-0.00460	0.00008	**	0.497	-0.00469	0.00013	**	0.647
Communication equipment	0.00424	0.00026	**	1.989	0.00725	0.00040	**	3.426
Communication services	0.02341	0.00037	**	2.866	0.00330	0.00019	**	4.771
Dairy products	0.00875	0.00035	**	1.565	0.00933	0.00029	**	2.427
Drugs/medicines	0.00002	0.00012		1.004	-0.00015	0.00014		0.964
Edible oil	-0.00930	0.00012	**	0.475	-0.01108	0.00017	**	0.556
Education	0.01258	0.00055	**	1.575	0.00346	0.00031	**	1.453
Electricity	0.00083	0.00021	**	1.033	0.00126	0.00020	**	1.079
Fish	-0.01234	0.00038	**	0.754	-0.00277	0.00058	**	0.958
Flours/bread	0.00235	0.00015	**	1.242	0.00155	0.00022	**	1.166
Fruits	0.00612	0.00029	**	1.220	0.01019	0.00039	**	1.374
Furniture	0.00186	0.00011	**	1.810	0.00414	0.00019	**	2.787
Gasoline	0.01456	0.00031	**	2.270	0.01130	0.00028	**	3.063
Water and gas	0.00166	0.00012	**	1.275	0.00063	0.00006	**	1.674
Health	0.00731	0.00074	**	1.488	0.00985	0.00077	**	1.758
Hotel and restaurant	0.00753	0.00054	**	1.188	0.01268	0.00065	**	1.607
Jewelry	0.00218	0.00016	**	1.767	0.00563	0.00029	**	2.953
Kerosene	-0.01530	0.00020	**	0.228	-0.00302	0.00021	**	0.840
Livestock	-0.00331	0.00023	**	0.888	0.01122	0.00037	**	1.418
LPG	0.00424	0.00009	**	2.166	0.00182	0.00008	**	3.432
Meat	0.00894	0.00028	**	1.475	0.01483	0.00035	**	2.228
Noodles	-0.00112	0.00014	**	0.890	0.00329	0.00017	**	1.382
Other durable	-0.00397	0.00029	**	0.607	-0.01973	0.00052	**	0.358
Other fuels	0.00348	0.00009	**	2.177	0.00424	0.00020	**	3.175
Other transportation	0.00488	0.00058	**	1.238	0.00893	0.00075	**	2.072
Food (manufacturing)	-0.01072	0.00062	**	0.890	0.00368	0.00066	**	1.050
Other services	0.04807	0.00153	**	1.352	0.00459	0.00086	**	1.061
Paper/print products	0.00541	0.00017	**	1.623	0.00281	0.00024	**	1.500
Plastic, ceramics, etc	0.00092	0.00008	**	1.311	0.00232	0.00012	**	1.645
Recreation	0.00107	0.00008	**	2.162	0.00094	0.00007	**	2.643
Rice	-0.08405	0.00074	**	0.191	-0.12345	0.00101	**	0.358
Road transportation	0.00116	0.00016	**	1.134	0.00269	0.00014	**	1.774
Sugar	-0.00913	0.00012	**	0.423	-0.01000	0.00020	**	0.611
Textiles	-0.00001	0.00024		1.000	0.00450	0.00032	**	1.137
Tobacco products	-0.00813	0.00068	**	0.867	0.02490	0.00101	**	1.315
Vegetables	-0.02382	0.00029	**	0.498	-0.02076	0.00040	**	0.678
Vehicles	0.02141	0.00103	**	3.576	0.03471	0.00158	**	6.171

Note: **) significant at 1%, *) significant at 5%. Source: SUSENAS 2002 Consumption Module

4.4 Method for Analyzing Distributional Impact

In a general equilibrium framework, the distributional impact of any exogenous shocks to the model (e.g., policy or external shocks) works through the market mechanism. Optimizing firms will change their demand for factor inputs, intermediate inputs, and their supply of commodities. Change in a firm's demand for factors will affect factor prices, i.e., wages and non-labour income in the factor market, and at the end affect household's incomes and its distribution across households. Change in the income of every household depends on the composition of factor ownership (unskilled labour, skilled labour, capital, or land) of the household.

Change in household income together with change in all commodity prices, will simultaneously change household expenditures on various commodities. This will affect distribution of income and expenditure. In a general equilibrium framework, this series of mechanisms, works simultaneously in inter-related markets. Therefore, any attempt to assess the distributional impact of policies, by identifying either their impact on household expenditure "or" household income will be considered incomplete, because it is a one-sided story. Both sides are endogenous, and a CGE model elegantly takes these two different forces into account.

Figure 4 illustrate how, for example, subsidy cut on fuels affect distribution across households. Government may affect commodity prices through indirect taxes and subsidies. Subsidy cut on fuels will increase price of fuels sold in the commodity market. Household's demand for fuels will fall. Household's demand for other commodities may change as well because in a demand system, commodities are inter-related. Household's total expenditure will change, and this will affect their welfare. How much each household's expenditure change depends on their consumption pattern, which vary across households. However, this is not the end of the story.

Since fuels are also used by industries as intermediate, the rise in their prices will affect industry's optimal decision on the production process. Transportation sectors, for example, will be heavily affected, and most probably will contract, as well as some other industries. Industry's decision on production will affect their demand for various factors of production such as skilled labor, unskilled labor, and capital. This will in turn will change their prices such as wages in the factor market. Since factors of production are supplied by households, households will experience decline in their factor incomes.

How much each of the households experience income falls depend on their composition of factor ownership, and depend on how much the price of each factors falls/rises. When household's income falls, again this will affect household demand for commodities, and household's expenditures. When new equilibrium is found, the end results is the new distribution of household's welfare which could be measured by the new distribution of their (real) expenditure.

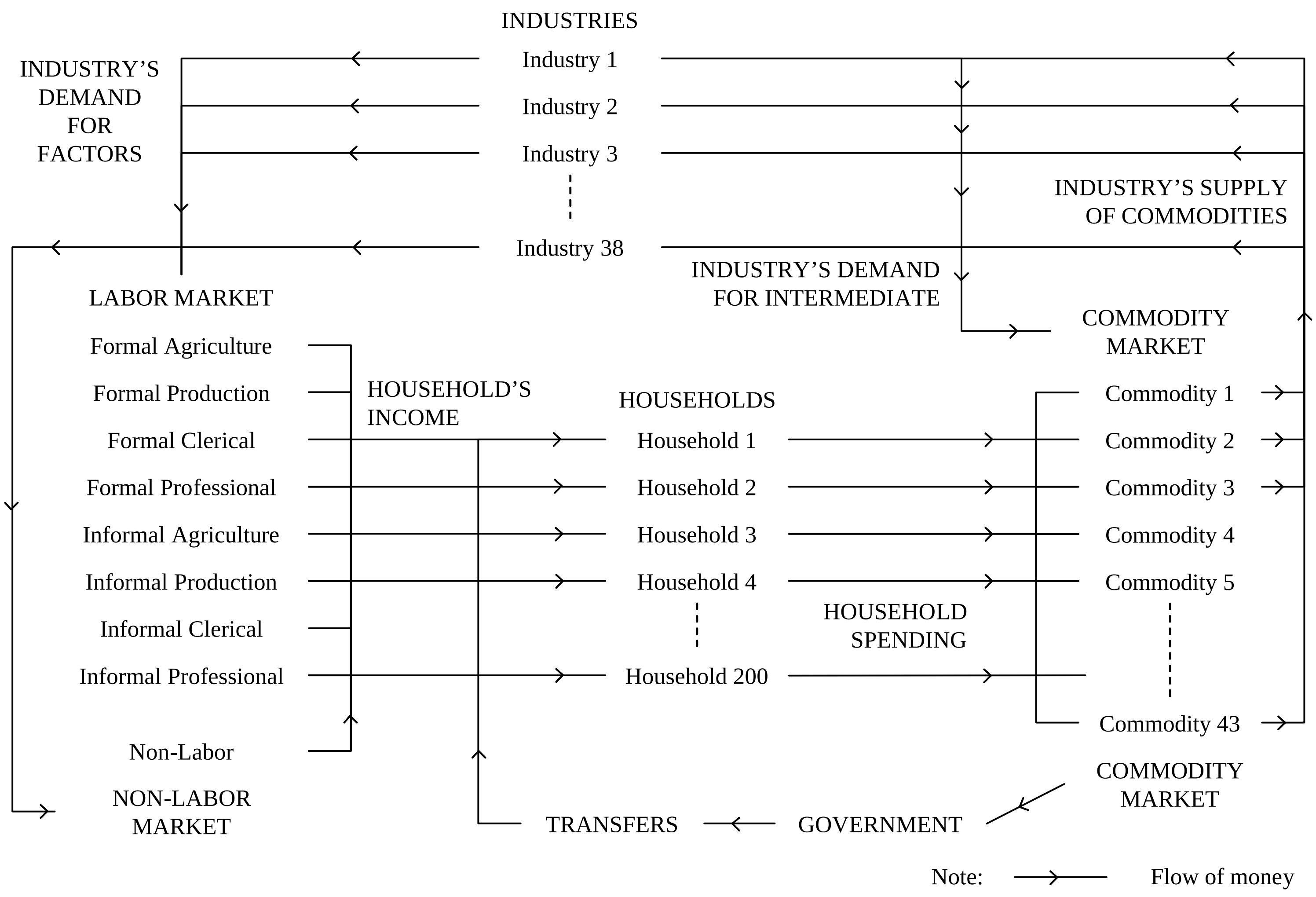

Figure 4: The Mechanism by Which Subsidy Cut on Commodities Affect Distribution of Income

There are a few approaches for dealing with income distribution analysis in a CGE model. The traditional one is the representative household method, where it is assumed income or expenditure of households follows a certain functional form of distribution[12]. Distribution is assumed to remain constant before and after the shock, and usually the behaviour of the group is also dominated by the richest. There has been growing evidences to suggest variation within the one single household-category is important and can significantly affect the results of the analysis (Decaluwé et al. 1999). Household-specific shocks, such as transfers to targeted household groups, are also impossible to carry out with approach. Studies by Indonesia by Sugema et al. (2005) and Oktaviani et al. (2005), among others, belong to this type of approach.

The most common studies for Indonesia are CGE studies that use the official household classification of the SAM, i.e., 10 socioeconomic classes. The distributional impact is only analyzed by comparing the impact of policies among these socioeconomic classes. Studies by Clements et al. (2003) Resosudarmo (2003), Azis (2000), and Azis (2006), among others, follow this approach.

Another approach is a top-down method, where price changes produced by the CGE model are transferred to a separate micro-simulation model, such as a demand system model or an income-generation model. Price changes are exogenous in this micro-model, hence endogeneity of prices is ignored. Studies for Indonesia by Bourguignon et al. (2003) and Ikhsan et al. (2005) are among this type of approach. Some attempt has been made to improve this approach by providing feedback from the micro-model to the CGE model. Belonging to this category among others are studies by Filho and Horridge (2004) for Brazil, and Savard (2003) for the Philippines.

The most recent approach is multiplying the number of households into as many as households available in the household level data. Increasing computation capacity allows a large number of households to be included in the model. It allows the model to take into account the full detail in the household data, and avoids pre-judgment about aggregating households into categories. All prices are endogenously determined by the model, and no prior assumption of parameter distribution is necessary. Difficult data reconciliation and that the size of the model can become a constraint are among the drawbacks of this approach. This integrated-microsimulation-CGE model has been conducted in various studies including Annabi et al. (2005) for Senegal, Plumb (2001) for U.K., Cororaton and Cockburn (2005) and, Cororaton and Cockburn (2006) for the Philippines.

The last approach, to be used in this paper, is disaggregating or increasing the number of household categories by the size of expenditure or income per capita. If the categories is detailed enough, such as centiles, the distributional impact such as poverty incidences or standard inequality indicators can be estimated more precisely. For example, Warr (2006) used this approach for Laos in assessing the poverty impact of large scale irrigation investment.

The ideal approach in distributional analysis where disaggregated households are integrated in the CGE model is when all observations in the household survey are integrated in the model like in the Micro-simulation CGE models. If using only 100 representative household classified by centile for expenditure per capita, how accurate is the distributional story? As figure 5 illustrates the accuracy in term of poverty incidence and inequality calculation could be fairly accurate. The line represents the almost continuous data point of urban households of 29,278 observations using SUSENAS 2003

[12]Of which the most popular one is log-normal distribution.

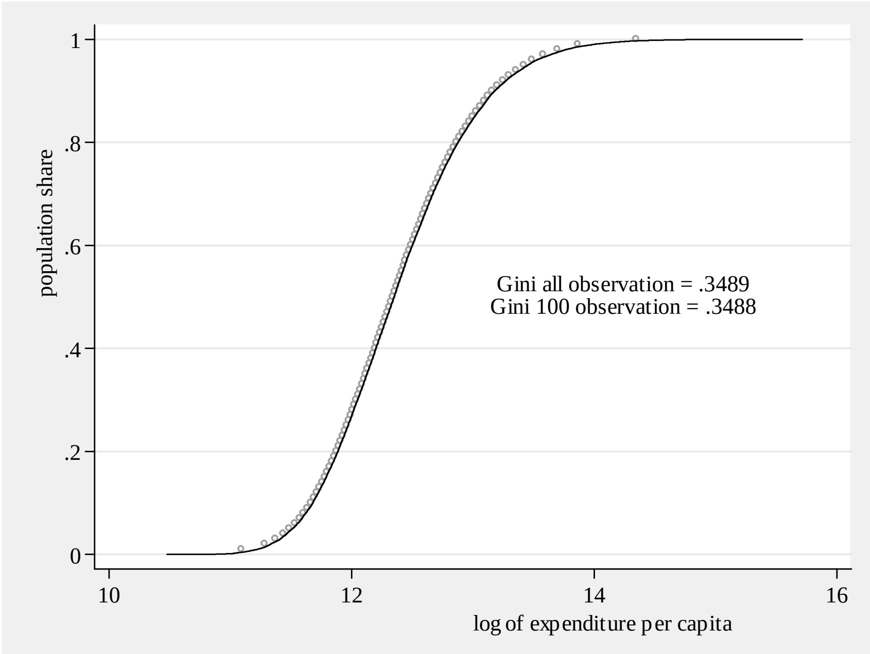

Figure 5: The accuracy of distributional analysis using 100 centiles

consumption module. This line can be used to calculate poverty incidence when we have the relevant poverty line. The gray circle points represent the data points where observations are collapsed or aggregated into 100 households by centiles of expenditure per capita. Calculating poverty incidences using only these 100 data points seems to be fairly accurate. Moreover, the calculation of Gini coefficient using all 29,278 observations and using only 100 observations produce almost identical results.

Poverty incidence is simply calculated by finding a point in the vertical axis in figure 5, where the expenditure curve cross the vertical line representing poverty line. Since using only 100 centiles, only discrete number of poverty incidence can be found, the exact poverty incidence is linearly approximated to find the decimal point.

Let y_c is real expenditure per capita of household of the c-th centile where $c = 1, \ldots, n$, and $n = 100$. Poverty incidence then is calculated using

$$P\left(y_c, y_P\right) = \max\left\{c | y_c < y_P\right\} + \frac{y_P - \max\left\{y_c | y_c < y_P\right\}}{\min\left\{y_c | y_c > y_P\right\} - \max\left\{y_c | y_c < y_P\right\}}$$

where y_P is the poverty line. The first term is simply the centile of of which expenditure per capita is the closest from the origin (the left) to the poverty line. The second term is the linear approximation of the decimal point of the poverty incidence. This formula is illustrated in figure 6.

The change in poverty incidence after a policy shock (simulation) is calculated as

$$\Delta P = P\left(y'_c, y_P\right) - P\left(y_c, y_P\right)$$

where

$$y'_c = \left(1 + \frac{\hat{y}_c}{100}\right) \cdot y_c$$

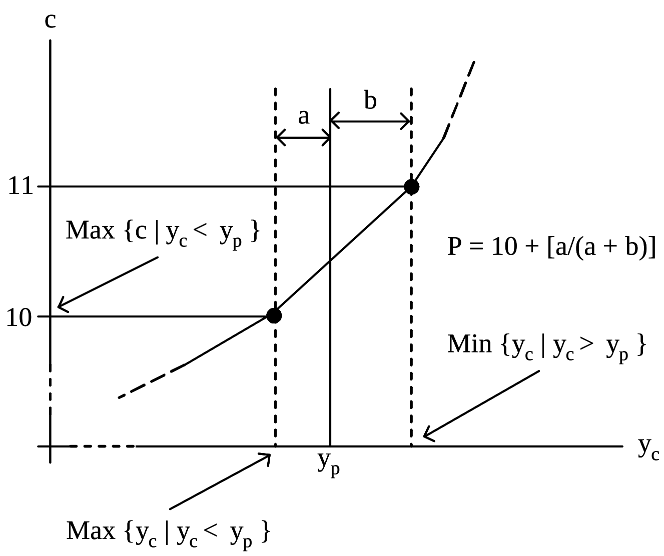

Figure 6: Calculating Poverty Incidence

where $\hat{y}_c$ is the percentage change in *real* per capita expenditure of household of the centile c produced from the simulation of the CGE model.

Gini coefficient is calculated as

$$G\left(y_c\right) = \frac{1}{n}\left(n + 1 - 2\frac{\sum_{c=1}^{n}\left(n+1-c\right)y_c}{\sum_{c=1}^{n} y_c}\right)$$

4.5 Scenario, closure and simulation strategy

4.5.1 Scenarios and simulation strategy

Table 4 summarises the scenarios to be simulated. All of the scenarios are related to the October 2005 package of fuel price reform i.e., increasing the price of gasoline by 87.5%, diesel by 104.7%, and kerosene by 185.7%. The initial database (which represent the equilibrium in the economy), is modified to mimic the fuel price system of the year 2005 before the implementation of the reform, in the sense that the rate of fuel subsidy represent the situation in 2005 where the market (or international) price of fuel products is relatively high due to rapid increase in the crude oil price.

There are two ways of conducting the simulation; first is by reducing subsidy rate and let the price determined endogenously by the model. However, it does not exactly mimic the implementation in the reality since fuel prices is administered or determined in Indonesia, and once it is announced it will stay the same until another adjustment. In this sense, fuel prices can be regarded as exogenous. It is also hard to determine how much the subsidy rate should be reduced to represent the October 2005 package. The second approach then is used, i.e., the price of fuels are set exogenously and subsidy rate is set to be determined endogenously in the model. In this way the simulation can represent exactly the rate of price increase as exactly announced by the government on the first of October 2005.

Table 4: Simulation Scenarios

	Scenario	Note
SIM 1.	NO-KER	October 2005 Package without increasing kerosene price (Gasoline 87.5%, Diesel 104.7%)
SIM 2.	ALL FUELS	October 2005 Package (Gasoline 87.5%, Diesel 104.7%, Kerosene 185.7%)
SIM 3.	100% UT	October 2005 Package with unconditional cash transfers to targeted household of Rp. 1.2 million with 100% effectiveness.
SIM 4.	75% UT	October 2005 Package with unconditional cash transfers to targeted household of Rp. 1.2 million with 75% effectiveness.
SIM 5.	100% UTUR	October 2005 Package with unconditional cash transfers to targeted household with higher amount to urban household and lower amount to rural household (100% effectiveness)
SIM 6.	CT ONLY	Conditional transfers to be spent on education and health
SIM 7.	CT	October 2005 Package with conditional transfers to be spent on education and health

The objective of Simulation 1 (SIM 1 NO-KEROSENE) is to see the economy wide impact and more importantly the distributional direction of October 2005 package had the kerosene price increase not included. Many Indonesian economists believed that fuel price subsidy in itself benefit mostly the riches, hence, its removal or its reduction will hurt the riches more relative to the poor. Therefore a reform will be considered progressive. However, it will be argued that in Indonesia, kerosene, is part of important consumption of the poor especially in urban area. It will be compared and shown that the expectation of progressive nature of fuel price reform will more likely to be the case if the reform reduced the subsidy of only gasoline and diesel which are very likely to be important part of the riches' expenditure and did not touch kerosene. The simulation is intended only to see the direction of subsidy reduction (or ceteris paribus), hence will exclude compensation.

In simulation 2 (SIM 2 ALL FUELS), October 2005 reform package in the form of increasing fuel prices is implemented without compensation scheme. It is again to see how its distributional impact would have been likely if the big reform like this was implemented without compensation.

Simulation 3 (SIM 3 100% UT) is exactly what was implemented by the Government i.e., increasing price of gasoline by 87.5%, diesel by 104.7% and kerosene by 185.7% plus unconditional cash transfers to targeted households. Being unconditional means that the transfers is lump-sum and recipients households have any discretion on how it can be spent.

To whom was the compensation be targeted? In the initial database, poverty incidence is calculated based on the official SUSENAS-based poverty incidence in 2005. The approach is to find poverty line in urban and rural area that will give exact number of official poverty incidence. The poverty incidence in urban area is 11.37%, 19.51% in rural area, and 19.65% nation-wide. However, it turned out that the target of the compensation is not only those below official poverty line, but also those who are called the near poor.

Initially, the program was targeted to 15.5 million poor and near-poor households (around 28 percent of the national population and in excess of the poverty rate of 16 percent) (ESMAP 2006). However, later on, the recipients list was blown up to 19.2 million households (BPS 2006). The recipients then are well beyond the poor as defined by SUSENAS poverty line. The number of recipients households (and population) is calculated and equivalent to, in proportion, almost twice poverty incidences in urban and rural area. Therefore, in the simulation, the cash transfers will be given to the lowest 24% of the population in urban area, and the lowest 42% in rural area. With this estimate, the total amount of transfers is Rp. 18.3 trillion rupiahs (in 2003 price level, since the model database is using SAM 2003)[13]. World Bank (2006) even considered this scheme as the world's largest ever cash transfer program. The actual size of the transfer was Rp 300,000 per household and disbursed every three months, totalling Rp 1.2 million in one year. For the purpose of the simulation, the nominal transfers is deflated to the year 2003.

In simulation 3, it is assumed that the compensation scheme is 100% effective. This is clearly too idealistic. There are many possible sources of the ineffectiveness of the compensation. The ex-ante targeting may be imperfect, in the sense, that the entitled households were not among the target, and the households who are not entitled, on the other hand, were among the target. This source of ineffectiveness was mainly due to statistical error of recording. Another source of ineffectiveness is the possibility that the compensation did not reach the targeted households (although already disbursed) or not fully reach the target. This may happen due to ineffective administration or bureaucracy in the process of disbursement, as well as corruption.

There is not yet any consensus, however, on the degree of effectiveness of the compensation scheme. One study by SMERU (2006), however may give an indication. SMERU (2006) compared the number of recipient households with the number of poor households across regions and examined its correlation. This could be done, because SMERU (2006) uses the poverty mapping that enable observation in geographical detail. The exercise suggest a coefficient correlation of 0.65 to 0.72. Based on this result, another simulation, i.e. simulation 4 (SIM 4. 75% UT) is conducted by assuming that the effectiveness of compensation is 75 percent. In this simulation, the amount of cash that is given to every centile group of households is reduced by 25%. This can be interpreted as mis-targetting of households within each centile group or it may also be interpreted as the amount of cash received by the targeted households die out by 25%. In practice, both cases could happen.

Another issue that seems missing in the public discussion with regard to the effectiveness of compensation scheme is the simplistic way of giving the same amount of money to all household across Indonesia. Indonesia is a large country, and its geographic nature (such as being an archipelago of thousand of islands) is among the reason why price level, for example, vary across regions. Even if, the setting and planning for various different amount of transfer geographically seems not to be a simple task, at least distinction between urban and rural household might have made more sense. Simply using information from the most recent household survey, It is not difficult to see that urban households will be hurt more by the jump in kerosene price, compared to rural households, simply because poor household consume a lot less of kerosene. Therefore, giving the larger amount of money to urban poor households and less money to rural poor households could have been regarded as a sensible option. Among the possible

[13]With 19.2 million households as beneficiaries the actual amount in 2005 price level will be around Rp 23 trilion rupiahs.

reason, the government did not consider this option that they were confident that even with 1.2 million rupiah a household, urban poor will be compensated, and if it over-compensate rural poor, it was still under their budget anyway Simulation 5 (SIM 5 100% UTUR), then, attempt to simulate slight modification in the scheme by giving different amount of transfer to urban and rural household, since might help preventing even urban households poor fell into poverty.

In this simulation, urban household receive higher amount of transfers than rural households, such that the total budget allocated for the scheme more or less the same. The amount of money transferred to urban household is increased by 35 percent, while to rural household is reduced by 15 percent. This simulation assume 100 percent effectiveness, so comparable to SIM 3.

The way that the compensation scheme is an unconditional lump-sum cash transfers invited quite many criticism. Giving a lump-sum amount of cash to poor households with total discretion of them in spending them can be seen by some people to be a less wise means of helping the poor compared to giving them education, for example. However, those critics may miss the point that the nature of this transfer is a compensation. The idea is mitigating the adverse distributional effect of fiscal and efficiency-motivated reform. However, with regard to this idea, it seems that the government take this idea into consideration, and indicate of introducing a conditional cash transfers in the near future. Conditional cash transfers is a transfers to household with the condition that the recipients will spend it into specific type of spending, such as those related to human capital investment (health and education spending). Had the compensation scheme built in the energy price reform is conditional, how would its distributional impact have been? To explore this issue, first simulation Simulation 6 (SIM 6 CT ONLY), introduce a conditional cash transfers (conditional on spending into health and education) to targeted household, unrelated to energy price reform, with the purpose of seeing the distributional direction of this sort of transfer. And finally, this conditional cash transfer is combined and built in to the fuel price reform of October 2005 package in Simulation 7 (SIM 7 CT).

Simulating the conditional transfers is carried out by giving price subsidy to targeted household for the targeted commodities. For comparison purposes, the subsidy rate is simulated for the targeted households is increased such (in similar proportion between education and health) such that the budget allocated is equivalent to the unconditional cash transfers.

4.5.2 Closures

All of the 7 simulations above will be carried out under two different closures i.e., short-run and long-run closure. Short run is defined as a length of run such that capital is not mobile across sectors or sector-specific. Whenever demand for capital for each sector rises/falls, its price will adjust accordingly. In this closure, price of capital is not equalised across sector.

The long-run closure is more neoclassical in nature, that is capital is freely mobile across industry and its price is equalised nation-wide. On the other hand labor for each type (or skills) are freely mobile, but segmented between skills. Skill-specific wage is equalised nation-wide in both long-run and short-run closure. Another alternative closure, which is not used in the simulation is Keynesian closure, where wage rigidity may allow unemployment. Overall, the factor market closure represent neoclassical model, with fixed supply and fully-employed. The fixity of the primary factors supply constrains aggregated GDP at the supply side.

At the aggregate demand side, aggregate real investment and aggregate real government consumption are exogenous, whereas aggregate real consumption is endogenous hence can be interpreted as aggregate index of welfare. Trade balance is also endogenous. At the government account, the exogenous aggregate real government consumption is counter-balanced by endogenous government saving (nominal government revenue minus nominal government expenditure). Consumer's price index is set as the numeraire.

4.6 Result and discussion

4.6.1 Macroeconomic and industry results

Table 5 and table 6 shows selected macroeconomic impact as well as industry output result under short-run and long-run closure, respectively. The impacts of all simulations on real GDP is relatively small, under both closures. This merely reflects the fixity of primary factors supply and full employment assumed in the standard neoclassical model. The impact on GDP might have been larger under Keynesian closure when full employment assumption is relaxed, for example, by imposing wage rigidity in labor market.

Aggregate real household consumption can be interpreted as an index of aggregate welfare. It is also the summation of all household's real consumption in the economy. In general, increasing fuel prices reduced real household's expenditure both in the short-run and long-run. In simulation 4 for example, where October 2005 package plus compensation with 75% effectiveness, aggregate real consumption fall by 5.17% (compared to base line). Although compensation is given only to poor (and near poor) households, it also tend to mitigate the adverse impact on aggregate welfare. Comparing simulation 2 (fuel prices rise without compensation), and simulation 3 (increasing fuel price plus compensation, 100% effective), for example, have muted the negative impact on aggregate real expenditure by around 1.2% (6.01% compared with 4.89%). In the long-run the impact on aggregate real expenditure is slightly lower. This could be possible, because capital mobility may moderate the impact on return to capital, through adjustment in the factor market. This will help households with more endowment of capital.

The percentage change in output across industries represent, resource allocation effect from the shocks. Increasing price of petroleum products lower the demands for fuels, and its immediate industry impact is the reduction in the output of refinery industry. The final (new equilibrium) reduction in the output of petroleum refinery is around 2.8 percent in simulation 2 (without compensation). Other industries which experience rather big contractions are those which closely related to petroleum products. They are road transportation (−2.9%), other transportation (−4.7%), and utility sectors (electricity by −2.2%, and water and gas by −4.13%). Fall in output occurs, in some services sectors, and to lesser extent in agriculture (paddy and other food crops). Due to resource allocation, which in the short-run mostly from labor mobility, some others sectors expands. In simulating fuel subsidy reduction, Clements et al. (2003), also reports utilities, as well as agricultural, and services fall.

Table 5: Simulated Macroeconomic and Industry Results, Short Run Closure

	SIMULATION						
	1	2	3	4	5	6	7
Macroeconomic							
Gross Domestic Product (nominal)	-0.16	-1.01	-1.11	-1.08	-1.10	0.22	-0.81
Gross Domestic Product (real)	-0.35	-0.45	-0.42	-0.43	-0.42	-0.48	-0.77
Real household expenditure	-3.32	-6.01	-4.89	-5.17	-4.88	1.79	-4.69
Export (nominal)	3.68	6.15	3.73	4.33	3.73	-4.12	3.20
Real export	3.23	7.25	5.50	5.94	5.48	-3.71	4.41
Import (nominal)	-2.97	-5.93	-6.03	-6.01	-6.02	1.33	-4.99
Real import	-3.96	-6.22	-5.39	-5.60	-5.39	2.53	-4.66
Change in trade/GDP ratio	0.02	0.03	0.03	0.03	0.03	-0.02	0.02
Industry output							
Paddy	-0.14	-0.59	-0.10	-0.21	-0.14	0.13	-0.34
Other food crops	-0.40	-0.90	-0.62	-0.69	-0.63	0.23	-0.72
Estate crops	1.18	2.58	1.73	1.94	1.77	-0.92	1.83
Livestock	-0.69	-1.50	-1.15	-1.24	-1.14	0.36	-1.23
Wood and forests	0.73	1.32	1.06	1.12	1.06	-0.44	1.02
Fish	-0.34	-0.28	-0.39	-0.37	-0.39	0.01	-0.32
Coal	0.07	0.07	0.07	0.07	0.07	-0.07	0.02
Crude oil	-0.03	0.00	-0.01	-0.01	-0.02	-0.12	-0.09
Natural gas	-0.10	-0.07	-0.08	-0.08	-0.08	-0.12	-0.15
Other mining	0.05	0.20	0.15	0.16	0.15	-0.29	0.01
Rice	-0.15	-0.64	-0.11	-0.23	-0.16	0.16	-0.36
Other food (manufactured)	-0.32	-0.70	-0.47	-0.53	-0.47	0.06	-0.71
Clothing	1.27	2.07	1.84	1.90	1.83	-0.79	1.54
Wood products	1.47	2.54	2.02	2.15	2.03	-0.67	2.09
Pulp and paper	0.41	1.21	0.87	0.96	0.87	-0.61	0.81
Chemical product	0.23	1.17	0.89	0.96	0.88	-1.71	-0.05
Petroleum refinery	-2.02	-2.48	-2.49	-2.49	-2.49	-0.18	-2.62
LNG	-0.44	-0.35	-0.39	-0.38	-0.39	-0.32	-0.59
Rubber and products	0.97	2.66	1.87	2.07	1.88	-1.88	1.31
Plastic and products	0.42	0.84	0.69	0.73	0.68	-0.66	0.37
Non-ferous metal	0.08	0.39	0.33	0.34	0.32	-0.22	0.26
Other metal	0.05	0.51	0.36	0.40	0.35	-0.61	0.09
Machineries	2.02	4.24	3.44	3.64	3.40	-3.61	1.57
Automotive industries	-0.65	-0.87	-0.92	-0.91	-0.92	0.23	-0.75
Other manufacturing	0.84	1.53	1.41	1.44	1.39	-0.84	0.95
Electricity	-1.35	-2.20	-1.75	-1.87	-1.73	0.24	-2.00
Water and gas	-2.67	-4.13	-3.83	-3.90	-3.76	0.57	-3.69
Construction	-0.06	-0.08	-0.08	-0.08	-0.07	0.16	0.05
Trade	0.51	0.94	0.85	0.87	0.84	-0.80	0.35
Hotel and restaurants	-0.67	-1.62	-1.26	-1.35	-1.23	0.41	-1.29
Road transportation	-2.38	-2.98	-2.77	-2.82	-2.75	0.10	-2.88
Other transportation	-4.22	-4.67	-4.58	-4.61	-4.57	-0.40	-4.86
Banking and finance	0.30	0.42	0.34	0.36	0.35	-1.18	-0.47
General government	0.03	0.08	0.04	0.05	0.04	-0.11	-0.02
Education	-1.16	-2.22	-1.75	-1.87	-1.70	9.47	5.40
Health	-1.39	-2.87	-2.15	-2.33	-2.16	13.14	7.32
Entertainment	1.23	1.86	1.52	1.61	1.51	-3.22	-0.64
Other services	-0.64	-1.18	-1.11	-1.13	-1.10	-0.30	-1.43

Table 6: Simulated Macroeconomic and Industry Results, Long Run Closure

	SIMULATION						
	1	2	3	4	5	6	7
Macroeconomic							
Gross Domestic Product (nominal)	0.11	-0.76	-0.79	-0.78	-0.78	0.04	-0.64
Gross Domestic Product (real)	0.01	0.01	0.04	0.03	0.04	-0.52	-0.33
Real household expenditure	-2.80	-5.51	-4.29	-4.59	-4.28	1.53	-4.28
Export (nominal)	4.07	6.63	4.22	4.82	4.22	-3.51	4.09
Real export	4.32	9.14	7.08	7.59	7.07	-3.91	6.07
Import (nominal)	-2.40	-5.47	-5.39	-5.41	-5.38	1.41	-4.36
Real import	-2.61	-4.37	-3.62	-3.81	-3.62	1.65	-3.25
Change in trade/GDP ratio	0.02	0.03	0.03	0.03	0.03	-0.01	0.02
Industry output							
Paddy	-0.16	-0.78	-0.14	-0.29	-0.19	0.26	-0.44
Other food crops	-0.48	-1.42	-0.83	-0.98	-0.85	0.37	-1.07
Estate crops	1.17	2.85	1.82	2.08	1.86	-0.89	2.06
Livestock	-0.75	-2.01	-1.35	-1.52	-1.36	0.49	-1.58
Wood and forests	1.82	3.07	2.53	2.66	2.53	-0.74	2.55
Fish	-0.37	-0.47	-0.48	-0.48	-0.48	0.03	-0.46
Coal	3.16	3.13	3.42	3.35	3.44	-0.20	3.07
Crude oil	15.63	22.06	20.08	20.57	20.01	-6.05	17.15
Natural gas	9.93	18.99	15.89	16.66	15.79	-6.58	12.08
Other mining	0.81	1.51	1.30	1.35	1.29	-0.76	1.02
Rice	-0.16	-0.82	-0.14	-0.30	-0.20	0.29	-0.46
Other food (manufactured)	-0.60	-1.67	-1.03	-1.19	-1.04	0.34	-1.37
Clothing	2.44	3.96	3.55	3.66	3.54	-1.18	3.15
Wood products	3.73	6.09	4.93	5.22	4.94	-1.38	5.08
Pulp and paper	-0.13	0.73	0.31	0.41	0.33	0.55	1.21
Chemical product	-0.96	-0.25	-0.45	-0.40	-0.46	-1.08	-0.94
Petroleum refinery	-11.21	-14.08	-14.03	-14.05	-14.04	0.06	-14.10
LNG	-3.74	-1.81	-2.66	-2.44	-2.68	-2.49	-3.31
Rubber and products	0.37	3.08	1.58	1.96	1.61	-2.17	1.45
Plastic and products	0.34	1.10	0.81	0.89	0.80	-0.93	0.48
Non-ferous metal	-0.04	0.17	0.17	0.17	0.16	-0.15	0.11
Other metal	-0.29	0.14	0.00	0.03	-0.01	-0.44	-0.13
Machineries	1.82	5.30	3.91	4.26	3.88	-4.09	2.33
Automotive industries	-2.16	-3.24	-3.15	-3.18	-3.16	1.07	-2.39
Other manufacturing	0.81	1.54	1.67	1.64	1.62	-0.94	0.99
Electricity	-1.21	-2.17	-1.62	-1.76	-1.60	0.37	-1.81
Water and gas	-2.44	-4.04	-3.61	-3.72	-3.54	0.70	-3.45
Construction	-0.07	-0.11	-0.09	-0.10	-0.09	0.23	0.07
Trade	0.30	0.18	0.40	0.34	0.40	-0.21	0.09
Hotel and restaurants	-0.61	-1.98	-1.34	-1.50	-1.30	0.64	-1.41
Road transportation	-2.34	-3.05	-2.74	-2.82	-2.72	0.18	-2.84
Other transportation	-4.97	-5.88	-5.57	-5.65	-5.55	0.33	-5.51
Banking and finance	-0.01	-0.45	-0.32	-0.35	-0.29	-0.26	-0.57
General government	0.00	0.02	0.00	0.00	0.00	-0.06	-0.03
Education	-1.18	-2.42	-1.84	-1.99	-1.79	11.88	6.56
Health	-1.23	-2.82	-2.00	-2.20	-2.01	14.58	8.20
Entertainment	0.66	0.33	0.33	0.33	0.34	-1.06	-0.44
Other services	-0.80	-1.89	-1.61	-1.68	-1.58	0.26	-1.65

In general, the short-run simulation, suggest of resources reallocation (in this case, mostly labor) from refinery and related sectors, to some non-food agriculture sectors, non-food manufacturing, trade, and some other services. The fall in some food-related sectors is most likely, second round effect, following the decline in households real incomes especially the lowest income classes. It can be indicated, for example, by their much less contraction, when the shocks exclude kerosene (hence urban poor is less affected), or with compensation (where urban and rural poor's are compensated).

When capital is allowed to move freely across sectors, the refinery sectors experience a lot bigger contractions followed by significant expansion of crude oil and natural gas sectors. Since petroleum refinery is highly capital-intensive sectors, some capital is released and re-allocated to other highly capital intensive sectors i.e., resource-based mining sectors. The increase in the output of crude-oil and gas sectors are mostly sold to international market as exports, contributing more to additional surplus in the trade balance.

4.6.2 Distributional results

The biggest advantage of the CGE model with disaggregated households by centile of expenditure per capita is direct calculation of inequality indicator such as Gini coefficient. Therefore, more objective answer to a question of whether or not a policy shock is progressive or regressive is readily available. When the policy simulation increase Gini coefficient, then the policy can be judged regressive. If it reduces Gini coefficient, it can be regarded as progressive. As shown, in previous section as well, that the model also allows direct calculation of poverty incidences, in urban area, rural area, and all Indonesia.

The following discussions will focus on the result on distributional story across the scenarios, in particular, with regard to inequality and poverty incidences. Table 7 summarises the distributional results of the simulations.

Figure 7 to figure 13 illustrate the impact of each scenarios on household's real expenditure, income, and household specific consumer's price index (CPI) for urban and rural households as well as across centiles. In the same figures, Gini coefficients for urban, rural, as well as nation-wide are reported, including their Lorenz curves. From figure 7 to figure 13, how each scenarios affect real expenditure of each household groups could be indicated. The percentage change in this real expenditure will be used to calculate inequality and poverty incidence after each shocks (ex-post). In addition, how change in household income and household specific CPI may give indication of how expenditure pattern and factor return pattern of each household may contribute to the distributional results.

As explained in earlier section, in an economy-wide framework, both force contribute to the distributional story, and integrated and taken into account simultaneously in the model. Household specific CPI is essentially a consumption-weighted average of the price increase of every commodities consumed by the household, hence reflects the impact of household expenditure pattern and behaviour. These price changes reflects adjustment in the market for commodities. On the other hand, household income, reflect changes in all source of household income (i.e., labor by skill types, capital, and land, including transfers, as compensation), and hence reflect the impact of what happens in market for factors. Poverty impact of each scenarios are illustrated in figure 14 to 20, where change in poverty incidence both in urban and rural area, as well as nation-wide is also reported.

Table 7: Summary of distributional results

Poverty and Inequality	SIM 1 NO-KER		SIM 2 ALL FUELS		SIM 3 100% UT		SIM 4 75% UT		SIM 5 100% UTUR		SIM 6 CT ONLY		SIM 7 CT	
	SR	LR	SR	LR	SR	LR	SR	LR	SR	LR	SR	LR	SR	LR
Urban														
Ex-ante Poverty Incidence	11.37	11.37	11.37	11.37	11.37	11.37	11.37	11.37	11.37	11.37	11.37	11.37	11.37	11.37
Ex-post Poverty Incidence	12.70	12.57	14.71	14.69	12.73	12.63	13.18	13.07	12.14	12.06	9.40	9.31	12.80	12.69
Change	1.33	1.20	3.34	3.32	1.36	1.26	1.81	1.70	0.77	0.69	-1.97	-2.06	1.43	1.32
Rural														
Ex-ante Poverty Incidence	19.51	19.51	19.51	19.51	19.51	19.51	19.51	19.51	19.51	19.51	19.51	19.51	19.51	19.51
Ex-post Poverty Incidence	20.77	20.59	23.77	23.77	17.86	17.75	19.95	19.80	19.41	19.23	16.11	16.29	21.21	21.03
Change	1.26	1.08	4.26	4.26	-1.65	-1.76	0.44	0.29	-0.10	-0.28	-3.40	-3.22	1.70	1.52
Urban + Rural														
Ex-ante Poverty Incidence	15.80	15.80	15.80	15.80	15.80	15.80	15.80	15.80	15.80	15.80	15.80	15.80	15.80	15.80
Ex-post Poverty Incidence	17.09	16.94	19.64	19.63	15.52	15.42	16.87	16.73	16.10	15.96	13.05	13.11	17.38	17.23
Change	1.29	1.14	3.84	3.83	-0.28	-0.39	1.06	0.93	0.30	0.16	-2.75	-2.69	1.58	1.43
Urban														
Ex-ante Gini Coefficient	0.347	0.347	0.347	0.347	0.347	0.347	0.347	0.347	0.347	0.347	0.347	0.347	0.347	0.347
Ex-post Gini Coefficient	0.344	0.345	0.352	0.354	0.346	0.347	0.347	0.349	0.344	0.345	0.344	0.342	0.349	0.349
Change	-0.003	-0.002	0.005	0.007	-0.001	0.000	0.000	0.002	-0.003	-0.002	-0.003	-0.005	0.002	0.002
Rural														
Ex-ante Gini Coefficient	0.277	0.277	0.277	0.277	0.277	0.277	0.277	0.277	0.277	0.277	0.277	0.277	0.277	0.277
Ex-post Gini Coefficient	0.273	0.274	0.276	0.278	0.259	0.260	0.263	0.265	0.262	0.263	0.275	0.273	0.273	0.273
Change	-0.004	-0.003	-0.001	0.001	-0.018	-0.017	-0.014	-0.012	-0.015	-0.014	-0.002	-0.004	-0.004	-0.004
Urban + Rural														
Ex-ante Gini Coefficient	0.350	0.350	0.350	0.350	0.350	0.350	0.350	0.350	0.350	0.350	0.350	0.350	0.350	0.350
Ex-post Gini Coefficient	0.346	0.347	0.353	0.354	0.340	0.342	0.343	0.345	0.341	0.342	0.346	0.344	0.348	0.349
Change	-0.004	-0.003	0.003	0.004	-0.010	-0.008	-0.007	-0.005	-0.009	-0.008	-0.004	-0.006	-0.002	-0.001

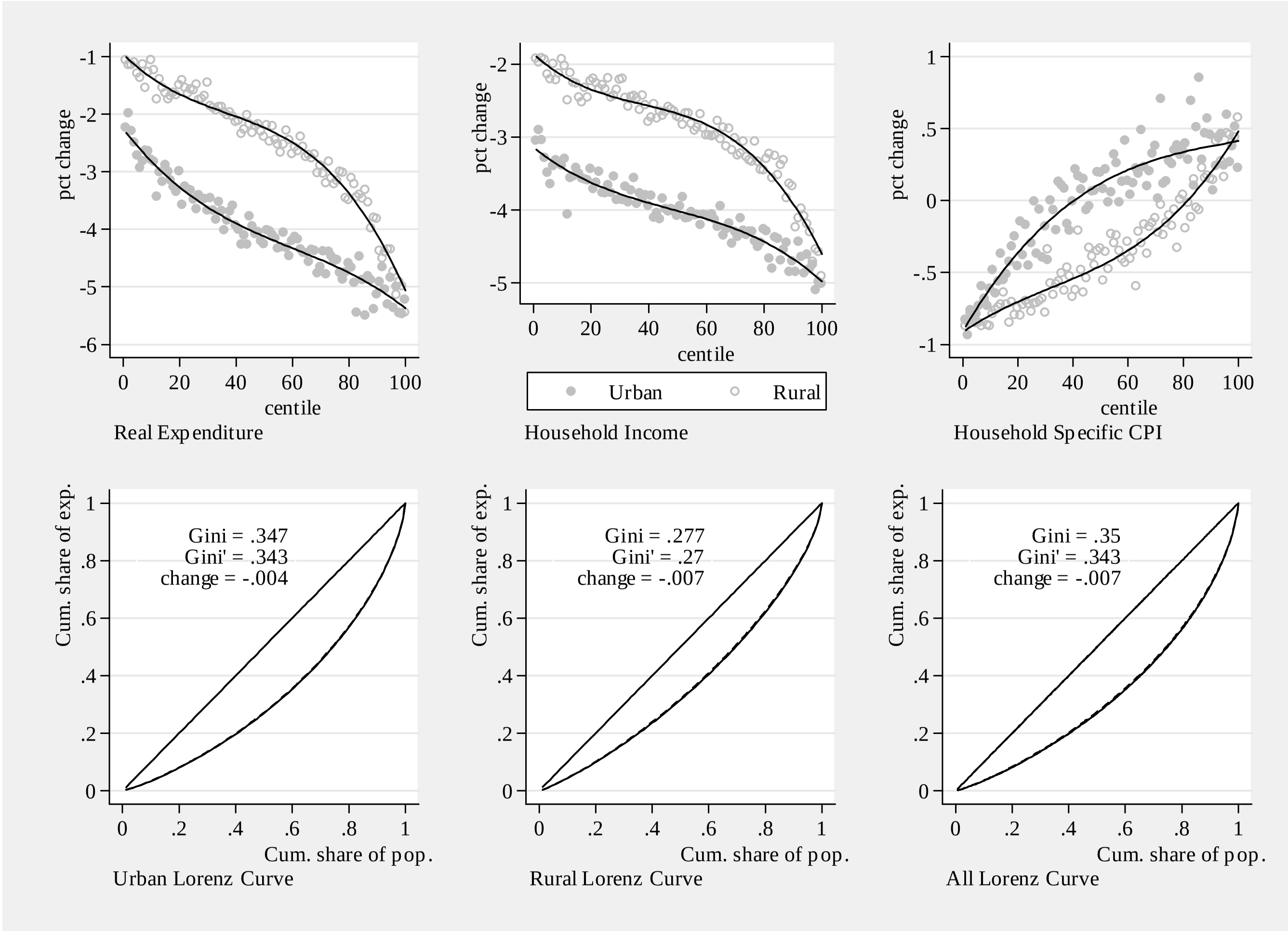

Figure 7: Simulated Distributional Impact of SIM 1 NO-KEROSENE

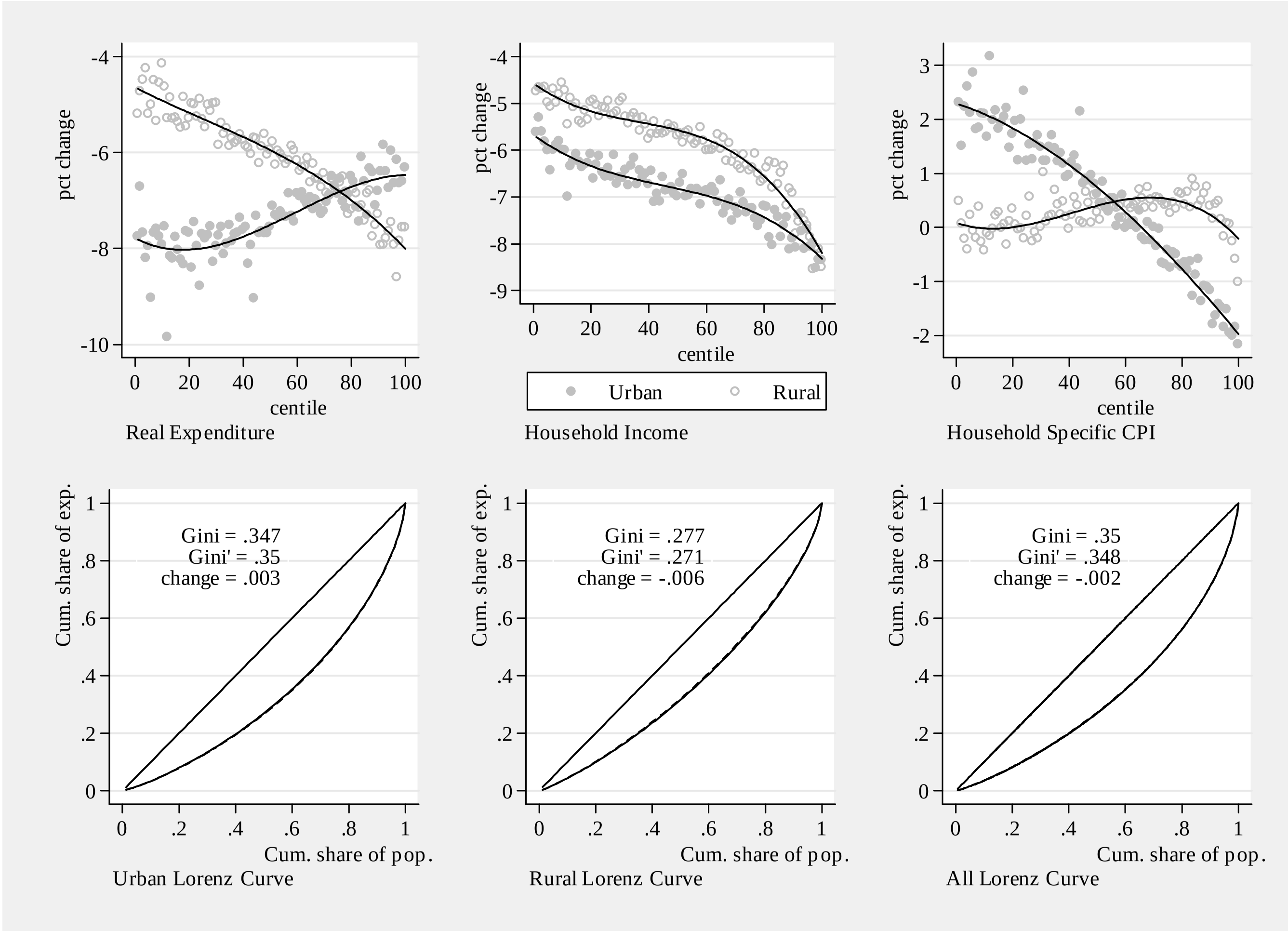

Figure 8: Simulated Distributional Impact of SIM 2 ALL FUELS

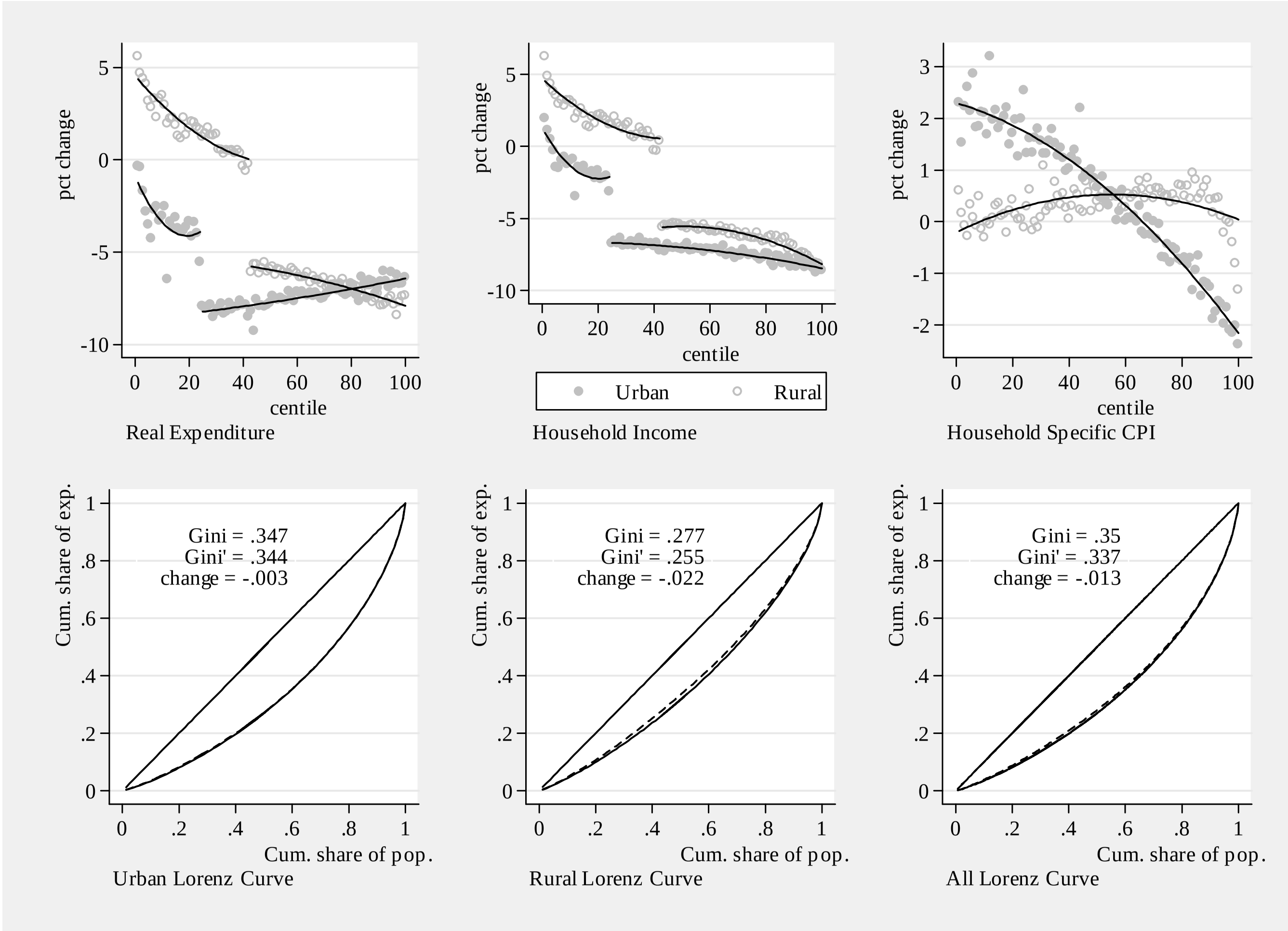

Figure 9: Simulated Distributional Impact of SIM 3 100% UT

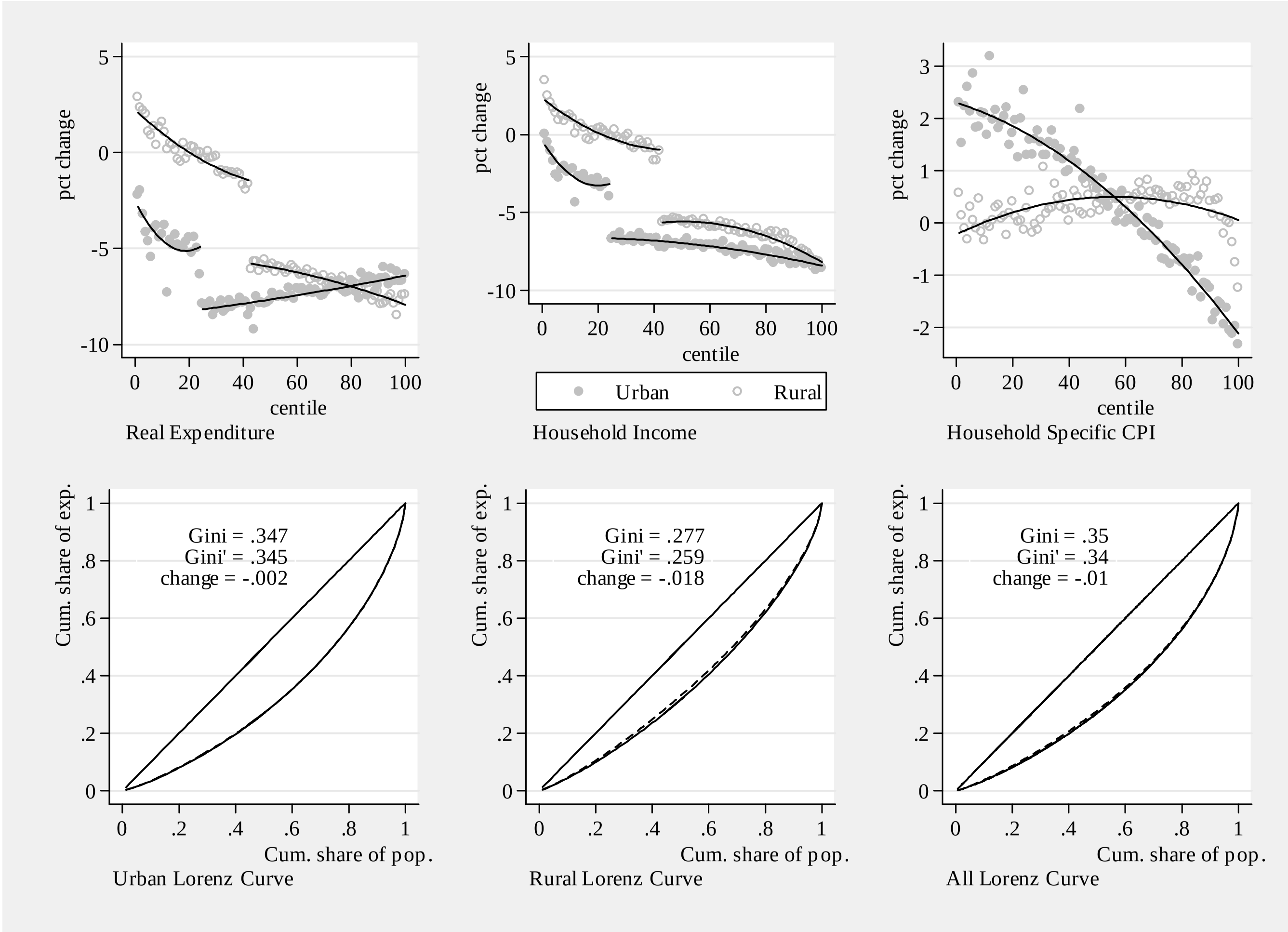

Figure 10: Simulated Distributional Impact of SIM 4 75% UT

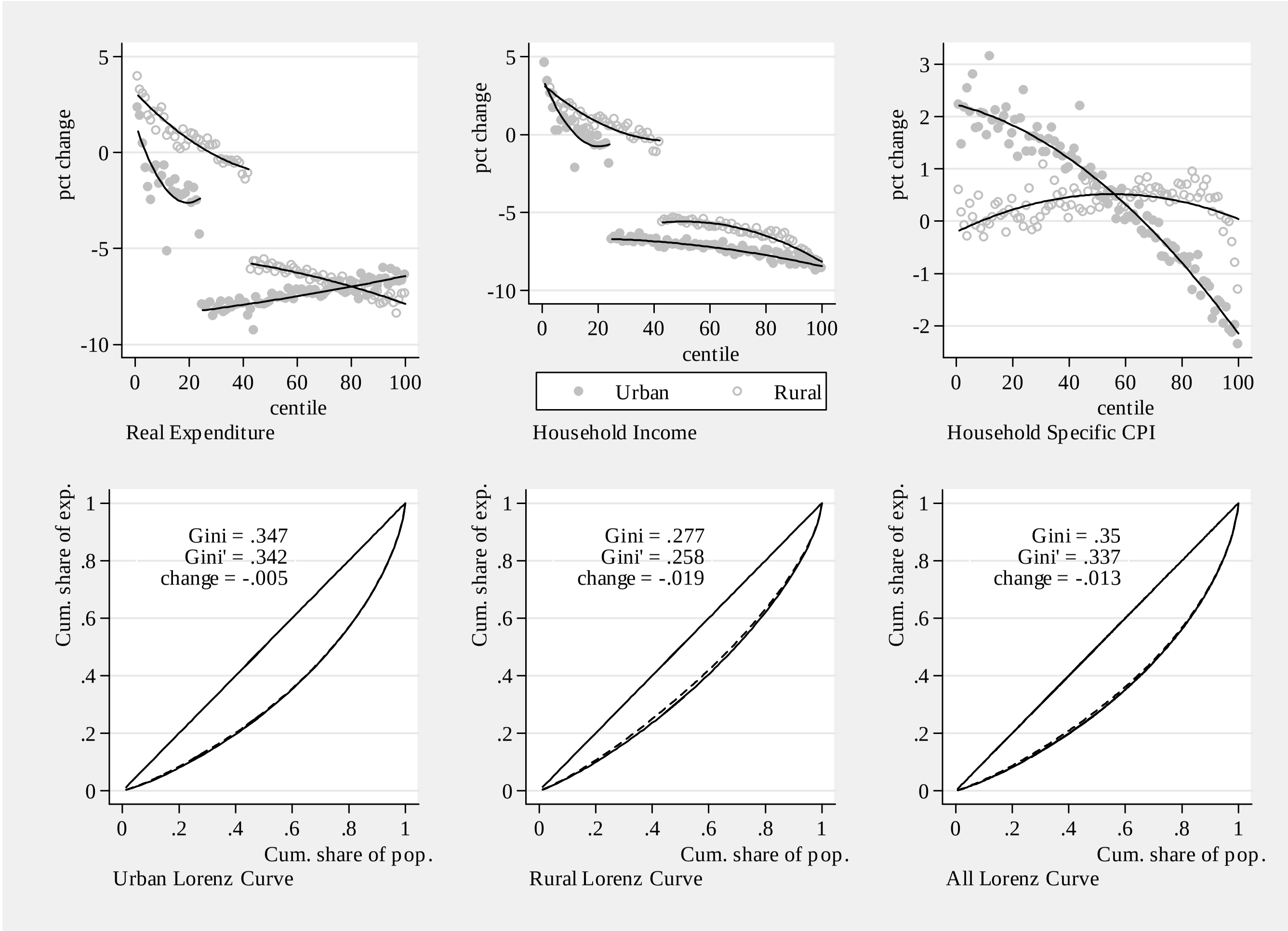

Figure 11: Simulated Distributional Impact of SIM 5 100% UTUR

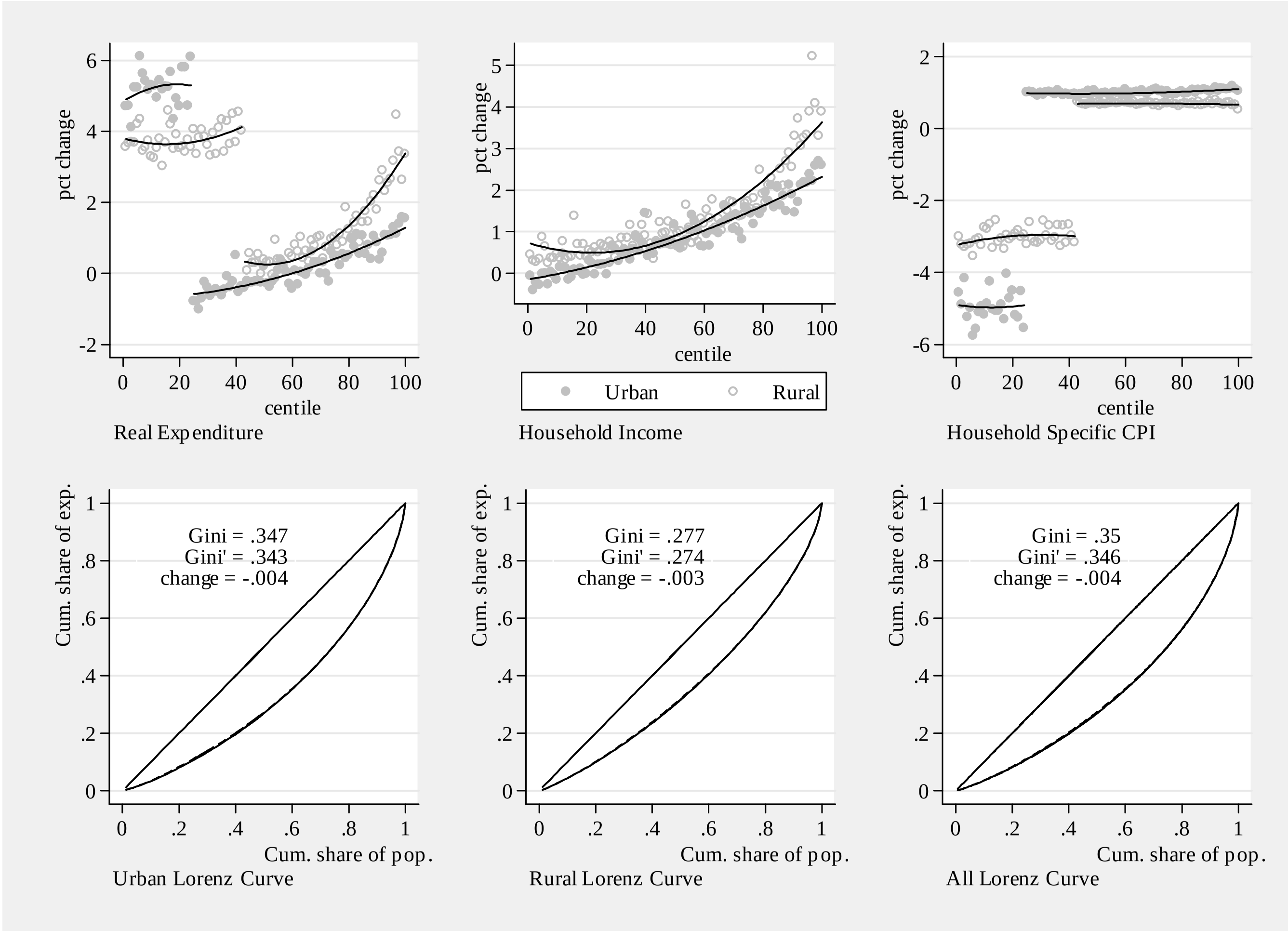

Figure 12: Simulated Distributional Impact of SIM 6 CT ONLY

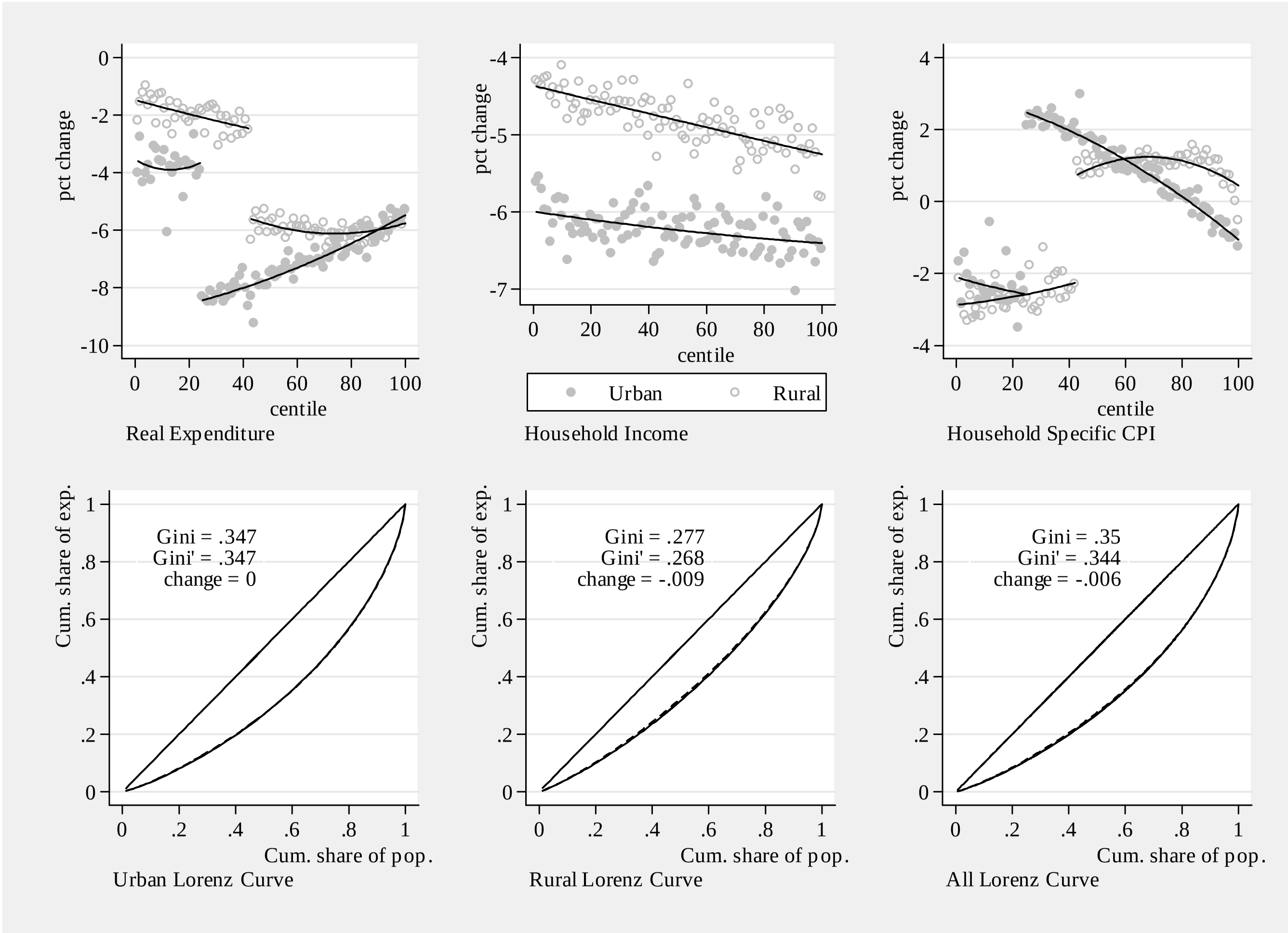

Figure 13: Simulated Distributional Impact of SIM 7 CT

Subsidy on vehicle fuels is regressive, its removal is equitable.

As mentioned previously, long before the implementation of fuel price reform in October 2005, fuel subsidy had been regarded as both inefficient and inequitable. Because the rich was regarded as the big consumers of fuel, especially vehicle fuels, it had been a long-held view, that reducing fuel subsidy will hurt the non-poor more, and such reform would be progressive. Simulation 1 (SIM 1 NO-KEROSENE) to some extent support that the long-held view. Fuel subsidy on gasoline and diesel had been inequitable. Therefore, cutting the subsidy on such vehicle fuels is a progressive reform. In this simulation, October 2005 package without compensation is simulated but only to non-kerosene commodity.

As can be seen from figure 7, the obvious declining pattern of the fall in real expenditure over expenditure centile clearly suggest the progressivity of this sort of reform. This happens both in urban and rural area. As a result, inequality drops both in urban and rural area, as well as nation-wide, as indicated by the falling Gini coefficient. This progressivity is driven both from the household consumption pattern (from the pattern of the change in household CPI) and household income pattern (from the pattern of the change in household income). Richer households experience far more rise in their consumer's price, reflecting their higher dependence on non-kerosene vehicle fuel consumption, as well as lower fall in their income, reflecting the adjustment in factor market which is not in favor of the higher income class' factor endowment[14].

Despite its progressivity, however, it should be noted that without compensation, such reform would still have adverse poverty impact. Figure 14 shows that nation-wide poverty rises by 1.28 percent.

Including kerosene, however, is regressive, especially in urban area.

However, the actual real reform package implemented in October 2005, not only touched kerosene commodity, of which urban poor is its bigger consumers, but also increase the price of kerosene even higher than the increase in other fuel prices. Kerosene administered price was drastically increased almost tripled (185.7 percent), a lot higher compared to the increase other fuel prices (87.5 percent for gasoline, and 104.7 percent for diesel). Being implemented in this way, will this package of reform still be progressive?

To find out the impact of this package might have been on distribution, the increase in the administered prices of fuel without compensation is simulated in SIM 2 (ALL FUELS). It turns out, that the simulation produce markedly different distributional story compared to the first simulation. In urban area, the decline in the real expenditure of the 20 percent poorest households, fall within the magnitude of 7.5 to 9 percent, whereas the richest 20 percent households experience decline in real expenditure of between 4 to 5.5. percent only. The pattern of the fall in real expenditure of the urban households is clearly increasing over centile of expenditure. As a result, Inequality increase quite significantly in urban area, as Gini coefficient increase from 0.347 to 0.352 (see figure 8).

In rural area, however, the pattern is less clear. Rural real expenditure for all households falls within the range of around 5 to 7 percent. Overall, the impact is

[14] Allowing free capital mobility in the long-run closure simulation, slightly reduce the degree of progressivity and the fall in inequality. Because capital can move to less-contracting or even expanding sector, household with more endowment of capital can mitigate the adverse fall in their return to capital.

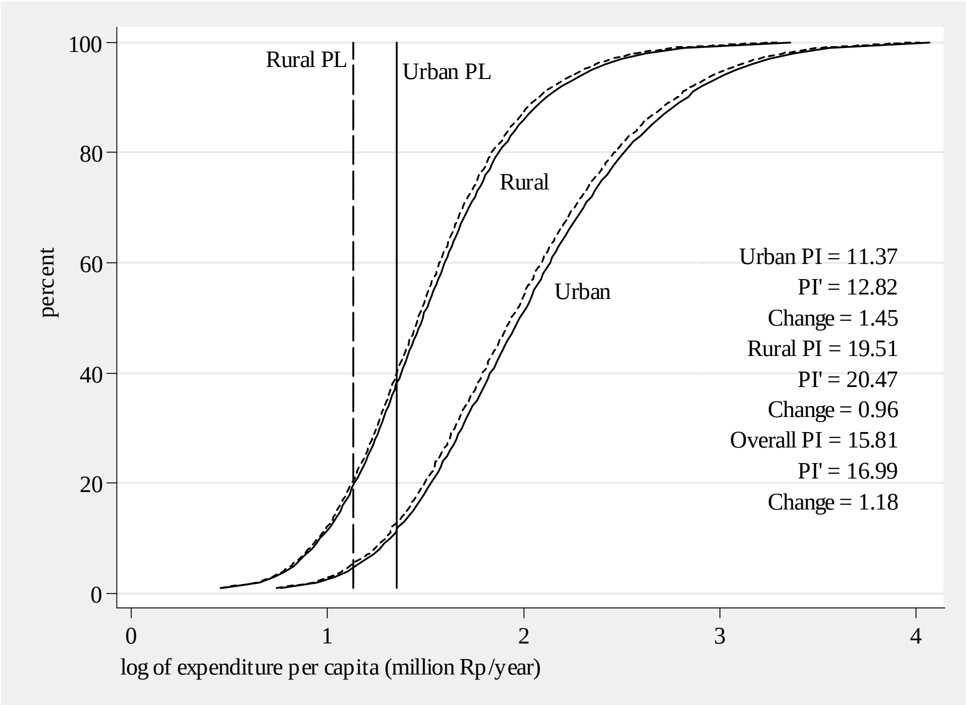

Figure 14: Simulated Poverty Impact of SIM 1 NO-KEROSENE

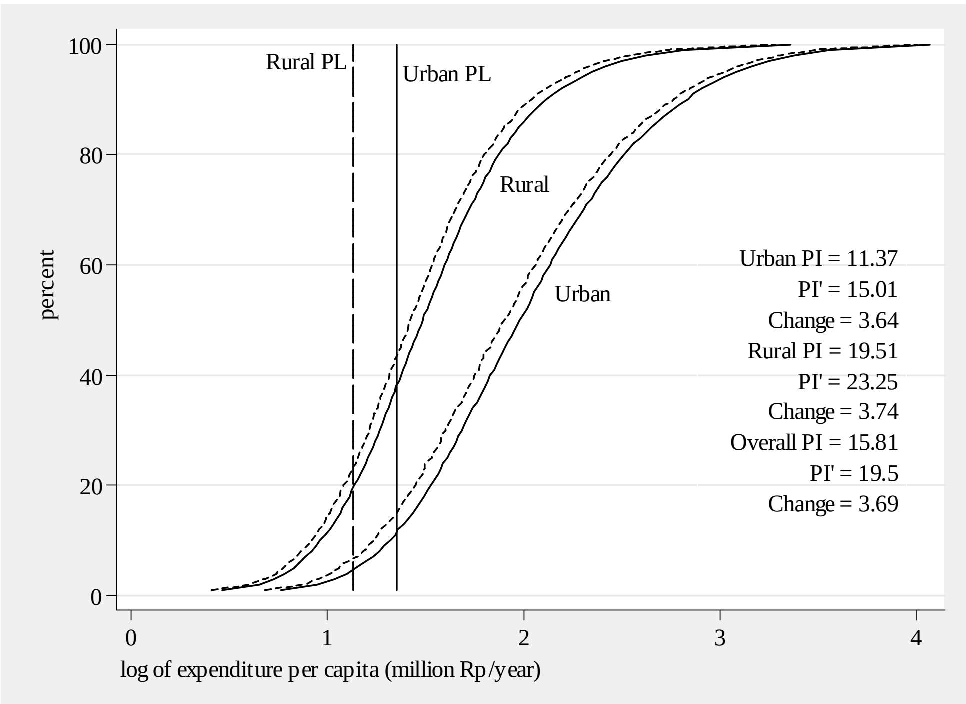

Figure 15: Simulated Poverty Impact of SIM 2 ALL FUELS

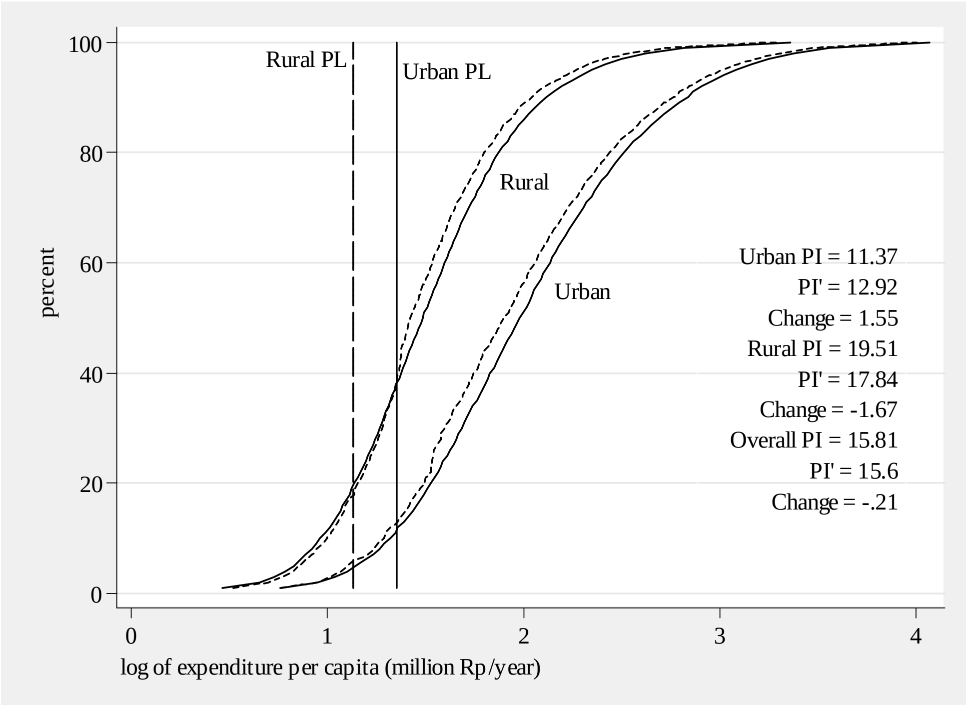

Figure 16: Simulated Poverty Impact of SIM 3 100% UT

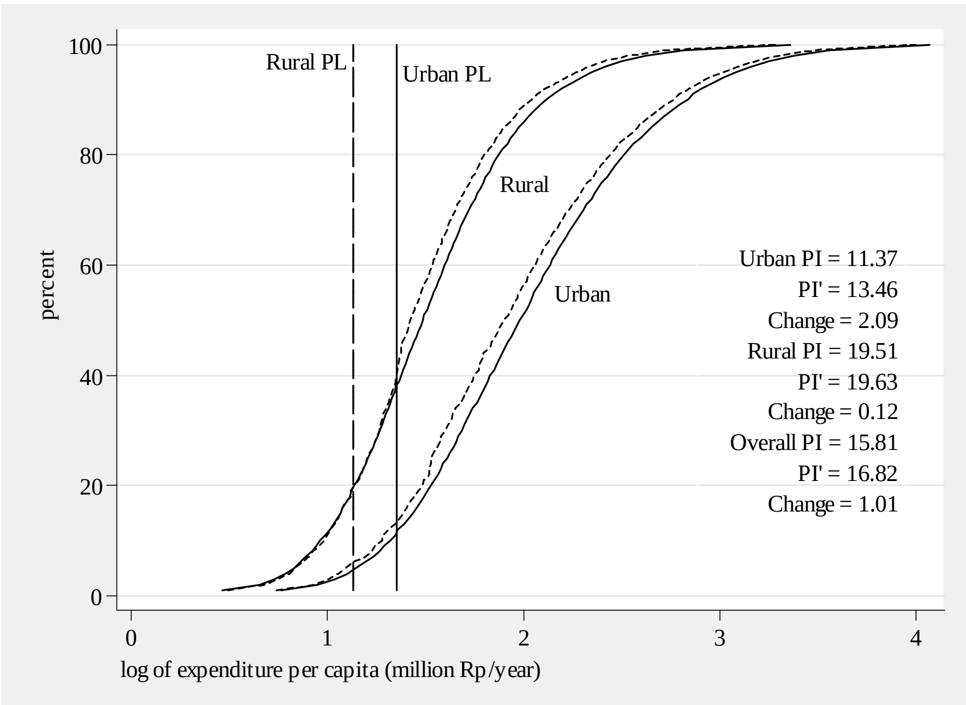

Figure 17: Simulated Poverty Impact of SIM 4 75% UT

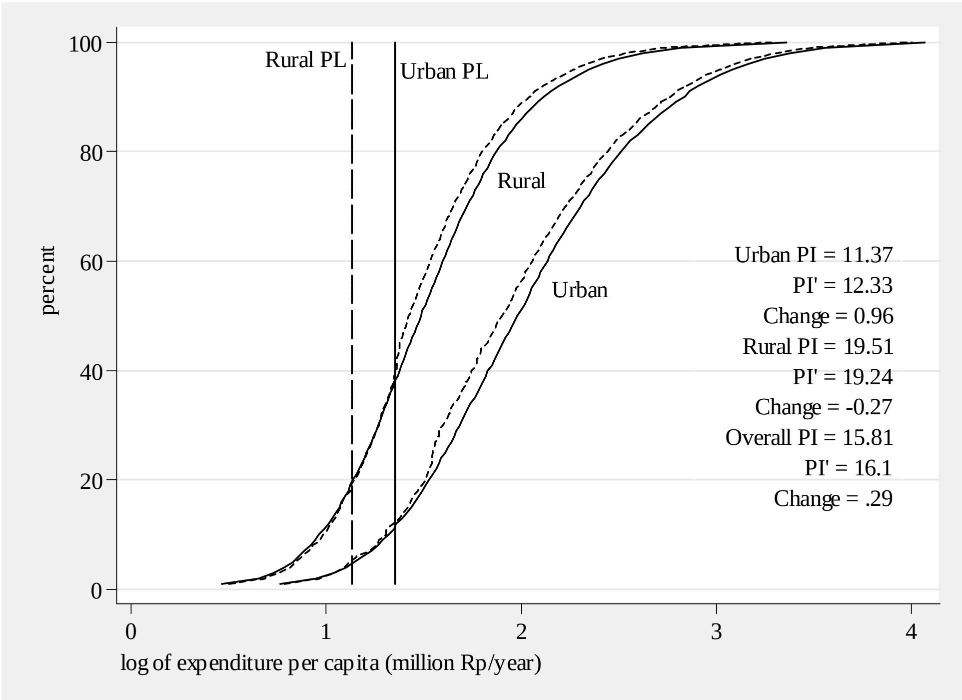

Figure 18: Simulated Poverty Impact of SIM 5 100% UTUR

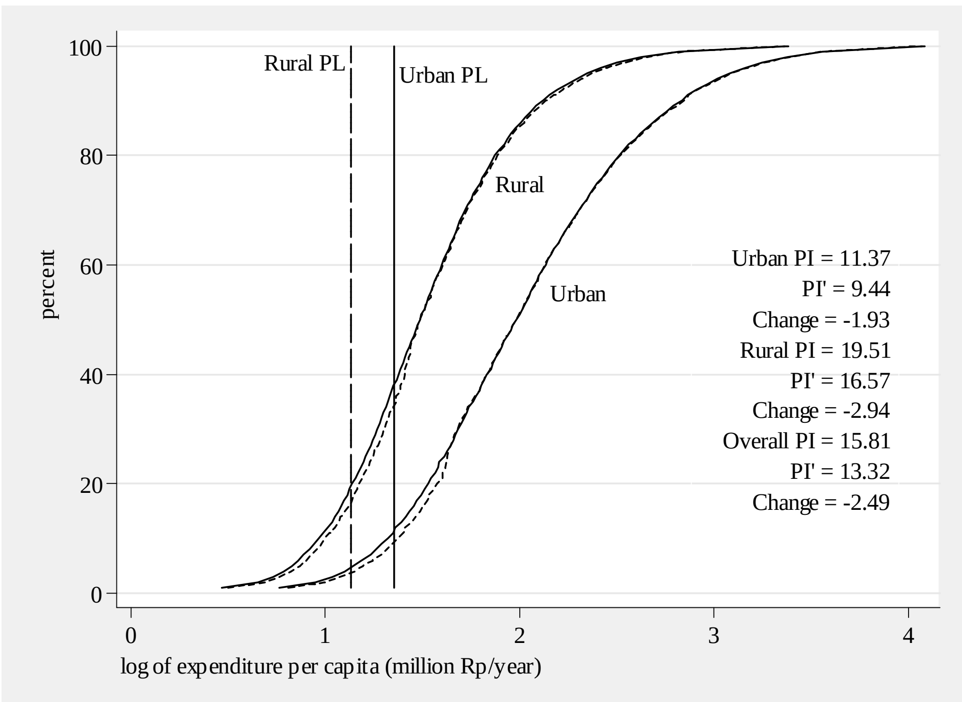

Figure 19: Simulated Poverty Impact of SIM 6 CT ONLY

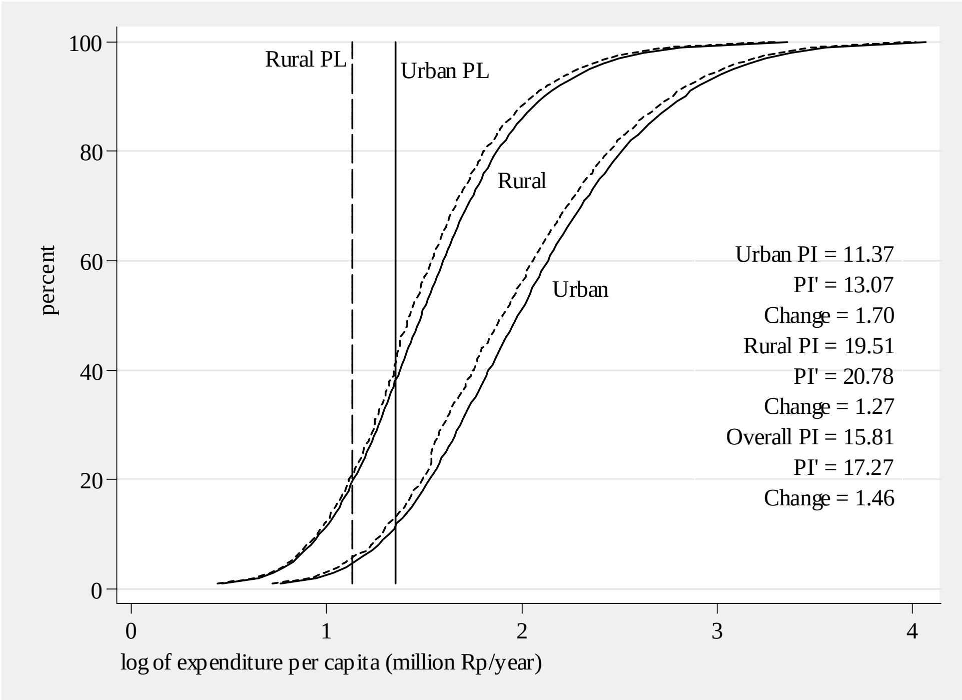

Figure 20: Simulated Poverty Impact of SIM 7 CT

slightly progressive, reducing inequality slightly. Over the nation (urban and rural area combined) October 2005 package of fuel price rise (including kerosene) without compensation, is slightly regressive, increasing Gini coefficient to 0.353. As figure 8 suggests, the main driver of this regressive result is urban lower income household's dependence on kerosene consumption, as well as increase in other commodities related to fuels, such as transportations. This is reflected in the increase in their household consumer's price which is far higher than that of higher income households.

It should be noted, that when capital mobility is allowed in the long-run closure (see table 7, the distributional impact is slightly more regressive than in the short run when capital is industry specific. In the long-run richer households with more endowment of capital experience less and less fall in their factor income. This happens because capital mobility might moderate the decline to capital returns.

Had October '05 Package been without compensation, additional 8.5 million would have become poor.

The impact of October 2005 package without compensation, might have on poverty could have been tremendous. As shown in figure 15, poverty incidence in urban area increase by 3.34 percent from 11.37 to 14.71 percent, whereas in rural area it rises even more by 4.26 percent from 19.51 percent to 23.77 percent. It is a bit surprising to see, that the reform creates more poverty in rural area than in urban area, when it is observed from figure 8, that the decline in real expenditure of the rural poor is a lot less than that of the urban poor. Figure 15 however, suggests that the steepness of the distribution of expenditure per capita, especially around the poverty line may explain this result. Rural household is more vulnerable to poverty for a given fall in real expenditure per capita. The same percentage fall in real expenditure will create more poverty in rural area compared to urban area. In all, poverty incidence, nation-wide, rise by 3.84 percent. Using the population in 2005, the package without compensation might have driven around 8.5 million people into poverty.

The above exercise of what-if scenarios suggest that although the reduction in fuel subsidy as part of the energy price reform might have unambiguous ground in term of economic efficiency, the way the reform is implemented matter when the concern is its distributional costs. Reducing fuel subsidy per se, without careful prior examination on how the reform will have impact on the poorer part of population, may have adverse distributional impact. Something that should be avoided even by the pro-energy price reformist, because the reform should be carried out with the least cost including distributional cost in terms of inequality and poverty implication.

Most probably, the above concern was the main reason why the actual fuel price reform in October 2005 package was combined with a compensation scheme. The choice was lump-sum cash transfers to targeted households (households considered as poor and near poor). Targeted households was given a cash transfers of 1.2 million rupiahs (annual) in 4 installments. The government claimed that the amount of transfers was more than adequate to compensate the potential fall in the welfare of the poor. Some studies, such as Ikhsan et al. (2005), backed this claim, as well as later study by World Bank (2006). Simulation 3 (100% UT) is carried out to see the distributional impact of this reform that was actually implemented. Simulations assumes 100 percent effectiveness of the cash transfers in reaching the targeted households.

October '05 Package + Compensation might reduce inequality.

As shown in figure 9, the claim that the cash transfers would, in theory, more than compensate the adverse welfare impact on the poor is only true for the rural poor. For the urban poor, although, some of the poorest centile gain positive (nominal) income, when deflated with their specific consumer's price rise, the net real expenditure effect is still negative. None of the targeted households experience positive welfare gain. The compensation scheme over-compensate the rural poor but under-compensate the urban poor. however, in term of inequality, despite the drastic rice in the price of kerosene, the October 2005 package reduce inequality, especially in rural area, by 0.018 point, and reduce overall Gini coefficient from 0.35 to 0.34. This was mainly driven by significant increase of real expenditure of the rural poor, less severe fall in the real expenditure of the urban poor (due to compensation) than the urban non-poor, and the sharp decline in the real expenditure of the non-targeted (non-poor) households.

However, even if 100% effective, compensation could not help preventing poverty from rising in urban area.

Figure 16 illustrates the poverty impact of simulation 3 (100% UT). Due to under-compensation of the urban poor, October 2005 package (with compensation) could not prevent urban poverty incidence of rising by 1.36 percentage point, despite the fall in the poverty incidence in rural area by 1.65 percentage point. However, the overall net nation-wide impact is a slight decline in national poverty incidence by 0.28 percent. The decline in the rural poverty incidence by 1.65 percent help prevent the overall rise of nation-wide poverty incidence, mostly because the rural population is higher than in urban area.

The poverty impact of the simulation with the long-run closure give more or less similar results (see table 7). What is slightly different is only its impact on inequality, since in the long-run richer households with more non-labor endowment experience less severe negative return to capital, due to more factor mobility. As a result, the impact of the October 2005 reform is slightly more regressive in the long-run.

Moreover, if compensation is only 75% effective, nation-wide poverty still rises, including in rural area.

It is easily expected that, with the assumption of 75 percent compensation effectiveness, although still inequality reducing[15], poor households experience more adverse impact. As shown in figure 10, even in rural area, only less than half of the targeted households are compensated. For more than half of them, compensation does not help mitigate the negative impact of their declining real expenditure. As a result, in contrast to the assumption of 100 percent effectiveness where poverty incidence in rural area fall, here it rises by 0.44 percent.

Poverty incidence in urban area rises even more by 1.81 percent. Overall nation-wide poverty incidence, now increase by 1.05 percent[16]. This result does not support the claim that cash transfers prevent the increase in the number of people fell into poverty. Perfect targeting (100% effectiveness) is not a plausible assumption, and in this simulation, with only assuming 25% ineffectiveness, the story changes. The result does not even support the possibility of over-compensation in rural area. In contrast, World Bank (2006) recent calculation suggests that the combined effect of the fuel price increase and compensation point to a net positive income gain for the poorest 20 percent of the population. World Bank (2006) suggests that analysis[17] of three alternative scenarios with regard to the targeting show that the lower deciles were on average more than compensated for the impact of the fuel price increase by the cash transfer. Even under assumptions of moderate mis-targeting (e.g. with cash benefits randomly distributed to the bottom 40 percent instead of the targeted bottom 28 percent), the lower deciles were on average more than compensated for the immediate price impacts.

Compensate more to urban, less to rural. It might help.

In simulation 5 (100% UTUR), the scheme is slightly modified by giving more cash to urban and less to rural targeted households. The result suggests that this modification might have prevent quite significant number of urban household fell into poverty, by still leaving poverty incidence in rural area intact. In this simulation, poverty incidence in urban area increase by 0.76 percent, in contrast to 1.4 percent if the amount of money is uniform across urban and rural. In rural area, poverty incidence still fall by 0.1 percent. The number of people in urban area that fell into poverty due to the reform might have been reduced significantly. Uniform cash transfers produce twice additional new poor people with the slightly modified compensation, compared to the uniform compensation.

The very purpose of the compensation scheme is mitigating the poverty or distributional impact of the reform. In nature, it is not a means of structural poverty eradication program. The objective of the compensation scheme is "compensating" households from

[15]Shown by overall Gini coefficient which still fall by 0.007 point.

[16]In September, 2006, BPS announce the poverty incidence of March 2006, six months after the package was implemented. Nation-wide poverty rises by 1.78 percent from February 2005 to March 2006, despite the steady decline in the poverty rate since the crisis.

[17]Using micro-simulation with SUSENAS data. However in the publication, the methodology is not clearly explained, the explanation does not distinguishes urban-rural, and mostly based on expenditure pattern from the household survey data.

the adverse impact of the reform. Hence even if the uniform compensation scheme may potentially reduce poverty nation-wide due to the over-compensation in rural area, if it was at the cost of huge increase in poverty in urban area, the slightly modified compensation scheme may be preferable.

Conditional transfers might not have been effective as compensation.

Price subsidy given to targeted households to be spent on education and health (with more or less using the same budget as the cash transfers) not as a means of compensating fuel price reform increase the output of education sectors by 9.5%, and health sector by 13.1% (under short-run closure, see table 5). Since it is given only to lower income classes, the simulation is progressive, reducing Gini coefficient in urban, rural area, as well as nation-wide (see figure 12). The subsidy, however, from the point of view of factor market, expand the service sectors like education and health in favor of higher income class, due the distribution of factor ownership (such as skilled-labor employed in these sectors). The percentage change in household's income is higher for higher income groups both in urban and rural area. However, since the subsidy is given to poorer part of the population, the decline in their household specific CPI drives the distributional impact to be more progressive. Poverty falls both in urban and rural area significantly. Nation-wide poverty incidence fall by 2.76% (figure 19).

However, when conditional transfers like this is used as a compensation scheme together with October 2005 package, the story turns out to be rather different. As figure 13 shows, Simulation 7 (CT) suggests that inequality rise in urban area, despite its decline in rural area and slight fall nation-wide. Since expansion in the education and health sectors increase demand for more skilled-labor and capital which are more endowed by higher income classes, it drives regressive results even more from the income pattern. The pattern on the fall in household income shows increasing trends toward higher income groups. It is worse in urban area, because of their high dependence on kerosene consumption, and others fuel-related consumptions, such as transportation.

More importantly, the fall in households purchasing powers (as indicated too by household's specific CPI) does not help compensate the poor. Both in urban and rural area, all households, including the poor experience fall in their real expenditure. As a result, poverty rises in urban and rural area, by 1.43% and 1.70% respectively. Nation-wide it increases by 1.57%. Conditional transfers may be good as an incentives for human capital investment, but may not be effective as a means of short-run compensation to mitigate adverse impact of a fuel price reform. It may be better suited for longer-term objectives, especially if combined with encouraging its demand to change the expenditure pattern or demand behaviour toward education, especially to rural households. This is however a longer-term approach of structural poverty alleviation program, not an ad-hoc occasional compensation scheme to minimize distributional cost of energy price reforms.

5 Concluding Remarks

From methodological perspective, this research shows that with households disaggregated by centile of expenditure per capita, integrated into a CGE model not only allows for taking into account simultaneously both income pattern and expenditure pattern as inseparable driving forces into distributional story in an economy-wide framework, but also allows for more direct and accurate calculation of inequality indicators and poverty incidences.

Implementing the methods for analysis of counter factual scenarios on energy price reform, of October 2005 package in Indonesia, the results suggests that reducing vehicle fuels subsidy hurt the higher income classes more and hence constitutes a progressive reforms. However, in the case of Indonesia, where urban lower income classes constitute the biggest consumers of domestic fuel like kerosene, a reform like October 2005 package which increasing price of Kerosene very drastically tends to be regressive, unless accompanied by a proper and effective compensation scheme. If October 2005 package had not been mitigated with compensation, additional poverty incidence could be quite huge.

The result also shows that October 2005 package (with compensation) might reduce inequality, hence, its net distributional impact is progressive. However, even if the compensation is 100% effective it could not prevent poverty incidence from rising in urban area, despite slightly falling poverty incidence nation-wide. Moreover, a moderate ineffectiveness of compensations, might even increase poverty nation wide as well as rural area. In a general equilibrium framework, rural household's being not that dependent on kerosene, are not immune to the fuel prices reform, due to its economy-wide impact, especially from the re-adjustment in the factor market.

A slight modification to the uniform amount of cash compensation, by giving more to urban households and less to rural households may help in minimising the rise in urban poverty incidences. With regards, to recent widely-discussed of conditional transfers targeted to education and health spending as compensations, the simulation suggests that it might not have been an effective way to be accompanied in an energy price reforms as a means of compensation. It might be better suited for longer-term objectives of poverty alleviation programs.

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A Appendixes

A.1 Labour Classification

Table 8: List of (official SAM) Labor Classfication

	Urban/ Rural	Formal/ Imputed	Skill type
1.	Urban	Formal	Agricultural Workers
2.	Rural	Formal	Agricultural Workers
3.	Urban	Imputed	Agricultural Workers
4.	Rural	Imputed	Agricultural Workers
5.	Urban	Formal	Production, Transport Operator, Manual, and Unskilled Workers
6.	Rural	Formal	Production, Transport Operator, Manual, and Unskilled Workers
7.	Urban	Imputed	Production, Transport Operator, Manual, and Unskilled Workers
8.	Rural	Imputed	Production, Transport Operator, Manual, and Unskilled Workers
9.	Urban	Formal	Clerical, Services workers
10.	Rural	Formal	Clerical, Services workers
11.	Urban	Imputed	Clerical, Services workers
12.	Rural	Imputed	Clerical, Services workers
13.	Urban	Formal	Administrative, Managerial, Professional, and Technician Workers
14.	Rural	Formal	Administrative, Managerial, Professional, and Technician Workers
15.	Urban	Imputed	Administrative, Managerial, Professional, and Technician Workers
16.	Rural	Imputed	Administrative, Managerial, Professional, and Technician Workers