THE ANALYSIS OF FISCAL ADJUSTMENT IMPACT ON INCOME DISTRIBUTION AND POVERTY IN INDONESIA: COMPUTABLE GENERAL EQUILIBRIUM APPROACH

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ABSTRAK

Objektif umum kajian ini adalah untuk menganalisis kesan polisi fiskal perbelanjaan pemerintah terhadap prestasi perekonomian Indonesia. Secara khusus, kajian ini bertujuan untuk menganalisis kesan (1) polisi fiskal menguncup dan mengembang terhadap perubahan petunjuk makroekonomi, (2) polisi pengurangan subsidi Bahan Bakar Minyak (BBM) diikuti dengan pemberian pampasan kepada isi rumah miskin berupa Bantuan Lansung Tunai (BLT) terhadap tahap kemiskinan dan pengagihan pendapatan, (3) polisi pengalihan subsidi BBM ke sektor Pertanian Tanaman Makanan terhadap tahap kemiskinan dan pengagihan pendapatan, dan (4) polisi pengalihan subsidi BBM ke sektor Pertanian selain dari Tanaman Makanan terhadap tahap kemiskinan dan pengagihan pendapatan. Pemerintah Indonesia telah melaksanakan pelbagai dasar untuk menggalakkan pertumbuhan ekonomi dan pada masa yang sama untuk mengurangkan masalah kemiskinan. Namun begitu, perbelanjaan pemerintah yang tinggi kerana pemberian subsidi menyebabkan terjadinya masalah defisit bajet. Ekoran dari itu, pemerintah cuba untuk mengurangkan subsidi terhadap bahan bakar minyak kerana telah menjadi pengetahuan umum, subsidi ini kurang berkesan dalam membenteras masalah kemiskinan kerana golongan yang bukan miskin menikmati faedah yang lebih besar dari subsidi ini. Walau bagaimanapun, dengan pengurangan subsidi bahan bakar minyak ini, golongan miskin pula yang tertekan. Justeru pemerintah memberi pampasan berupa Bantuan Lansung Tunai (BLT) kepada golongan miskin. Oleh itu, kajian ini cuba menganalisis kebaikan dan kelemahan dari dasar ini. Kajian ini juga cuba menganalisis dasar alternatif Bantuan Lansung Tunai (BLT) seperti mengalih subsidi BBM kepada pemberian subsidi bagi sektor Pertanian Tanaman Makanan dan sektor Pertanian selain dari Tanaman Makanan. Untuk mencapai objektif yang dimaksudkan, kajian ini menggunakan analisis model *Computable General Equilibrium* (CGE), Indeks *Foster-Greer-Thorbecke* (FGT) dan *beta density distribution function*. Hasil kajian menunjukkan bahawa polisi pemberian pampasan berupa BLT atas pengurangan subsidi BBM memberikan kesan negatif terhadap prestasi ekonomi makro dan meningkatkan bilangan penduduk miskin, menambah ketaksamaan pendapatan dan keparahan kemiskinan. Oleh kerana itu, polisi pengalihan subsidi BBM ke sektor Pertanian Tanaman Makanan dan sektor Pertanian selain dari Tanaman Makanan merupakan jalan penyelesaian alternatif untuk mengurangi tahap kemiskinan dan ketaksamaan pendapatan.

ABSTRACT

The general objective of this study is to analyze the fiscal policy of government expenditure on the Indonesian economic performance. Specifically, this study attempts to analyze the effects of (1) the contraction and expansion of the fiscal policy on the change in economic indicators, (2) the policy to reduce subsidy on fuel accompanied by giving compensation to poor household in the form of direct cash aid, (3) the policy of diverting fuel subsidy to food crops in agricultural sector on poverty level and income distribution, and (4) the policy of diverting fuel subsidy to other crops in an agricultural sector on poverty level and income distribution. The Indonesian government has implemented various policies to promote growth and at the same time to reduce the poverty level. However, there is a problem of budget deficit as a result of a big expenditure on subsidy. Thus, the government has tried to reduce fuel subsidy as it is a well known fact that fuel subsidy is less effective to alleviate poverty because the non-poor group receives more benefits of the subsidy compared to those of the poor. However, a fuel subsidy reduction has a negative effect on the poor. Therefore, the government implemented a compensation plan in the form of direct cash aid to the poor. Thus, this study attempts to analyze the advantages and disadvantages of this policy. This study also to analyze the alternative policies of the direct cash aid such as diverting fuel subsidy to the food crops and other crops in the agricultural sector. To achieve the above mentioned objectives, this study employed the Computable General Equilibrium (CGE) model, Foster-Greer-Thorbecke (FGT) Index, and beta density distribution function. It was found that the policy of giving direct cash aid to the poor as a result of a reduction in fuel subsidy has a negative impact on macro economics performance and an increase in poverty level, income disparity, and depth of poverty. Thus, the policy of diverting fuel subsidy to the food crops and other crops in the agricultural sector is an alternative policy to reduce the level of poverty and the disparity in income.

DEDICATION

To

My late mother, Umak Rohma

My wife Fitrawaty, and my children Ghaisa & Danish

ACKNOWLEDGEMENTS

Challenged by exhausting obstacles, eventually I managed to complete this study at the Universiti Utara Malaysia (UUM). Because of this achievement, I would like to say Alhamdullillah, the highest gratitude to Allah SWT for His continuous blessing and guidance until this thesis is materilized.

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I sincerely hope that Allah SWT bless you all. Amen.

Grateful,

Indra Maipita (91036)

Sintok, Kedah, Malaysia
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LIST OF ABBREVIATIONS

APBN	National Income and Expenditure (State Budget)
AD	Aggregate Demand
ADLI	Agricultural Demand-Led industry
APEC	Asia Pacific Economic Cooperation
AS	Aggregate Supply
BBM	Fuel (Bahan Bakar Minyak)
BKFDK-RI	Bureau of the Fiscal Policy, Finance Department, Republic of Indonesia
BLT	Direct Cash Aids
BPS	Indonesia Statistic Bureau
C.I.F	Cost Insurance and Freight
CEDS	Centre for Economic Development Studies Padjajaran University
CGE	Computable General Equilibrium
F.O.B	Free On Board
FGT	Foster-Greer-Thorbecke
FPB	Food Processing-Based industry
GDP	Gross Domestic Product
GEMPACK	General Equilibrium Modeling Package
HCR	Head Count Ratio
IGR	Income Gap Ratio
I-O	Input-Output
KLUI	Household expenditure data enterprises classification
LMB	Light Manufacturing-Based industry
PELITA	Five Year Development Plan
SAM /SNSE	Social Accounting Matrix
SUSENAS	National Socio-Economic Survey

CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

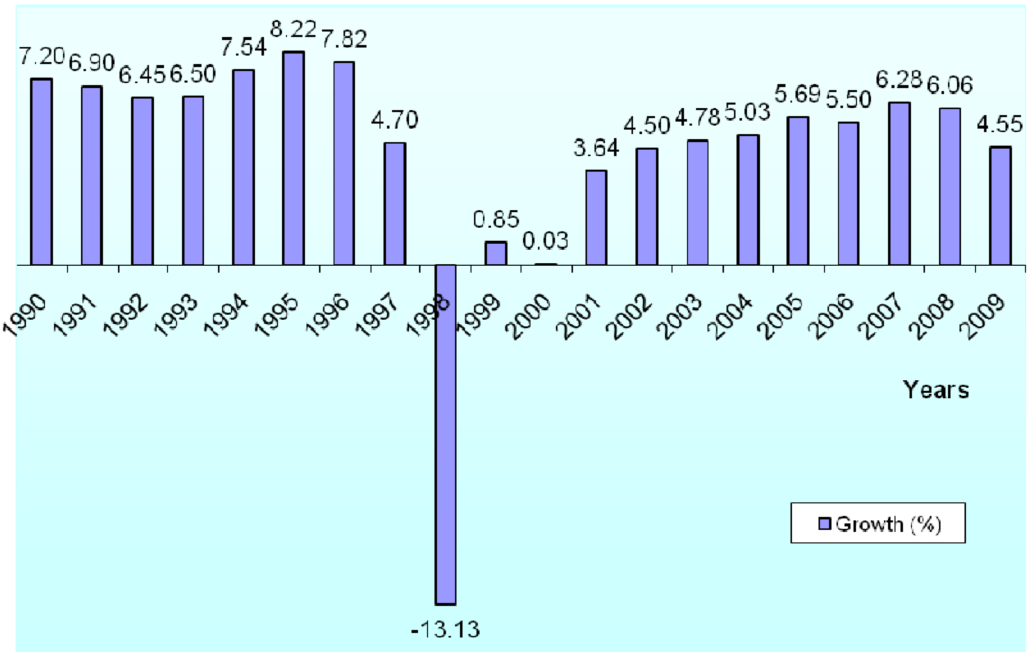
The disparity in income distribution, welfare of the public, and poverty have been attracting the interest of the various groups of people such as policy makers, social scientists, politicians, and the society at large. Income distribution, welfare, and poverty are major problems in many developing countries, including Indonesia. These problems might become so severe and if there is no action is taken, most likely there will be followed by social unrest and political instability. Poverty and disparity in income contribute to lagging in development and chaos. The tragedies of Malari in 1975 and May 1998 were two examples of social unrest during Suharto era. Until now, the people of Indonesia still looking for the answer of "if the socio-economic situation in Indonesia was comparable to those of Swiss, did the students' movement and demonstration take place until the Suharto's administration collapsed?" (Tambunan, 2006).

Realizing that there were problems of poverty and income distribution, the government has been implementing poverty alleviation programs, such as to fulfill the basic needs of the people, since 1960s as stipulated in the Eight-Year National Development Plan (Pembangunan Nasional Berencana Delapan Tahun, *Penasbede*). However, this program was aborted as a result of the political crisis in 1965. The government tried to revamp this poverty alleviation program in 1970s by introducing the Five-Year Development Plan (Rencana Pembangunan Lima Tahun, *Repelita*), especially the *Repelita* 1-IV that explicitly formulated for sectoral and regional development programs. In the *Repelita* V-VI, the government implemented the poverty alleviation program through the special strategy of reducing the socio-economic gap of the society. The development program was specially designed to incorporate the sectoral and regional development programs into poverty alleviation program as stated in the Presidential Instruction of the "Inpres Nomor 3, Tahun 1993." This Presidential Instruction aimed to uplift the status of the rural areas that had been lagged in terms of development (Inpres Desa Tertinggal, IDT). However, this effort was discontinued as a result of the 1997 financial and political crises.

And, then to overcome a more severe problem of the impact of the 1997 economic and political crises, the government introduced a social safety net (Jaring Pengaman Sosial, JPS) through the Presidential Decree in 1998 (Keppres Nomor 190, Tahun 1998). The implementation of this decree was as a result of the government realized that the effort to alleviate poverty for the last 40 years was not up to the expectation.

Since there was an urgency to tackle poverty problem, then there were another Presidential Decrees (Keputusan Presiden Nomor 124, Tahun 2001 dan Nomor 34 dan Nomor 8, Tahun 2002) were issued to form a poverty alleviation committee (Komite Penanggulan Kemiskinan, *KPK*) as a direct forum to monitor, coordinate, and evaluate all the poverty alleviation programs.

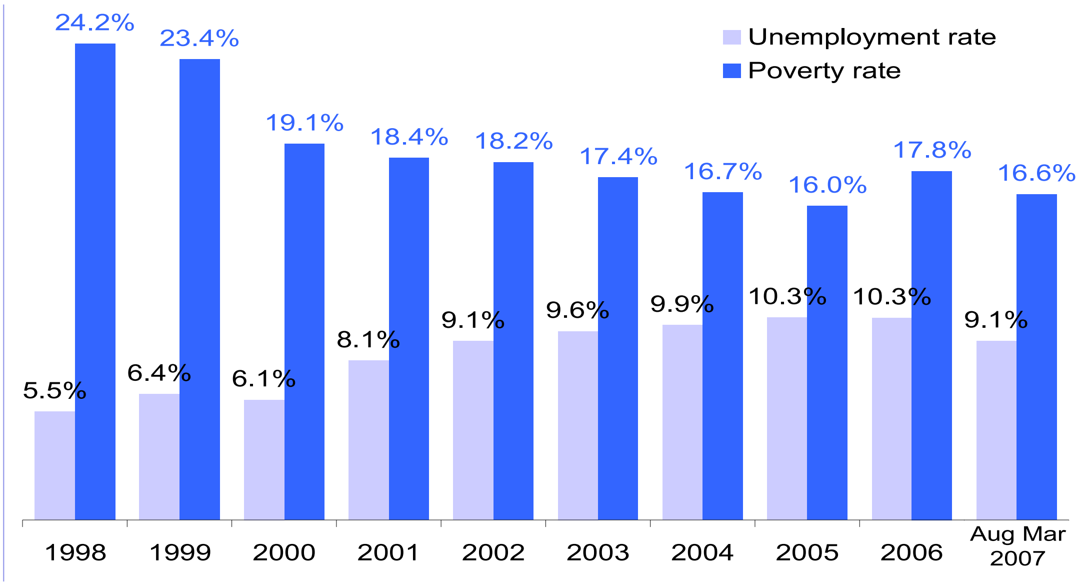
A high economic development as a result of a high economic growth and price stability during 1970 to 1996 (see Figure 1.1) resulted in a decrease in poverty level. The number of poor people has decrease from 54.2 million (40.10 percent of total population) in 1976 to 34.5 million (17.17 percent of the population) in 1996.



Sources: Author, using data from BPS.

Figure 1.1 Annual Economic Growth Rate (Percentage), 1990 - 2009

The economic crisis in Indonesia whereby there was a sharp depreciation in rupiah since the middle of 1997 has a detrimental impact on production. As a result of that, the economic growth was slowed down and in 1998 the growth rate was -13.13 percent. Almost all sectors experienced a negative growth rate except agricultural sector, utility, and communication and transportation sectors. The agricultural sector grew at 1.31 percent, utility (electric, gas and water) grew at 3.11 percent, and transportation telecommunication grew at 16.23 percent. Positive growth in the agricultural sector mainly due to the growth of the plantation, fishery and forestry sub-sectors. In addition, the depreciation of the rupiah against the U.S. dollar affected the price of agricultural commodities. The export price in dollar became relatively cheap and as a result there was an increase in export value and price competitiveness of the agricultural commodities had increased.

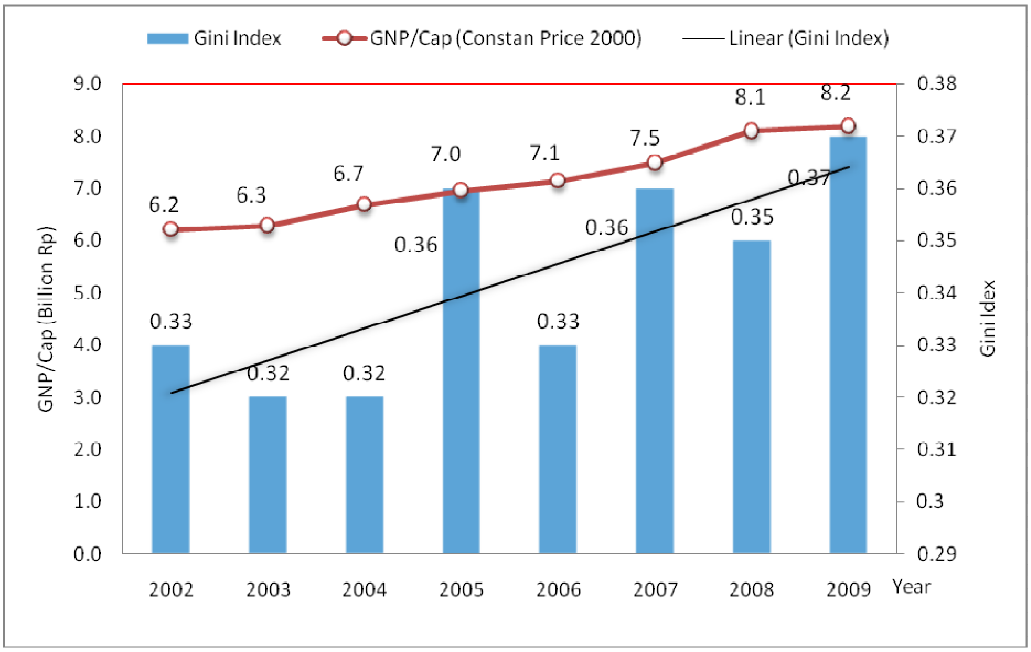


Sources: Author, using data from BPS.

Figure 1.2 Unemployment and Poverty Rates, Post-1997 Financial Crisis

One of the direct impact of this crisis was an increased in the number of poor people to 49.5 million (24.20 percent of the population) in 1998. Along with the improvement in the economy, the number of poor people was also had declined to 32.53 million people (14.14 percent) in 2009 (BPS, various years).

Despite an increased in economic growth (as shown in Figure 1.1) and a reduction in the number of poor people (as shown in Figure 1.2) during the period 1998-2005, there was an increased in the number of unemployed people (as shown in Figure 1.2). This indicated that there was an inequality of income distribution. Figure 1.3 shows that the period of 2002-2009 has the trend of rising inequality.



Sources: BPS and Bank Indonesia.

Figure 1.3 The Level of Per Capita Income and Inequality

One of the policies that are related to income distribution and poverty alleviation is the fiscal policy. This policy is able to show an increase in income and national output as shown in the *Estimated National Income and Budget* (APBN) document. APBN is an important document for government policy, it is not only understood as a government financial document, but it should be seen as a political document. In the formulation of the contents of this document, there are many aspects related to the political compromise is taken into account. Also, APBN shows the political commitment and priority of the government to the socio-economic of the people.

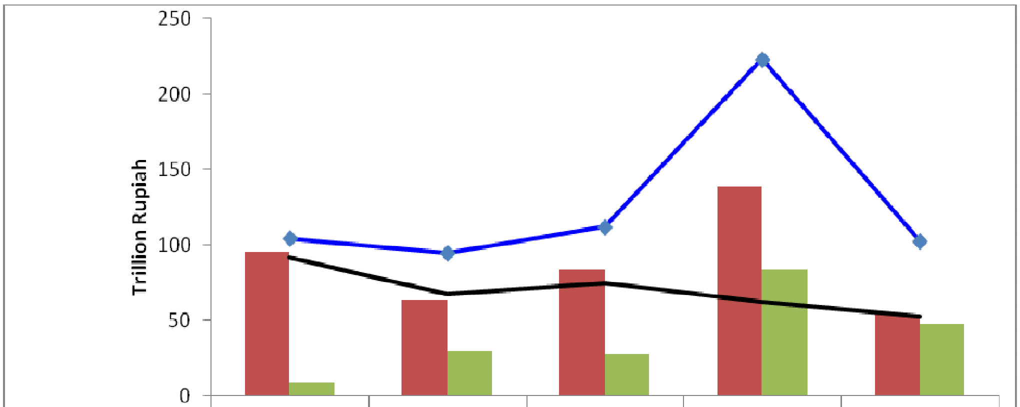
In addition, public perception related to the principle of *pro-poor* has a strong constitutional ground. Public finance philosophical ground that is subscribed by the people of Indonesia is the sovereignty of the citizen and not only as a public financial controller. As such, the allocation of the budget should be based on the need that is towards any marginalized group in terms of economic, social, political, and cultural. If the government budget, national and provincial levels, has a vision for *pro-poor*, then this public budget should be inclined to the poor (*pro-poor* budget) in alleviating poverty. Thus, this budget can be said as a political budget that can be used for the welfare of the citizen.

Realizing this problem, a good budget policy should not be related to growth orientation only. A budget policy that is related to growth orientation might have a drawback. The government should create a mechanism to achieve a high growth, and this high growth should be realized by all level of society, including the poor (*pro-poor* growth). Economic development policy and programs should be emphasized on the real economic sector that has direct or indirect impact on the majority of the poor in agriculture, fishery, small and medium enterprise, and informal sectors.

1.2 Problem Statement

The government has been implemented various policies to promote growth and at the same time to overcome poverty incidences in Indonesia. But, at the same time the government faces an increasing budget deficit. Budget deficit gives a pressure on APBN, especially in terms of expenditure because currently the government has to re-pay the principal and interest on the outstanding previous loan.

Figure 1.4 shows the amount of energy (fuel and electricity) subsidies that is borned by the state budget. In the period 2005-2008, the amount of subsidy showed an increasing trend. This was certainly more burdensome to the government. If the state budget needed to be met, then there will be an increased in the budget deficit or the budget allocation for other sectors will be reduced.



Year	2005	2006	2007	2008	2009
Fuel	95.5985	64.2121	83.7923	139.1067	54.3001
Electricity	8.8506	30.3933	28.0735	83.9065	48.1616
Energy (Total)	104.4491	94.6054	111.8658	223.0132	102.4617
% Fuel	91.53	67.87	74.90	62.38	53.00

Source: Depkeu, 2010

Figure 1.4 Government Subsidy on Energy (BBM and electricity) in State Budget

To lighten the burden on APBN, the government has identified some fiscal policy measures, such as to reduce staggerdly subsidy on fuel and electricity. And, at the same time various studies has shown that all these while the government subsidy on fuel, especially BBM, failed to hit the target groups, i.e. the poor, effectively. This subsidy is enjoyed more by the non-poor because these people are the major consumers of fuel.

As a result of a decrease in subsidy on fuel, the retail price of fuel has increased. For the period of 2001 to 2008, the price of fuel was increased staggering for eight times. Figure 1.4 shows a decreasing trend in fuel subsidy.

The price had increased to reflect the reduction of fuel subsidy until the amount of subsidy was zero. A decrease in fuel subsidy increases the number of poor people because those who are slightly above poverty line will be fallen to be under this line.

An increase in the price of fuel has a chain effect on the price of other goods and services. For high income group, an increase in price of goods and services is not a big problem to them. It is relatively easy for them to adjust their expenditure and saving. But, for the poor an increase in price makes them poorer than before. Those who are slightly above poverty line, an increase in price have a big impact on them and they will fall to below the poverty line.

One way to overcome this problem is through direct cash assistance (Bantuan Langsung Tunai, BLT), i.e. a form of transfer of payment amounted to 100,000 rupiah per month per poor household. The question now is whether this BLT is big enough to compensate the poor as a result of a reduction in fuel subsidy? What is the effect of this policy on the economy and income distribution and poverty in Indonesia? If the subsidy on BBM had failed to hit the target effectively, then the government should re-target to agricultural sector. It is well known that most of the poor are in agricultural sector.

Based on the above explanations, the problem statements to this research can be summarized as follows:

1. What are the effect of contraction and expansion of fiscal policy measures on the change in macroeconomic indicators in Indonesia?

2. What are the effects of a reduction in fuel (BBM) subsidy followed by transfer of payment (BLT) to the poor in terms of income distribution and the level of poverty?
3. What is the effect of fuel subsidy divertion policy to the food crop agricultural sector toward poverty level and income distribution?
4. What is the effect of fuel subsidy divertion policy to the other crop agricultural sector toward poverty level and income distribution?

The reasons for the selection of the agricultural sector for this study are: (1) most of the population of Indonesia is located in the rural area and working in the agricultural sector, (2) the agricultural sector has a relatively high elasticity of poverty to economic growth compared to those of other sectors, (3) the agricultural sector is the largest provider of employment and producing food which is the basic need of the population, (4) the agricultural sector is a domestic resource-based enterprise and the demand for some agricultural commodities are relatively inelastic to income and price, thus agricultural sector is able to "survive" during difficult time, (5) the labor absorption rate in agricultural sector is relatively more flexible, thus this sector is able to function as a survival sector during an economic crisis, (6) the agricultural sector have strong links to other sectors as a provider of raw materials.

1.3 Research Objectives

To answer the above research questions, the general objective of this study is to analyze the impact of government spending (i.e. fiscal policy) on economic performance in Indonesia. Specifically, the objectives of this study are:

(1) To analyze the effects of expansion and contraction of fiscal policy on the change of macroeconomic indicators, such as government saving, government expenditure, consumption, exports, imports, investment, and gross domestic product (GDP).

(2) To analyze the effects of a reduction of fuel subsidy (BBM program) and at the same time the poor is compensated in the form of transfer of payment (BLT program) on poverty level and income distribution,

(3) To analyze the effects of fuel subsidy divertion policy to the food crop agricultural sector toward poverty level and income distribution, and

(4) To analyze the effects of fuel subsidy divertion policy to the other crop agricultural sector toward poverty level and income distribution.

1.4 Benefits of the Study

This study is expected:

(1) To expand the horizon of the economic knowledge, especially related to the theory of general equilibrium, the effect of the macroeconomic policy, the expansion of the CGE Model and its implication to the performance of the economy,

(2) To add to the empirical literature of the economy, especially on the effects of the government revenue and expenditure on economic performance using the CGE Model, and

(3) To be used as an additional input in policy making especially related to government revenue and expenditure and its effect on economic growth, income distribution, and poverty alleviation.

1.5 The Scope and Limitations of the Study

The focus of this study is to analyze the effects of the fiscal policy measures on income distribution and poverty level in Indonesia. The fiscal policy measures are (1) a reduction in the subsidy of fuel (BBM program), (2) transfer of payment to households in the form of direct cash assistance (BLT program), (3) a policy on re-distribute of fuel subsidy (BBM program) from the general public to food crop agricultural sectors and other crop agricultural sector.

The data used in this study are extracted from the Social Accounting Matrix (SAM) Table and the National Survey on Socio-Economy (Survey Sosial Ekonomi Nasional, SUSENAS), 2005 produced by the Statistical Bureau (Badan Pusat Statistik, BPS). The main data for this research are the 2005 SAM data consisted of 107 x 107 sectors that are aggregated to 47 x 47 sectors. The factors of production are aggregated into two classifications, i.e. capital and labor. The institutions in this study follow the 2005 SAM classifications, namely households, firms, and government. For the purpose of the analysis, households are aggregated into four classifications as follows: (1) HRPOOR, poor household in rural area, (2) HRNPOOR, non-poor household in rural area, (3) HUPOOR, urban poor household, and (4) HUNPOOR, urban non-poor household. The production sectors analyze consisted of 27 aggregated sectors extracted from the 2005 SAM Table.

This study employs the Computable General Equilibrium (CGE) Model, an extension of the Applied General Equilibrium for Fiscal Policy (AGEFIS) Model developed by the Centre for Economic Development Studies (CEDS), Padjadjaran University, Bandung in collaboration with the Bureau of the Fiscal Policy Republic of Indonesia (Badan Kebijakan Fiskal Republik Indonesia, BKFDK-RI), 2008. This model is a fully SAM based, that is this model uses the inputs from the SAM Table. Since this model is an extension of AGEFIS, in this study, this model is called AGEFIS^{+}.

The limitations of this study, among others are (1) there is no theoretical link between the government revenue and expenditure on capital investment, (2) there is a limited parameters for Indonesia, as such some of the parameters used in this study are adopted from the studies of other countries, (3) the model is limited, as such not all sectors in the SNSE (SAM) are included in the model, (4) the limitation of the households, in which there are only four out of ten classifications of households in the SAM Table are included into the analysis.

1.6 The Reason behind the Usage of CGE Model

In the analysis of the general equilibrium, there are several models that can be used, such as Input-Output (IO), Social Accounting Matrix (SAM), and Computable General Equilibrium (CGE) Models.

One of the models that are often discussed related to Leontief production function is Input-Output Model. The inter-industry analysis term is often used because the general objective of the input-output analysis is to analyze the inter-industry relationship in an economy (Miller and Blair, 1985).

The I-O Model is employed in the development plan of the economy because its practicality and quantitatively. The I-O Table is an explanation of statistics in matrix format related to transactions of goods and services in related sectors in a region for a given time period. All the transactions used in the I-O Model should fulfill at least three main assumptions:

(1) Homogeneity, that is every sector should produced one single output using one single input, and there is no automatic substitution among various sectors,

(2) Proportionality, that is in the production process there is a linear relationship between input and output. In other words, an increase (decrease) of the usage of an input must be accompanied by an increase (decrease) of an output produced by that particular sector, and

(3) Additive, an assumption that says that the total effect of production in various sectors is produced by each individual sector separately. In other words, anything outside input-output framework is ignored.

The above assumptions limit the I-O Table into a constant ratio between input and output during the period of analysis. Thus, the producer is unable to make an adjustment on the input or to change the technology of production. The constant relationship shows that if an input of a sector is doubled, then the output produced should be doubled too. This assumption rejects the influence of the change in technology and productivity that are influenced by the quantity and price of an input utilization in line to the change in the quantity and price of output produced. Other weakness of the I-O Table is that it is not counted the household's transaction balance sheet; as such it is unable to capture the poverty phenomenon of the society. Also, the I-O Model does not allow the substitution among the factors of production even though there is a change in relative price of a factor. Other than that, the I-O Model can only be used in the analysis at industrial level.

The SAM Model is an extension of the I-O Model. The scope of the SAM Model is wider and more detail compared to those of the I-O Model. The flow of the I-O Model explains economic transactions from production sector to factors of production, households, government, firms, and the rest of the world. Meanwhile, in the SAM Model, all the sectors are disaggregated into detail components. For example, household sector is disaggregated based on income level or the combination of income level and area of residency. Also, the SAM Model is able to accommodate macroeconomic variables such as taxes, subsidy, capital, and transfer of payment from the institution. Consequently, the SAM Model is able to give a big picture of all the macroeconomic transactions, either at sectoral or institutional level, in a balance sheet. The SAM Model is also able to show the flow of the distribution of income in an economy.

The difference between the two above mentioned models, the CGE Model incorporates the possibility of substitution among factors of production. If there is a change in relative price of a factor, a producer will change the inputs mix towards a relatively cheaper input. This case is not possible in the I-O and

SAM Models, in which substitution among inputs is prohibited due to the assumption of the fixed ratio of the Leontief technology.

The CGE Model is able to analyze the policy effects at institutional level, income distribution among various household groups, income distribution among primary factor of production, trade balance sheet, and other applications (Horison, 1997). Further, Wobst (2001) explains that in CGE Model, price is treated as endogenous while in the I-O Model price is treated as exogenous.

1.7 Organization of the Study

This thesis consists of six chapters. The next chapter describes a detailed review of the literature on the Computable General Equilibrium model and the literature on poverty and growth. Chapter III explains the theoretical framework of this study. The theoretical framework consists of fiscal policy, income distribution and poverty, government revenue and expenditure, Pareto efficiency, equilibrium in production and consumption, general equilibrium theory, and various forms of production function. This is followed by Chapter IV that describes the methodology and data. Chapter V presents the results and discussion. The last Chapter concludes.

CHAPTER TWO
REVIEW OF LITERATURE

2.1 Introduction

As mentioned in the previous chapter, the objective of this study is to investigate the role of fiscal policy on economic performance and income distribution. The fiscal policy measures are the reduction in the subsidy of fuel (Bahan Bakar Minyak, BBM), the direct cash aid (Bantuan Lansung Tunai, BLT) to the poor, and the subsidy to agricultural sector. For the purpose of this study, the change in macroeconomic indicators, sectoral performance of the economy, and the change in poverty and income distribution are examined using the Computable General Equilibrium (CGE) Model. To evaluate poverty, the Foster, Greer, and Thorbecke (FGT) and Cockburn methods are employed in this study.

In section 2.2 of this chapter, a detailed review of the literature on the Computable General Equilibrium model is presented. In section 2.3, a review of the literature on poverty and growth using other models is explored. Section 2.4 concludes.

2.2 Review of the Computable General Equilibrium (CGE) Model

This section discusses the CGE model and the empirical and simulation findings of the various fiscal policy measures and the impact on economic performance, poverty, and income distribution. The studies reviewed include: Decaluwé *et al* (1999), Damuri and Perdana (2003), Abimayu (2000), Fane and War (2002), Cororaton and Cockburn (2004), Cockburn (2001), Oktaviani, (2001), Oktaviani *et al* (2006), Oktaviani *et al* (2005), Oktaviani and Sahara (2005), and Maipita (2009).

Decaluwé *et al* (1999) had studied poverty using the general equilibrium framework. The objective of their study was to show how the SAM and CGE models can be employed to analyze the issues related to poverty and income distribution. Their study were divided into two main components, namely to explain the SAM Model and to calibrate the CGE Model into the African economies. In their study, the poverty line is considered as an exogenous variable for the household group. And, income distribution was analyzed using the beta distribution functions. With these specifications, the poverty line kept changing according to the variation in the relative prices until a new poverty line and a new income distribution were determined. To observe the change in poverty level, the poverty in the base year was compared to the ex-post value using the Foster, Greer and Thorbecke's method. To measure the level of poverty among households they used the P_α classification. Their simulations were based on two hypothetical scenarios in which a decrease in price by 30 percent and a decrease in import tariff by 50 percent.

They found that the decrease in the world price of goods and services in the exporting countries has an impact on the household income and a reduction in poverty incidences. On the other hand, one-way trade liberalization has a negative consequence on the household income.

Damuri and Perdana (2003) tried to quantify the effect of fiscal policy on the distribution of income and poverty in Indonesia using the CGE WAYANG Model. They found that the fiscal expansion significantly affected income distribution and poverty. The fiscal expansion has a positive impact on the urban and non-labor rural households. Generally, these households consisted of rich people (1) who owned factors of production and get the most benefit of the expansion of fiscal policy, (2) who received little impact of the increase in price of their consumption goods, and (3) in real term the tax burden of the poor is bigger than those of the high income people.

Abimayu (2000) examined the issues of trade liberalization, agricultural production sector, and environmental policy and evaluated these issues on the industrial sector using the general equilibrium approach by expanding the INDORANI Model. The main issues that he analyzed were related to the economic, social, and their implication on environment. The first simulation was a reduction in the tariff of imported agricultural inputs. The second simulation was an increase in the subsidy of fertilizer, and the third simulation was the combination of both a decrease in the tariff of agricultural inputs and an increase in the government transfer to poor farmers. The focus of the debate in his research was to see a short term comparative-static projection in order to stimulate the economy. The concept of the short term comparative-static closures that were used in the simulations were (1) fixed capital stock for each industry, (2) labor market for all categories of labor or real wage rate were fixed and exogenous, (3) the aggregate investment by firms and government expenditure were exogenous,

(4) the exchange rate was exogenous, and (5) the depreciation of air pollution was exogenous.

Abimanyu found that the effect of a decrease in the import tariff on the agricultural input has a positive impact on the growth of GDP. An increase in the subsidy of fertilizer has a positive effect on the growth of GDP. The combination of policies on trade liberalization and government transfer to the poor also showed a positive impact on the growth of GDP. The simulation results shown that the agricultural sector, especially rubber plantation and forestry, received the biggest benefit of the government policy. The government subsidy was an effective way of helping the poor in rural area that had no permanent job. Generally, a reduction in import tariff of agricultural inputs has no impact on the environment. However, the usage of fertilizer was not efficient and as such it was considered as not environmental friendly.

Using a CGE Model, Fane and War (2002) studied how economic growth was able to reduce poverty in Indonesia. They concluded that the larger the growth rate that has an influence on the returns to the factors of production that were considered the sources of income of the poor, then most likely the bigger the probability to reduce poverty and disparity of income. The difference in the source of growth had a different impact on poverty and income distribution. This was because each source of growth influenced each factor income differently. And, since the poor and non-poor owned a different proportion of factor income, thus this proportion affected them in a different manner.

Cororaton and Cockburn (2004) analyzed the trade reformation and poverty in the Philippines using the CGE-Microsimulation approach. Their approach was almost similar to the approach developed by Cockburn (2001) that analyzed the influence of reduction in tariff on poverty from 1994 to 2000. They used the Philippines SAM 1994 data consisted of eight factors of production in 12 production sectors. These sectors were agriculture (consisted of food crops, animal production, fishery, and other crops), industrial sectors (mining, food manufacturing, non-food manufacturing, construction, and electricity, gas, and water supply), and services (wholesale and retail, government administration, and other services).

There were 24,797 households data retrieved from the Family Income and Expenditure Survey (FIES) of the Philippines. The closure that was used in their model consisted of the government real expenditure that was assumed to be fixed in order to control various probabilities on the welfare effect from the variation in the government expenditure. The total nominal government revenue was assumed to be fixed. The reduction in government revenue from a decrease in tariff was compensated exogenously. One of them was direct income taxes on households or indirect taxes or both. Government nominal or real saving was flexible in absorbing the change in price that was determined exogenously from the total real government consumption. Total investment was fixed and free from the influence of the welfare between periods. The current account balance was assumed to be constant to avoid the ”free-lunch” effect on the welfare related to capital inflow. The nominal exchange rate was used as a numeraire. The international trade sector was effectively explained by the change in the real exchange rate, i.e. the ratio between nominal exchange rate multiplied by word price and divided by domestic price level. The propensity to save from various household groups was adjusted proportionately to accommodate the change in the price of investment index and government saving, with the assumption that the total real investment was fixed. The simulation result of the Cororaton and Cockburn (2004) in tariff reduction between 1994 and 2000 was able to reduce poverty. However, a reduction in poverty was larger for rural people compared to those of the urbanites. It was well known fact that poverty was bigger in the rural area compared to poverty in the urban area.

Oktaviani (2001) analyzed the impact of trade liberalization for Indonesia in the context of the Asia Pacific Economic Cooperation (APEC). An employed technical analysis was Indonesian forecasting model with a basis of the General Equilibrium model (ORANI-F) adapted from the model that was developed in Australian. The ORANI-F model was more comprehensive compared to the ordinary CGE model because the former combined the flexibility to capture various alternative assumptions that were related to the investment behavior and the usage of agricultural land.

The influence of trade liberalization was analyzed based on the change in the world price of goods because of the existence of free trade as an exogenous variable in the model. The change in the free trade in APEC zone on the world market can be analyzed using GTAP Model. The simulation results shown that improvements in productivity and job opportunity have a positive impact on the real GDP, with or without trade liberalization. The implication to this simulation was that variables, productivity and job opportunity, can be used to improved the economy.

Oktaviani *et al* (2006) analyzed the effect of a decrease in fuel subsidy and an increase in the government expenditure on education for administrative personnel, director, and professional. They employed a computable general equilibrium model to capture the macro- and micro-economic effects of the policies. They did the simulations on a decrease in the fuel subsidy and at the same time an expansion of the administrative job, managers/professional; and a decrease in the fuel subsidy and at the same time an expansion of the directoral and professional jobs. The results of both simulations shown that there was an increase in real GDP, but Indonesia has to depend on imports for long period of time. Both scenarios have a positive impact on nominal wage rate, but it did not automatically increases the purchasing power of the workers. These policies were not strong enough to increase the production and income of the households without an increase in the skilled workers, such as administrator, director and professional people.

In another study, Oktaviani *et al* (2005) examined the impact of government policy on educational sector and the transfer of income to the households on income distribution and economic growth. They employed the Computable General Equilibrium Model in their analysis. The data used were extracted from the Input-Output Table, the National Socio-Economic Survey (SUSENAS) and various elasticity parameters from various researches.

They found that the real GDP and other macroeconomic variables showed an improvement if the government transfer was given directly to the poor versus an increase in the educational budget. The direct transfer of payment to the poor households has a positive impact on the sectoral and macroeconomic profile, even though the share of educational expenditure was small for each household group. Therefore, it was suggested that the government should do a direct transfer of payment to the poor households, with the assumption that the ”leaking” from this policy was minimum.

Oktaviani and Sahara (2005) analyzed the effect of an increase in the price of fuel (BBM) on the macroeconomic performance, sectoral economics, and households in Indonesia using the Recursive Dynamic General Equilibrium Model. There were two simulations undertaken by Oktaviani and Sahara; an increase in the price of BBM with and without any compensation to the households. The results of the simulation showed that an increase in the price of BBM resulted in a reduction in the consumption of fuel for every sector of the economy and every household group, even though they were compensated. As a result, some manufacturing sector reduced their output and thus the labor force. An increase in BBM before and after compensation resulting in the purchasing power of the society decreased for every household group because an increase in the nominal income was small compared to an increase in the inflation rate. This outcome was so severe among unskilled workers. To maintain their utility level, the number of households in each group had reduced. Thus, this finding confirms that the level of poverty has increased. An increase in the BBM resulted in a small increase in the real GDP. This was because the household consumption had decrease even after they were compensated.

Maipita (2009) employed a CGE Model to analyze the impact of fiscal policy on the level of poverty in Indonesia. He concluded that an increase in the indirect taxes has various impacts on every sector and household groups. A negative impact was realized by the manufacturing and hotel, restaurant, and trade sectors. On the average, the price of outputs for these sectors had increased. An increase in price was realized in the secondary and tertiary sectors. The utility level of the rural labor and the rural agricultural entrepreneur households has increased. On the other hand, a decreasing level of the utility of other household groups was recorded. These outcomes were based on the increase in the head count index or poverty incidence, the poverty depth index, and the poverty severity index for each household group. The poverty severity index for each household group showed the biggest incremental. This was followed by the poverty depth index and head count index. An increase in the subsidy has decreased the price of the products in transportation and quarrying, manufacturing industries, and LGA (electricity, gas and water). The impact of subsidy on poverty severity was realized significantly for the rural poor.

2.3 The Literature Using Other Models

Yudoyono (2004) examined the relationship between government expenditure on agricultural sector and economic growth, wage rate, and decentralization policy. He found that the rural poverty level was influenced by the government expenditure on agricultural sector, economic growth, wage rate, and decentralization policy of the government. On the overall, it can be said that the government expenditure was an effective policy for a short term to reduce poverty.

In another study done by Bidani and Ravillion (1993) employing an Ordinary Least Squares (OLS) method and instrumental variables have found that the consumption expenditure as a percentage of poverty line income and the Gini coefficient has an impact positively or negatively on various measures of poverty such as head count ratio, poverty gap ratio, and the squared of the poverty gap. The average consumption expenditure also has a positive significant impact on the Gini coefficient at provincial and country wide. Their findings showed that there was no evidence of the inverted U relationship as hypothesized by Kuznet, in other words this not apply in the case of Indonesia.

Asra (2000) in her study tried to decompose the change in the incidences of the aggregate poverty in Indonesia based on urban and rural households. She found that a decrease in poverty in rural area was the main contributor to the overall decrease in poverty and economic growth was the main source in poverty reduction. The elasticity of poverty on the distributionally neutral growth for the three measures of poverty (head count index, poverty gap index, and distributionally sensitive index) developed by FGT in rural area was higher compared to those in the urban area. The implication of this finding was that the rural poverty was more elastic or more sensitive to the change in the economic growth compared to those in the urban area. The movement in the labor force and the improvement in the work environment in urban area played an important role in reducing poverty level as a whole.

Simatupang and Dermoredjo (2003) in their study found that the effect of GDP on poverty varies according to sectors. An increase in the contribution of the agricultural to GDP has a big impact on rural poverty. On the other hand, the urban poverty was influenced by the manufacturing sector's GDP. The GDP originating from other sectors (non-agriculture and industries) also has an impact on rural poverty. The poverty incidences also influenced by the price of rice, a staple crop in Indonesia. Thus, the agricultural led-development programs especially on food crops sub-sector was more effective to alleviate poverty.

Calderon and Serven (2004) examined the impact of an expansion on infrastructure on economic growth and income distribution. Their study was based on the data for 121 countries for the period of 1960 to 2000. (1) They found that infrastructure development has a long term effect to the economy. (2) The low quantity and quality of infrastructure have a negative effect on the equality of income. In almost all Latin American countries that emphasized on the quantity and high quality of infrastructure realized a high economic growth.

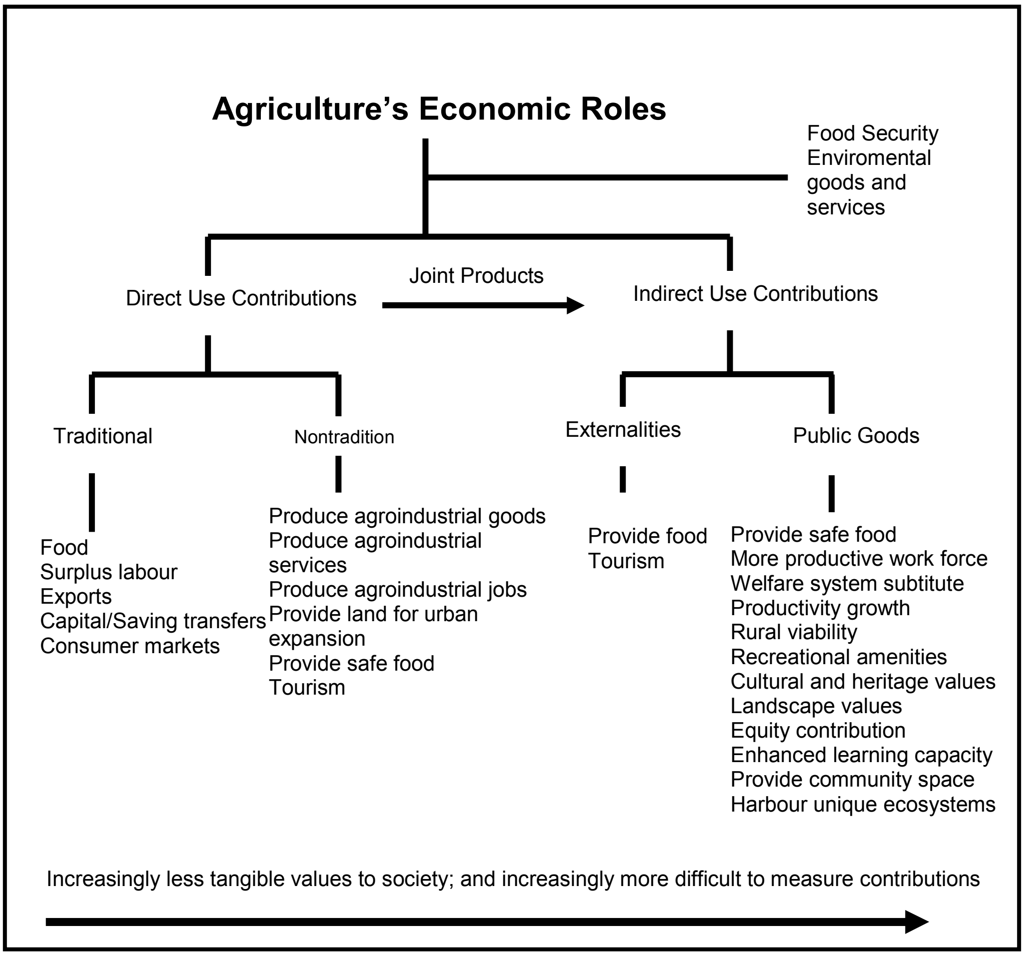
A study on the strategic industrial development was carried out by Bautista *et al* (1999). They tried to measure the effect of three alternative industrial developments in Indonesia using the analysis of the multiplier of the SAM and CGE. The three alternatives were agricultural demand-led industry (ADLI), food processing-based industry (FPB), and light manufacturing-based industry (LMB). The focus of their study was the supply side using the Indonesian SAM 1995 data. Their units of analysis consisted of 17 production sectors, seven groups of household based on income, three government balance sheets, and one balance sheet, respectively, for firm, capital, and the rest of the world. Their analyses covered; *firstly* the multipliers of the injection of the exogenous variables and their effect to three alternative industrial developments. The income multiplier was able to show the relationship between the productions in each sector to the economy with the assumption that there was no constraint in the supply.

The income multiplier also may be used to explain the relationship between various different groups of household to reflect growth and distribution in income. *Secondly*, the authors measured the level of income distribution by comparing the change in income of the various groups of household based on the ADLI, FPB, and LMB strategies. The groups of household were farm worker, small land holding farmers, non-farm low-income people, and urban low-income.

From analysis conducted, They found that the industrial development that concentrated on the agricultural commodity has bigger and significant influence in increasing the real income compared to those of the industrial development that were emphasized on manufacturing of food and light manufacturing. An increase in GDP has more effect on the low income households, either in agricultural as well as non-agricultural sectors.

Based on a study by Gemmell (1994) the agricultural sector has a positive impact on economic development of developing economies. He found that (1) agricultural sector was able to maintain inflation rate and the wage rate remained low in the economy, (2) agricultural sector was able to provide raw materials for agro-based industry, (3) agricultural sector was able to provide job opportunities for the growth in non-agricultural industry through the transfer of labor force, (4) agricultural sector was able to accelerate the capital formation, (5) agricultural sector was able to improve the balance of payment, and (6) agricultural sector was able to widen the domestic market.

Gemmell's study was supported by another study by Stringer (2001) that found even bigger contribution of the agricultural sector to the economy, either directly or indirectly. Figure 2.1 shows the linkages of the agricultural sector which is classified as traditional role in the development, as the contribution toward labor, food, export, market and transfer of capital. Meanwhile, the role which is classified as non-traditional is the agricultutral sector which is linkage with agro industry, land expansion for city expansion, tourism and food security.



Source: Stringer (2001)

Figure 2.1 The Role of Agricultural Sector in the Economy

The agricultural sector indirectly, through positive externality and public goods, contributes to economic development in the form of joint products. One of them is in the form of agro-tourism. For examples, Bogor and Purwosari (in West Java) are famous for their botanical gardens and Bunaken (in Sulawesi) is famous for its marine park. These are the examples of tourism products that are created by the agricultural sector. If this potential is fully explored, then the livelihood of the farmers will be affected in a positive manner (Hafizrianda, 2007).

Simatupang *et al* (2000) stresses the importance of agricultural sector in economic development. There are four characteristics of agricultural sector that can be used for this purpose. *First*, agricultural sector is the biggest job provider and produces food crops that are essential to the society. In this case, the agricultural sector plays an important role in uplifting the welfare of the majority of the society and alleviates poverty as a main objective of economic development. Thus, agricultural extension program can be used as an effective tool that should be given a high priority by the government. *Second*, agricultural enterprise based on domestic resources and the demand of agricultural output is inelastic income and price that can be resilient in the economic fluctuation. Thus, agricultural sector is an appropriate effort in terms of indepent and economic resilient that is essential for sustainable economic development in globalization era. *Third*, the labor absorption rate in the agricultural sector is very flexible, consequently this sector is well known as a "survival sector" in the case of economic crisis. Since this sector is able to act as a survival net in risk coping mechanism, therefore this sector is essentially important to face the risk and uncertainty. Forth, agricultural production is relatively stable and has wide linkages to other sectors and very important for food security, to suppress inflation, and may increase the receipt of the state income. The growth in agricultural development is a key to economic growth and stability. In other words, the agricultural sector should be considered as an alternative to the manufacturing sector in economic development.

A study done by Townsend and McDonald (1997) used the SNSE to investigate various policies that support the agricultural sector and income distribution in South Africa. The findings of their study showed that an agricultural reformation policy was able to stimulate economic activity of other sectors as well as able to improve income disparity. In another study, Bautista (2000) supported the finding of Townsend and McDonald. Bautista's study was on the agricultural-based development strategy in Vietnam using the SNSE multiplier to examine the effect of the agricultural development on income distribution. He concluded that the agricultural-based development strategy was relevant to increase regional income. This development strategy was able to allocate the increase in the resources of the society to the agricultural sector and rural area and at the end was able to increase agricultural productivity and improve the income of the rural households. Consequently, a strong demand for non-agricultural goods was created in the local market.

Suselo and Tarsidin (2008) examined the Indonesian economic structure and its impact on the poverty level. This study used sectoral approach in which economic growth and poverty were decomposed based on sectoral economy. The relationship between economic growth, structural change, and sectoral poverty were measured using the head count ratio (HCR). The HCR was a function of real economic growth and real GDP share. The income gap ratio (IGR) was employed to show the relationship between economic growth and the structural change in the economy. The IGR was a function of the real GDP and the share of the real GDP for each and every sector. The poverty level for each sector was seen from two angles, namely sectoral poverty and sectoral poverty in relation to the national poverty levels. The former was measured using sectoral HCR and IGR, while the latter was measured using the weighted HCR and IGR. They found that the poverty incidences and elasticity of poverty to economic growth were relatively high in agricultural, plantation, and fishery sectors. A high elasticity reflected that for every one percent increase in economic growth, the poverty rate in agricultural, plantation, and fishery sectors decreased by more than one percent. A decrease in the share of these sectors in the Indonesian GDP has a negative impact on poverty. Thus, the most appropriate step to decrease poverty is by paying more attention on agriculture, plantation and fishery sectors.

The Bureau of Research IPB (2002) tried to summarize the Structural Adjustment Program and agricultural development in Indonesian using the analysis of the SNSE multiplier. The product of their study was a model known as the Agricultural Based Development for food and plantation crops sub-sectors, as well as the overall agricultural sector including agribusiness and agro-industry. Using this strategy economic growth can be driven at a faster rate. Thus, the effort to reduce the disparity in income distribution through an increase in rural income can be achieved.

In another study, Arndt *et al* (1998) employed the 1995 SAM Mozambique (MOZAM) found that agricultural extension program was extremely important in the production, value added, and household income of the agricultural sector. The agricultural extension program was able to reduce the income disparity between rural and urban households. Thus, the growth strategy should be focused towards agricultural sector. This can be seen at the multiplier effect of the variables that were related to the economics of the rural people.

2.4 Conclusions

Based on the literature as discussed above, the study on the effect of the fiscal policy on income distribution and poverty in Indonesia, generally still far from over. Even though, Damuri and Perdana (2003) have done an analysis on the effect of the fiscal policy on income distribution and poverty, but their analysis was limited in the sense that their emphasized the general fiscal policy expansion using the CGE WAYANG model. They followed the SUSENAS classification of household, thus they were unable to differentiate the poor and non-poor household sectors. They also employed poverty line as determined in the model, i.e. without employing the FGT index to measure poverty. In a study done by Maipita (2009), even though he employed the FGT index to measure poverty but he followed the SUSENAS household classification, i.e. he did not separate the households into the poor and non-poor groups. Maipita adopted the CGE IFPRI developed by the International Food Policy Research Institute, using the GAMS software. Oktaviani *et al* (2005) and Oktaviani and Sahara (2005) have shown a specific fiscal policy that was related to the BBM and educational sector. However, the impact was only limited to one aspect only, that was poverty or income distribution. Thus, this current study is more specific in terms of policy analysis. The intended fiscal policy measures are (1) a decrease in the fuel (BBM) subsidy and (2) the saving from this subsidy is disbursed as a direct cash aid (BLT) to the poor or to the agricultural sector. As such, their impact to the various sectors in the Indonesian economy, as well as on poverty and income distribution can be seen.

Looking from the approach of the analysis used by the previous researchers, the CGE Model was able to explain more specific on the aspect of the fiscal policy on poverty and income distribution. The simulation results on the level of income of the households were able to get from the CGE Model. To do a simulation on the level of poverty the method developed by Foster-Greer-Thorbecke (FGT Index) is employed by comparing the pre- and post-simulation using the SUSENAS data. To investigate the impact from the various scenarios and simulation of the income distribution the beta density distribution function or simply known as beta distribution function is employed. This approach follows Decaluwe *et al* (1999), Cockburn (2001) and Agenor *et al* (2003). Then, the simulated income distribution is compared to those published by the Indonesian SUSENAS. To analyze income distribution based on household groups, it is suggested that a summary of income distribution for each charateristic of households is developed.

CHAPTER THREE
THEORITICAL FRAMEWORK

3.1 Introduction

This chapter consists of 15 sections. The following section describes the fiscal policy. The Keynesian impact of fiscal policy, fiscal policy in a closed and open economy and the exchange rate regimes are presented in this section. Since fiscal policy is related to government revenue and expenditure, the sources and uses of fund are also discussed. The third section of this chapter describes fiscal policy and poverty in Indonesia. This is followed by section 4 that explains income distribution and poverty. Section 5 of this chapter explains the role of fiscal policy in reducing income inequality, income distribution, and poverty. Various indexes to measure poverty are presented in this section. These measures are poverty head count, poverty gap, Gini coefficient and Lorenz curve, Sen Index, and the Foster-Greer-Thorbecke. Pareto efficiency is described in section 6. Efficiencies in exchange are explained in section 7. Sections 8, 9, and 10 discuss equilibrium in production, consumption, and simultaneous equilibrium in consumption and production, respectively. Section 11 discusses the general equilibrium theory. This is followed by section 12 that describes social accounting matrix (SAM). Section 13 describes the computable general equilibrium (CGE) for various versions of the model. Section 14 discusses various forms of production and utility functions. These functions are the CES, Cobb-Douglas, Leontief, Translog, Nested CES-Leontief, and Nested CES-Cobb-Douglas and the last section is concludes.

3.2 Fiscal Policy

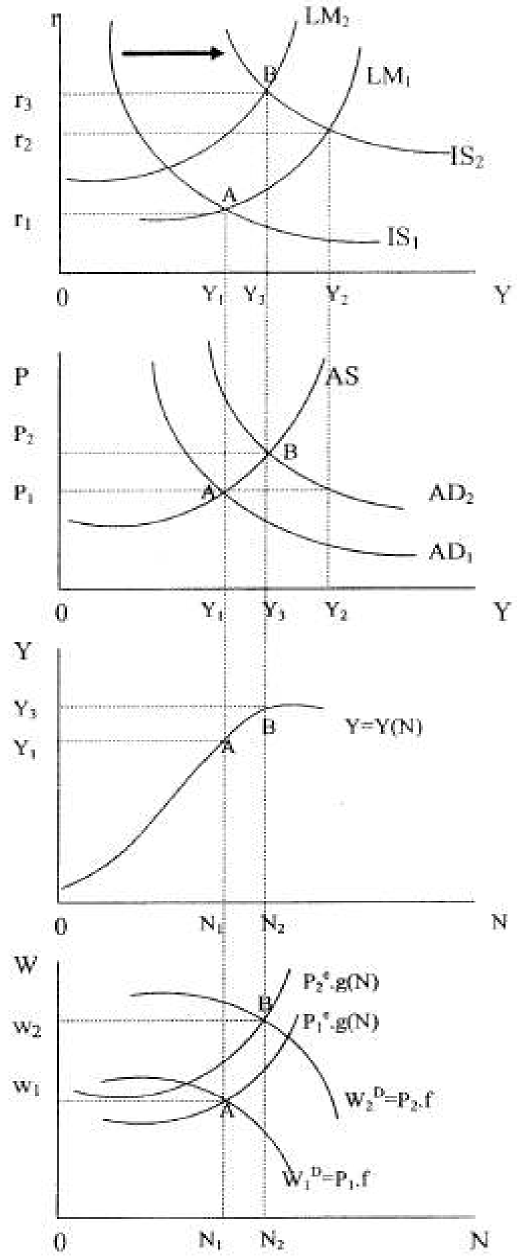
Fiscal policy is a form of government intervention in the economy and development of a particular country. Fiscal policy has two main instruments, namely (1) tax policy, and (2) government expenditure (Mankiw, 2003; Turnovsky, 1981). According to Soediyono (1985), the variable instruments of the fiscal policy can be in the forms of tax, government transfer, subsidies, and government expenditure. Fiscal policy is also known as budgetary policy that is executed through the National Revenue and Expenditure Budget (Anggaran Pendapatan dan Belanja Negara, APBN). Fiscal policy can be used to achieve three main functions, they are (1) allocation, (2) distribution, and (3) stabilization functions. Allocation function is related to the provision of social goods or the total utilization of resources to be used in the production of private, social, and the combination of both social and private goods. Distribution function is related to the equity of wealth and income distribution within a society. Stabilization function of the fiscal policy aims to maintain a low level of unemployment rate, price level stabilization, and to enhance economic growth rate.

3.2.1 Keynesian Path of The Impact of Fiscal Policy

Keynes postulates that during an economic turmoil and depression, monetary policy such as reducing interest rate is ineffective. Aggregate demand (AD) could be increased rapidly by using a fiscal policy measure (Romer, 2001). In the Keynes Macroeconomic model, government budget is seen as an important element to enhance the aggregate demand. If the economy is below full employment level, aggregate demand could be increased by increasing government expenditure and/or by decreasing the tax rate. According to Keynes, the government has an important role to promote aggregate demand in order to achieve a full employment level.

3.2.2 Fiscal Policy in a Closed Economy (Internal Balance)

According to Keynes, fiscal policy is an effective way to increase output and overcome the problem of unemployment. The effectiveness of this policy is based on the size of the multiplier effect of the fiscal policy towards output and the sensitivity of the money demand towards the change in interest rate. The change in interest rates has a big impact on the speculative function of money demand. This implication is a result of the position of LM curve that is relatively flat. On the supply side, Keynesian economist assumes that the aggregate supply (AS) curve is horizontal or relatively flat. Keynesian AS curve is horizontal or relatively flat because the economy is at a high unemployment rate. At a high unemployment rate, firms are able to get as many workers as they want at the current wage rate. Thus, the wage rate remains unchanged. Keynesian also assumes that information is imperfect ($0 < p < 1$); as such workers do not make any adjustment on wage rate as a result of a change in price level. Keynesian model is also known as an imperfect foresight model. Graphically, macro equilibrium of the Keynesian is presented in Figure 3.1 (Mankiw, 2003; Sukirno, 2005).



Source: Mankiw (2003), Sukirno (2005)

Figure 3.1 Keynesian Approaches in Macroeconomic Equilibrium

Let say, the initial equilibrium is at point *A* where the employment level is at N_1. At this equilibrium, the unemployment level is relatively high. To increase the employment level, the government increases its spending (G). As government expenditure increases, the IS curve moves to the right from IS_1 to IS_2. An increase in government expenditure increases output (Y). An increase in Y at a fixed price of P_1 and interest rate r_1 triggers the demand for money until there is an increase in interest rate along LM curve, reduces investment, and exists a crowding out effect.

On the demand side, an increase in output resulted an increase in aggregate demand from AD_1 to AD_2, tighten the money market, increase the interest rate (r), and decrease the investment. On the supply side, an increase in price has an impact on the demand for labor by the firms. As such, the labor supply curve shifts up to the right. On the assumption that there is imperfect information, an increase in the demand for labor as a result of an increase in price, P, and the worker demanding for an increase in wage rate to W_2. As a result, the labor supply curve shifts to the left, that is to $P_2^e.g(N)$ but the movement of the supply curve is smaller than those of the demand curve for labor. The labor market equilibrium increases from N_1 to N_2. The price, P, increases continuously until excess demand no longer exists, as shown by point P_2Y_3. The employment level increases to N_2 and the wage rate increases to w_2. The real wage rate decreases, but if the labor elasticity of demand at the new equilibrium is relatively higher than the initial equilibrium, then the real wage rate increases. At the new equilibrium (point B), the output is at Y_3 which is larger than those of at the initial equilibrium. There is a growth in output. The end result is an increase in interest rate (r), a decrease in investment (I), and an increase in nominal wage rate (w).

3.2.3 Fiscal Policy in an Open Economy (External Balance)

The core problems in most developing economies are high unemployment and inflation rates, and deficit in current account balance (external imbalance). To overcome these problems, a high economic growth is required. However, sometimes an expansionary policy to spur growth is not matched with the existing supply capacity. The mismatch between high growth and lack of supply capacity creates problems in external balance because (1) an increase in imports and a decrease in exports create an external imbalance, and (2) an increase in excess demand triggers inflation. These problems create another problem in terms of a decreasing in national competitive advantage that further increases the external imbalance. The objective to increase employment is achieved but the current account position of the balance of payment (BOP) is worsening.

The conflict between internal and external balances requires an effective policy instrument with minor negative impact to the economy. Historically, developing countries relied on expansionary fiscal policy to attain economic growth. The Mundell-Fleming (MF) model of the standard IS-LM model employing Keynesian approach is able to explain this historical phenomenon. The MF model of Balance of Payment (BOP) assumes that (1) price and nominal wage are fixed, (2) aggregate demand is positively related to government expenditure (G) and foreign output (Y_f); and the exchange rate (e) is negatively related to domestic interest rate (r_d), (3) the demand for money is a negative function of world interest rate (r^*), and a positive function of domestic income, (4) the money supply is negatively influenced by the deviation between exchange rate (e) and targeted exchange rate (e^*), (5) the volume of trade is determined by domestic level of output (Y_d) and foreign output (Y_f), and (6) the capital account is determined by the difference between domestic and foreign interest rates (Husain and Chowdhury, 2001).

The degree of capital mobility, that is determined by the sensitivity of interest rates (r and r^*), has an important role in MF model. Mathematically, this model can be summarize as follows:

$$Y = C(Y-T) + I(r^*) + G\,(D) + NX(e) \quad (3.1)$$

$$M/P = f(r^*, Y) \quad (3.2)$$

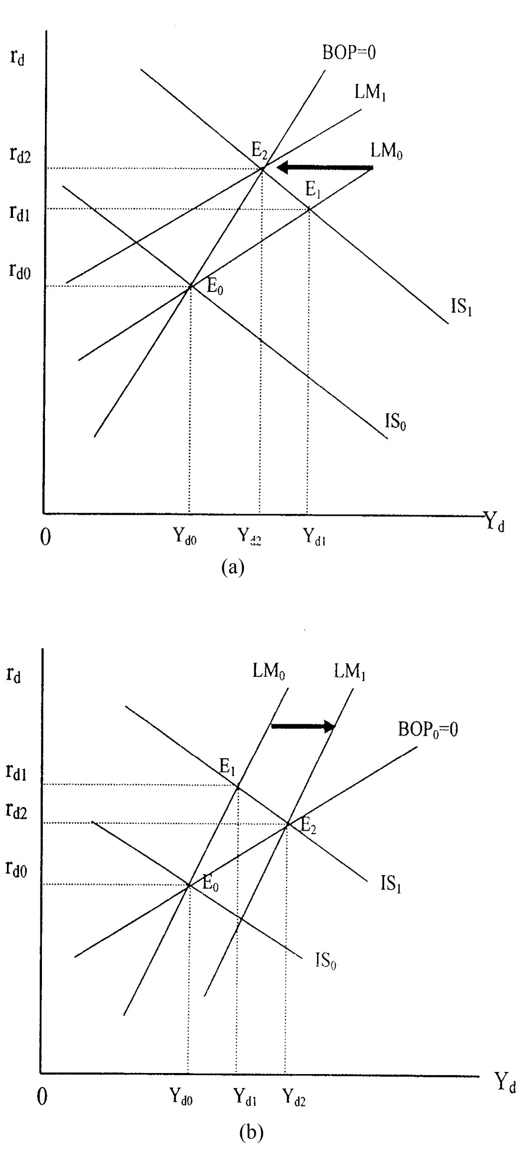
$$BOP = f(Y_f\ Y, ER, r, r^*) \quad (3.3)$$

Equation (3.3) shows that the Balance of Payment, BOP = 0 for various combinations of national income (Y) and their corresponding domestic interest rates (r). The government expenditure (G), exchange rate (e), and foreign income (Y_f) are variable positive shifters. The slope of the BOP curve shows the degree of the capital mobility. If the BOP curve is vertical, then there is no capital mobility. And, if the slope of the BOP curve is horizontal, then capital is perfectly mobile. The horizontal BOP curve implies that there is a small difference between domestic and foreign interest rates and such there is an incentive for the mobility of capital. The effectiveness of fiscal policy in the MF model in an open economy depends on the degree of capital mobility and the exchange rates. For East Asian countries, including Indonesia, even in an open economic regime, do not attract many foreign investments. This implies, the slope of BOP is relatively steep or probably almost vertical that limits capital mobility. The interest rates seem to have no important role in the demand for money in almost all developing countries. As such, the LM curve is relatively steep.

a. Fiscal Policy in Fixed Exchange Rate Regime and Limited Capital Mobility

In the MF Model, with the assumption of fixed or managed exchange rate, capital mobility is limited and the LM curve has a relatively steeper slope or more flatter than those of the BOP curve. An expansion fiscal policy shifts the IS curve to IS_1 (Romer, 2001; Sukirno, 2005). If the BOP curve is relatively steeper than that of LM curve, as shown in Figure 3.2 (a), the new internal balance resulted in a deficit of the BOP. When the Central Bank intervenes in the money market, the LM curve shifts to the left reducing the effectiveness of the expansionary fiscal policy.

If the BOP curve is relatively flatter than that of the LM curve, as shown in Figure 3.2.(b), the new internal balance (point E_1) produces a surplus in the BOP, as such money supply increases. The LM curve moves to the right and if the capital inflows are not sterilized, then there is a high effectiveness in the expansionary of the fiscal policy. Under a fixed exchange rate regime, the effectiveness of the expansionary fiscal policy is large as an increase in capital mobility.



Source: Romer (2001), Sukirno (2005)

Figure 3.2. Effectiveness of Fiscal Policy in Fixed Exchange Rate Regime and Limited Capital Mobility

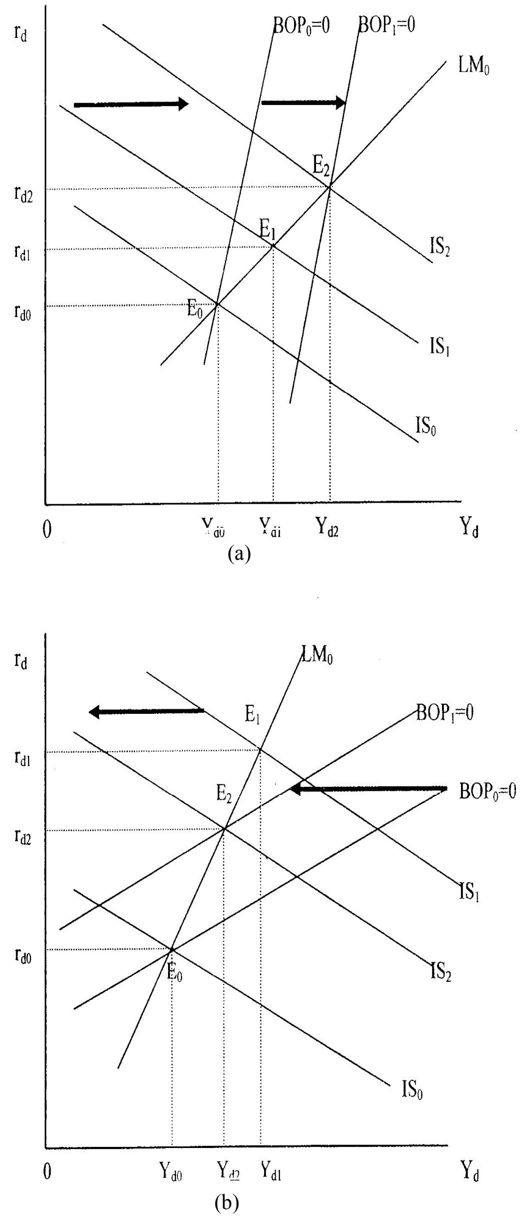


Figure 3.3. Effectiveness of Fiscal Policy in Flexible Exchange Rate Regime and Limited Capital Mobility

b. Fiscal Policy in Flexible Exchange Rate Regime and Limited Capital Mobility

Figure 3.3 shows the BOP curve under a flexible exchange rate regime (Romer, 2001; Sukirno, 2005). If the BOP curve is steeper than the LM curve, as shown in Figure 3.3(a), an expansionary fiscal policy results in the deficit in BOP and depreciation in real exchange rate. The impacts are an increase in the competitiveness and exports until the IS and the BOP curves move to the right. The new equilibrium is at E_2 in which the effectiveness of an expansion of fiscal policy becomes relatively large.

If the BOP curve is flatter than the LM curve, as depicted in Figure 3.3(b), an expansionary fiscal policy would create a surplus in the BOP. This surplus causes appreciation in real exchange rate, reduces competitiveness, and thus decreases exports. The final equilibrium, either the IS or BOP curve shifts to the left until the new internal and external balances are achieved at point E_2. For the flexible exchange rate regime, if the sensitivity of the capital mobility on interest rate is high, then the effectiveness of the fiscal policy diminishes.

3.2.4 Government Revenue

Sources of government revenue are taxes, non-tax, and grant. The tax revenues are in the forms of central tax, i.e. the tax that is collected by the Central Government, and district tax, i.e. the tax that is collected by the local government. The Central Tax consists of (1) income tax (PPh), (2) value added tax on goods and services (PPn), (3) tax on the sales of luxurious goods (PPnBM), (4) quit rent and assessment (PBB), (5) real estate tax (BPHTB), (6) stamp duty, (7), excise tax

(8), export tax, and (9) entry tax (Hutahaean, et. al., 2002). The income tax (PPh) and the value added tax (PPn) have a relatively fast transmission effect on the change in saving behavior, investment, and firm expansion (James and Nobes, 1992). According to them, the behavior of households and firms in Indonesia is sensitive to a change in PPh and PPn. Consequently, government intervention to influence sectoral performance would be effective using the instruments of PPh and PPn (Darsono, 2008). The combination analysis of income tax (PPh) and value added tax (PPn) are found in Atkinson and Stiglizt (1976), Mirrlees (1976), and Myles (1997). In this model, it is assumed that there are *n* goods provided by the producer as good 1 and wage rate, *w*. Rule of normalization says that tax is linear toward *n* goods. By this rule, a limited budget (*qx*) faced by a consumer that has an ability to pay tax, *s*, and tax level *T* is:

$$\sum_{1=2}^{n} q_i \chi_i = swx_1 - T(swx_1) \qquad (3.4)$$

In order to simplify derivation, production technology is assumed to be linear so that production possibility is bounded by the following relationship:

$$\sum_{i=2}^{n} \int_{0}^{\infty} x_i(s)\gamma(s)ds \leq \int_{0}^{\infty} swx_1(s)\gamma(s)ds - z^G \qquad (3.5)$$

where, z^G is the imposition of government on tax. The linearity of technology enable us to derive producer's price for each good 2, . . , n becomes 1. The optimal tax could be attained by positioning *U(s)* as a real value and $x_i(s,)$, i =1,..., n-1 as control variables. The x_n(s,) is determined by the identity $U(s) = U(x_1(s),...,x_n(st))$. The requirement of the first order for self-selection is derived by using the fact $u_s = -\frac{U_1{}^2}{s^2} = \frac{U_1 l}{s}$ or in the notational form as $u_s = -\frac{U_{x_l} x_1}{s}$. The Hamiltonian first order condition for maximization can be written as equation (3.6).

$$H = \left[U + \lambda \left[swx1 - \sum_{i-2}^{n} xi \right] \right] \gamma(s) - \mu \frac{x_l U_{x_l}}{s} \tag{3.6}$$

In order to choose $x_k(s)$,k = 2,...,n-1, the first fact that being used is:

$$\frac{\partial x_n}{\partial x_k} = -\frac{U_{x_k}}{U_{x_n}} \tag{3.7}$$

The necessary condition for optimality is:

$$-\lambda \left[1 - \frac{U_{x_k}}{U_{x_n}} \right] \gamma - \frac{\mu x_1}{s} \left[U_{x_1 x_k} - U_{x_1 x_n} \frac{U_{x_k}}{U_{x_n}} \right] = 0, k = 2, ... n - 1 \tag{3.8}$$

From the above necessary condition, households maximize their utility as follows:

$$\frac{U_{x_k}}{U_{x_n}} = \frac{1 + t_k}{1} \tag{3.9}$$

Substitute equation (3.9) into equation (3.8) and rearrange terms to get an optimal tax (t_k) that can be written as follows:

$$t_k = \frac{\mu x_1 U_{x_k}}{\lambda \gamma s} \left[\frac{d \log \left[\frac{U_{x_k}}{U_{x_n}} \right]}{dx_1} \right], k = 2, ... n - 1 \tag{3.10}$$

Equation (3.10) is an optimal condition for tax revenue from *k* goods.

3.2.5 Government Expenditure

The estimated government revenue and expenditure for 2010 produced by APBN is shown in Table 3.1. For the case of Indonesia, the details of government expenditures can be viewed on the State Budget (APBN). The State Budget consists of revenue and grants, expenditures, primary balance, budget surplus (or deficit) and the source of fund. The government receipts are from the internal revenue (i.e. tax and non-tax) and grants (internal and external grants). The government expenditures consist of central government expenditures and transfers to district (see Table 3.1).

Table 3.1 Estimated Revenue and Expenditure in Indonesia, 2010 (in Trillion Rupiah)

Account	Amount
A. Revenue and Grant	**949.66**
I. Internal revenue	948.15
1. Tax Revenue	742.74
2. Non-tax Revenue	205.41
II. Grant	1.51
1. Internal and External Grants Received	1.51
B. Government Expenditure	**1,047.67**
I. Central Government Expenditure	725.24
1. Salary and Emolument	160.36
2. Goods and Services Expenditure	107.09
3. Capital Expenditure	82.18
4. Subsidy	157.82
a. Subsidy on energy	106.53
b. Subsidy on non-energy	51.29
5. Interest Paid	115.59
6. Social Expenditure	64.29
7. Other Expenditures	37.91
II. Transfer to District	322.42
C. Primary Balance	**17.58**
D. Budget Surplus / (Deficit)	**(98.01)**
E. Source of Fund	**98.01**
I. Internal Financing	107.89
II. External Financing (net)	(9.88)
F. Budget Surplus / (Deficit)	**0.00**

Source: State Budget (APBN) 2010.

The central government transfers to the district can be either in the form of General Allocation Fund (Dana Alokasi Umum, DAU) and Special Allocation Fund (Dana Alokasi Khusus, DAK). The general transfer of fund is the amount of fund allocated for development purposes to each Autonomous Region (province/district/city). This allocation is a component of expenditure in the central budget, and became one of the various components of revenue in district budget (APBD). The general allocation fund aims as the equitable distribution of financial ability to fund the purposes of inter-regional autonomous region within the framework of the implementation of the decentralization policy. The general allocation fund consists of: (1) DAU Fund for the Province and (2) DAU to regency and city. The amount of the General Allocation Fund for each year is determined by the Presidential Decree by looking at various variables such as area and population as such the amount of fund for each district is not the same.

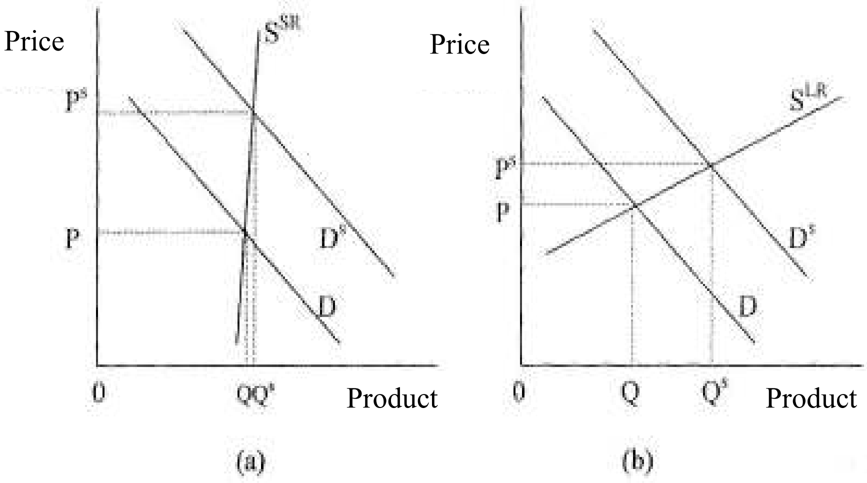
The special allocation fund is allocated to the state budget to be transferred to certain district to fund activities that are included in national priority programs, but implemented by the district. This fund is given based on three criteria, namely: (1) general criteria, (2) specific criteria, and (3) technical criteria (Usman, 2008). The general criteria established by considering the financial capability district index calculated by the fiscal net. Based on these criteria, areas that have a fiscal index less than unity has the priority to get the special allocation fund. The specific criteria are determined by taking into account legislation and characteristics of a district. A district with characteristics such as coastal areas and islands, border areas with other countries, regions, areas prone to flooding and landslides and others natural disaster will be given a priority. The technical criteria are formulated by the ministries associated with the use of indicators that can describe the condition of facilities and infrastructure in each activity to be funded by special allocation fund. These criteria are formulated through technical index by individual ministry concerned. Some of the areas that became targets of the special allocation fund, among others: education, health, roads and irrigation, drinking water, agriculture, environment and forestry.

From the above description, the amount of government expenditures for each year is determined based by various considerations, among others: (1) the amount of government revenue, (2) national priority plan, (3) other incidental circumstances, such as natural disaster.

3.2.6 Subsidies and Direct Cash Aid (BLT)

Subsidy is a form of government payment to firms and households to achieve a certain target so that the beneficiaries are able to produce and consume a certain type of commodity at a bigger quantity or at a cheaper price. The goal of a subsidy is to decrease the price of a good or to increase the quantity of output produced (Spenser & Amos, 1993). According to Suparmoko (2003), subsidy or transfer of payment is a sort of government expenditure which is also known as a negative tax and eventually would increase the income of the subsidy recipient or the consumer realizes an increase in real income if they consume a subsidized good. There are two types of government subsidies – transfer of cash and in-kind subsidy. Cash transfer is given to the consumer as an additional income or if it is given to the producer it is expected that a lower product price. In-kind subsidy is a subsidy in which a recipient receives a quantity of good without paying fot it (Handoko & Patriadi, 2005). Subsidy is a form of government expenditure to help the people for their basic needs at an affordable price. Also, a subsidy is given to help the producer to produce enough quantity of a basic need type of good at an affordable price to the society. The subsidy is aimed to stabilize the economy, especially price stability. Subsidy is expected to keep the existing raw materials in a ready stock and to ensure its price is affordable (NKAPBN-RI,2009). In many developing countries, subsidy is very important to enhance productivity and welfare (Norton, 2002). Subsidy is an efficient way of transfer of payment from the government to the people as a way of welfare redistribution. Welfare redistribution is the bottom line of a subsidy.

The effect of a government subsidy, especially for agricultural products, is shown in Figure 3.4. An agricultural product supply curve in a short run (SR) is assumed to be inelastic as shown in Figure 3.4(a). If the government pays aggregate subsidy for agricultural product, then the impact would be an increase in the product demand, i.e. the demand curve shifts to the right and above. An increase in demand leads to an increase in price, but in the SR the farmers are unable to increase their production. However, in the long run (LR), subsidy on agricultural production leads to an increase in quantity supplied because in the LR, supply curve is more elastic as shown in panel (b), Figure 2.4.



Source: Stiglitz (2000)

Figure 3.4 The Effect of Subsidy on Agricultural Output

A subsidy on consumption shifts the demand curve up (to the right). However, a subsidy on production shifts the supply curve down (to the right). Any one of these subsidies has an impact on quantity and price, i.e. a relatively bigger quantity and a lower price. The effects of both of these subsidies are shown in Figure 3.5. In Figure 3.5(a), consumption subsidy moves the demand curve D up to D'. Panel (b), Figure 3.5 shows the shift in supply curve from S to S' as a result of a production subsidy.

The effects of elasticity on supply and demand curves are shown in Figure 3.6. Panel (a) shows a perfectly inelastic demand curve. A subsidy shifts the supply curve from S to S'. Since the demand is perfectly inelastic, the impact of subsidy is a lower price than before. However, the equilibrium quantity remains the same. If the demand is perfectly elastic, as shown in panel (b), subsidy increases equilibrium quantity, but the price remains constant. If the supply is perfectly elastic, as shown in panel (c), the effects of a subsidy are similar to those in panel (b), i.e. an increase in quantity at the same price.

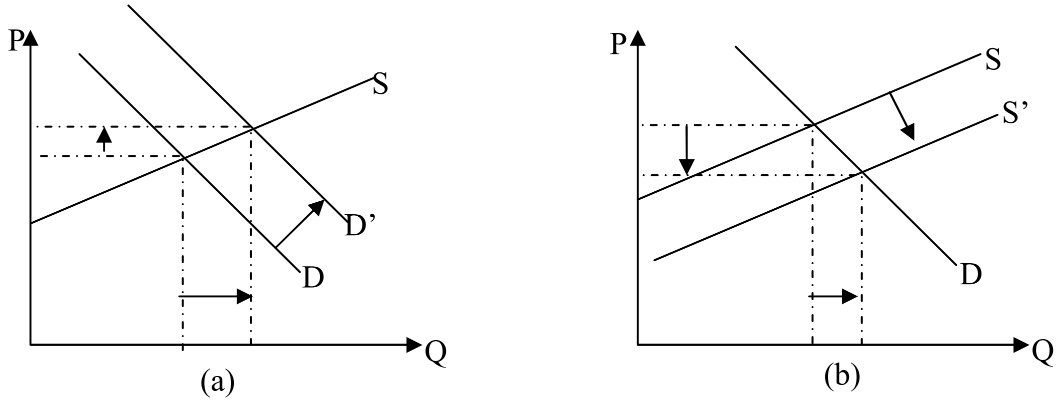


Figure 3.5 The Effect of Subsidy on Supply and Demand

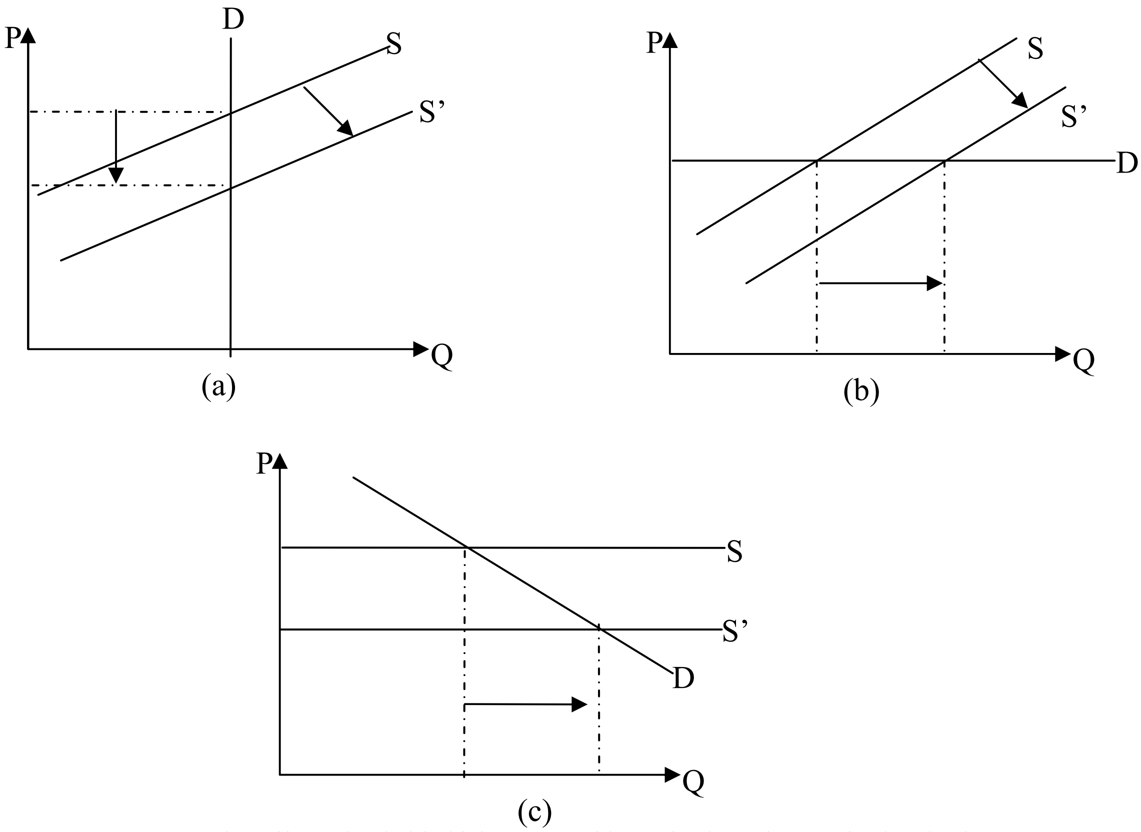


Figure 3.6 The Effect of Subsidy if the Demand is perfectly and Imperfectly Elastic

A subsidy policy is usually related to a good or service that has a positive externality for the purpose of to increase an output produced and consumed. However, a negative externality of a subsidy is inefficient allocation as a result of consumers pay a lower price compared to those of the market. As such, there is a tendency for a consumer to consume excessively of a subsidized good. Since the price is lower than the opportunity cost, then there is a waste of resources to produce a subsidized good (Spencer & Amos, 1993). A subsidy which is not transparent and not well targeted creates price distortion, inefficiency, and failed to reach the intended beneficiary (Basri, 2002).

On June 2008, the government reduced a subsidy on fuel (BBM). Thus, the retail price of fuel has increased, but the consumption of fuel has increased too and as such the burden on the government budget also has increased. Other than that, all this while a subsidy on BBM has benefitted not only the poor but also the rich (Ministry of Social Affairs, Depros, 2008). The increasing of fuel price triggers an increase in people’s basic need. The purchasing power of the poor declined and the end result was a decrease in their welfare. Those who were a little bit above poverty line had fallen below this line as a result of a reduction in purchasing power. Consequently, the number of poor people had increased. Realizing this problem, the government has introduced a social safety net to protect the poor in the form of compensatory program specially design known as the Compensation Program of the Abolishment of Subsidy on Fuel (Program Kompensasi Penghapusan Subsidi BBM, PKPS BBM). This program has been implemented since 2008 in the form of Direct Cash Aid (Bantuan Lansung Tunai, BLT); it is an unconditional cash transfer amounted to Rp100, 000 per month per poor household.

Some people argue that the BLT Program is a form of charity from the government that creates laziness, dependency and begging. Besides, its micro basis creates an "instant consumption" culture. To overcome the problem of the poor, the government should not adopt a "hit and run" type of policy, it must be in the form of empowerment. However, it is the government responsibility to have a social protection plan for the poor to lighten their burden as a result of an increase in the price of fuel (BBM).

3.2.7 The Effect of the Government Expenditure

The impact of an increase in government expenditure on the expansion of output depends on the size of the multiplier effect of that policy that can be explained using the IS-LM approach. The IS curve shows the balance in the good market, while the LM curve shows the balance in the money market. Mathematically, the IS curve can be written as equation (3.11) and the LM curve is written as equation (3.12).

$$y = c(y - t_{(y)}) + i_{(r)} + g \qquad (3.11)$$

$$\frac{M}{P_0} = l_{(r)} + k_{(y)} \qquad (3.12)$$

The consumption function and tax have a positive slope but smaller than one, ($0 < c', t' < 1$). The slope of investment and the total- and transaction demand for money functions are $i' < 0$, $l' < 0$, and $k' > 0$ (the symbol shows a certain value), respectively. Equations (3.11) and (3.12) are derived with the assumption that $\frac{M}{P}$ is constant, to get equations (3.13) and (3.14).

$$dy = c(dy - t'dy) + i'dr + dg$$

$$dy = c(1-t')dy + i'dr + dg \qquad (3.13)$$

$$0 = l'dr + k'dy$$

$$dr = -\frac{k'}{l'}dy \qquad (3.14)$$

Substituting (3.14) into (3.13) yields equation (3.15).

$$dy = \frac{1}{1-c'(1-t')+\frac{i'k'}{l'}}dg \qquad (3.15)$$

Since $c'(1-t')<1$ and $\frac{i'k'}{l'}$ has a positive value, then the multiplier would be positive. The slope of the LM curve is $-\frac{i'k'}{l'}$ that shows a decrease in investment triggered by an increase in the interest rate, *r*, when *y* and *r* increase along the LM curve. If the slope of the LM curve is horizontal, i.e. zero sloped, and then the multiplier would be:

$$dy = \frac{1}{1-c'(1-t')}dg = \frac{1}{1-MPC}dg \qquad (3.16)$$

The implication of equation (3.16) is that even though the government spending is at a low level, it has an impact on output. In other words, the change in output is relatively bigger if the LM curve is relatively flat, i.e. when the slope of the LM curve approaches zero.

3.3 Fiscal Policy and Poverty in Indonesia

The Central Bureau of Statistics (Badan Pusat Statistik, BPS) uses the basic needs approach to measure poverty in Indonesia. This approach sees poverty as an economic inability to fulfill the basic needs for food and non-food items, which is measured using household expenditure. Using this approach, three measures of poverty are able to be computed. These measures are (1) Headcount Index that is percentage of people who lives below poverty line, (2) poverty depth index (P_1), and (3) poverty severity index (P_2).

The BPS divided the poverty line (Garis Kemiskinan, GK) into two: food poverty line (GKM) and non-food poverty line (GKBM). The calculation of the poverty lines for each province is based on urban and rural areas. Someone is considered as poor if his family's expenditure per capita per month is below the poverty line of his place of residency.

The GKM is an expenditure on the minimum food basic need is equivalent to 2,100 kilocalories per capita per day. The market basket of the basic needs of food commodities consisted of 52 types of commodities that include, among others, are whole grains, tubers, fish, meat, eggs, milk, vegetables, nuts, fruits, and oils and fats.

The GKBM is a minimum expenditure for housing, clothing, education, and health. The package of non food basic needs is represented by 51 types of commodities for urban households and 47 kinds of commodities for rural households.

3.4 Income Distribution and Poverty

In economic development and public policy, income distribution has become an important concern among the scientific community and policy makers. The analysis which links income distribution to the stage of development was pioneered by Simon Kuznets in 1955 (Daoed, 1995). Using cross-country and time series data, he found that there was no direct relation between income inequality and the level of income per capita. Kuznets found an inverted U-shaped type of relationship between between equality and income that showed the average income per capita in the early development is still low and inequality levels are also low. When average income rises, the gap also increased. Then, when average income rises higher, the gap becomes small.

These results are interpreted as the evolution of income distribution in the process of economic transition from rural to urban economies or from agricultural economy (traditional) to industrial economies (modern).

Various studies have been conducted to test the Kuznets hypothesis and some conclusions can be drawn from these studies, namely: (1) majority of the studies support the Kuznets hypothesis, (2) some studies found a long-term positive relationship between economic growth and equitable distribution of income in developed countries that have high income levels, (3) on the left hand side of the Kuznets' curve shows the income gap is more volatile than the right hand side of the curve. The right hand side shows a declining or improving in the income gap.

However, several studies failed to see any correlation between income and equality, for example, a study conducted by Deininger and Squire (1998), and Barro (1997) found no systematic relationship between income growth and distribution.

In general, the relationship between economic growth and equitable distribution of income can be shown in Figure 3.7 (Kasliwal, 1995 and Susilowati, et al, 2007). Community groups are divided into two, which is 50 percent of people with high income (rich) and 50 percent of people with low income (poor). Initial distribution is at point E that is in favor of the wealthy community. The required policy for distribution is to move towards the line of perfect equality, but income distribution affects total income.

The impact of income distribution policy should be able to shift income distribution line to the areas A, B, C or D. If the intended policy is executed and the end result is the income distribution shifts to region A, then this policy should be reviewed because none of the income groups benefitted from this policy. The rich will lose their wealth while the poor will become poorer. If the distribution shifts to region B, then the income of the rich group will be reduced while the poor would gain benefit in terms of increasing in their income.

However, the benefit received by the poor is smaller than the losses suffered by the wealthy so the total revenue to the society is reduced. If the distribution shifts to region C, a constant income zone, then there is possibility that growth will be followed by equal distribution of income, because total income to the society is increased. If the distribution shifts to region D, the redistribution is Pareto superior for both groups in which both groups experience an increase in income.

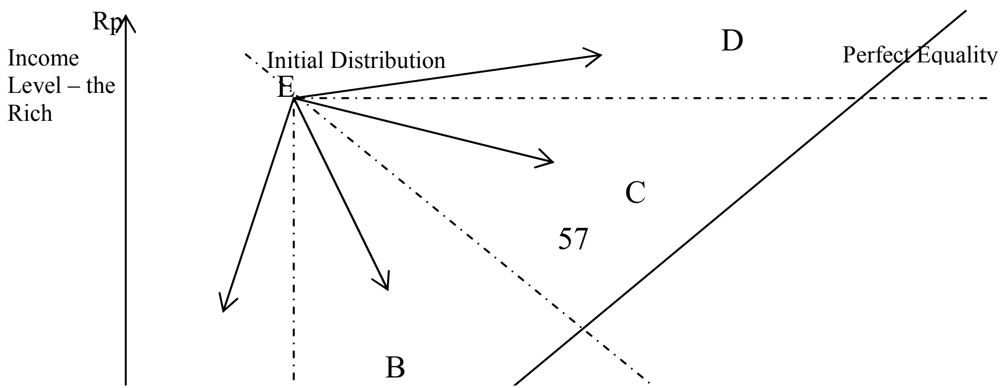


Figure 3.7 Growth Income and Inequality

The concept of income distribution, in general, can be distinguished by three school of thoughts. The *first* is according to the Classical or orthodox who hold to the concept of the balance of resources and the concept of a free market. The difference among sectors causes the exchange or allocation of resources efficiently in the absence of government intervention to achieve Pareto optimal conditions (Susilowati, et al, 2007). The Classicalist believes that the equal distribution of income happens by itself along with the increase in income per capita. The economic development is done through commutative of income among wealthy community. The production sector is assumed to be efficient and the distribution in income is done through taxes and transfers that are believed not to distort the economy. This idea is also known as the capitalist ideology that focused on growth (grow first, and then redistribute).

The *second school* is the structuralism that assumes economic development is a transition that is characterized by a fundamental transformation in the so-called economic structural transformation. According to the

Structuralism, the structural change is seen as an imbalance that can cause a long-run gap adjustment (Arndt, 1987; Gillis et al., 1987; Djojohadikusumo, 1994). The Structuralism is sceptical on the price mechanism and believes that government intervention is needed to overcome market failure. The government should take over the ownership of capital and land from the capitalist and re-distribute them to small-scale producers. This policy provides a double impact on income distribution, namely the impact of short-term and long-term impacts. A short term impact has a direct impact on income distribution that can be increased significantly. While a long-term impact is when the assets are transferred from large producers to small producers, these assets can be managed efficiently, and then the redistribution effect will be successful. However, if these assets are not well managed and productive, initial asset owners will lose their assets while the new owners do not get the benefit. This thought is also called the Socialist sect that focuses on equity (redistribute first, and then grow).

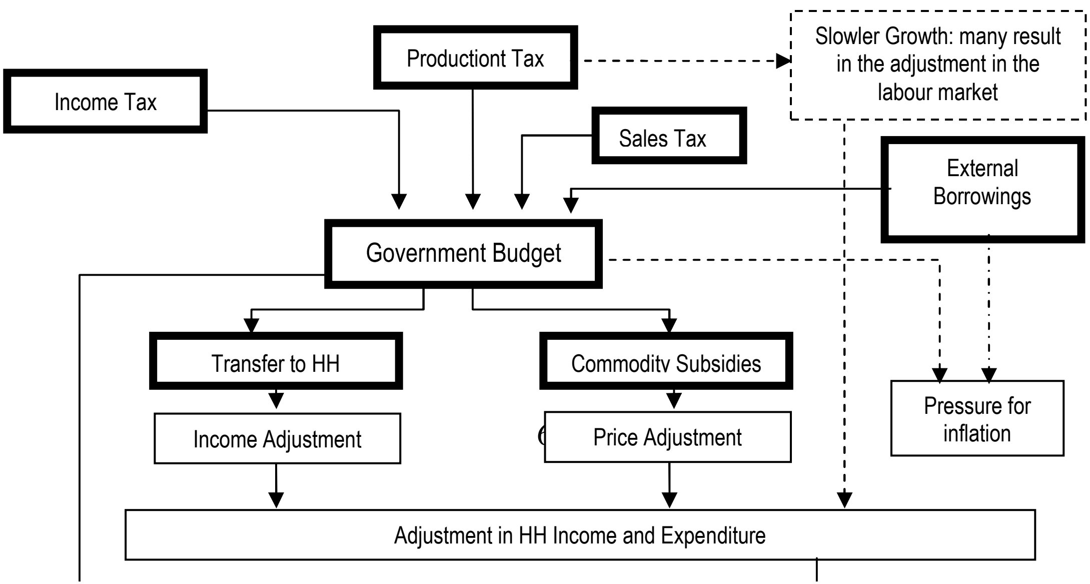
The *third school of* thought is an alternative to the two school thought. This thought was developed by the World Bank's moderate wing that has an objective strategy to achieve growth and equity. Thus, the objective is also known as redistribution with growth (redistribution with growth) (Chenery et al., 1974).

3.5 The Role of Fiscal Policy in Reducing Inequalities in Income Distribution and Poverty

Inequality in income distribution and poverty are two crucial issues for every country, so the government in each country tries to reduce these problems through fiscal instruments. The scheme of the fiscal instruments associated with the Indonesian government revenue and expenditure is shown in Figure 3.8.

From the revenue side, the government budget for public financing can be generated from two sources, namely domestic and foreign loans. Domestic revenues, can be obtained from income tax, sales tax and production tax, while from abroad, the loan can be of various shapes such as foreign loans to the public.

In terms of expenditure, poverty reduction and income redistribution is implemented through three instruments of government budget allocations, namely (1) direct subsidy or subsidy targeted for low-income households, (2) price subsidy or subsidy allocated for commodities that are used by households so that the price is lower compared to if there is no subsidy, especially for basic needs, and (3) direct government expenditure on public services and infrastructure, especially in improving the welfare, health and education, which is an advantage for the group of low-income households.



Poverty can be divided into two categories, namely structural and natural poverty. Structural poverty is caused by socio-economic conditions of the low income group and it is related to the underdevelopment trap. Both direct and indirect poverty in this category is generally caused by the existing institutional arrangements that included not only the organization but also covers issues applicable to the rules of the game. Natural poverty is caused by the low quality of human resources and natural resources.

The level of poverty can be measured with or without reference to the poverty line. The concept of measurement that refers to the poverty line is called relative poverty. On the other hand, the absolute poverty is the concept of poverty measurement that does not refer to any poverty line. The relative poverty rate is measured as a proportion of the average income per capita. The relative poverty is different from one country to another and may change with the changing time period. The absolute poverty is the poverty where the minimum needs for survival cannot be fulfilled. There is a fixed guideline to determine the minimum basic needs such as a minimum kilocalories requirement for food and a minimum provision of other services should be fulfilled.

There are various measures or indices of poverty that are often used in various empirical studies, among others, Blackwood and Linch (1994):

a. Poverty ***Head***count

Poverty headcount represents the ratio of the number of poor to total population. Mathematically it can be expressed as follows:

$$H = \frac{q}{n} \tag{3.17}$$

Where H is the ratio of the number of poor to total population (poverty headcount), q is the total population or the percentage of population below the poverty line, and n is the total population. This measure can be effectively used if the intended measurement is to measure the percentage of population below the poverty line. If the percentage of population below the poverty line is decreasing (increasing), then it is said that the poverty rate is decreasing (increasing).

However, this measure considers that the distribution of income among the poor population is homogeneous, so this measure cannot show the severity of the poor themselves.

b. Poverty Gap or Income Shortfall

This measure calculates the amount of income needed to lift the poor out of poverty (to above the poverty line). Mathematically it can be written as:

$$I = z - \mu \tag{3.18}$$

were I is the average income shortfall that measure the amount of money needed to increase the average incomes of the poor to income above the poverty line. The average income of the poor is μ and z is the poverty line.

Income shortfall can be measured by determining the aggregate amount of money needed to raise revenue to all poor people above the poverty line. Income shortfall can be obtained by multiplying the right-hand side of equation (3.18) to the number of poor people, the formula is written as:

$$P = q(z - \mu) \tag{3.19}$$

Where P is the aggregate income shortfall and q is the number of poor people. The downside of this measure is that it is unable to explain the severity of the poverty problem in terms of the number of people who suffer from poverty.

c. Gini Coefficient and Lorenz Curve

This measure is widely used to measure inequality and income distribution. *S*-Gini is the ratio between equality line and the Lorenz curve as shown in Figure 3.9. The Lorenz curve provides a clearer picture of income distribution compared to any other curve. This is due to the fact that the horizontal and vertical axes do not use a logarithmic but arithmetic scale so there is no shrinkage, both at the level of low and high income.

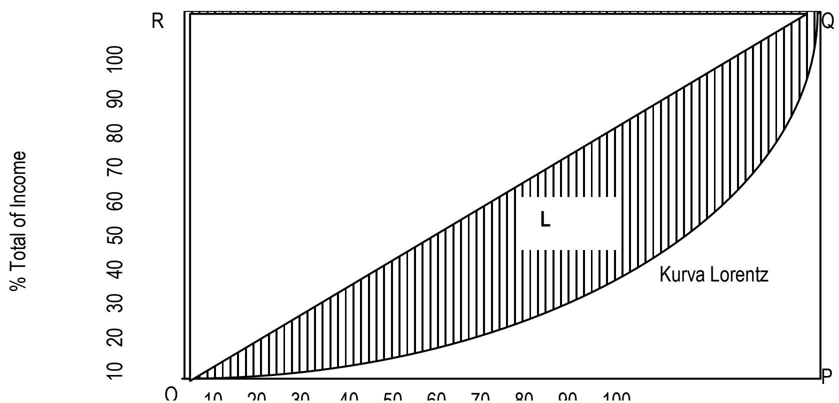


Figure 3.9 The Lorenz Curve

The Lorenz curve shows the degree of inequalities in income distribution (Perkins, et.al, 2001). If the income is perfectly equitable in distribution, then *X* percent of the population received *X* percent of total income. For example, 40 percent of the population or income recipients must receive 40 percent of the total available income. In the Lorenz curve, this can be shown as a diagonal line from lower left to upper right (OQ). This means, the entire family income will be equal to average income.

If *X* percent of the number of individuals or families receives less than *X* percent of income, then the Lorenz curve deviates from the diagonal line *OQ*, than *OQ* become heavy downward or become a concave. The more uneven income distribution, the Lorenz curve will be more concave (Todaro and Smith, 2003).

Measuring regional income inequity can be done by looking at the ratio of the shaded area (*L*) divided by the half planar area of *OPQR*. This ratio is known as the Gini concentration ratio and is often called the Gini coefficient.

$$G = 2\sum_{i=1}^{k}(P_i - Q)(P_i - P_{i-1}) \qquad (3.20)$$

with P_i is the percentage of cumulative number of families or individuals to the i^{th} class, Q_i is the cumulative percentage of total family income up to class-i and *k* is the number of income classes. The Gini concentration ratio (G) has a range of values between 0 and 1. A perfect equitable in income distribution is when $G = 0$, on the other hand if $G = 1$ then there is a perfect inequality of income distribution.

The model equation (3.20) can be converted into the dynamic equation, so that the Gini index formula can be written as follows:

$$\frac{GINI}{2}\int_0^1 (p - L(p))dp \qquad (3.21)$$

Another method that is often used to measure the level of income distribution is the Theil index and Statistics beta distribution function (as will be used in this study).

Limitations of the Gini Coefficient and Lorenz Curve are that both of these measurements showed only a partial ranking of the income distribution. In other words they only indicate the number of people below the poverty line and do not reflect the extent of impoverishment (Nanga, 2006).

The World Bank has established criteria for measuring the level of income equalization. Residents are grouped into three layers (strata) of income, consisted of 40 percent low-income residents, 40 percent middle-income residents, and the remaining 20 percent of high-income population. Furthermore, the size distribution or inequality of income is calculated by based on:

1. If 40 percent of the population in low-income layer has a share of income of less than 12 percent of total revenue, then it is said that there is a disparity in income or "high" inequality.

2. If 40 percent of the population in low-income layer has an income share of between 12-17 percent of total revenue, then it is said that there is a disparity in or "moderate" inequality.

3. If 40 percent of the population in low-income layer has a share of income of 17 percent of the total income, then it is said that there is a disparity in income or "low" inequality.

In addition to the above absolute poverty measure, Blackwood and Lynch (1994) also suggested several ways to measure poverty composites, namely:

a. Sen Index

The Sen Index was introduced by Sen in 1976 that can be used to measure the percentage of poor people as well as the extent of poverty and income distribution among the poor. The Sen Index is:

$$S = H[I + (1 - I)Gp] \tag{3.22}$$

$$I = \sum_{i=1}^{q} (z - y_i / qz) \tag{3.23}$$

Equations (3.22) and (3.23) show that the Sen index has the headcount, poverty gap and Gini Coefficient. *S* is Sen poverty index, *H* is the headcount index, *I* is the percentage of average income shortfall from the poverty line, y_i is the income of the i^{th} poor household, *z* is the poverty line, *qz* is the number of households with incomes less than *z*, $H = \frac{q}{n}$ is the poverty headcount, *n* is the total number of households or population, and *Gp* is the Gini index among the poor ($0 \leq Gp \leq 1$).

b. Foster-Greer-Thorbecke (FGT)

Foster, Greer and Thorbecke (FGT) (1984) tried to incorporate elements of the degree of poverty of the poorest people through the parameter α. This index is widely used in various empirical studies on poverty due to its sensitivity to the depth of poverty and the severity of poverty. The formula for the FGT index is written as follows:

$$P_\alpha = \frac{1}{n}\sum_{i=1}^{q}\left[\frac{g_i}{z}\right]^\alpha \text{ ; } \alpha \geq 0 \qquad (3.24)$$

were n is the number of individuals in the population, q the number of individuals or households under the poverty line, g_i is the poverty gap of the i^{th} household, z is the poverty line, P_α an index of poverty by FGT and α is the degree of poverty that is an arbitrary number.

If the value of $\alpha = 0$, then P_α is the headcount ratio, so that equation (3.24) can be written as:

$$P_0 = \frac{1}{n}\sum_{i=1}^{q}\left[\frac{g_i}{z}\right]^0 = \frac{q}{n} = H \qquad (3.25)$$

The P_0 index shows the proportion of population below the poverty line that is defined as the percentage of poor population to total population. The drawback of this index is its inability to describe the depth of poverty and the severity of poverty.

To overcome this weakness, there is an indicator of the income gap ratio or better known as the poverty gap index (PG), which measure the difference in average incomes of the poor with the poverty line that can be used. This difference is expressed as a proportion of the poverty line, i.e. $\frac{Z-y_i}{Z}$, where y_i is the income or the average expenditure of the poor.

If the value of $\alpha = 1$, then P_α is the multiplication of the headcount ratio (H) and the poverty gap index. Mathematically it can be expressed as follows:

$$P_1 = \frac{1}{n}\sum_{i=1}^{q}\left[\frac{g_i}{z}\right]^1 = HI \qquad (3.26)$$

This index can be used to measure the level of poverty or the incidence of poverty, and the depth of poverty. But, this index is not sensitive to the distribution of income among the poor. In other words, if $\alpha = 1$ then a normalized poverty gap is shown.

If the value of $\alpha = 2$, then P_α is a distributionally sensitive index. Mathematically it is written as:

$$P_2 = \frac{1}{n}\sum_{i=1}^{q}\left[\frac{z-y_i}{z}\right]^2 = \frac{1}{n}\sum_{i=1}^{q}\left[1-\frac{y_i}{z}\right]^2 \qquad (3.27)$$

Up to a certain extent, this index may provide a picture of the spread of expenditure among the poor. It can also be used to determine the intensity of poverty.

In addition to the above poverty measures, general the poverty measures, which combines indicators of poverty such as the percentage of poor people, the gap of poverty, and income distribution among the poor, can be expressed as follows:

$$\theta = \int_0^1 p(z,x) f(x) dx \qquad (3.28)$$

Where *p(z, x)* is a homogeneous function of degree zero in *z* and *x* that satisfy the restriction of:

$$\frac{\partial p(z,x)}{\partial x} \prec 0 \quad ; \quad \frac{\partial^2 p(z,x)}{\partial x^2} \succ 0 \quad \text{, and} \quad p(z,z) = 0$$

Foster, Greer, and Thorbecke (1984) proposed a class of poverty measures that is obtained by substituting the following equation:

$$p(z,x) = \left(\frac{z - x}{z} \right)^{\alpha} \qquad (3.29)$$

Into equation (3.28), where α is a parameter of inequality aversion. The greater the α value, the greater the value given to the poor.

When the headcount ratio (*H*) is used as a measure of poverty, then $\alpha = 0$, this means that $\theta = H$. The size of the headcount ratio gives equal weight to all poor people regardless of the intensity of their poverty. If $\alpha = 1$, then each poor is weighted based on their relative distance from the poverty line *(z)*. This measure is called the ratio of the gap or the depth of poverty (poverty gap ratio). If $\alpha = 2$, that's mean the weight age given to each poor individual is proportional to the square of their income shortfall from the poverty line. This measure is called the poverty severity ratio. The poverty severity ratio meets all three indicators of poverty that has been described previously.

The level or degree of poverty of a country depends on at least two factors. These factors are (1) the level of income per capita, and (2) the degree of inequality in income distribution (Kakwani *et al* 2004; Todaro and Smith, 2003;

Kakwani, 1993, 2000) Thus, the poverty measure can be expressed by equation (3.30):

$$\theta = \theta(\mu, L(p)) \tag{3.30}$$

Where μ is the average income of the society, and $L\ (p)$ is the percentage of income received by the top p percent of the population.

3.6 Pareto Efficiency

According to the neoclassical ideology, the main strength lies in the mechanism of market economy, therefore the price is an indicator that needs to be considered carefully, because the price level determines the direction and how much resources are channeled through the supply and demand mechanisms.

The economy is said to be efficient if the individuals in the economy (consumers and producers) are in equilibrium. In other words the economy is efficient if there are (a) efficiency in exchange, and (b) efficiency in production (Raharja and Manurung: 1999).

Efficient resource allocation is said when the goods and services cannot be reallocated, among consumers without making another consumer worse off. This principle is called Pareto efficiency. Pareto efficiency or Pareto optimality occurs when general equilibrium is achieved through a perfect market mechanism. This concept includes three types of efficiency, namely, the efficiency of resource allocation (or the balance of production), efficiency of commodity distribution (or the balance of consumption), and the efficiency of the combination product (simultaneous equilibrium in the production and consumption sector).

In order for this mechanism continues to run well and for the concept of a Pareto optimum can be met, it needs five basic assumptions, namely (Susanto: 1997):

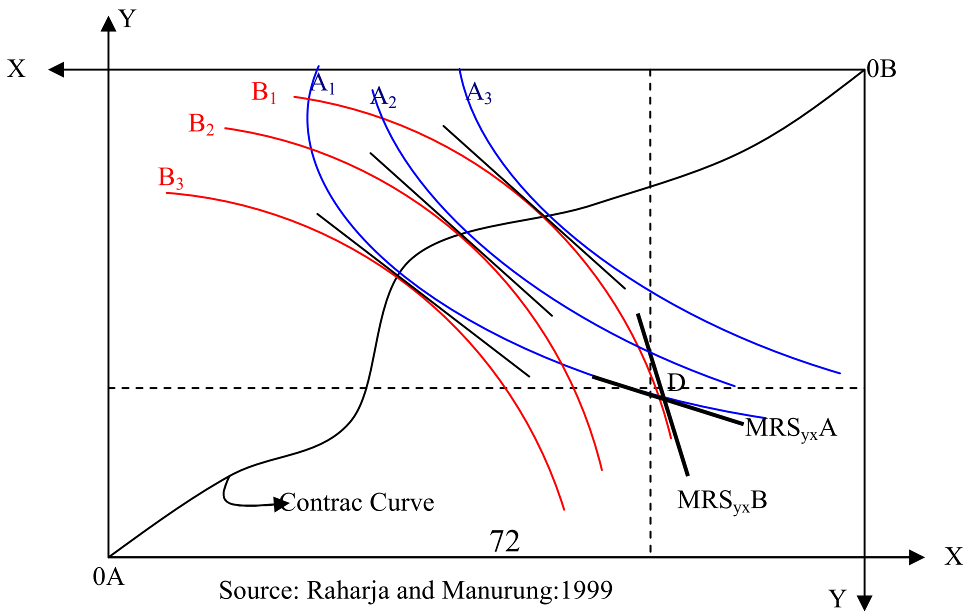
1. The firm maximizes its profits subject to the budget constraint and the consumer maximizes utility subject to his/her budget constraint. Then either the buyer or seller is a price taker.
2. The satisfaction obtained by a consumer depends on his/her utility function that consisted of the bundle of goods and services he/she consumed.
3. The production of a firm depends on its own production as well as from the inputs used in the process. There is no consumer utility function or other firm's production function that has an influence on it. In other words there are no externalities in the production sector.
4. The indifference curve is continuous and convex to the origin. In other words, there is a diminishing marginal rate of substitution between the consumption bundles of each other.
5. Isoquant curve is continuous and convex to the origin. This indicates that there is a diminishing technical rate of substitution between one input with another input, so that the Pareto optimality can always be achieved in a competitive equilibrium (Koutsoyiannis, 1989).

3.7 Efficiency in Exchange

Suppose there are two individuals *A* and *B* and two types of goods *X* and *Y*. Individual *A* consumed good *X* as *Xa*, and good *Y* as much as *Ya*, while individual *B* consumed good *X* as much as *Xb*, and good *Y* as much as *Yb*. From this information an Edgeworth Box can be drawn as shown in Figure 3.10. Point *D* is the initial endowment; MRS_{yx} shows the number of *Y* that can be sacrificed to obtain additional *X*. The exchange between *A* and *B* aim to increase the utility level of each individual. This exchange can be seen from the shift of the indifference curves of *A* and *B*. The shift from A_1 to A_2 and A_3 will raise the level of satisfaction of *A* ($A_3 > A_2 > A_1$), as well as *B*, the shift from B_1 to B_2 and B_3 will raise the level of satisfaction ($B_3 > B_2 > B_1$).

The exchange stops if A cannot increase his satisfaction without the sacrifice of the B's utility. Mathematically, it can be written as:

$$MRS_{yx} A = MRS_{yx} B \qquad (3.31)$$



Source: Raharja and Manurung:1999

Figure 3.10. Edgeworth Box Diagram

If there are more than two customers, then the efficiency will be achieved when the MRS of each consumer equal to the ratio of the price of both goods, as shown in equation (3.30).

$$MRS_{yx}A = MRS_{yx}B = ... = MRS_{yx}Z = \frac{px}{py} \quad (3.32)$$

Where *px* is the price of good *X* and *py* is the price of goods *Y*.

3.8 Equilibrium in Production

The production theory states that a producer is in equilibrium if the marginal rate of substitution (MRTS) of labor (L) for capital (K) is equal to the ratio between the prices of factors L and K. Mathematically it is written as follows:

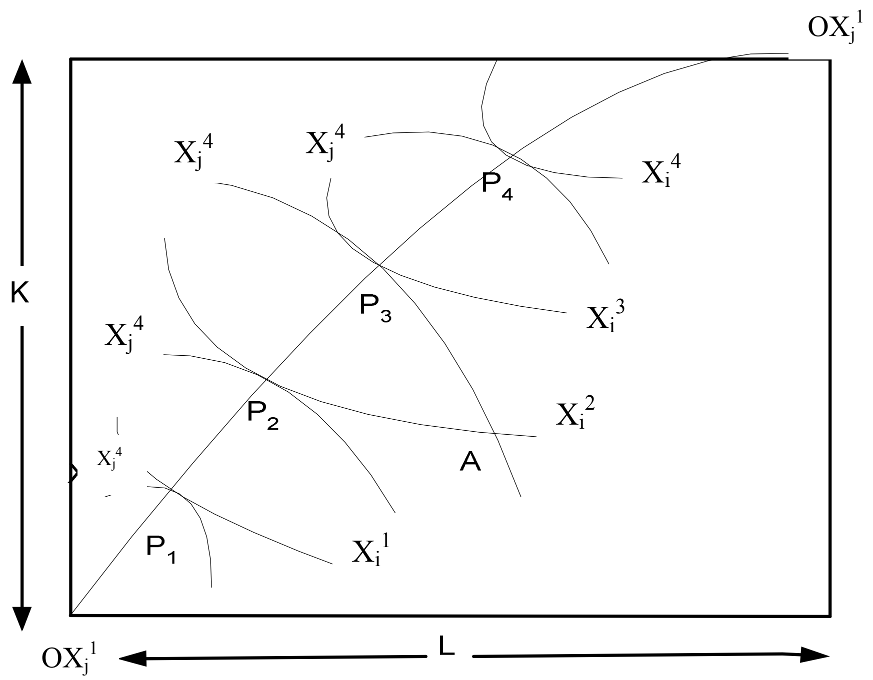
$$MRTS_{lk} = \frac{w_1}{w_2}, \quad (3.33)$$

Where w_1 is the price of factor L and w_2 is the price of the factor K. Suppose there are two firms that produce two different commodities, namely x_i and x_j. Simultaneous equilibrium occurs can be explained using the Edgeworth box in Figure 3.11. Simultaneous balance between the two products x_i and x_j is reached when the isoquant of the two intersect at various levels of output. If the points of tangency are connected to each other, it will form a curve called the Contract Curve (CC). The choice of output levels to be produced is determined by the ratio between the prices of factor *L* with the price of factor *K*. Mathematically it is written as follows:

$$MRTS^{i}_{lk} = MRTS^{j}_{LK} = \frac{w_i}{w_j} \tag{3.34}$$

Where w_i is the price of factor *L* and w_j is the price of the factor *K*. Since the *MRTS* is the slope of the isoquant, then Equation (3.34) is a formula of general equilibrium in the production sector, which is reached when the *MRTS* for all types of output are the same. If the price factor is known then x_i and x_j is the amount that must be produced for maximum profit can be determined.

The total output of x_i and x_j produced by the firms must be equal to consumers demand for goods x_i and x_j. The consumer demand is determined by relative prices p_i and p_j, where p_i is the price of commodities x_i, p_j is the price of commodities x_j. To adjust the supply sector with demand sector, it takes the concept of Production Possibility Curve (PPC) as in Figure 3.12. *PPC* derived from the *CC* that formed in the Edgeworth box.



Source: Nicholson, 2005

Figure 3.11 Equilibrium in the Production Sector

The PPC is a curve showing the various possible combinations of efficient production that used a certain quantity of production factors. The PPC curve decreases from right to left or it is downwards sloping because scarcity of inputs, where to produce one extra unit of X_j, a quantity X_i must be sacrificed and vice versa. Hence the slope of the PPC describes the degree of marginal transformation of the X_j and X_i that is called the Marginal Rate of Product Transformation (MRPT). Mathematically, it can be proven that $MRPT_{ij} = \frac{p_i}{p_j}$, as follows:

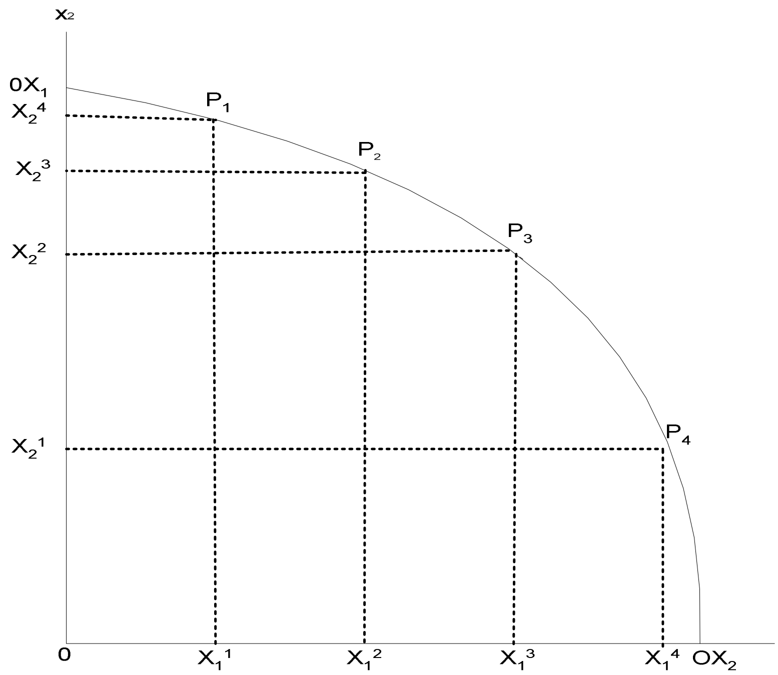
By definition: $\mathrm{MC_r} = \frac{dC_r}{dx_r}$, so

$$\frac{MC_i}{MC_j} = \frac{dC_i}{dx_i} . \frac{dx_j}{dC_j}$$
$$dC_i = w_i(dL_i) + w_j(dK_j)$$
$$dC_j = w_i(dL_i) + w_j(dK_j); dL_i = -dL_j; dK_i = \gamma dK_j$$
$$\frac{dC_i}{dC_j} = \gamma$$

$$\text{so}: \frac{\mathrm{MC_i}}{\mathrm{MC_j}} = -\frac{dx_j}{dx_i} = MRPT_{ij}$$

In a perfectly competitive market $MC_i = p_i$ and $MC_j = p_j$, so:

$$MRPT_{ij} = \frac{pi}{p_j} \qquad (3.35)$$



Source: Nicholson, 2005

Figure 3.12 A Production Possibility Curve

3.9 Equilibrium in Consumption

Equilibrium in the consumption sector occurs when consumers reach the maximum utility subject to income constraint. This condition is fulfilled when the Marginal Rate of Substitution (MRS) between two commodities is equal to the ratio of relative prices. Mathematically, it can be written as $MRS_{12} = \frac{p_1}{p_2}$. This condition can be shown as follows:

Suppose the utility function is given as $U = f(x)$ and income is I

(a) $Max \;\; U = f(x_1.x_2) \quad subject\ to \quad p_1x_1 + p_2x_2 = I$

$$\gamma = f(x_1.x_2) + \lambda(I - p_1x_1 - p_2x_2)$$

$$\frac{\partial\gamma}{\partial x_1} = MU_1 - \lambda p_1 = 0; \;\; \lambda = \frac{MU_1}{p_1} \tag{3.36}$$

$$\frac{\partial \gamma}{\partial x_2} = MU_2 - \lambda p_2 = 0\,;\ \lambda = \frac{MU_2}{p_2} \tag{3.37}$$

$$\frac{\partial \gamma}{\partial \lambda} = I - p_1 x_1 - p_2 x_2 \tag{3.38}$$

Equations (3.36), (3.37), and (3.38) are simultaneous equations and solving them to get:

$$\frac{MU_1}{MU_2} = \frac{p_1}{p_2} \tag{3.39}$$

(b) $U = f(x_1.x_2)$

$$dU = \frac{\partial U}{\partial x_1} dx_1 + \frac{\partial U}{\partial x_2} dx_2 = 0 \tag{3.40}$$

Where $\frac{\partial U}{\partial xi} = MU_i$, then equation (3.40) can be written as:

$$MU_1 dx_1 + MU_2 dx_2 = 0$$

$$\frac{MU_1}{MU_2} = \frac{dx_2}{dx_1} = MRS_{12} \tag{3.41}$$

From (a) and (b), it is proven that $MRS_{12} = \frac{p_1}{p_2}$.

Simultaneous equilibrium in the production and consumption are achieved when $MRPT_{12} = MRS_{12} = \frac{p_1}{p_2}$.

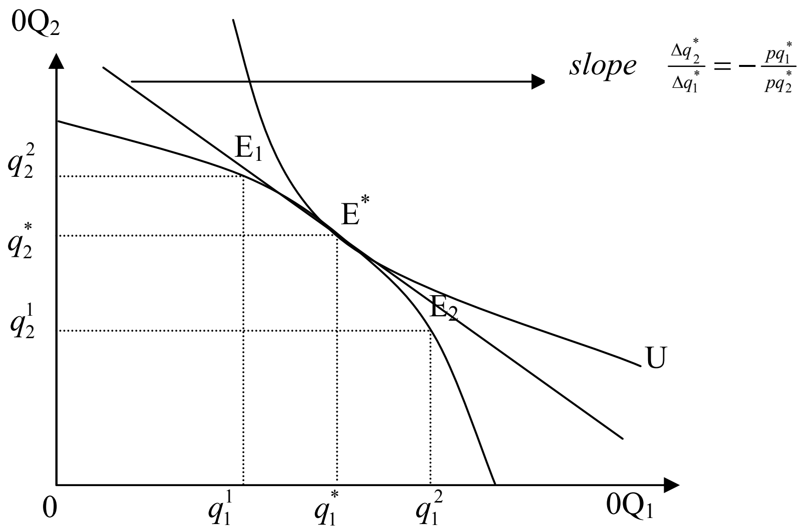
3.10 Simultaneous Equilibrium in Consumption and Production

Pareto optimality in production and consumption (product mix) imply that the Marginal Rate of Product Transformation (MRPT) must be equal to the Marginal Rate of Substitution (MRS) for all consumers. Mathematically, they can be written as follows:

$$MRPT_{q1q2} = MRS^{A}_{q1q2} = MRS^{B}_{q1q2} \qquad (3.42)$$

The MRPT shows how a product is transformed into other products, and MRS showed the extent to which consumers are willing to substitute a commodity with another commodity. The equilibrium occurs when the production plan is in line with the consumption plan. Figure 3.13 shows the equilibrium situation.

The economic definition of the total equilibrium is that the combined output of q_1 and q_2 should be optimal both from the producers and consumers point. The overall balance should be fulfilled by the equilibrium allocations in the sector of production and consumption, which is done through the price mechanism (in a perfectly competitive market), thus efficiency is achieved in the economy.



Source: Nicholson, 2005

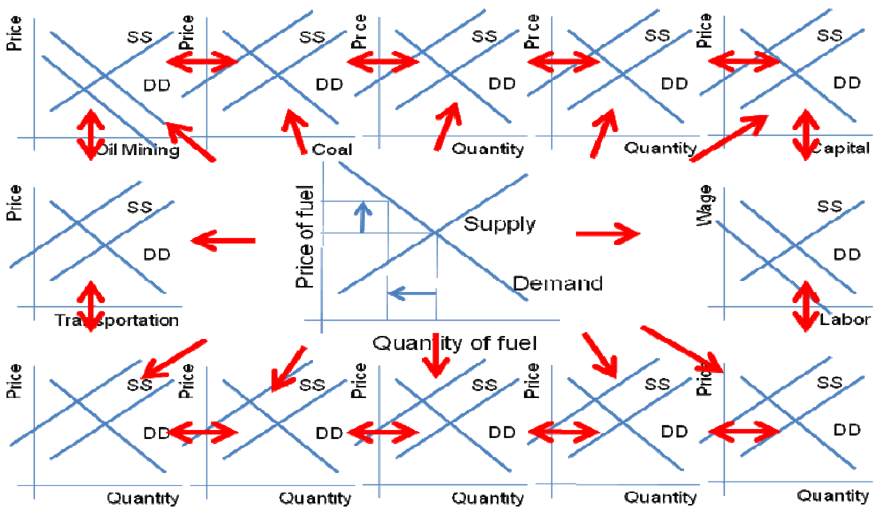
Figure 3.13 Equilibrium in Production and Consumption

3.11 General Equilibrium Theory

The general equilibrium theory is a fact formalization that markets are interrelated each other. The changes of both demand and supply in one market will have an impact to the equilibrium prices in other markets. The existence of this equilibrium has been mathematically proven by Kenneth J. Arrow and Gerard Debreu in 1954.

The Computable General Equilibrium (CGE) model is a system of nonlinear equations that can be used to simulate the mechanism in the economy to accommodate any changes in price and quantity of commodities as a market balance between production factor and commodity markets. In other words, the CGE model works by simulating the optimal behavior of all economic agents; consumer, producer, and government. The CGE model is able to capture all transactions that occur in the mechanism of circular flow of money, goods and services in an economy (Lewis, 1991). Thus, the CGE model can be used to evaluate a policy that accommodates any structural change as well as a predictor of any policy performed (Robinson, 1991).

The general equilibrium explicitly analyzes the relationship among the existed markets, where the price adjustment, demand, supply and the number of commodities being traded in a market will have an impact on other markets. As an illustration, the linkages between these markets are shown in Figure 3.14.



Source: BKFDK-RI, 2008

Figure 3.14 Inter-market linkages in General Equilibrium

The general equilibrium analysis is different from the partial equilibrium analysis in which the latter simply look at the impact that occurs in one market only. For example, in middle of Figure 3.14 it is shown that a subsidy fuel reduction (fuel) will have an impact on the price and quantity of oil. In this case, the oil price increases and there is a decrease in demand of fuel. The impact of this kind is called partial equilibrium impact.

In the inter-related markets, there will be a chain effect due to this oil price increase. The public transportation market is on the left side of the oil supply-demand curve. Due to the increase of oil prices, the supply of the public transport curve shifts to the left resulting in an increase in transportation price. This increase will be followed by a decrease in supply of other commodities that use transportation as an input. On the other hand, (to the right side of the oil market) there will be a reaction in the labor market. The labor demand curve shifts to the left which could lead to a reduction in the wage rate, or even unemployment. Thus, it seems that the general equilibrium analysis is more realistic than the partial equilibrium analysis.

The General equilibrium theory originally refers to the Walrasian general equilibrium theory that explains the *pure exchange economy* which is dealt with the process of exchanging goods in a market through an intermediary of price. In a competitive market, problems faced by agents can be formulated as follows (Varian, 1992):

$$e_i = \sum_{h=1}^{H} e_i^h \qquad (3.43)$$

$$\max U^h(x^h) \text{ s.t. } px^h \leq pe_i^h \qquad (3.44)$$

$$x_i = \sum_{h=1}^{H} x_i^h \qquad (3.45)$$

H is household with *n* goods, e_i^h is a household endowment vector, e_i is the aggregate endowment, *i* is the type of goods, *p* the price of goods, *U* is utility, px^h is expenditure, pe^h is the amount of budget or income of the x[th] individual, and x_i is market demand. The aggregate endowment e^i is the sum of endowment of various goods. Households seek to maximize their utility (U^h) by consuming some goods *xh* subject to a budget constraint (pe^h). The demand for good-*i* of every individual is x_i^h. If there is a difference between individuals, then there is a net demand. On one side, this can be shown as the market demand (Δ_i^h), and on the other side it can be seen as an offering (O_i^h). The x^i is a market demand that reflects the summation of individual demand (Azwardi, 2006).

The maximization problem above produces a solution vector x $x(p,pe^h)$ that says the demand, *x*, as a function of price and income.

3.12 Social Accounting Matrix (SAM)

The CGE model is used to build the SAM Table. The SAM Table aims to provide a comprehensive illustration of the initial distribution of consumption, income and consumer good production factors, producers and government in an economy. These in formations are useful to know the economic growth, income distribution, welfare and the evaluation of the various economic performances (Wuryanto: 1999).

The SAM table is a comprehensive data framework, which specifically describes the economy of a nation. A Standard SAM has a number of important features. *First*, the SAM distinguishes standard balance between "activities" (production sectors) and "commodities". The income in the balance activity is assessed using producer prices and the commodity balance sheet is valued at market prices (including commodity indirect taxes and transaction costs). The commodities are listed as outputs of activities, which are exported, imported as well as traded domestically.

The separation of activities sector from the commodities sector allows an activity to produce some commodities (for example, a daily activity may result in the production of cheese and milk), while some commodities may be generated by some activities (for example, both small-scale production activity and large-scale produces the same commodity such as corn). In the field of commodities, payments are made to domestic activities, Rest of the World (ROW), and into some kind of balance of tax (for domestic and import tax). These treatments provide the data necessary to model the imports sector as perfect or imperfect substitutes who deal with domestic production.

Second, the matrix is explicitly linked to trade flows and transaction costs (trade and transport); also it is linked to the marketing margin. For each commodity, the balance of SAM to the costs associated with domestic marketing, import and export. Domestic market for domestic output describes the marketing margin costs to move commodities from producers to domestic consumers. For imports, illustrated with costs of moving the commodity from the border (adding to c.i.f price) to domestic consumers, while exports, shown by the costs of moving commodities from producers to the border (reducing the producer price of admission relative to the f.o.b price).

Third, the government is disaggregated into the core government's balance sheet (core government) and the tax balance sheet is distinguished one from each type of tax. Disaggregation is often necessary to avoid the ambiguity of the interpretation of several other payment methods. In some applications, SAM may remove some (or all) of individual income tax balance sheet. At SAM, payments between the government and other domestic institutions are provided through a transfer.

Fourth, domestic non-governmental institution on the SAM consists of households and firms. The firm obtains a factor income (represented from their ownership of capital and/or land) and the firm may also receive transfer from other institutions. Their income is used to pay direct taxes, savings, and transfer to other institutions. In contrast to households, companies do not make consumption. Assume that the relevant data are available then it is preferable to have one or more corporate balance sheets, because they have a tax liability and savings behavior is independent of the household sector. Corporate sector should be disaggregated to capture the difference between firms in terms of tax rates, savings rates, and parts (shared) and retained earnings received by households of different types. For example, some adjustments may be needed to separate the firm into non-agricultural category (meaning that income from non-agricultural sector), small-scale agriculture (income from land and capital are controlled by small farmers), and large-scale agriculture (income from land and capital are controlled by large farmers). Household consumption on commodities that are marketed appears as payment in the balance sheet of households to the balance sheet of the commodity, where this value includes marketing margins and commodity taxes.

The SAM table shows production activities that can be classified based on the expertise of the workforce, types of capital, and land classification. The results show that the distribution of factor income for each institution that is divided based on socio-economic groups, namely corporations, and government. Table 3.2 illustrates the flow of commodities that reflect the economic situation. From Table 3.2 one can derive accounting multiplier (Sutomo, 1991) as follows:

The Value of the Propensity of Average Expenditure is computed first solve the balance multiplier.

$$A_{ij} = T_{ij} 1_j^{-1} \quad \text{Or}$$

$$T_{ij} = A_{ij} 1_j \tag{3.46}$$

Where:

A_{ij} is the average expenditure propensity to row *i*, column *j*

T_{ij} is balance row *i*, column *j*

T_j is total column *j*

Tabel 3.2 Simple Structure of SAM Table

			EXPENDITURE					
			1	2	3	4		TOTAL
						Others		
			Production Factor	Institutions, Including Household	Production Activities	Capital Combination	Part of the World	
REVENUE	1	Production Factor			Income distribution of production factors (T13)			Revenues from the production factor (T1)
	2	Institutions, Including Household	ncome Distribution to the household and other industrial (T21)	Transfer of taxes and subsidies (T22)				Revenue institution (T2)
	3	Production Activities		Institutional demand for goods and services (T32)	The demand inter industries (T33)	Gross capital formation	Exsport	Gross Demand = Gross Uutput (T3)
	4 Others	Capital Combination		Domestic Saving				Balance of payments / current account deficit
		Part of the World		Imports of goods complementary	Imports of goods competitive			The total outflow of foreign currency exchange rates
	TOTAL		Revenue factors (T'1)	Institutional expenditure (T'2)	Finance gross (T'3)	Aggregate investment (T'4)	Total inflows of foreign exchange	

Source: Azwardi, 2006

Equation (3.46) can be written in a matrix form as follows:

$$\begin{vmatrix} t_1 \\ t_2 \\ t_3 \\ t_4 \end{vmatrix} = \begin{vmatrix} 0 & 0 & A_{13} \\ A_{21} & A_{22} & 0 \\ 0 & A_{32} & A_{33} \\ A_{41} & A_{42} & A_{43} \end{vmatrix} \begin{vmatrix} t_1 \\ t_2 \\ t_3 \end{vmatrix} + \begin{vmatrix} X_1 \\ X_2 \\ X_3 \\ X_4 \end{vmatrix} \qquad (3.47)$$

X_i is the vector of the matrix T_{14}, where *i* is 2,3,4. If A_{ij} is a matrix with constant elements:

$$\begin{vmatrix} t_1 \\ t_2 \\ t_3 \\ t_4 \end{vmatrix} = \begin{vmatrix} 0 & 0 & A_{11} \\ A_{21} & A_{22} & 0 \\ 0 & A_{32} & A_{33} \\ A_{41} & A_{42} & A_{43} \end{vmatrix} \quad \begin{vmatrix} t_1 \\ t_2 \\ t_3 \\ {}_4 \end{vmatrix} + \begin{vmatrix} X_1 \\ X_2 \\ X_3 \\ X_4 \end{vmatrix} \qquad (3.48)$$

Furthermore equation (3.48) can be written in the following form:

$$\begin{aligned} t &= A_t + X \\ t &= (I - A)^{-1} X \\ t &= Ma.X \end{aligned} \qquad (3.49)$$

Where $Ma = (1 - A)^{-1}$ is an accounting multiplier. This equation explains that the endogenous balance of income would change for *Ma* due to changes in exogenous balance of one unit.

3.13 Computable General Equilibrium (CGE)

The CGE model was first introduced by Leif Johansen in Norway in 1960 in his dissertation titled: A Multi-sectoral Study of Economic Growth which analyzes economic growth of Norway (Azwardi, 2006). Theoretically, the basic structure of a CGE model include the functions of production, demand for primary inputs, institutional income (households, firms and governments), savings and investment, demand (households, firms and government), price and condition of equilibrium.

The CGE model for a closed economy is the foundation to build a CGE model in an open economy and can be expanded into inter-regional CGE model by incorporating inter-regional trade relations, investment flows between regions, the structural relationship between the national economy as a whole with the economic areas studied and ties the various levels of government (Berck, et al, 1997).

The CGE model is a nonlinear system of simultaneous equations that simulate the activity of an economy that needed an adjustment in price and quantity of commodities to balance the factor markets and commodity markets. The CGE model simulates optimal behavior of all economic actors (including government) in an economy. Thus, in general, CGE models can capture all transactions that occur in circular flow mechanism between money, goods and services in an economy (Lewis, 1991).

CGE model is able to answer the lack in econometric studies or econometric model constructed for developing countries (De Melo, 1988). There are several reasons to support this statement regarding the CGE model: (1) Availability of time series data for long periods of time that are usually not sufficient. If the data are available (2) it is usually not in according to the standard of econometric analysis and has a lot of inconsistencies. The CGE model is able to overcome these problems that occur from the availability and consistency as the data for the CGE models do not require long time series data. Therefore, the problems associated with the availability of time series data can be avoided.

The CGE model is a derivative or an expansion of the input-output model developed by Wassily Leontief. It is usually resolved at the aggregate level by using the principles of input-output method, where the production inputs used in production must equal the amount produced. Each factor of the economy should be considered, and therefore the CGE model can be used as a tool to evaluate the effects of a policy on the economy as a whole.

Viewed from the side of the structure, the CGE model consists of equations that represent a detailed economic system. This model consists of economic agents (households, industry and government) that have an inventory balance revenues and expenditures of each agency. In addition, each agent is assumed to behave rationally and to maximize utility or profit. This model must also consider the assumption of economic structure (for example, perfect competition or entirely under government control), and with the constraints that exist, the CGE model will be optimized to achieve equilibrium. Theoretically, the CGE model refers to the Walrasian General Equilibrium Theory, which means all kinds of markets, including markets that are not taken into account (ignored) must be in equilibrium (Varian, 1992).

However, a CGE model also has several disadvantages. According to Devarajan, et al. (1994), there are some weaknesses of the CGE model, among others: (1) the CGE model is too complicated. Usually the CGE model built to describe the functional form of the market economy with many sectors; therefore, it requires a lot of arguments to suggest how a policy works in the real economy, (2) there are too many assumptions. The CGE model can run for both premises required a lot of assumptions that sometimes occur diminishing model because sometimes there are some assumptions that are less realistic, (3) the GCE model requires a lot of data. Because the model is used to analyze specific policy or mechanism, it is necessary to build a collective and complex, (4) The CGE model is used as an approach only, while results are not much use if the parameters are not estimated econonometrically. The CGE model should use empirical estimates for key parameters, but due to data limitation often this is not done and the parameter values are adopted from the findings of others or other comparable countries, (5) the model does not generate new theory, but only stating what is already known, (6) the CGE model is considered as a *black box* for those who do not understood in depth, and (7) the lack data for a fairly long period of time (Robinson, 1991).

3.13.1 The CGE Model that is Based on a Solution Method

Based on the finishing method, the CGE model can be divided into two parts, the top-down and bottom-up solutions. The top-down method, an optimization is done at the national level by first performed the aggregation of all regional and sub-regional data. The aggregate results of the optimization that is performed, such as output or final demand, is then is disaggregated back to each region by using the divider parameters that are consistent with the source of data that are used to construct the model. This approach is known as regional variation approach in terms of quantity, but not in terms of price. In other words, the price will be similar for all regions.

This approach employs the optimization and shock at the national level (one region) and is unable to perform inter-region analysis. This is the main weakness of the top-down approach. However, this approach is relatively easier in data collection and computation. Thus, this approach allows a researcher to concentrate on each and average sector and applied to the CGE model.

In contrast, a bottom-up method treats each region and sub-region as an independent economic entity and they are inter-related. Then, every region is aggregated to form national economy level as an economic-wide system. The optimization is performed at the level of regions or sub-region (sub-CGE). The result of optimization of each sub-CGE is then combined to obtain the aggregate results. Thus, price and quantity of output can be different for each region.

The advantage of this method is its ability to conduct and analyze the shock that occurred in a region. While weaknesses of the bottom-up approach are the lack of data and the calculations are more complicated than those of the top-down approach. Therefore, the CGE model with bottom-up method solution, a detailed specification for each sector or region is often not the main focus in order to avoid an overly complex system of calculation and need a big data set.

3.13.2 Types of CGE model

Based on the input data and its usefulness, CGE models can be grouped into several classifications as below:

The model of International Trade

(1) Global Trade Analysis Project (GTAP)

This model was first developed by Dr. Tom Hertel in the mid-1980s. Until now it is still being used by the Department of Agriculture Economics, Purdue University. The GTAP model is an example of multi-regional and multi-sectoral models. This model is a CGE model with perfect competition and constant returns to scale. Bilateral trade is done by using the Armington assumption. The GTAP model also provides an opportunity for users to choose different types of closures, including unemployment rates, tax revenues, trade equilibrium and the equilibrium partial closures.

(2) LINKAGE

The linkage model is a global model of dynamic Computable General Equilibrium used by the World Bank to support the global trade policy analysis. This model is a global model, multi-regional, multi-sectoral and is also an applied general equilibrium model. This model applies a neo-classical model for the entire production input markets, commodities and services.

The LINKAGE model uses a nested Armington model and the transformation of production structures to determine the flow of bilateral trade. This model tries to capture the behavior of international trade and transportation costs which occur either directly or indirectly by using the approach of iceberg trade costs.

The final version of the model has been implemented the linkage of tariff rate quotas (TRQs). With a more recursive framework, this model is used for a more dynamic analysis, especially to analyze the relationship between saving-investment and productivity. This model also adopts the adjustment cost of capital on capital markets and the productivity of each regional or sectoral.

The CGE model of National Standards

(1) Models Based on Input – Output

ORANI

The ORANI is a general equilibrium model that is widely used in different countries. This model has been used in Australian for nearly two decades to analyze the policy of the country. This model has a generic version (ORANI-G) that is intended for teaching purposes and is a basic model to develop new models and more complex, as needed. Countries that adopt the ORANI model, among others are China, Thailand, South Africa, Korea, Pakistan, Brazil, the Philippines, Japan, Ireland, Vietnam, Indonesia, Venezuela, Taiwan and Denmark.

The ORANI Model is used to disaggregate the Australian economy. Thus, it is used to analyze a firm in producing various kinds of products (multiproduct industries) and also a product of various types of firms (multi-industries products). In addition, this model is also able to estimate the elasticity of substitution between domestic spending with imported commodities.

WAYANG

The WAYANG CGE model is a model for Indonesia that was built by Glyn Wittwer and colleagues from the Centre for International Economic Studies. This model has the same basic model ORANI-G. The most significant difference in this Wayang model is the inclusion of agricultural technology innovation. The WAYANG model can be regarded as the standard model of the CGE model which uses a top-down method of settlement with regional expansion and using household data. This model is used by the Australian Centre of International Agricultural Research (ACIAR) to explore the implications of the economic crisis and the various policies that are used to cure the economic crisis, on food and agriculture sector in Indonesia (Wittwer, 1999).

(2) Models Based on SAM

Indonesian IFPRI (International Food Policy Research Institute)

The Indonesian IFPRI is Indonesian version of the CGE model that is static, small and open economy. This CGE model focuses on the agricultural sector which can be used to analyze the impact of technological change in agriculture, changes in market structure for agricultural products and the exchange rate on the allocation of resources, agricultural production and trade in Indonesia.

The structure of this model was built with more focus on agriculture and behavioral pricing for agricultural commodities is carried out by the National Logistics Agency (BULOG), Indonesia. This model was used to observe the impact on the economy arising from changes in rice prices and local currency exchange rates. Based on the assumptions about the performance and operational BULOG. The data used in this model is data SAM 1990, which later was amended by using the level of indirect taxes and tariffs for the year 1995 (Robinson et al, 1998).

Regional CGE Model

The Regional CGE model is used to analyze the impact of a policy, technological change and other external factors in a particular region. In this model, the economy of a region is regarded as an independent economic entity in which the flow of commodities and services trade between the regions is considered as part of a trans-regional exports and imports. For example, a regional CGE model of Jakarta, Jakarta treats the economy as a separate entity and the trading of commodities such as rice from outside Jakarta are treated as imported commodity. Instead of commodities from Jakarta who were sent to outside Jakarta is considered as an export commodity.

Interregional CGE Model

(1) Interregional CGE model (Method of Settlement Top-down)

Inter-regional CGE model using top-down method of solution is a model that dispute shall be settled at the national level, which means the optimization is carried out at the national level. The national results obtained will be distributed within each region using the parameters of a predetermined divisor. Therefore, in this CGE model, the impact of price and supply-side shock from a particular region cannot be measured. On the other hand, using this model, the need for data becomes easier, because the inter-regional trade flows are not needed. The examples of this model are INDORANI and WAYANG.

(2) Interregional CGE model (Bottom-up Method of Settlement and IRSAM)

The inter-regional CGE model with bottom-up method of solution can be categorized into two forms, depending on the construction databases used. The first is inter-regional CGE model using the Inter-regional Input-Output (IRIO) database and the second is the inter-regional CGE model that uses a database of the Inter-regional Social Accounting Matrix (IRSAM) Table. The IRSA-INDONESIA5 is a model that uses IRSAM database for inter-regional CGE model. This model was built and developed in collaboration between three institutions, namely, Australian National University, Padjadjaran University and the University of Indonesia. In this model, Indonesia is divided into five regions, namely, Sumatra, Java-Bali, Kalimantan, Sulawesi and eastern Indonesia. Within each region, economy sector is divided into 35 classifications.

3.14 Production and Utility Functions

In the CGE models, there are various functional form, namely the function of the CES, Leontief, Cobb-Dougglas, Nested and Translog. Although each of this function has its own characteristics, therefore is interrelated.

3.14.1 Constant Elasticity of Substitution (CES)

The CES function was first introduced by Arrow, Minhas, Chenery and Solow in 1961. This function is a function used most in CGE models, both as a production function, as well as a utility function. As the name implies, this function indicates a substitution relationship between productive inputs used in the production process or the relationship between commodities substitution in consumption with elasticities that are held constant. Because this function is more general in nature, then this function often serves as aggeregator function with constant elasticity of substitution.

For CGE models that use the Open-Economy, the function of the CES aggregator, also known as Argminton Aggregator. If the function is used as a CES production function, then its functional form is:

$$q_i = A\left(\sum_j \alpha_{ij} x_{ij}^{-\rho}\right)^{-\frac{\gamma}{\rho}} \quad \text{where } i=1,2,...,I, \text{ and } j=1,2,...J \qquad (3.50)$$

where:

A is Technology
q_i is output of industry i,
x_{ij} is input j from industry i,
α_{ij} is proportion of input j in industry i,
$\sum_j \alpha_{ij} = 1$,
ρ is substitution parameters that determine the value of the elasticity of substitution,
γ is constant.

The elasticity of substitution is calculated by the following formula.

$$\sigma = \frac{\rho}{\rho - 1} \qquad (3.51)$$

The CES production function shows that the more production inputs are used, the total production will increase more. In other words, the value of each additional input is positive. If the CES function is used as a utility function, then its functional form will be as in equation (3.52).

$$U_h = A\left(\sum_j \alpha_{hj}^{\rho}\right)^{\frac{\gamma}{\rho}} \text{ where } h=1,2,...I, \text{ and } j=1,2,..J \tag{3.52}$$

Where:

U_h is utility of household h

x_{hj} is consumption of commodity j by household h, and

α_{hj} is proportion of commodity j consumed by household h

γ is a value that describes the concept of return to utility, equivalent to the concept of returns to scale, but γ no specific value and should be valued at 1. Just as in the production function, the CES utility function also illustrates the increase in utility for each additional quantity of goods consumed. This function describes the relationship of constant elasticity of each input or production of goods consumed.

Based on the value of ρ of the CES function, this function is a generalization or a parent function of other functions. This is a characteristic that distinguishes the CES function from other functions.

If the CES function has the value of $\rho = 1$, then the CES function will be turned into an ordinary linear function.

$$q_i = A\left(\sum_j \alpha_{ij} x_{ij}^{-\rho}\right)^{\frac{1}{\rho}} = A\sum_j \alpha_{ij} x_{ij} \text{ When } \rho = 1 \tag{3.53}$$

In this case each input factor in the production function or goods consumed in the utility function has the perfect substitution relationship. In other words, this function has an elasticity of substitution (σ) equal to infinity.

If the CES function has a value of $\rho \rightarrow 0$, then the CES function will be turned into a Cobb-Douglas function. This transformation is shown below.

$$q_i = A\left(\sum_j \alpha_{ij} x_{ij}^{-\rho}\right)^{-\frac{1}{\rho}} \qquad (3.54)$$

If this function is transformed into a logarithmic form, we will obtain the following equation.

$$\ln\frac{q_i}{A} = -\frac{\ln\left(\sum_j \alpha_{ij} x_{ij}^{-\rho}\right)}{\rho} \qquad (3.55)$$

By using L'Hopital rule:

$$\lim_{x \longrightarrow a} \frac{m(x)}{n(x)} = \lim_{x \longrightarrow a} \frac{m'(x)}{n'(x)}$$

Then equation (3.55) can be transformed into:

$$n'(x) = 1 \quad ; \quad m'(x) = \frac{-1}{\left(\sum_j \alpha_{ij} x_{ij}^{-\rho}\right)} \frac{-1\sum_j \alpha_{ij} x_{ij}^{-\rho}}{\ln\left(\sum_j \alpha_{ij} x_{ij}^{-\rho}\right)} = \ln\left(\sum_j \alpha_{ij} x_{ij}^{\rho}\right)$$

So that:

$$\lim_{\rho \longrightarrow 0} \ln\frac{q_i}{A} = \lim_{\rho \longrightarrow 0} \frac{\ln\left(\sum_j \alpha_{ij} x_{ij}^{\rho}\right)}{1} = \ln\left(\sum_j \alpha_{ij} x_{ij}^{\rho}\right) \qquad (3.56)$$

$$= \prod_j \alpha_{ij} x_{ij}^{\rho}$$

Which is a Cobb-Douglas production function.

If the CES function has the value of $\rho \rightarrow -\infty$, the CES function will be turned into a Leontief function. Below is proof of this statement.

Suppose: $x_k \le x_{-k}$, will be proved that $x_k = q_i A\left(\sum_j \alpha_j x_j^{-\rho}\right)^{\frac{-1}{\rho}}$. Because the value $\rho < 0$ dan $x_j \geq 0$, we will get that $x_k \le x_k + x_{-k} = x_j$ so that:

$$\alpha_k^{\frac{-1}{\rho}} X_k \geq \left(\sum_j \alpha_j x_j^{-\rho} \right)^{-\frac{1}{\rho}} \tag{3.57}$$

Because $x_k \leq x_{-k}$ (x_{-k} means that all x other than x_k), then,

$$\sum_j \alpha_j x_j^{-\rho} \leq \alpha_k x_k^{-\rho} + \alpha_{-k} x_k^{-\rho} = x_k^{-\rho} \sum_j \alpha_j \tag{3.58}$$

or

$$\left(\sum_j \alpha_j x_j^{-\rho} \right)^{-\frac{1}{\rho}} \geq \left(x_k^{-\rho} \sum_j \alpha_j \right)^{\frac{-1}{\rho}} \tag{3.59}$$

From equations (3.57), (3.58) and (3.59) obtained:

$$\alpha_k^{-\frac{1}{\rho}} x_k \geq \left(\sum_j \alpha_j x_j^{-\rho} \right)^{-\frac{1}{\rho}} \geq \left(x_k^{-\rho} \sum_j \alpha_j \right)^{\frac{-1}{\rho}} \tag{3.60}$$

so that:

$$\lim_{\rho \to \infty} \left(\sum_j \alpha_j x_j^{-\rho} \right)^{-\frac{1}{\rho}} = \lim_{\rho \to \infty} \left(x_k^{-\rho} \sum_j \alpha_j \right)^{-\frac{1}{\rho}} = \lim_{\rho \to \infty} \left(\alpha_k^{-\frac{1}{\rho}} x_k \right) = x_k \tag{3.61}$$

Cost minimization can be done with the Lagrange method to obtain the optimal demand function of the x_{ij}.

$$\min c_i(x_{ij}) \text{ s.t. } q_i = A\left(\sum_j \alpha_{ij} x_{ij}^{-\rho} \right)^{-\frac{1}{\rho}} \text{ with } i=1,2,...I \text{ and } j=1,2,..J \tag{3.62}$$

First Order Condition (FOC):

$$L = \sum_j x_j w_j + \lambda \left[q - A\left(\sum_j \alpha_j x_j^{-\rho} \right)^{-\frac{1}{\rho}} \right]$$

$$\frac{\partial L}{\partial x_k} = w_k - \lambda \frac{A}{\rho}\left(\sum_j \alpha_j x_j^{-\rho}\right)^{-\frac{1}{\rho}-1} \rho\alpha_k x_k^{-\rho-1} = 0 \qquad (3.63)$$

$$\frac{\partial L}{\partial x_j} = w_j - \lambda \frac{A}{\rho}\left(\sum_j \alpha_j x_j^{-\rho}\right)^{-\frac{1}{\rho}-1} \rho\alpha_j x_j^{-\rho-1} = 0 \qquad (3.64)$$

From equations (3.63) and (3.64) obtained:

$$\frac{w_k}{w_j} = \frac{\alpha_k}{\alpha_j}\left(\frac{x_k}{x_j}\right)^{-\rho-1} = \frac{\alpha_k}{\alpha_j}\left(\frac{x_j}{x_k}\right)^{1+\rho}$$

$$x_j = \left(\frac{\alpha_k w_j}{\alpha_j w_k}\right)^{-\frac{1}{\rho+1}} .x_k \qquad (3.65)$$

By Substituting equation (3.65) into the production function will be obtained:

$$q = A\left\{\sum_j \alpha_j\left[\left(\frac{\alpha_k w_j}{\alpha_j w_k}\right)^{\frac{1}{\rho+1}} x_k\right]^{-\rho}\right\}^{-\frac{1}{\rho}}$$

$$= Ax_k\left[\sum_j \alpha_j\left(\frac{\alpha_k w_j}{\alpha_j w_k}\right)^{\frac{\rho}{\rho+1}}\right]^{-\frac{1}{\rho}} \qquad (3.66)$$

Equation (3.66) can be rearranged to determine the optimal amount of demand for input in the production of *k*, as follows:

$$x_k = \frac{q}{A}\left[\sum_j \alpha_j\left(\frac{\alpha_k w_j}{\alpha_j w_k}\right)^{\frac{\rho}{\rho+1}}\right]^{-\frac{1}{\rho}} \quad \text{or}$$

$$x_k = Z\alpha_k^{\frac{1}{\rho+1}}\left[\frac{w_k}{w_{ave}}\right]^{-\frac{1}{\rho+1}} \qquad (3.67)$$

Where: $Z = \frac{q}{A}$ and $w_{ave} = \left[\sum_j \alpha_j^{\frac{1}{\rho+1}} w_j^{\frac{\rho}{\upsilon+1}}\right]^{\frac{\rho+1}{\rho}}$

Equation (3.67) shows that the demand for input k will increase when: (1) the amount of output produced increases, and/or (2) relative prices of these inputs towards the average price of all inputs decreased.

3.14.2 Leontief

This function was first introduced by the United States-Russian economist, Wassily Leontief, who used the Input-Output analysis, where the technology or the input of the production process has a fixed proportion.

$$q_i = \min\left(\frac{x_{ij}}{\alpha_{ij}}\right) with, i = 1,2,...I, and, j = 1,2,...J \qquad (3.68)$$

Where:

q_i is industry output i,
x_{ij} is input j in industry i
α_{ij} is proportion of input j in industry i.

In the Leontief production function, technology or inputs has a fixed proportion. This means that the magnitude of the production would depend on the constant proportion of input usage. Therefore, the total production is based on the least amount of inputs used. In other words, if all production inputs, except for k inputs, valued at one ($x_{j-k} = 1$), the production of the industry will be strongly influenced by the value of x_k. If $x_k \leq x_{j-k}$ then $q_i = x_k$ and if $x_k \geq x_{j-k}$, then $q_i = x_{j-k}$. If this definition is transformed into a diagram, then we will get what is known as the perfect complementary diagram.

To obtain the optimal value of x_{ij}, it can be done by minimizing the cost of production:

$$\min c_i(x_{ij}) s.t. q_i = \min\left(\frac{x_{ij}}{\alpha_{ij}}\right) \tag{3.69}$$

Because of the argument in equation (3.69) is that the input with the smallest value, then the optimization process in this case can be made without using the Lagrange method. Input demand functions of these factors are the proportion of production inputs *j* to total output, so that:

$$x_{ij} = \alpha_{ij} q_i \tag{3.70}$$

Equation (3.65) shows that the demand for input *j* will only increase if the demand for other inputs increases too in determining the total production also increased by a fixed proportion.

3.14.3 Cobb-Douglas

The Cobb-Douglas function is the most frequently used functions, as well as production function or as a utility function. The Cobb-Douglas functional form that represented a production function is formulated as follows:

$$q_i = A_i \prod_i x_{ij}^{\alpha_{ij}} \tag{3.71}$$

The form of Cobb-Douglas function to represent a utility function is obtained by replacing *q* with *U*, in order to obtain the following equation:

$$U_h(x_{hj}) = A_h \prod_i x_{hj}^{\alpha_{hj}} \tag{3.72}$$

α_{ij} is the notation for the marginal productivity or marginal utility of each type of inputs or consumer goods. Specifically for the combination of the input $\sum_i \alpha_{ij}$ have three possibilities:

1) $\sum_i \alpha_{ij} = 1$, this condition is known as constant returns to scale, i.e. the situation whereby for every increase in one unit of input will increase output by one unit.
2) $\sum_i \alpha_{ij} \prec 1$, this condition is known as decreasing returns to scale, where the situations are described for each additional one unit of input will increase the total output of less than one unit.
3) $\sum_i \alpha_{ij} \succ 1$, this situation is known as the increasing returns to scale, i.e. the situations where increasing one unit of input will increase output of more than one unit.

As already explained in the CES function, a CGE model that assumes a constant returns to scale, that is, a CGE model that uses a Cobb-Douglas production function, it can be ascertained that any number of inputs used in the model are $\sum_i \alpha_{ij} = 1$. In regards to a utility functions, if the total exponent of the Cobb-Douglas function is equal to one, then the same interpretation is applied. This applies to the proportion of the increase in utility.

Please note on the elasticity of the substitution of a Cobb-Douglas function. In the CES function, substitution among production inputs and consumption goods for the utility function, has a constant elasticity substitution but it is not equal to one ($\sigma \neq 1$). If the elasticity of substitution of the CES function is equal to one then the CES function will be a Cobb-Douglas function. Noteworthy here is the difference between the concept of elasticity of substitution (□) with the proportion of inputs or consumer goods (□) with the proportion of inputs or consumer goods, and the substitution parameter (□) that has no equivalence in the Cobb-Douglas and Leontief functions.

If the elasticity of substitution of the Cobb-Douglas function is $\sigma = 1$, it does not mean that $\sum_i \alpha_{ij} = 1$. Although $\sum_i \alpha_{ij} \prec 1$ or $\sum_i \alpha_{ij} \succ 1$, the Cobb-Douglas function still has the elasticity of substitution equal to one. If the elasticity of substitution has a value other than one but it is constant, it is certain that this function is a CES function.

To maximize the utility function with a Cobb-Douglas expenditure function as a constraint function can be performed with the method of Lagrange. Constraint function of the households in this case has a structural form similar to the cost function of the industry.

$$\max U_h(x_{hj}) \text{ subject to } M = \sum_j p_j x_j \tag{3.73}$$

With $U_h(x_{hj}) = A_h \prod_j x_{hj}^{\alpha_{hj}}$ where M is the wealth owned by households and $\sum_j \alpha_{hj} = 1$. Lagrangian form of equation (3.72) along with its first order condition is shown as follows.

$$L = \left(A \prod_j x_j^{\alpha_j} \right) + \lambda \left(M - \sum_j p_j x_j \right)$$

$$\frac{\partial L}{\partial x_k} = \alpha_k A x_k^{\alpha_k - 1} \prod_{j-k} x_{j-k}^{\alpha_{j-k}} - \lambda p_k = 0 \tag{3.74}$$

$$\frac{\partial L}{\partial x_n} = \alpha_n A x_n^{\alpha_n - 1} \prod_{j-n} x_{j-n}^{\alpha_{j-n}} - \lambda p_n = 0 \tag{3.75}$$

From equations (3.74) and (3.75) is obtained:

$$\frac{p_k}{p_n} = \frac{\alpha_k x_n}{\alpha_n x_k} \text{ or}$$

$$p_k x_k = \frac{\alpha_k}{\alpha_n} p_n x_n \tag{3.76}$$

Generalizing equation (3.76) to obtain equation (3.77):

$$p_k x_k = \alpha_k \frac{p_{j-k} x_{j-k}}{\sum_{j-k} \alpha_{j-k}}, \text{ where } j\text{-}k=1,2,\ldots k\text{-}1,k+1 \tag{3.77}$$

Substituting equation (3.77) to the expenditure function will be obtained following demand function.

$$M = \sum_{j-k} p_{j-k} x_{j-k} + p_k x_k = \sum_{j-k} p_{j-k} x_{j-k} + \alpha_k \sum_{j-k} \frac{p_{j-k} x_{j-k}}{\alpha_{j-k}}$$

$$M = \left(1 + \frac{\alpha_k}{\sum_{j-k} \alpha_{j-k}}\right) \sum_{j-k} p_{j-k} x_{j-k} = \left(\frac{\sum_{j-k} \alpha_{j-k} + \alpha_k}{\sum_{j-k} \alpha_{j-k}}\right) \sum_{j-k} p_{j-k} x_{j-k}$$

$$\frac{\sum_{j-k} \alpha_{j-k} M}{\sum_{j-k} p_{j-k}} = x_{j-k} \tag{3.78}$$

The above demand function applies to all types of consumer goods, and then equation (3.78) can be written as:

$$x_j = \frac{\alpha_j M}{p_j} \tag{3.79}$$

Equation (3.79) shows that the demand for a good *k* increases if its price decreases and/or the income level of household increases.

3.14.4 Transcendental Logarithmic

Transcendental logarithmic function (abbreviated translog), is one of the functions in the group non-algebraic functions, i.e. functions that are expressed in the form of exponential, logarithmic, or trigonometric. Mathematical equation of the translog function is written as follows.

$$\ln q = \alpha_0 + \sum_j \alpha_j \ln x_j + \tfrac{1}{2} \sum_j \sum_k \beta_{jk} \ln x_j \ln x_k \tag{3.80}$$

Equation (3.80) is a translog production function. The utility function is obtained by changing *q* and replaces it with *U* and thus equation (3.80) gives a different interpretation for *x*. In production function the notation *x* is an input, but for utility function *x* is a notation for consumption goods. A constant is denoted by α_0 while α_j is the notation for the proportion of production inputs in the production function or the proportion of consumption goods for utility functions. The combined proportion of either the same or different types of inputs is denoted by β_{jk}. If it is a utility function, then it is a combined proportion of either the same or different types of consumer goods.

Similar to the Leontief and Cobb-Douglas functions, the Translog function is a special case of the CES function or a second order expansion of the CES function when $\rho \rightarrow 0$. Therefore, there are similarities between the translog function and the Cobb-Douglas function as both of them are a special case of the CES function when $\rho \rightarrow 0$.

3.14.5 Nested CES-Leontief

The Nested CES-Leontief function is a joint function between the CES function and the Leontief function. Since the merger of the two is using the Leontief function, the function is often used to represent the production process.

The Nested CES-Leontief Functions can be analogous to a two-stage optimization, in which the CES function is used in stage 1 that acts as a CES aggregator of all production inputs that are identical coming from various sources. While the Leontief function is used in stage 2 as a production function that is known to process intermediate or finished goods, where the inputs in the Leontief function is aggregated from various sources that occur in stage 2. In the form of diagrams, Nested CES-Leontief can be represented as shown IN Figure 3.15.

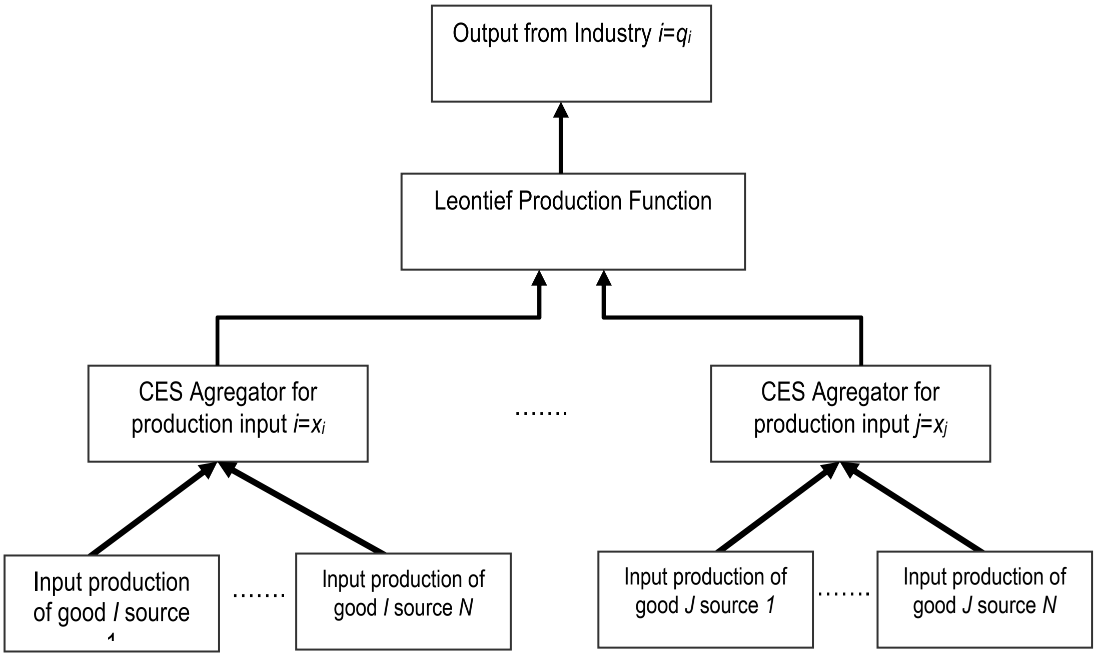
Mathematically, the Nested CES-Leontief function can be written as follows:

$$q_i = \min\left(\frac{x_{ij}}{\alpha_{ij}}\right) with, i = 1,2,...I, and, j = 1,2,...J \tag{3.81}$$

Where:

$$x_{ij}^* = A\left(\sum_s \alpha_{is} x_{is}^{-\rho}\right)^{\frac{\gamma}{\rho}}$$

Subscript s is a notation to distinguish the source of a production input.



Source: BKFDK-RI, 2008a

Figure 3.15 The Optimization Process of the Nested CES-Leontief Function

To minimize the CES-Leontief Nested function can be performed using a Leontief separable production function. With this Leontief function, the optimization can be done as in Figure 3.15 and the Leontief separable function is shown in equation (3.82).

$$q_i = \min\left\{\sum_j \frac{x_j^*}{\alpha_j}\right\}, \text{ where } x_j = A\left(\sum_s \alpha_s x_s^{-\rho}\right)^{\frac{-1}{\rho}}, s=1,2,...,S \tag{3.82}$$

Subscripts s represents the source of a production input. The j input demand function is the result of the optimization of the CES function. By using a separable Leontief production function it is possible to find the value of each input, x_j, separately. In addition, the value of x_j can also be searched in two ways namely, (1) by transforming of the cost minimization function using the CES function as a constrained function (optimization for first stage), and (2) by transforming of the cost minimization function using the Leontief function as a constrained function (optimization for second stage).

The optimization of first stage is optimization of the CES function, so the resolution steps as in the optimization function of CES in the previous section with the final result as follows.

$$x_j^* = Z\alpha_k^{\frac{1}{\rho+1}}\left[\frac{w_k}{w_{ave}}\right]^{-\frac{1}{\rho+1}} \tag{3.83}$$

where: $Z = \dfrac{q}{A}$ and $w_{ave} = \left[\sum_j \alpha_j^{\frac{1}{\rho+1}} w_j^{\frac{\rho}{\upsilon+1}}\right]^{\frac{\rho+1}{\rho}}$

The optimization of the second stage is an optimization of the Leontief function, so the same solution with the optimization step Leontief function at the previous portion.

$$\min\left\{\sum_j c_j(x_j)\right\} s.t. q_j = \min\left(\frac{x_j^*}{\alpha_j}\right)$$

$$x_j^* = q_j\alpha_j \tag{3.84}$$

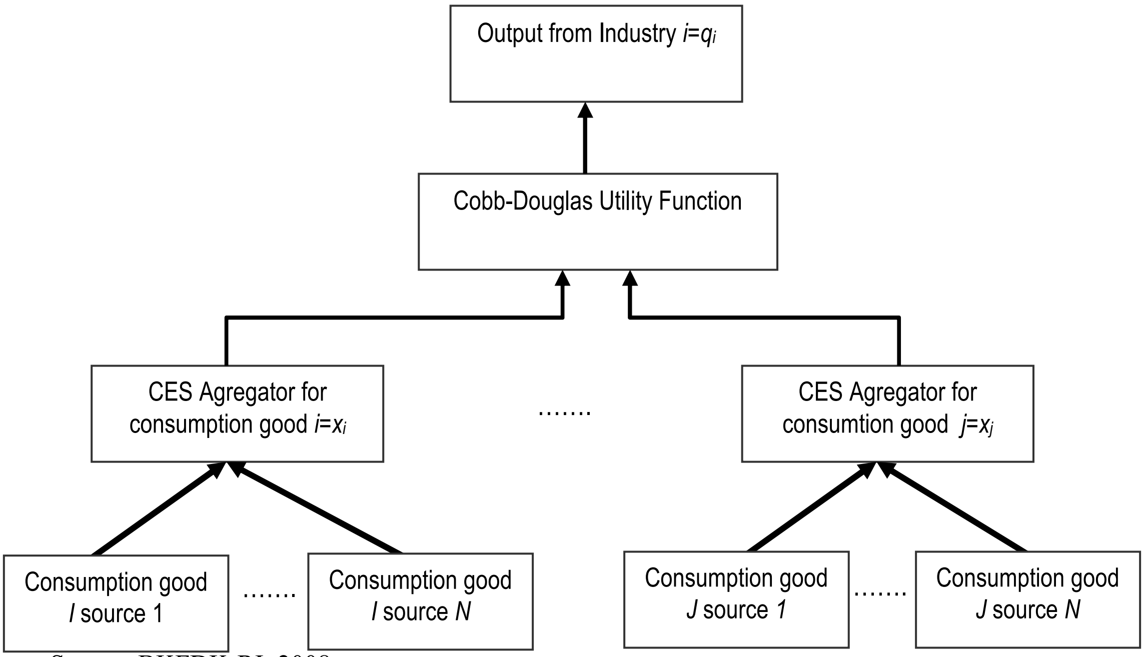
The results of the optimization of the demand function as in stage 1 should produce the same value of x_j with the results of optimization in stage 2 as such the equations in (3.83) and (3.84) are equal. Mathematically, it can be written as follows:

$$x_j^* = Z\alpha_k^{\frac{1}{\rho+1}}\left[\frac{w_k}{w_{ave}}\right]^{-\frac{1}{\rho+1}} = q_j^*\alpha_j \qquad (3.85)$$

If the condition of the equation (3.85) is not fulfilled, then the value of x_j is not an optimal value. In other words, there is an excess in demand for unused inputs. The second stage of the above optimization process, jointly determine the optimal value of the total amount of optimal production generated by the economy.

3.14.6 Nested CES-Cobb-Douglas

The Nested CES-Cobb-Douglas function is a joint function between the CES and Cobb-Douglas functions. In many CGE models this function is more often used to represent utility functions. Just as the Nested CES-Leontief function, the Nested CES-Cobb-Douglas function has two stages for optimization (decision making), where for the initial stage the optimization is done by using a CES function that acts as an aggregator function of the total consumption of identical goods that come from various sources. The Cobb-Douglas function is used in stage 2 as consumption function to determine the combination of goods that will be consumed, where the goods are the result of aggregation from various sources that occur in stage 1. In the form of diagram, the Nested CES-Cobb-Douglas is shown in Figure 3.16.



Source: BKFDK-RI, 2008a

Figure 3.16 The Optimization of the Nested CES-Cobb-Douglas Function

Mathematically the Nested CES-Cobb-Douglas function is presented in equation (3.86).

$$U_h(x_{hj}) = A_h \prod_i x_{hj}^{\alpha_{hj}} \tag{3.86}$$

Where:

$$x_{ij}^* = A\left(\sum_s \alpha_{hs} x_{hs}^{-\rho}\right)^{\frac{\gamma}{\rho}}$$

Subscript s denotes the source of an item of consumption.

Similarly, the optimization of the Nested CES-Leontief function, the optimization function of the Nested CES-Cobb-Douglas is also a combination between Cobb-Douglas function optimization and optimization of the CES function. Thus the optimization function of the Nested CES-Cobb-Douglas can be done in 2 stages. In stage 1, the optimization of the CES function is undertaken as mentioned in the optimization solution in the preceding CES function as shown in equation (3.82). While stage 2 optimization is the optimization of the Cobb-Douglas function and the solution is similar to equation (3.79).

If the condition in equation (3.79) is not met then the value of x_j is not the optimal value. In other words, there is an excess demand for unused inputs. The second stage of the above optimization process, jointly determine the optimal value of the total optimal amount of production generated by the economy.

3.15 Conclusion

Fiscal policy can be used as allocation, distribution and stabilization functions. The Keynesian views the fiscal policy to be most effective policy to overcome unemployment problem and to increase in output. During an economic crisis and depression, aggregate demand can be increased rapidly only through fiscal policy. Since the government has a role in the allocation, distribution and stabilization of the economy, then for the purpose such as reducing poverty level, increase output and consumption, and improve income distribution, the government needs to intervene in the form of a policy that is called a fiscal policy.

Another theory underlying this study is the general equilibrium theory or Computable General Equilibrium (CGE). This model refers to the Walras equilibrium theory in which each market has a link to other markets. As such a change in price in one market has a chain effect to other markets. The general equilibrium analysis explicitly takes into account the relationship among various markets in an economy. Price adjustments, demand, supply and the number of commodities traded on a market have an effect on other markets and ultimately can impact on poverty and income inequities.

According to various studies such as Berk *et al* (1997), Lewis (1991), De Melo (1998), Varian (1992), and Robinson (1991), the CGE model is a simultaneous equation system, linear and non-linear, that can be used to simulate an economy by looking at the adjustment of price and quantity in market equilibrium and to do a simulation based on an optimal behavior of the economic agents. As such, the CGE is useable tool to analyze a government policy towards an economy a whole.

CHAPTER FOUR
METHODOLOGY AND DESCRIPTION OF DATA

4.1 Introduction

This chapter consists of nine sections. The next section describes research design for this study. Section 3 explains the data and their sources. The model of the analysis is explained in section 4. In this section, the structure of the models such as production, demand, closure, and institutions are described in detail. This is followed by section 5 that described the equations in the general equilibrium. These equations are domestic-import sourcing, purchaser's price, demand for commodities, production sector, market clearing, and institutions. In section 6, income distribution and poverty analysis are discussed in depth. Section 7 explains the elasticity and parameter. Section 8 described the aggregation and disaggregation of data related to institution and household and the production sector. Section 9 describes on how the simulations of the government policies will be undertaken in this study. The last section is concludes.

4.2 Research Design

This study employs a variation of a Computable General Equilibrium known as AGEFIS^{+}. Basically, this model is an adaptation of a CGE AGEFIS (Applied General Equilibrium for Fiscal Policy) Model developed by the Bureau of the

Fiscal Policy, Finance Department, Republic of Indonesia (Badan Kebijakan Fiskal Departemen Keuangan Republik Indonesia, BKFDK-RI) in collaboration with the Center for Economics and Development Studies (CEDs), Padjadjaran University, Bandung (BKFDK-RI, 2008). The steps taken in this research are shown by the operational design layout as presented in Figure 4.1.

The *first* step is to determine the sectors that are being used in the 2005 Indonesian SAM Table. This table has 107 x 107 sectors as shown in Appendix 1. The SAM table consists of endogenous and exogenous balanced blocks. The endogenous balance sheet has three main blocks, namely (1) production factors (17 sectors), (2) institutions (10 sectors), and production (24 sectors). Trade and transport margins are also included in these exogenous blocks.

The factors of production balance sheet consist of labor force and non-labor force (i.e. capital). The labor force balance sheet is further divided based on types of occupation and localities, either urban or rural. As such, labor force is classified into 16 sectors.

Institution balance sheet is for the economic agents such as household, firm, and government. The household balance sheet can be further divided into 10 sectors based on localities (urban and rural) and types of occupation (agriculture and non-agriculture). As such, the total institution balance sheet consists of 12 sectors.

The exogenous block can be classified into (1) domestic commodity balance sheet, (2) imported commodity balance sheet, (3) capital account, (4) indirect taxes, (5) subsidy, and (6) foreign institutions.

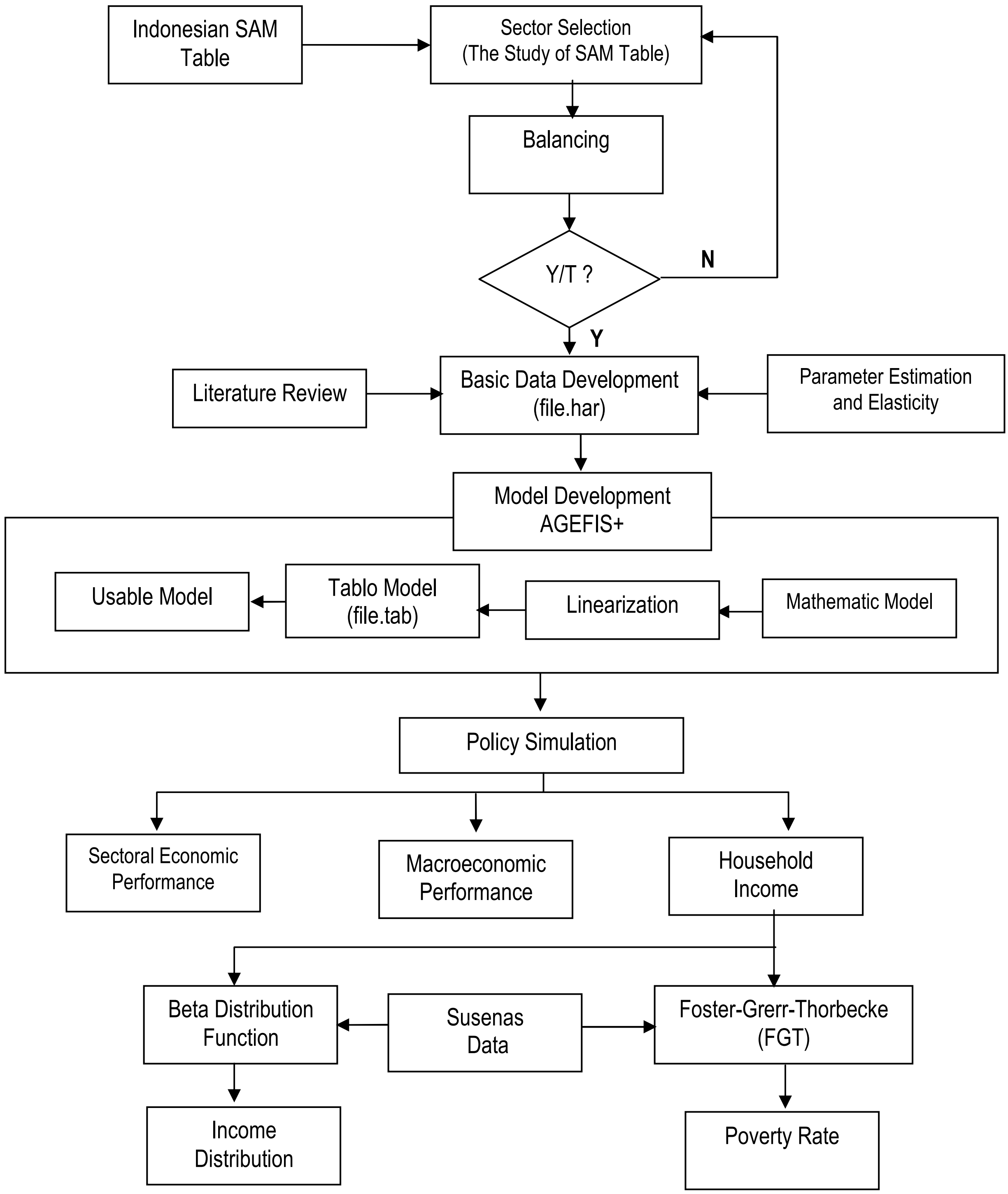


Figure 4.1 Research Design

This current study uses the 2005 Indonesian SAM Table as a guideline, with some modifications – aggregation and disaggregation – as explained below:

(1) The labor force balance sheet is aggregated into one from the 16 original sectors. Consequently, the production sectors become two sectors only, that is (a) labor force, and (b) capital.

(2) The household is aggregated into four sectors, based on localities (urban and rural) and income levels (poor and non-poor). The aggregation of the household is done by comparing the data from the 2005 Indonesian SAM Table with the data from the I-O table and SUSENAS. After the aggregation, the households are classified into four sectors: (a) urban non-poor household (HUNPOOR), (b) urban poor household (HUPOOR), (c) rural non-poor household (HRNPOOR), and (d) rural poor household (HRPOOR).

(3) This study disaggregates the production sectors from 24 to 27. The disaggregated sectors are (a) coal and metal ore mining and petroleum are disaggregated into (i) quarrying sector (mining of coal and ore), and (ii) petroleum sector (BBM), (b) air and water transportation and communication sector is disaggregated into three sectors (i) air transportation sector, (ii) water transportation sector, and (iii) communication sector.

(4) Imported commodity columns are aggregated into one by summing up all the figures in all columns to get foreign sector balance sheet column.

(5) Imported commodity rows are aggregated to get the total imported commodities, and then this figure is transferred to the row of the foreign sector balance sheet.

(6) Once the 4th and 5th steps are done, the row and column of the imported commodities are removed from the table.

(7) The next step is to remove the value in the entry of the diagonal matrix for the row of the production sector and the column of the imported commodity.

(8) Sum up all the entries in the domestic commodity column to the column of the production sector.

(9) Sum up all the entries in the row of the domestic commodity to the row of the production sector.

(10) Delete the row and column of domestic commodity from the table.

(11) Sum up the entries in the row of the trade margin to the row of the trade sector in the production sector balance sheet. And, then delete the row and column of the trade margin.

(12) Sum up all the entries in the row of the transportation margin to the row of the land transportation, water transportation, and communication to the production sector balance sheet. The distribution is according to the proportion of the production in each column of the transportation margin to respective sectors. .

(13) Delete the column and row of the transportation margin from the table.

(14) Make sure the total columns and rows are equal for all sectors.

Once the number of rows and the number of columns are the same for all sectors, then the “new” SAM table is available for the analysis in this study. This new SAM table is named as the SAMX.xl or SAMX.xls as shown in Appendix 1.

The *second* step is to construct database from AGEFIS^{+} that will be used in the analysis. Using the *Gempack* software, the SAM file in the form of the Microsoft Excel is transformed into the database file with the ".har" extension. In this study this file is known as "indra.har." This database file has all the information and data of the new SAM table. These data are including the needed elasticities and parameters that are retrieved from the AGEFIS model.

The *third* step is to expand the model. This step is done by linearization of all mathematical equations and transforms them into percentage change or level accordingly. These equations are written in a "tablo file." If there is no error, then the expansion of the model is considered done.

The *forth* step is to do policy simulations according to each scenario. The simulation output reveals the impact of macro-economic and sectoral performance. Also, the output shows the impact on income and expenditure of each household group. The simulation results of the change in household income are then compared to the SUSENAS data to analyze (1) poverty level (poverty index) using FGT method, and (2) income distribution using beta distribution function using the DAD software. The DAD software was developed by MIMAP Program, International Development Research Center, Canada and the CREFA, University of Laval.

4.3 Data Types and Sources

The data used in this study are retrieved from the Social Accounting Matri*x* (SAM), SUSENAS, and the Bureau of Statistic (Badan Pusat Statistic, BPS).

Macroeconomic data and estimated sectoral parameters are retrieved from past studies. The complete data is figured at Table 4.1

Table 4.1 Types and Data Sources

No	Sources	Year	Types of Data
1	Indonesian Statistic Bureau	2005	Social Accounting Matrix
2	Indonesian Statistic Bureau	2005	National economic social survey- (SUSENAS) – Household expenditures data
3	Directorate General of Taxes of Republic Indonesia	2003	enterprises classification (KLU)
4	Ministry of Finance of Republic Indonesia	2006	Indonesia Economy Indicator
5	Fiscal Policy Board of Finance Department of Republic Indonesia (BKFDK-RI)	2008	Value of model parameter (from the AGEFIS Model)

4.4 Model Analysis

The CGE Model is employed to analyze the effect of fiscal policy on income distribution and poverty. Generally, to answer the objectives of this research, an adhoc method is used because of the output of an approach is used as an input to other approaches. The CGE Model that is employed in this study is developed from AGEFIS Model that is written using the GEMPACK software.

The Indonesian CGE Model that has been written using GEMPACK software usually uses data taken from I-O Table as a base data. This technique produces various models such as INDORANI, WAYANG, and INDOCEEM. However, this research uses the AGEFIS Model which is fully-SAM Based CGE Model.

There are several differences between the model that is developed in this study, i.e. AGEFIS^{+} and AGEFIS Model. These differences are (1) the AGEFIS has 23 commodity sectors and there is no fuel (BBM) sector, while AGEFIS$^+$ has 27 sectors, including BBM sector. As such the latter has a flexibility in doing simulation on sectoral basis, (2) the AGEFIS Model uses labor only as a factor of production, but the AGAFIS$^+$ uses both capital and labor as factors of production, (3) the AGEFIS Model uses aggregated household only as a group, but the AGEFIS$^+$ uses disaggregated the data on household into four groups based on urban-rural, and below-above poverty line (poor and non-poor).

This study employed a method known as beta density distribution function or beta distribution function to evaluate the disparity in income distribution. The beta density distribution function is adopted from the model developed by Decaluwe, et.al (1999). The Foster, Greer, and Thorbecke (FGT) method is used to evaluate poverty incidence among household groups in the general economic equilibrium. Following Cockburn (2001), this evaluation is done by comparing the poverty level between pre- and post-simulations.

4.4.1 Summary of the Structure of the Model

The theoretical structure of the AGAFIS$^+$ model follows that of AGEFIS Model that has been developed by the Board of the Fiscal Policy, Finance Department, Indonesia in collaboration with CEDS, Padjadjaran University, Bandung. This theoretical structure can be summarized as follows:

(1) The primary factors of production are capitalal and labor. The structure of production for the first 27th sectors of the economy uses the Nested Leontief

for intermediate inputs, but for the production function of the value added has the characteristics of the constant elasticity of substitution (CES).

(2) The optimal combination of the domestically produced and imported goods is done by an economic agent as per Armington's specification.

(3) Households are assumed to maximize their utility as per Cobb-Douglas Utility function.

(4) Households receive their income from their holding of factors of production, transfers of payment from the government, firms, and foreigners.

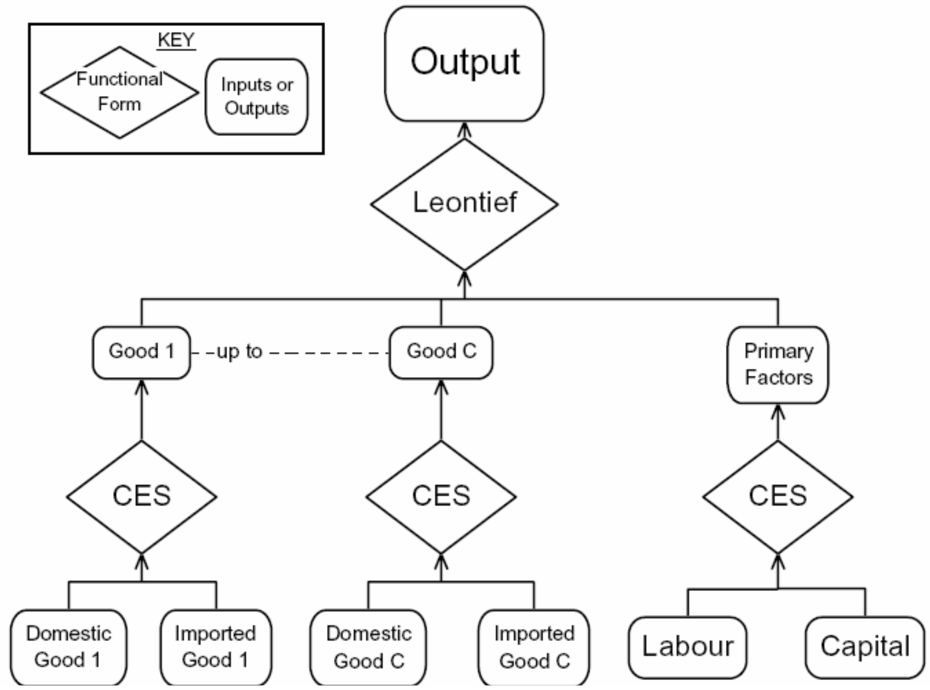
(5) The government gets its revenue from direct-tax, non-direct tax, ownership of factors of production, and transfers from institution domestically and internationally.

(6) The government expenditure consists of consumption, commodity subsidy, and transfer to other institution such as households.

(7) The closure of the model is flexible as follows: (a) the long term closure is at a full employment level of the factor of production, and the mobility of capital and labor among sectors, (b) the first closure in the short term is capital immobility, whereas aggregate employment is mobile so that unemployment probably exists. The second short term closure is capital is immobile among sectors, but labor is assumed at a full employment level.

4.4.2 The Model of Production Structure

The principal activity of a firm is to transform inputs in to output. Each producer, represented by an activity, is assumed to maximize profits. The profit maximization subject to production technology is shown in Figure 4.2.



Source: BKFDK-RI, 2008a

Figure 4.2 Structure of Production

For every sector of production, the relationship between inputs and output is explained by the CES-Leontief production function. The demand for factors of production is based on the following: (1) the demand for primary factor is for each industry *i*, (2) the price of composite primary factor, (3) industrial demand toward composite primary factor, and (4) the value of demand toward production factor.

As Figure 4.2 depicts, the production input in this model is divided into two namely (1) capital and labor which is primary composite of the production factor, and (2) intermediate inputs which is a composite of domestic and imported inputs.

At the first stage of Figure 4.2 the intermediate inputs and production factors are aggregated into a CES. Thus, the primary composite factors from each industry are a CES aggregate function that can be written as follows:

Primary factor composite = CES(Labor, Capital) (4.1)

The intermediate input (composite goods) is an aggregate function of CES, so that it can be written as follow:

Composite good (i) = CES [*domestic good (i), imported good (i)*] (4.2)

At the second stage, primary factors and composite goods are blended to produce an output using the Leontief (fixed proportions technology) function. Since this model assumes that an output is a function of primary factors composite and composite goods, then this function can be written as follows:

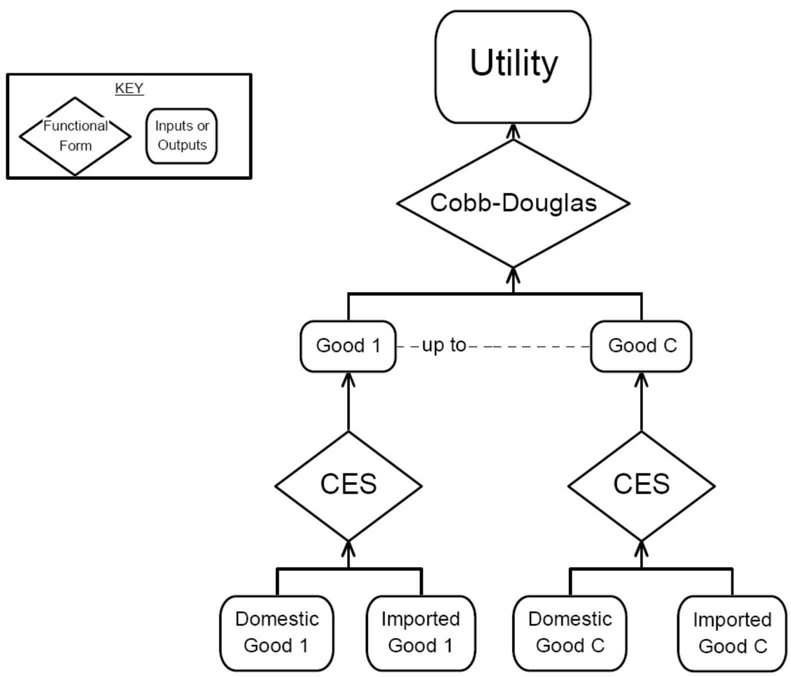
Output=f (input)=f (labor, capital, domestic goods, imported goods)
= f (primary factor composite, composite goods) (4.3)

The consequence of using the CES-Leontief function is that all inputs demand has a direct proportion to output.

In the AGEFIS Model, total production function in the economy is represented by a Leontief function. However, generally this function can be used to represent a utility function. The reason behind the employing of this function is to make the model manageable. The Leontief function is a representation of perfect complementary relationship which is common in the production of inputs compared to consumption goods.

4.4.3 The Structure of the Demand Model

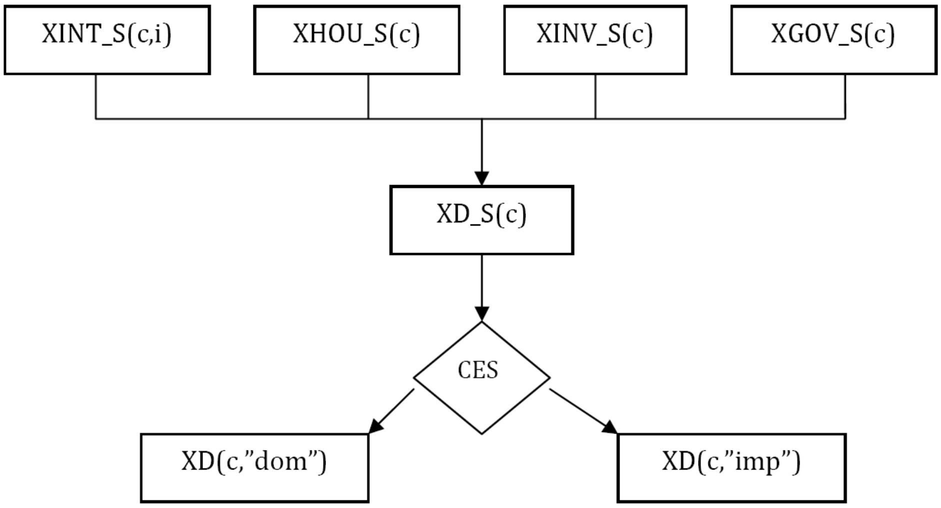
In this model, an institution is assumed to maximize its utility by looking at an optimal combination of good that can be utilized based on provided budget. The institution maximizes its utility by using an aggregate function of CES-Cobb-Douglas as shown in Figure 4.3. To maximize its utility, an institution faces two stages. The first stage (upper part), an institution has to decide the choice of composite goods using a Cobb-Douglas aggregator function. The second stage (lower part), an institution has to decide on the choice of composite goods consisted of domestically produced and imported goods.



Source: BKFDK-RI, 2008a
Figure 4.3 the Structure of Demand

There are three institutions in this model: (1) household, (2) firm, and (3) government. There are four types of demand for composite goods: (1) the demand for commodity for investment, (2) the demand for commodity by firms,

(3) the demand for commodity by households, and (4) the demand for commodity by the government. The structure of demand for these commodities is summarized in Figure 4.4.



Source: BKFDK-RI, 2008a

Figure 4.4 the Demand for Composite Goods

4.4.4 Closure

In the CGE Model, conventionally the number of equations must be equal to the number of exogenous variables. But, sometimes the number of variables is more than the number of equations. Thus, extra variables, i.e. the exogenous variables, are needed to cover this deficiency, which is called "closure".

There are two standard closure models used in this study: (1) the standard short run closure, and (2) the standard long run closure. The difference between the two is on the factor of market closure.

In the short run closure, capital has a special characteristic because it is immobile among the sectors. In other words, capital is a fixed input in each industry. This can be done by assigning the variable of the demand for capital (xfac("capital", IND)) in all industry as exogenous and coding the factor price distortion for capital (wdist["capital", IND]) is not represented in closure model. However, labor is represented in closure model as (wdist ["labor: IND]). The total number of aggregate workers for labor market varies. This can be done by making the variable total factor supply for labor (xfacsup["labor"]) as endogenous variable and the wage rate (pfac["labor"]) as an exogenous variable. In other words, it is assumed that there is nominal wage rigidity in the economy.

The long run closure is different from the short run closure. In the long run closure, the supply of the factor of production for all factors of production (capital and labor) is exogenous (full employment) and mobile among sectors. Thus, the factor price is the same for all sectors. This is done by making factor price distortion for all factors of production (wdist [f,i]) as exogenous while the variable for their price is exogenous (it is not in the closure or exogenous statement). In this closure, variables such as tariff, tax, various types of transfer and technology parameters are also exogenous in nature. The exchange rate variable remains as a numeraire.

4.4.5 Institution

In the CGE Model, institutions consist of households, firms, government, and the rest of the world. The household receives income from the owner of the factor of production, firms, foreigners (rest of the world), and from other households.

4.5 The Equations of the General Equilibrium Economics Model

This section describes in detail the structure and the equations of the CGE Model used in this study. Mathematically the CGE Model is a system of simultaneous equations in which part of it is written in non-linear equations.

Almost all of the structural equations in this model present the variables in the form of the "percentage change". To shows a percentage change, an equation is written in a lower case. The rest of the structural equations are in the form of "ordinary change" which is written as a pre-fix "del." The equations in the level form can be transformed into a percentage change by using total differential (refer to Appendix 4). Table 4.2 summarizes notation, parameters and selected variables to facilitate the interpretation.

The equations for this model are classified into seven broad groups, namely (BKFDK-RI,2008a):

(1) The domestic-import sourcing, i.e. an equation that is related to the composition of the demand according to the country of origin (domestically produced and imported goods) based on the Armington's characteristics.

(2) The purchase's price, i.e. an equation that link between producer's price and international price with the buyer's price.

(3) The demand for a commodity, i.e. an equation that is related to the demand for goods by various types of consumers.

(4) The production sector consists of equation related to the production of goods and services.

(5) The market clearing consists of an equation of the conditions of the market clearing in which the supply is equal to the demand for a commodity as well as the factor of production.

(6) The institution consists of an equation that relates income and the institutional budget of the households, firms, government and foreigners.

(7) The closure, i.e. to fill the gap between the number of equations and the number of exogenous variables.

Table 4.2 summarizes the notation used based on the seven groups of equations.

Table 4.2 the Notation Used in the Model

Notation	Meaning
Subscript *c*	Set statement for commodity (commodity)
Subscript *i*	Set statement for industry (industry)
Subscript *f*	Set statement for factors of production: capital and labor (factor)
Subscript *s*	Set statement for source of a commodity, i.e. a composite of commodity between domestic and foreign sources (source)
Variable: written using lower case letter	To denote that a variable is in the form of percentage change.
Variable: pre-fix **del**	To denote that a change or "delta", i.e. a variable in the form of an "ordinary change". For example, delTX means delta TX.
Coefficient: written using upper case letter	To show that a variable is in level.
Variable: pre-fix V	To denote a variable that shows a value (value).
Variable: pre-fix P	To denote a variable that shows a price (price).
Variable: pre-fix X	To show that a variable is in the form of quantity (quantity) or in real value.
_*c*	To denote as an aggregate or an average data from every commodity (over COM [commodities]).
_s	To denote as an aggregate or an average data from every source of goods (over SCR [dom+imp]).
_*i*	To denote as an aggregate or an average data from every industry (over IND [industries]).

4.5.1 Domestic-Import Sourcing

The structure of the demand for goods is presented in Figures 4.3 and 4.4. An economic agent (wholesaler) tries to maximize the composition of imported and domestically produced goods by minimizing transaction cost as shown in the CES aggregation function.

$$Minimize : \sum_{s} PQ(c,s).XD(c,s)$$

Subject to

$$XD\_S(c) = CES(XD(c,s)|\sigma(c)) = \left(\alpha(c,s)\sum_{s}\delta(c,s)^{-\rho(c)}\right)^{-\frac{1}{\rho(c)}} \quad (4.4)$$

First Order Condition (FOC) for this optimization is:

$$XD(c,s) = \alpha(c,s)^{-\frac{\rho}{1+\rho}}.XD\_S(c)\delta(c,s)^{-\frac{1}{\rho+1}}\left(\frac{PQ(c,s)}{PQ\_S(c)}\right)^{-\frac{1}{\rho(c)}} \quad (4.5)$$

Equation (4.5) is transformed into linear equation as shown in equation (4.6).

$$xd(c,s) = xd\_s(c) - \sigma(c)(p(c,s) - p\_s(c)) \quad (4.6)$$

Where: $\sigma(c) = \frac{1}{(1+\rho(c))}$ is Armington elasticity of substitution.

$PQ(c,s)$ is consumer price for commodity c by source s
$XD(c,s)$ is demand for commodity c, source s
$XD\_S(c)$ is demand for commodity composite
$\alpha(c,s)$ is scale economies
$\delta(c,s)$ is elasticity of substitution c,s

In the Tablo file, this equation is in the form of *eq_xd.*

The aggregate CES equation or constraint equation can be replaced by a zero profit equation as shown in equation (4.7).

$$PQ\_S(c)XD\_S(c) = \sum_{s} PQ(c,s)XD(c,s) \quad (4.7)$$

In a linear form it is written as:

$$VXD\_S(c)(pq\_s(c)+xd\_s(c))=\sum_{c} VXD(c,s)(pq(c,s)+xd(c,s)) \qquad (4.8)$$

Where: $VXD\_S(c)=PQ\_S(c)XD\_S(c)=$ which is the value of all commodities in a country including imports is equal to price multiplied by its quantity, and $VXD(c,s)=PQ(c,s)XD(c,s)=$ which is the value of demand by sources is equal to price times its quantity.

$PQ\_S(c)$ = consumer price of composite good c

This equation is *eq_pq_s* in the Tablo file.

4.5.2 Purchaser's Price

The purchaser's price equation is a link between producer's price for domestically produced goods and international price for imported good with consumer's price. The price paid by the consumer is a net price after tax or subsidy. Thus, the consumer's price can be written as follows:

$$PQ(c,"dom")=(1+TX(c)-SC(c)).PTOT(c) \qquad (4.9)$$

Where:

$PQ(c,"dom")$	is domestic price for each commodity c that is paid by the consumer.
$TX(c)$	is tax imposed for each commodity c.
$SC(c)$	is subsidy given for each commodity c.
$PTOT(c)$	is the price for each commodity c that is paid by the consumer.

In a linear form, this equation can be written as

$$pq(c,"dom") = ptot(c) + 100\frac{VTOT(c)}{VTOT(c)+VTX(c)-VSC(c)}(delTX(c) - del(SC(c)))$$

(4.10)

Where: $pq(c,"dom")$ is domestic price for each commodity c,
$ptot(c)$ is the total price for each commodity c,
$VTOT(c)$ is the value of each commodity c,
$VTX(c)$ is the tax revenue from each commodity c,
$VSC(c)$ is the value of subsidy for each commodity c,
$TX(c)$ is the tax rate imposed on each commodity c, and
$SC(c)$ is the subsidy rate for each commodity c.

In the Tablo file, this equation is in the form of *eq_pqdom* equation.

The price at the international market is connected to the price paid by the domestic consumer for every commodity (PQ [c,"dom"]) by the import price equation. Since import tariff for each imported commodity (*tm*) adds to the price that is paid by the domestic consumer based on the exchange rate (*EXR*) of the imported goods (*PFIMP*), then at the level, this equation becomes:

$$PQ(c,"imp") = EXR.(1+tm(c)).PFIMP(c) \quad (4.11)$$

Where: $PQ(c,"imp")$ is domestic price for each imported commodity,
EXR is the exchange rate,
$tm(c)$ is the import tariff for each commodity c, and
$PFIMP(c)$ is imported price for each commodity c.

In the Tablo file, this equation is termed as *eq_pqimp*, and in linear form shown as equation (4.12).

$$pq(c,"imp") = pfimp(c) + exr + 100\frac{VCIF(c)}{VCIF(c)+VTM(c)}delTM(c) \quad (4.12)$$

Where: $VCIF(c)$ is the value of the imported commodity before tariff,
$VTM(c)$ is the value of import tariff, and $delTM(c)$ is the change (delta) of the import tariff.

4.5.3 Demand for Commodities

The demand for each commodity is derived by cost minimization of the constraint Leontief production function.

$$\min : PPRIM(i).XPRIM(i) + \sum_{c} PQ\_S(c).XINT\_S(c,i) \text{ s.t.}$$

$$XTOT(i) = \frac{1}{ATOT(i)}.MIN\left[all, c, com : \frac{XINT\_S(c,i)}{AINT(c,i)}, \frac{XPRIM(i)}{APRIM(i)}\right] \quad (4.13)$$

The equation for intermediate goods becomes:

$$\frac{XINT\_S(c,i)}{ATOT(i)} = XTOT(i) \quad (4.14)$$

After linearized, equation (4.14) becomes:

$$x\text{int}\_s(c,i) - atot(i) = xtot(i) \quad (4.15)$$

Where: $PPRIM(i)$ is the Price of composite Primary factor by industry
$XPRIM(i)$ is the Demand for composite factor composite by industry
$XINT\_S(c,i)$ is the Demand for commodity by industry
$XTOT(i)$ is the Output or supply commodity
$ATOT(i)$ is the technical change of all factors
$APRIM(i)$ is the Armington Elasticity

From the above equation, it can be seen that intermediate demand is proportionate to the demand for total output, and follows all input saving technical change (atot [i]). In the Tablo file, this equation is known as *eq_xint_s*.

Household demand is derived by maximizing Cobb-Douglas utility function with the constraint of disposable income (*EH*) as shown in equation (4.16).

$$\max : U = \prod_{c} XHOU\_S(c)^{\alpha(c)} s.t. \sum_{c} PQ\_S(c).XHOU\_S(c) = EH \quad (4.16)$$

Where: $XHOU\_S(c)$ is the households demand for commodity c
$PQ\_S(c)$ is the domestic price of each commodity c, and
EH is the disposable income.

This equation is optimized by employing Lagrangian optimization model, as shown in equation (4.17).

$$XHOU\_S(c) = \alpha(c).\frac{EH}{PQ\_S(c)} \quad (4.17)$$

Equation (4.17) is linearized to get equation (4.18) as follows:

$$xhou\_s(c) = eh - pq\_s(c) \quad (4.18)$$

In the Tablo file, this equation is known as *e_exhou_s.*

By using the same fashion, the government expenditure equation is derived. In a linear form, it can be written as:

$$xg\_s(c) = fxg\_s(c) - fxg\_sc \quad (4.19)$$

Where: $fxg\_s(c)$ is a single commodity shifter, and
fxg_sc is the shifter for all commodities.

The right hand side of the government expenditure equation in (4.10) is assumed to be exogenous, thus the expenditure of government consumption (*xg_s(c)*) is exogenous too.

In this CGE model, international demand (RoW) on the goods and services is assumed to be sensitive to price. In other words, if the domestic price increases relative to the world price, then the world demand decreases. The exports demand curve has a negatively sloped. At a level this equation can be written as:

$$XEXP(c) = FXEXP(c)\left[\frac{PQ(c,"dom")}{EXR.PFIMP(c)}\right]^{EXPELAST(c)} \tag{4.20}$$

Where: $XEXP(c)$ is the total export for commodity
$FXEXP(c)$ is the q-shifter of export demand
$EXPELAST(c)$ is the price elasticity of export demand.

Equation (4.20) shows that exports for commodity *c* is a decreasing function of the price of the foreign exchange rate or $\left[\frac{P(c,"dom")}{EXR}\right]$. In the Tablo file, this equation is written as *eq_xexp* and in the linear form equation (4.20) becomes:

$$x\exp c(c) = fx\exp(c) + \exp elas(c)[pq(c,"dom") - exr - pfimp(c)] \tag{4.21}$$

In this model, the total demand for goods is equal to the quantity demanded by households, government, investment, and the demand for intermediate goods, as shown in Figure 4.4. In level form, the total demand for composite goods is written in equation (4.22).

$$XD\_S(c) = sum(i, XINT\_S(c,i) + XHOU\_S(c) + XG\_S(c) + XINV\_S(c) \tag{4.22}$$

Where: $XD\_S(c)$ is the total demand for commodity c,
$XINT\_S(c)$ is the industry total demand for commodity c,
$XHOU\_S(c)$ is the household total demand for commodity c,
$XG\_S(c)$ is the government total demand for commodity c,
$XINV\_S(c)$ is the investor total demand for commodity c,

In the Tablo file, equation (4.22) is written as *eq_xd_s*, and in linearized form it is written as:

$$VXD\_S(c).xd\_s(c) = sum(i, IND, VXINT\_S(c,i).x\text{int}\_s(c,i)) + VXHOU\_S(c).xhou\_s(c) + VXG\_S(c).xg\_s(c) + VXINV\_S(c).xinv\_s(c) \quad (4.23)$$

4.5.4 Production Sector

The equation of factors production demand is derived by minimizing the cost with the constraint of CES production function.

$$\min : \sum_f WDIST(f,i).PFAC(f).XFAC(f,i) \quad Subject\ to$$

$$XPRIM(i) = \left[\sum_f \delta_f \left(\frac{XFAC(f,i)}{AFAC(f,i)} \right)^{-\rho} \right]^{-\frac{1}{\rho}} \quad (4.24)$$

Where: $XFAC(f,i)$ is the demand for factor f by industry *i,*
$PFAC(f)$ is the price of factor f,
$WDIST(f,i)$ is the distortion premium for factor *f* in industry *i*,
$XPRIM(i)$ is the total value added.

Transforming equation (4.24) into a Langrangian function, and then taking the first derivative to get the first order condition in linear form that can be written as:

$$xfax(f,i) - afac(f,i) = xprim(i) - \sigma^{PRIM}(I)\left[pfac(f) - wdist(f,i) + afac(f,i) - pprim(i)\right] \quad (4.25)$$

This equation is the demand for factors of production and in the Tablo file, it is written as *eq_xfac*. The last part of equation (4.25) is the effective price of primary factor, and, in the Tablo file it is written as *eq_pprim* (Refer to equation (4.26)).

$$pprim(i) = \sum_f SFAC(f,i).[pfac(f) + wdist(f,i) + afac(f,i)] \quad (4.26)$$

Where: $SFAC(f,i)$ is the cost share of the factor *f* in industry *i,*
σ is the elasticity of substitution between factors of production.

The demand for primary factor composite is derived from the optimization of the Leontief production function as below:

$$\min : PPRIM(i).XPRIM(i) + \sum_{c} PQ\_S(c).XINT\_S(c,i)$$

Subject to;

$$XTOT(i) = \frac{1}{ATOT(i)} MIN\left[all,c,com : \frac{XINT\_S(c,i)}{AINT(c,i)}, \frac{XPRIM(i)}{APRIM(i)} \right] \tag{4.27}$$

The first order condition of the Lagrangian equation is shown in equation (4.28).

$$\frac{XPRIM(i)}{ATOT(i)} = APRIM(i).XTOT(i) \tag{4.28}$$

In the Tablo file, this equation is known as *eq_exprim* and is written in linear form as:

$$xprim(i) - aprim(i) - atot(i) = xtot(i) \tag{4.29}$$

4.5.5 Market Clearing

The market clearing requires that the total output or the supply of the commodity is equal to the quantity demanded for that commodity. The total demand consists of locally produced goods and imported goods. In the level form, the mathematical equation for market clearing is shown in equation (4.30).

$$XTOT(c) = XD(c,"dom") + XEXP(c) \tag{4.30}$$

The linearized of equation (4.30) is derived using linearization rule as shown in Appendix 4. The total derivative of equation (4.30) is shown as:

$$XTOT(c) = XD(c,"dom") + XEXP(c)$$
$$XTOT(c).xtot(c) = XD(c,"dom").xd(c,"dom") + XEXP(c).x\exp(c)$$

$$PQ(c,"dom").XTOT(c).xtot(c) = PQ(c,"dom").XD(c,"dom").xd(c,"dom")$$
$$+ PQ(c,"dom")XEXP(c).x\exp(c)$$

$$+ PQ(c,"dom")XEXP(c).x\exp(c) \qquad (4.31)$$

4.5.6 Institutions

Households receive income from the ownership of production factors. Also, they receive income in the form of transfer payment from various sources, such as (1) central government, (2) firms, (3) foreigners, and (4) other households. In the level form, the household's income equation is:

$$YH = \sum_f SFACSH(f)YFAC(f) + TRHOGO + TRHOCO + TRHORO + TRHOHO \qquad (4.32)$$

Where: *YH* is household's income,
SFACSH is the households' share of income from factors of production that is disbursed to the owners of the factors in the economy. The ownership of the factors of production is not only households, but also the government and other firms.
YFAC is the factor income,
TRHOGO is the transfer from central government to households,
TRHOCO is the transfer from firms to households (for examples, scholarship and corporate social responsibility),
TRHORO is the transfer from the rest of the world to households (for examples, scholarship and aid).
TRHOHO is the transfer from other households.

Since households' income (YH) should be reduced by the amount of income tax (taxh), the disposable income of households is:

$$EH = YH - T \qquad ; T = taxh * YH$$
$$EH = YH - taxh * YH = (1 - taxh)YH \qquad (4.33)$$

Since consumption is a percentage of disposable income (mpch*EH), then equation (4.33) becomes:

$$EH = mpch(1 - taxh)YH \qquad (4.34)$$

The unspent part of the disposable income is saving. The size of this saving depends on the marginal propensity to save (mpsh) of the households. The total consumption plus the saving should be equal to the disposable income, then *mpch* + *mpsh* = 1 or *mpch = 1 – mpsh.*

$$EH = (1 - mpsh)(1 - taxh)YH \qquad (4.35)$$

where: *EH* is the disposable income
mpsh is the marginal propensity to save
mpch is the marginal propensity to consume
taxh is the household's income tax.

In the Tablo file, equation (4.35) is written as *eq_eh*, and in linear form it is written as equation (4.36).

$$\overline{E} = \overline{Y} - 100\frac{Y}{Y - TRH}\Delta t - 100\frac{Y - TRH}{Y - TRH - SH}\Delta s \qquad (4.36)$$

4.6 Income distribution and Poverty Analysis

Income distribution can be calculated by comparing the simulated households' income and the Indonesian SUSENAS Table. To analyze poverty based on household groups, it is important to have a summary of the distribution of income based on the characteristics of the households. The distribution depends on the minimum and maximum of income, as well as the skewness of the income distribution. The beta distribution function, developed by Decaluwe, et.al (1999), is employed to analyze income distribution based on the characteristics of the households. The beta distribution function is shown in equation (4.37):

$$I(y;p,q) = \frac{1}{B(p,q)} \frac{(y-mn)^{p-1}(mx-y)^{q-1}}{(mx-mn)^{p+q-1}}$$

Where

$$B(p,q) = \int_{mn}^{mx} \frac{(y-mn)^{p-1}(mx-y)^{q-1}}{(mx-mn)^{p+q-1}}\, dy \qquad (4.37)$$

Parameters *mx* and *mn* are maximum and minimum income within a group. Parameters *p* and *q* have influenced to the skewness of the distribution. This distribution is based on certain distribution beta parameter which is estimated from various statistical parameters. The relationship between parameters *p* and *q* in the beta distribution function with various statistical parameters on production data is explained using the following formula:

$$p = \bar{x}\left(\frac{\bar{x}(1-\bar{x})}{s^2} - 1\right) \text{ and} \qquad (4.38)$$

$$q = (1-\bar{x})\left(\frac{\bar{x}(1-\bar{x})}{s^2} - 1\right) \qquad (4.39)$$

Where $\bar{x}$ is the sample mean and s^2 is the sample variance as shown in equations (4.40) and (4.41), respectively:

$$\textit{Sample mean:} \quad \bar{x} = \frac{1}{n}\sum_{i=1} x_i \qquad (4.40)$$

$$\textit{Sample variance} \quad s^2 = \frac{1}{n}\sum_{i=1}^{n} (x_i - \bar{x})^2 \qquad (4.41)$$

If $p > q$, then the distribution is skewed to the left. As such, the disparity between p and q increases. On the other hand, if $q > p$, then the distribution is skewed to the right; as such the disparity in income increases too. If $p = q$, then the function is symmetric. These three situations are true if the values for p and q are bigger than one.

The distribution function as shown in equation (4.37) is used to evaluate the poverty incidence on each group of households in the general equilibrium model of the economy. If, on average income increases by ψ, then the income of each household in the group should increase by ψ. Following this rule, income distribution proportionately would change horizontally as income changes.

The above procedure allows for the comparison between the poverty level created at a pre- and post-simulation using an instrument developed by Foster, Greer, and Thorbecke (FGT), i.e. the Pα. The FGT formula is capable of measuring the degree of poverty among the poorest through parameter α. This index is used in various empirical studies to measure poverty because of its sensitivity to the depth and severity of poverty. The mathematical formula is written as (Cockburn, 2001):

$$P_\alpha = \frac{1}{n}\sum_{i=1}^{q}\left[\frac{g_i}{z}\right]^\alpha \text{ ; } \alpha \geq 0 \qquad (4.42)$$

where n is the total number of individuals in a population, q is the total number of individual or households below poverty line, g_i is the poverty gap of the i^{th} household, z is the poverty line, P_α is the poverty index as per the FGT and α is the degree of poverty that is arbitrary in nature.

If the value of $\alpha=0$ then P_0 is the head count ratio or the head count index, thus equation (4.42) can be written as:

$$P_0 = \frac{1}{n}\sum_{i=1}^{q}\left[\frac{g_i}{z}\right]^0 = \frac{q}{n} = H \qquad (4.43)$$

The P_0 index shows the proportion of the population under poverty line, defined as the percentage of the poor out of the total population. For example, if $P_0 = 0.10$, then there is a 10 percent of the population who is poor. The bigger the number of this index means the higher the poor among total population in a particular group. The drawback of this index is that it is unable to show the depth of poverty. To overcome this problem, another ratio known as income gap ratio can be used to measure the difference in the average income of the poor and poverty line. This difference can be expressed in the proportion from the poverty line, i.e. $g_i = \frac{Z - y_i}{Z}$, where y_i is the average income or the budget of the poor. The value of $g_i = 0$ if $y_i > z$.

If α = 1, then P_α is the product between headcount ratio (*H*) and poverty gap index $\frac{Z - y_i}{Z}$. Mathematically, it can be presented as:

$$P_1 = \frac{1}{n}\sum_{i=1}^{q}\left[\frac{g_i}{z}\right]^1 = HI \qquad (4.44)$$

This index is also known as poverty gap index that is a measure of the average income disparity of each household in relation to the poverty line. This index is usually used to measure the depth of poverty. For example, if the value of $P_1 = 0.10$, this means that the total gap of the overall poor people from the poverty line is 10 percent. However, this index is not sensitive to income distribution among poor people. In other words, if α = 1 creates the normalized poverty gap (NPG).

If $\alpha=2$, then P_2 as in equation (4.45) are written as the following:

$$P_2 = \frac{1}{n}\sum_{i=1}^{q}\left[\frac{z-y_i}{z}\right]^2 = \frac{1}{n}\sum_{i=1}^{q}\left[1-\frac{y_i}{z}\right]^2 \qquad (4.45)$$

It can be seen that equation (4.45) shows that the share of every poor individual is proportionate to the squared of the gap between their income and poverty line. This index is distribution ally sensitive index to the change in income or distribution of the income of the poor population. This ratio or index is known as the poverty severity index. Up to a certain limit, this index has the ability to show the distribution of expenditure among poor people. Also, this index can be used to measure intensity of poverty.

4.7 Elasticity and Parameter

To develop a general equilibrium model, not only the base data are needed, but also the parameter elasticity data and some behavioral parameters. Ideally, the parameters used in this study are taken from the econometrics estimation of the time series data. However, the availability of data is limited; these parameters are extracted from previous studies, either locally or any country that is comparable to Indonesia in terms of characteristics or applicable to Indonesian case.

The types and values of the elasticity of the parameter used in this study is base on AGEFIS database. The elasticity of the parameters are (1) The Armington elasticities in which the values of this elasticity are equal across sector, that is 2, (2) the factor of production elasticities in which the values of this elasticity is equal across sectors, that is 0.5, and (3) the expenditure elasticities by commodities in which the values of this elasticity is equal across sector, that is 5.

4.8 Aggregation and Disaggregation

In line whith the objectives of this study that used the model that has been developed, the 2005 Indonesian SAM Table is aggregated and disaggregated according to the needs of each research objective. The aggregation is done on the data of the factors of production and production sectors, while disaggregation is done on the institutional data.

4.8.1 Institution and Households

Basically, the institutions that are used in this study are following the 2005 Indonesian SAM Table which consist of the government, households, and firms. To see the distribution of income as one of the objectives of this study, households are classified into four groups: (1) poor households in rural area, HRPOOR, (2) non-poor households in rural area, HNPOOR, (3) urban poor households, HUPOOR, and (4) urban non-poor households, HUNPOOR.

4.8.2 Production Sector

There are 27 production sectors that are used in this study. The mapping of these sectors and institutions are presented in Table 4.3.

Table 4.3 the Mapping of the SAM Aggregate Sectors

In this study					In the Model	
Description				**Sector**	**Description**	**Sector**
Factors of Production				1	LAB	1
Non-labor force				2	CAPITAL	2
Institution	HH	Rural	Poor	3	HRPOOR	3
Institution	HH	Rural	Non-poor	4	HRNPOOR	4
Institution	HH	Urban	Poor	5	HUPOOR	5
Institution	HH	Urban	Non-poor	6	HUNPOOR	6
Institution	Firm			7	CORP	7
Institution	Government			8	GOVT	8
Production Sectors	Agriculture – Food Crops			9	CROPS	9
Production Sectors	Agriculture – Other Crops			10	OCROPS	10
Production Sectors	Livestock Farming and Its Products			11	LIVEST	11
Production Sectors	Forestry and Hunting			12	FOREST	12
Production Sectors	Fishery			13	FISHR	13
Production Sectors	Mining of coal, Metal core, and Petroleum			14	QUARY	14
					BBM	20
Production Sectors	Mining and Quarrying of other minerals			15	MINE	15
Production Sectors	Food Products, Beverages, and Tobacco Industries			16	FOOD	16
Production Sectors	Spinning / Weaving, Textile, Apparel, and Leather Industries			17	TEXTIL	17
Production Sectors	Wood and Wood Products Industries			18	WOOD	18
Production Sectors	Paper, Printing, Transportation Equipments, and Metal Product Industries			19	PAPER	19
Production Sectors	Chemical and Chemical Products Industries			20	CHEM	21
Production Sectors	Electric, Gas, and Water Supply			21	ELEC	22
Production Sectors	Construction			22	CONST	23
Production Sectors	Trading			23	TRADE	24
Production Sectors	Restaurant s			24	REST	25
Production Sectors	Hotels			25	HOTEL	26
Production Sectors	Land Transportation			26	LNDTR	27
Production Sectors	Air and Water Transportation and Communication			27	AIRTR	28
					WTRTRAN	29
					COMMUN	30
Production Sectors	Storage and Transportation Services			28	SERVTR	31
Production Sectors	Bank and Insurance			29	BANK	32
Production Sectors	Real Estate and Business Services			30	REAL	33
Production Sectors	Public Administration and Defense, Education, Health, Film and Other Social Services			31	GOVSR	34
Production Sectors	Individual, Households, and Other Services			32	SERV	35
Capital Balance Sheet				33	CAPAC	36
Indirect Tax				34	IND_TAX	37
Subsidy				35	SUBSIDY	38
Foreign Countries / The Rest of the World				36	ROW	39

Source: SAM Table Indonesia 2005

The grouping of the production sectors follows the Standard Industrial Classification (*Klasifikasi Lapangan Usaha, KLU, Wajib Pajak 2003*). Based on the KLU, the Food Crop of Agricultural Sector consists of (1) paddy production - involving all activities beginning from land preparing, sawing, planting, tending, harvesting, and post harvesting – either wet or dry paddy, (2) other cereals, tuber, and root crops production; involving all activities such as land preparing, sawing, tending, harvesting, and post-harvesting of cereal crops such as corn, sorghum, wheat, sunflower seed, nuts and beans (peanut, soy bean, green bean), and also tubers and roots (such as, tapioca, sweet potato).

Other Crops of Agricultural Sector consists of (1) sugar cane and other sweetener crops that involve various activities such as land preparing, planting, tending, and harvesting of sugar case, Stevie, sugar bit, and sweet sorghum, (2) tobacco growing that involves actives such as land preparing, planting, tending, harvesting and sorting/grading of fresh leaves, (3) plantation of havea rubber and other types of rubber that involve activities such as land preparing, seedling, planting, tending, and harvesting of hevea rubber and other types of latex such as gutta-percha, and incense (kemenyan), (4) plantation of fiber for textile and similar products that involve activities of crops husbandry beginning from land preparation until harvesting of cotton, kapok, rosella, jute, ramie, linen, agave, abaca, and kenaf, (5) herbs for medicinal and pharmaceutical products that involve various activities from land preparation to harvesting of crops such as quinine, ginger, fennel, turmeric, curcuma, gambier and castor, (6) aromatic "oil" plant that involves various activities from land preparation until harvesting of crops such as aromatic betel leaf, nilam, menthol, cendana, kananga, and ilang-

ilang, (7) other crops that are not classified elsewhere that involve various activities from land preparation to harvesting of crops for green manure, cover crops, and fodder crops (elephant grass and others), (8) horticultural crops that are harvested once such as onion, garlic, potato, cabbage, green (sawi), carrot, white raddish, and other leaf vegetables such as morning glory and spinach, (9) horticultural crops that are harvested more than once such as long bean, red bean, chili, tomatoes, brinjal, French bean, cucumber, pumpkin, spinach, morning glory, and mushroom, (10) horticultural crops for ornamental such as orchid, and jasmine, (11) Other ornamental plants such as bonsai, and palm, (12) nursery and seedling for horticultural crops, orchard, and plantation crops, (13) seasonal orchard plantation such as rambutan, orange, durian, duku, water melon, and manggo, (14) orchard (all year around) such as banana and pineapple, (15) coconut plantation, (16) oil palm plantation, (17) crops for beverages such as coffee, tea, and cocoa, (18) plantation of jambu air, (19) pepper plantation, (20) clove plantation, and (21) plantation of other spices such as vanilla, cinnamon, and nutmeg.

4.9 The Simulation of the Government Policy

Since 2000, the government has been trying periodically to reduce various subsidies, especially the subsidy on fuel, in a staggering manner. The reason behind this action is that it is believe that these subsidies, especially fuel subsidy, do not hit the right target groups. It is publicly known that fuel subsidy has been enjoying more by the rich, for industrial and automobile, than the poor.

However, if the subsidy on fuel is reduced or abolished then the price of BBM will increase. An increase in the price of fuel has a chain effect on the prices of other goods and services. Perhaps, the increase in the prices of other goods is not a big problem to the high income group. But, what is the effect of an increase in price to the poor? The poor become poorer as a result of a decrease in their purchasing power. How about those who are marginally above the poverty line? These people will fall below the poverty line as a result of an increase in the price of goods. For overcome these problems, the government has introduced a direct transfer payment to the poor, urban and rural, known as direct cash aid scheme (BLT) amounted 100,000 Rupiah per month per poor household.

To answer the research problems and to achieve the objectives of this study, various simulations are carried out as below:

Scenario 1: The government decreases in a staggering manner on the fuel subsidy until this subsidy becomes zero and at the same time the government compensates poor households through the BLT schemes amounted 100,000 Rupiah per month per household. There are three stages of subsidy reduction. Stage I: a decrease in subsidy by 12.35 percent from the total BBM subsidy. Stage II: a reduction in subsidy by 43.20 percent of the existing total subsidy. Stage III: a reduction in subsidy by 100 percent. In other words, the subsidy of fuel (BBM) is abolished. The reduction in the size of the subsidy for each stage was determined by the amount of subsidy for BBM from 2005 to 2009. For the period of 2005 to 2007, the reduction in subsidy was

12.5 percent. And for the period of 2005 to 2009, the reduction in subsidy was 43.2 percent.

Scenario 2: The reduction in subsidy of the fuel as per Scenario I is replaced by a subsidy that is given to the food crop agricultural sector.

Scenario 3: Fuel (BBM) subsidy diversion as big as subsidy reduction which is done at the first scenario to other crop agriculture sector.

The complete scenarios and simulations to the model of this study are presented in Table 4.4.

Table 4.4 the Scenario and Policy Simulation

Scenario		Simulation	
1	The government staggeringly reduces subsidy on fuel (BBM) until the subsidy is zero, and followed by compensation to the poor in the form of direct cash aid (BLT) amounted 100,000 Rupiah per month per household.	1_a	The government reduces fuel subsidy by 12.35 percent, followed by compensation to the poor in the form of direct cash aid (BLT) amounted 100,000 Rupiah per month per household.
		1_b	The government reduces fuel subsidy by 43.2 percent of the total BBM subsidy, followed by compensation in the form of BLT amounted 100,000 Rupiah per month per household.
		1_c	The government abolishes fuel subsidy, followed by direct cash aid amounted 100,000 Rupiah per month per poor household.
2	Fuel subsidy diversion is as big as subsidy reduction which is done at the first scenario to the food crop agricultural sector.	2_a	The government reduces fuel subsidy by 12.35 percent of the total subsidy and distributes this amount to the food crop agricultural sector.
		2_b	The government reduces fuel subsidy by 43.2 percent of the total subsidy and distributes this amount to subsidize the food crop agricultural sector.
		2_c	The government abolishes fuel subsidy and re-distributes to this amount to subsidize the food crop agricultural sector.
3	Fuel subsidy diversion is as big as subsidy reduction which is done at the first scenario to other crop agricultural sector.	3_a	The government reduces fuel subsidy by 12.35 percent of the total BBM subsidy and distribute this amount to subsidize other crop agricultural sector.
		3_b	The government reduces fuel subsidy by 43.2 percent of the total BBM subsidy and distribute this amount to subsidize other crop agricultural sector.
		3_c	The government abolishes fuel subsidy and distributes this amount to subsidize other crop agricultural sector.

4.10 Conclusion

This study employs the CGE model called AGAFIS^{+} to determine the impact of fiscal policy on macroeconomic indicators and income level. The AGAFIS^{+} was an extension of the AGEFIS (Applied General Equilibrium for Fiscal Policy) model that was developed by the Bureau of the Fiscal Policy, Finance Department, Republic of Indonesia in cooperation with the Center for Economic Development Studies (CEDs), Padjadjaran University. The fundamental distinction of the two models lies in the number of production sectors, institutions and factors of production that are used in this study.

In order to facilitate analysis of poverty and income distribution, households are divided into four groups, namely: (1) non-poor households in the urban (HUNPOOR), (2) poor households in the urban (UPOOR), (3) non-poor households in the rural (HRNPOOR), and (4) poor households in the rural (HRPOOR). The Foster-Greer-Thorbecke (FGT) method is employed to measure the level of poverty that occurred before and after the simulation. To analyze the distribution of income among households in the group this study uses the Beta Density Distribution Function, while to analyze the distribution of income among the groups this study employs the criteria established by the World Bank.

The main data that are used in this study are extracted from the 2005 Indonesian SAM and SUSENAS. Therefore, the poverty line that is used in this study is the Indonesian poverty line of 2005.

To answer the problem statements and to achieve the objectives of this study, there are three scenarios of the government policy and each scenario consists of three simulations are conducted. The first scenario is a reduction in fuel subsidy in stages until it reaches zero followed by the provision of direct cash aid (BLT) to poor households amounted to USD 100.000/month/hh. The second scenario is the transfer of fuel subsidy to the Food Crop Sector, and the third scenario is the transfer of fuel subsidy to Other Crops sector.

CHAPTER FIVE
RESULTS AND DISCUSSIONS

5.1 Introduction

This chapter consists of six sections. The next section describes the overview of the Indonesian economy that is related to economic performance, oil industry, and poverty. This is followed by Section three that reveals the simulation analysis of various policy measures on macroeconomic performance. Section four explains the analysis of income and poverty based on the simulation of various policy measures. Section five describes the income distribution analysis. The last section concludes.

5.2 Overview of the Indonesian Economy

The yearly economic growth in Indonesia shows a significant improvement, even though Indonesia faces various internal and external problems. The external problems stem from an increasing price of crude oil and the tendency of the international interest rate to increase that have an impact on the external performance and the stability of the exchange rate for Rupiah and further creates inflation. Internally, the initiative to promote investment is regarded as a result of lack of fund, investment climate that is not conducive and low level of competitiveness. To overcome various problems, the Indonesian government implements various policy measures.

One of the various measures implemented by the government to achieve the development target is fiscal policy. Fiscal policy has three main functions (1) allocation function of the budget for the purpose of development, (2) distribution of income and subsidy function to increase the welfare of the society, and (3) stability of the macroeconomics function to increase the growth of the economy. If the economy is in a recession, government autonomous budget, especially government expenditure on goods and services as well as government spending on capital, may spur economic growth. However, if the economy is overheating because of an excessive in aggregate demand, contractionary of fiscal policy has an impact to stabilize the demand and supply of economic resources. As such, fiscal policy has a strategic role in determining economic activities to reach a development target (NKAPBN, 2009).

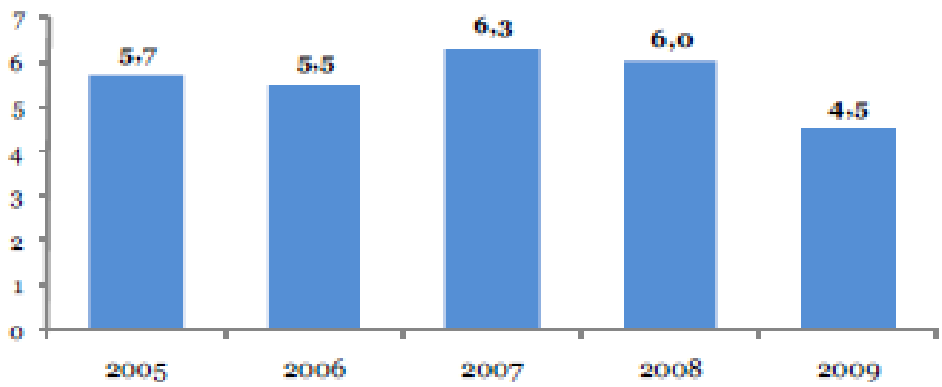
The high and dynamic development of global economy has an impact on the national economy. Fluctuation in the price of primary commodities and financial crisis that led to a global economic crisis has put a pressure on the national economic and the government has to revise the target of the economic growth. Even though the average growth rate for 2005 to 2008 was 5.9 percent, this achievement was not easy to achieve. The surge of the crude petroleum price in the international market impacted the subsidized fuel (BBM) price locally. The government had to increase the price of BBM.

The financial burden to the BBM subsidy for 2005 was huge. This problem arose from an increase in the price of crude petroleum at an international market. In the framework to increase efficiency and effectivity of the routine budget, as well as the main task related to the missed target of the fuel subsidy, the government has adopted a policy to reduce the subsidy on BBM by increasing the price of BBM. In 2005, the government re-adjusted the retail price of the fuel twice, i.e. on March 1, 2005 and October 1, 2005. An increase in the price of fuel has a spiral impact on the price of other goods and services. An increase in the fuel price has a direct impact on transportation and manufacturing sectors. Transportation sector has increased the tariff for the transportation of people and goods because in transportation sector, the cost of fuel consisted of 15 to 25 percent of the total direct operational costs. In the manufacturing sector, an increase in the price of fuel has an impact on the production process that used BBM, as well as the transportation of inputs and output. An increase in the cost of production as well as shipping and handling costs has an impact on the overall cost. As such an increase in these costs has an impact on the retail price and the end result is an increase in inflation.

An activity in one sector of the economy has a link to other economic sector. And, at the end, a policy in one sector has an impact on the macroeconomic. Thus, a decrease in subsidy on fuel (BBM) has a direct effect on the transportation and manufacturing sectors. At the end, this effect will be passed to other sectors such as food and other crops sub-sectors in agriculture. The direct effect felt by the farmers were an increase in the operational cost of the farm such as cost related to the usage of tractor, water pump, power thresher, and rice mill. The indirect effect is an increase in the transportation cost of the inputs and output in the agricultural sector. According to Dermoredjo (2003), the impact of an increase in the fuel price on agricultural sector is related to upstream activities as well as downstream activities. Upstream activities are related to inputs used by the farmers, while downstream activities were related to agro-industries such as rice milling.

5.2.1 The Performance of Indonesian Economics

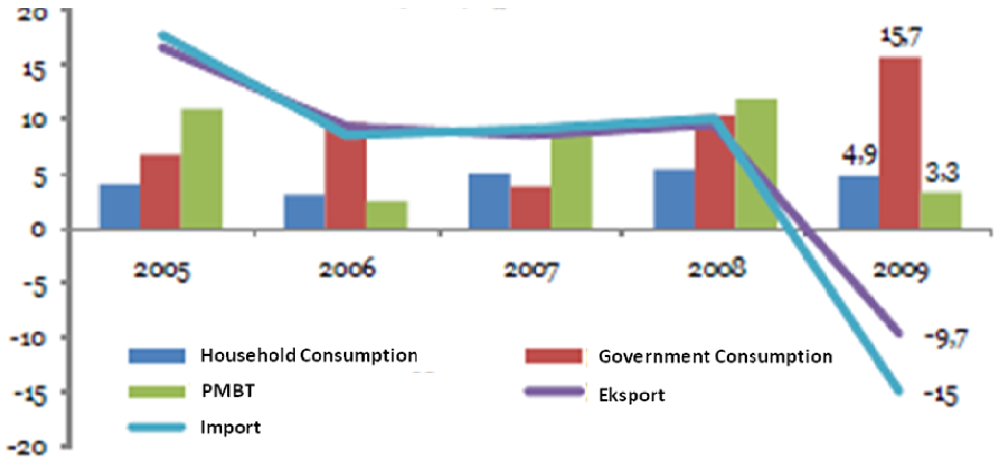
The external pressure as a result of global economic crisis has a negative impact on the Indonesian economy for the period of 2005 to 2009. During that period, the average growth rate was 5.6 percent (year-on-year, y-o-y). In 2005, the growth rate was 5.7 percent (y-o-y), the following year it was down to 5.5 percent (y-o-y). The Indonesian economy hit a relatively high rate of 6.3 percent (y-o-y) in 2007. As a result of a global economic crisis in 2008, the economic growth rate was 6.0 percent (y-o-y). The economic slowdown was dragged until 2009 in which the economy grew at 4.5 percent (y-o-y). Figure 5.1 shows the growth rate of the economy from 2005 to 2009.



Source: BPS, Various years

Figure 5.1. Indonesian GDP Growth Rate (2005-2009) (y-o-y, percent)

The Indonesian economy in 2005 to 2007 has achieved an improving growth rate. In 2007, the growth rate was 6.0 percent. Various external pressures such as a high price of crude oil and several major commodities and the global economic slowdown were faced by the Indonesian economy, but these problems were overcome in which the national economy was sustained. Internally, the economic achievement was a result of the high optimism towards domestic economy. The coordination between fiscal and monetary policies created a stimulus and sustained the economic stability. Figure 5.2 shows the growth in consumers' consumption, while Figure 5.3 shows the growth in output.



Source: BPS, various years.

Figure 5.2 GDP Growth in Indonesia Based on Sectoral Consumption, Years 2005-2009 (y-o-y, percent)

From the consumption side, household consumption grew by 5.0 percent in 2007, which was higher than that in 2006 at 3.3 percent. Household consumption consisted of 63.5 percent of GDP. And, it was the highest component of the economy. An increase in household consumption was a result of an increase in the growth rates of the consumption of food and non-food items. The consumption of food grew at 4.2 percent, while the growth of non-food items grew at 5.8 percent. A decrease in inflation resulted in an increase in the consumers' purchasing power and thus an increase in consumption. An increase in consumption, among others, was shown by an increase in the growth of consumer credit by 24.9 percent, electric consumption by 7.0 percent and the sales of motor vehicles by 8.4 percent. An increase in consumers' consumption was also supported by an increase in the social expenditure of the Central Government as shown by an increase in social compensation, education, and the provision of public infrastructure. The government consumption grew at 3.9 percent in 2007, lower than the growth rate of 9.6 percent a year before. The growth rate in 2006 was relatively higher than that in 2007 because there was left over spending from 2005. Also, in 2007 the government tried to be thriftier aimed to reduce a budget deficit. The role of government was relatively small at 8.3 percent of the GDP.

In 2007, the growth rate of investment (i.e. the gross fixed capital formation) has experienced a very high growth rate at 9.2 percent. In 2006, the growth rate of investment was 2.5 percent. This was in response to the strong purchasing power of the society, and an increase in demand both internally and externally. An indication of the growth of investment can be seen through an increase in the realization of the growth in the Foreign Direct Investment (FDI) and the Domestic Investment that reached 72.9 percent and 67.7 percent, respectively. The growth in the sales of cement was 7.1 percent and the growth in the import of capital goods was 25.1 percent. In the banking sector, the growth in investment credit and working capital credit, in 2007, was 23.1 percent and 28.6 percent, respectively. The investment, in the form of machine and equipments, that originating from foreign countries grew at 21.4 percent. Investment was 24.9 percent of total GDP.

The growth in exports of goods and services was 8.0 percent in 2007. This growth was slightly lower than the growth rate of 9.4 percent a year before.

The growth in exports was related to the strong growth of the world economy that has a role in increasing the demand for Indonesian products. An increase in the price of crude oil and Indonesian primary commodities exported to international market also supported the growth in exports. The growth in exports was 7.5 percent. The component of exports in GDP was the second highest after consumption at 29.4 percent. The growth in imports in 2007 was 8.9 percent. This figure was higher compared to that in 2006 at 8.6 percent. An increase in imports was the result of an increase in the growth of importation of goods (13.1 percent) consisted of consumption goods (38.0 percent), capital goods (25.1 percent), and raw materials (19.7 percent). An increase in imports was parallel to an increase in the purchasing power of the society and production activities, and an increase in investment. The share of imports in GDP was 25.3 percent.

In 2008, household consumption was the main source of growth, followed by exports and investment. The contribution of consumption in GDP was 60.0 percent. And, the growth rate of consumption in 2008 was 5.3 percent, compared to that in 2007 at 5.0 percent. The growth in household consumption was contributed by the growth in food item by 4.3 percent and the growth of non-food item by 6.2 percent. The policy to increase social expenditure and the payment of direct cash aid (BLT) to combat the increase in fuel price resulted in a reduction in the declining in the societal purchasing power. The strong in household consumption can be seen from increase in various indicators, among others the PPN, the sales of motor vehicles, electrical consumption, and consumer credit (BPS, various years).

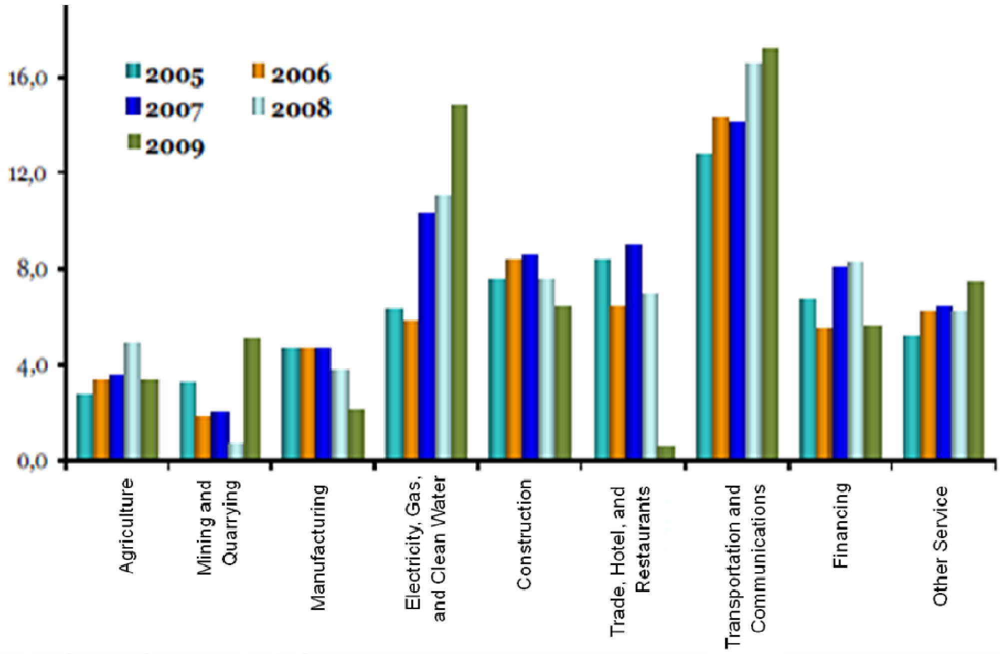
The government consumption in 2008 increased by 10.4 percent, compared to 3.9 percent growth a year before. This growth was driven by an increase in the purchase of goods by 22.6 percents, even though the growth in emolument was only 4.5 percent. Even though the growth rate was relatively high, the component of government spending in GDP was small at 8.4 percent in 2008.

Investment was the third source of GDP growth. In 2008, investment growth was 11.7 percent, higher than the growth in investment in 2007 (9.4 percent). The growth in investment was as a result of an increase in investment in the form of transportation equipments (41.4 percent). However, there was a contraction in investment of machines and equipments by 0.2 percent. The performance of investment has shown an increasing trend as shown by several indicators such as an import of capital equipment by 56.6 percent, the sale s of cement by 12.6 percent, and the FDI by 43.7 percent. The investment credit and the credit of working capital have increased by 37.4 percent and 28.4 percent, respectively. The contribution of investment in GDP was 27.6 percent.

The growth in exports in 2008 was 9.5 percent, higher than that in 2007 (8.5 percent). The growth in exports was supported by the growth in the exports of merchandise by 8.7 percent and the growth in the exports of services by 17.5 percent. An increase in the exports of goods, among others, contributed to the high demand of the crude palm oil (CPO), petroleum, and minerals. The exports demand contributed to 29.8 percent of the GDP. This contribution was the second highest after the consumption.

The imports growth reached 10.0 percent in 2008, which was higher compared to the growth in 2007 (8.97 percent). The imports growth was the result of imports of goods (10.7 percent) and services (7.6 percent). The growth in imports of goods was in line with the growth in imports of oil and gas (42.6 percent) and the imports of non-oil items amounted to 35.7 percent. The share of imports in GDP was 28.6 percent.

On the production (supply) side, the growth of economy in 2007 was a result of an increase in the growth of every sector in the economy, as shown in Figure 5.3. A high growth was recorded in the non-tradable sectors such as transportation and communication, electric, gas and water supply, construction, trade, manufacturing, and agricultural sectors. In 2007, the transportation and communication sector grew by 14.4 percent. High mobility of the people, advancement in technology, and innovation in communication have significantly contributed to the growth in this sector. The share of transportation and communication in GDP was 6.7 percent, in which transportation sub-sector contributed 3.8 percent, while communication sub-sector contributed 2.9 percent. The manufacturing sector grew at 4.7 percent, higher than a year before at 4.6 percent. This growth originating from the growth in transportation and equipment sub-sector that grew at 9.7 percent. The market demand, domestically and internationally, was conducive; as well as low level of inflation, and reduction in interest rates was the major contributors the growth in manufacturing. The contribution of the manufacturing sector to GDP was 27.0 percent, in which the contribution of non-oil sub-sector was 22.4 percent while the contribution of oil and gas sub-sector was 4.6 percent. The biggest role of oil and gas sub-sector came from the refinery of oil at 3.1 percent. The biggest contribution of non-oil sub-sector were manufacturing of food, beverages, and tobacco at 6.7 percent. And, this was followed by manufacturing of transportation equipment, machine and equipments at 6.4 percent.



Source: BPS, various years

Figure 5.3 The Sectoral GDP Growth Rates, 2005-2009 (y-o-y, percent)

The growth rate of the trade sector in 2007 was 8.5 percent, higher than 6.4 percent growth rate that was recorded in 2006. An increase in the societal purchasing power and a decrease in interest rates spurred the growth rate in trade sector. The trade sector was the second contributor of GDP (14.9 percent). The origin of the volume for this sector came from the wholesale and retail (11.8 percent), restaurant (2.7 percent), and hotel (0.4 percent) sub-sectors. The growth in agricultural sector was 3.5 percent in 2007, compared to the growth in 2006 which was 3.4 percent. An increase in the growth of the agricultural sector was contributed by food crops sub-sector, especially paddy. The forestry sub-sector has shown a declining growth rate due to the damage done to the forest by illegal loggers. Agricultural sector was the third largest sector in the economy. Its contribution to the GDP was 13.8 percent. The main sub-sectors were food crops (6.8 percent), plantation crops (2.1 percent), livestock and livestock products (1.6 percent), and forestry (0.9 percent) sub-sectors.

In 2008, the highest growth was achieved in the non-tradable sectors such as transportation and communication; electric, gas, and water supply; and financial sectors. The transportation and telecommunication grew at 16.7 percent in 2008; the highest growth rate among the non-tradable sectors, compared to 14.0 percent growth rate in 2007. The high growth in this sector was contributed by the growth rate in telecommunication sub-sector at 31.3 percent due to the growth in cellular telephone industry. The transportation sub-sector was weak because of the sluggish in ocean and air transportation industries as a result of air and sea disasters. The contribution of the transportation and communication sector to GDP was 6.31 percent. The electric, gas and water supply grew at 10.9 percent in 2008 compared to 10.3 percent a year before. An increase in this sector was contributed by urban gas supply and water supply that grew at the rate of 33.2 percent and 3.7 percent, respectively. Even though, the growth of this sector was relatively high, its contribution to GDP was 0.08 percent only.

In 2008, the manufacturing sector grew at 3.7 percent which was lower than the growth in 2007. The slow growth of this sector was a result of a global economic slowdown that affected the demand for manufactured goods, especially the demand for food, beverages, and tobacco; paper and printed products; cement and non-metal mineral products; and steel and iron products, from Indonesia. The manufacturing goods contributed to GDP at 27.9 percent. The sources of this contribution came from non-oil industries (22.3 percent) and oil and gas industries (4.9 percent). Their contribution to the growth in GDP was 1.0 percent.

The growth the trading sector in 2008 was 7.2 percent, lower than that in 2007 (8.4 percent). A decrease in the purchasing power of the society and an upward trend movement in the interest rate contributed to the slowdown in the trading sector. The trading sector consisted of 14.0 percent of the GDP, i.e. the third largest sector of the economy. The wholesale and retail sub-sector consisted of 11.1 percent of the trade sector; this was followed by restaurant sub-sector (11.1 percent) and hotel sub-sector (0.4 percent). The contribution of trade sector to the growth rate of GDP was 1.2 percent.

The agricultural sector has shown an increasing growth rate in 2008 (4.8 percent) compared to the growth rate a year before (3.4 percent). An increase in the growth rate of this sector was a result of an increase in the food crops sub-sector, especially paddy. There were many government policies and programs for the agricultural sector that aimed to increase the growth rate of this sector. Among others, an increase in the price floor for paddy and rice, the introduction of high yield varieties of paddy to increase the output, an improvement in the distribution of fertilizer, an improved irrigation system, and an improvement in the post-harvest technology. The agricultural sector was the second important sector to the GDP. This sector contributed 14.4 percent of GDP. The importance of the agricultural sector to the economy was a result of the contribution of the food crops sub-sector (7.0 percent), fishery sub-sector (2.8 percent), plantation crops sub-sector (2.1 percent), livestock sub-sector (1.7 percent), and forestry (0.8 percent).

In terms of poverty, global economic development which was characterized by an increase in the commodity prices and the weakening of world economy in the late 2007 until the early 2008 did not significantly affect the level of poverty. In March 2008, the number of poor people in Indonesia has decreased by 2.2 million. In March 2007, there were 34.96 poor people (15.42 percent of the population). In March 2007, the number was 37.2 million people (16.58 percent). The decrease in the number and percentage of poor people during the period of March 2007 - March 2008 was caused by several factors including: the rate of inflation was relatively low and stable; the declining in price of the basic needs, especially rice; and an increase in the average nominal and real wages. The decline in unemployment caused by the opening of employment in the informal sector which was also widely significantly contributed to the decline in the number of the poor. The decline of poverty was also related to various government efforts in providing protection to the poor. Dealing with the social protection for the poor, the government has implemented various programs such as the RASKIN (rice for poor people), JAMKESMAS (public health insurance), scholarship, direct cash assistance (BLT), and family program expectation (PKH). In addition, the government also performed various community development programs through a national community empowerment program (PNPM) independent. Within this program the poor through community groups can determine their own needs, planning, implementing and monitoring the implementation of the activities that they have proposed.

5.2.2 The Performance of Oil Extraction

The stability of the national economy is heavily influenced by the international crude oil price. An increase in the crude oil price is influenced by the strong demand for petroleum at the international market as a result of high economic growth in China, India, and the Organization for Economic Co-operation and Development (OECD) countries. Also, a high price of oil is a result of geopolitical turmoil in oil producing countries and the uncertainty of the market as a result of depletion of the world oil reserve that reduces the supply of crude oil at the international market.

The development of oil extraction, which is also known as oil lifting for 2005 to 2009 is shown in Figure 5.4. The realization of the Indonesian oil lifting experienced a gradual declining trend. In 2005 the average production of oil was 1,006.69 thousand barrels per day and it reached the lowest rate at 870.98 thousand barrels per day in 2008. However, the government had implemented various policies so that the oil lifting was increased at an average production of 943.89 thousand barrels per day.

As shown in Figure 5.4, the volume of the oil lifting was 951.82 thousand barrels per day, a decreased by 4.8 percent compared to the volume lifted for 2005 (1,006.99 thousand barrels per day). The tendency of the declining in the volume of oil extracted lately was related to the natural declining of the capability of the aging oil rigs. The natural declining of the capacity of the oil rig was in the range of five to 10 percent per year. Also, there were natural disasters, such as flood, that has a negative effect on oil exploration and extraction. Since investment in the oil sector has still lacking behind, this has an impact in the growth of oil production significantly.

Source: Ministry of ESDM
Figure 5.4 the Volume of Oil Extraction (2005-2009)

In 2007, oil extraction had declined by 5.29 percent to 904.01 thousand barrels per day. The decline in the oil extraction was a result of an expansion of oil fields in deep water frontier that needed a longer time period for cost recovery, and as such these new oil rigs were still ineffective to be operated. Also, there was a problem to increase the capacity of "matured" oil rigs that were experiencing a natural declining in the volume of oil lifting. Until 2007, the oil exploration has not achieved an optimal level.

The oil lifting for 2008 was 0.931 million barrels per day. This rate of production was above the targeted level by the APBN-P 2008 of 0.927 million barrels per day. An increase in oil lifting was achieved because the government had implemented various incentives in the oil industries. Among others were the exemptions of the import duty (BM) on equipment for the upstream activities for oil and gas; and the tariff reduction on the importation of floating platform or underwater oil exploration equipments.

Since the government has implemented various policies and incentives for the oil sector, the 2009 production has increased to 0.944 million barrels per day. However, there were various problems related to an increase in the volume of oil lifting such as (1) a 12 percent natural declining in of the aging oil rig, (2) the impact of the Environmental Protection Law No. 32, 2009, and (3) the problem of space and overlapping of forested land.

5.2.3 The Poverty Level in Indonesia

The number of poor people is strongly influenced by the poverty line. The higher the poverty line, the more poor people are. Table 5.1 shows the poverty line in Indonesia. It can be seen that the poverty line has increased as reflected by an increase in the price level. The poverty line for rural area was relatively lower than that of the urban area. The difference in poverty lines was a result of the price of essential goods, food and non-food items are usually lower in the rural area compared to those in the urban area.

Table 5.1. Rural and Urban Poverty (2005-2009)

Region/Year	Poverty Line (Rp/Capita/Month)			Poor Population	Percentage of Poor People
	Food	Non	Total		

		Food		(Million)	
(1)	(2)	(3)	(4)	(5)	(6)
Urban					
2005	103,992	46,807	150,799	12.40	11.37
2006	126,527	48,797	175,324	14.29	13.36
2007	132,259	55,683	187,942	13.56	12.52
2008	143,897	60,999	204,896	12.77	11.65
2009	155,909	66,214	222,123	11.91	10.72
Rural					
2005	84,014	33,245	117,259	22.70	19.51
2006	103,180	28,076	131,256	24.76	21.90
2007	116,265	30,572	146,837	23.61	20.37
2008	127,207	34,624	161,831	22.19	18.93
2009	139,331	40,503	178,835	20.62	17.35
Urban and Rural					
2005	91,072	38,072	129,108	35.10	15.97
2006	114,619	38,228	152,847	39.847	17.75
2007	123,993	42,704	166,697	37.17	16.58
2008	135,270	47,366	182,636	34.96	15.42
2009	147,339	52,923	200,262	32.53	14.14

Sources: BPS,2000-2010

At the beginning of the Government's New Order Administration in 1966, the average per capita income was around USD50 per year. During that time more than 80 percent of the Indonesian population lived in rural areas and earned a living as farmers. It was estimated that almost 60 percent of the population was illiterate and almost 65 percent was living under poverty (Tambunan, 2006). Since the launching of the first development plan, REPELITA I, the Indonesian economy grew at an encouraging rate. The inflation rate that almost reached 500 percent at the end of Soekarno's administration was reduced to a single digit in a few years that followed. In the 1980's until before the 1997 economic crisis, the average growth of the economy was 7.0 percent. At a high and continuous growth rate, the per capita income had increased and the level of poverty declined. During the period 1976 to 1996, the level of poverty had declined from 40 percent to 17.7 percent. In parallel to the improvement in the economy post-economic crisis, the level of poverty has declined from 15.42 percent in 2008 to 14.14 percent in 2009.

A decreased in the number of the rural poor was faster than a decrease in the number of urban poor. Between 2005 and 2009, a reduction in the poverty rate in the rural area was 2.16 percent compared to the reduction in poverty among urbanites (0.65 percent only). The factors that have influenced this imbalance in the reduction in poverty rate were: (1) the migration of workers from rural to urban during the New Order. According to the Lewis Theory (Todaro, 2000), the migration of people from rural to urban has a positive effect on the rural economy. Job opportunity, productivity level, and the average income in the rural area increase as a result of migration from rural to urban. On the other hand, in urban areas the absorption rate of workers decreases and creates an imbalance between the supply of and the demand for labor. Thus, urban unemployment keeps increasing. (2) The difference in the structure of the market and the distortion between urban and rural markets. A small market in the rural area relative to the big market in urban area, thus the structure and complexity of the rural market are moderate. (3) The positive spillover effect from the process of the national economic development.

The government has implemented various policies and programs to alleviate poverty. Among these programs was social safety net, consolidated program for workers, in kind subsidy on food items such as rice for the poor and direct cash aid. In the RPJM 2004 – 2009, it was specifically stated that the intention of the government was to reduce poverty from 16.7 percent in 2004 to 8.2 percent in 2009 (Bappenas, 2007). Thus, the government had to spend a big sum of money to reach this target. The total budget allocated for poverty alleviation was 18 billion Rupiah in 2004; 23 billion Rupiah in 2005; 42 billion

Rupiah in 2006; and 51 billion Rupiah in 2007 (Bappenas, 2007). By March, 2009, the total amount of money spent on poverty alleviation programs was 66.2 billion Rupiah resulted in 1.27 percent poverty reduction (BPS, 2009). It was expected that the big sum of money spend on poverty reduction will be able to reduce poverty rate significantly.

5.3 The Results of the Policy Simulation on the Macroeconomics Performance

As mentioned in Chapter IV, there are three scenarios of simulations conducted in this study. The three policy simulations are (1) a staggering reduction in the subsidy of fuel (BBM) until it reaches a zero level accompanied by a compensation in the form of direct cash aid (BLT), (2) the removal of fuel subsidy but the amount saved by the government is channeled to food crop sub-sector, and (3) the removal of fuel subsidy and the amount saved by the government is channeled to other crops sub-sector. The results of the first simulation are presented in Table 5.2.

The simulation results presented in Table 5.2 show that a reduction in subsidy of fuel (BBM) accompanied by a direct cash aid (BLT) (Sim 1_a, 1_b, and 1_c) generally have a negative impact on the performance of the economy. All macroeconomic variables, except the government saving (delSG) and nominal exports (wexp_c), have declined. An increase in the government saving is a result of a surplus after fuel subsidy reduction. An increase in the nominal exports is a result of a decrease in the purchasing power of the society because there is an increase in the price level. The end result is that locally produced goods for domestic consumption are transformed to become exports goods and thus the nominal exports increases.

Table 5.2. The Effect of the Policy Simulation on the Macroeconomic Performance

Macros	SIM 1_a	SIM 1_b	SIM 1_c	SIM 2_a	SIM 2_b	SIM 2_c	SIM 3_a	SIM 3_b	SIM 3_c
delSG	8062.71	24175.27	44224.81	1483.81	84.02	-18359.65	-5885.14	-8097.73	-211734.97
egc	-2.29	-6.90	-12.67	-0.82	-1.49	1.44	1.41	1.53	50.58
wcon_c	-0.38	-1.20	-2.38	0.00	0.18	1.17	0.50	1.45	18.11
wexp_c	0.25	0.80	1.62	-0.33	-1.32	-3.79	-0.45	-1.41	-14.88
wimp_c	-0.29	-0.81	-1.23	-0.21	-0.49	-0.29	0.11	0.18	8.58
winv_c	-0.37	-1.15	-2.24	-0.21	-0.59	-0.81	0.16	0.19	5.33
wgdpexp	-0.17	-0.57	-1.22	-0.11	-0.37	-0.72	0.18	0.38	5.54

Note: delSG = government saving (change); egc = government expenditure; wcon_c = nominal consumption; wexp_c = nominal exports; wimp_c = nominal imports; winv_c = nominal investment; wgdpexp = gdp from expenditure side.

SIM 1_a: A 12.35 percent reduction in fuel (BBM) subsidy accompanied by a direct cash aid (BLT) to poor households amounted to Rp 100,000 per household per month.

SIM 1_b: A 43.20 percent reduction in fuel subsidy accompanied by a direct cash aid amounted to Rp 100,000 per month per poor household.

SIM 1_c: A 100 percent fuel subsidy abolishment accompanied by a direct cash aid amounted to Rp 100,000 per month per poor household.

SIM 2_a: A 12.35 percent removal of fuel subsidy and the same amount is transferred to food crop farmers.

SIM 2_b: A 43.20 percent removal of subsidy and the same amount is transferred to food crop farmers

SIM 2_c: A 100 percent removal of fuel subsidy and the same amount is transferred as subsidy to food crop farmers.

SIM 3_a: A 12.35 percent removal of fuel subsidy and the same amount of money is transferred as subsidy to the other crops farmers.

SIM 3_b: A 43.20 percent removal of fuel subsidy and the same amount of money is transferred as subsidy to other crops farmers.

SIM 3_c: A 100 percent removal of fuel subsidy and the same amount of money is transferred as subsidy to other crops farmers

The first scenario is the simulation of fuel (BBM) subsidy reduction accompanied by direct cash aid (BLT) amounted to Rp 100,000 per month per poor family. It is found that this simulation has a negative impact on government expenditure, nominal consumption of the society, and GDP. These findings are in agreement to what is expected. A decrease in fuel subsidy has a negative impact on consumption expenditure because the purchasing power of the consumer declines. On the supply side, a subsidy reduction resulted in an increase in the price of input (at least in this case is fuel) where the supply curve shifts to the left.

As such, quantity supplied of output declines and at the same time the price of output increases. An interaction between supplier and consumer in which the price of goods and services has increased and the purchasing power of the society has decreased, thus the levels of consumption of the society and government decrease.

In the first scenario, the effect of a reduction in subsidy on the performance of the macroeconomics, in this case is government saving, is positive. Government budget, consumption, exports, imports, and investment as well as the level of GDP move in the same direction. The simulation of policy to reduce fuel subsidy by 12.35 percent of total fuel subsidy that is followed by BLT given to the poor amounted to Rp 100,000 per household per month (sim 1_a) shows that the reduction of subsidy resulted in an increase in government saving amounted to 8,062.71 billion rupiah, a decrease in government spending by 2.29 percent, a decrease in the people consumption by 0.38 percent, an increase the exports by 0.25 percent, a decrease in imports by 0.29 percent and a decrease in investment by 0.37 percent. The aggregate of the supply side of the GDP is decreased by 0.17 percent. Similarly, the simulation results in a reduction in fuel subsidy by 43.2 percent (sim 1_b) and the simulation results in abolishing of fuel subsidy by 100 percent (1_c) resulted in the same direction for various variables as mentioned before, but with different magnitudes as shown in Table 5.2.

The second scenario deals with the diversion of fuel subsidies to the Food Crops Agricultural sector. The results of the simulations show the same pattern as the results in scenario I. However, the simulation results of the 100 percent removal of fuel subsidy and transfer the money to food crop agricultural sector (sim 2_c) show a difference performance in government savings, government spending and exports. This simulation led to an increase in fuel price that has an impact on the performance of economic sectors. However, subsidy is aimed to maintain economic stability, especially price stability. With subsidy, it is expected that the people’s basic needs is available in sufficient quantities, at stable and affordable prices (Finance and Budget Memorandum, APBN 2010). In addition, the granting of subsidies is also aimed at reducing poverty in the agricultural sector where this sector is the largest contributor to the level of poverty. Therefore, the Food Crops Agricultural sector that receives the transfer of fuel subsidies should be more productive, then the people's income increases, the purchasing power increases, which in turn increase consumption.

Scenario III (Sim 3_a, 3_b and 3_c) is the policy related to the transfer of fuel subsidies to Other Crops Agricultural sector. The simulation results reveal a different picture compared with scenarios I and II. In scenario III, almost all activities show a high performance as represented by an increase in GDP. The increase is GDP is caused by an increase in investment, private consumption and government expenditure. An increase in investment leads to an increase in production and ultimately an increase in the people's income. An increase in income encourages consumption of goods, both for domestically produced as well as imported goods. This is what causes a decrease in exports and an increase in imports.

5.4 The Analysis of Income and Poverty

The CGE model provides the impact of the policy simulation on the level of household income, while the Foster-Greer-Thorbecke (FGT index) is employed to see the impact of the policy simulation on poverty measurement. If the average earnings increase by ψ, then the income of each household in the group also increase by ψ. With this rule, an income distribution proportionately shifts horizontally in income. This rule allows comparing the resulting poverty rate before and after the simulation. The FGT equation is shown in equation (3.28), where α is the degree of poverty that is arbitrary and Pα is the FGT poverty index. If $\alpha = 0$, then P_0 is also called the head count index that shows the proportion of population below the poverty line. It is defined as the percentage of poor population to total population. If $\alpha = 1$, then the index is P_1. This index is used to measure the depth of poverty or the poverty gap (depth of poverty index) or the level of inequality of poverty (poverty gap index). This index describes the average size of each income inequality of the poor against the poverty line or a total gap of all households in the group to the poverty line. If $\alpha = 2$, then the index is P_2. This index is used to measure the poverty severity.

5.4.1 The Impact of Fuel Subsidy Reduction Policy Accompanied by the BLT (Scenario I) to Income and Poverty Level

Scenario I is a simulation of the policy of reducing fuel subsidy accompanied by compensation to poor households in the form of income transfer amounting to Rp 100,000 per month per household. Scenario I consists of three simulations. The difference between each simulation is only in the amount of reduction in fuel subsidy, while the amount of the BLT for each level of reduction in fuel subsidy is fixed. Here is the impact of policy scenario I toward the level of income and poverty.

The impact of simulation policy scenario I toward the level of household income for all households and simulation can be seen in Table 5.3. It is apparent that the policy scenario I give a negative impact on the level of household income for all simulations. This means that the provision of the BLT to improve the people's purchasing power failed to offset the impact of fuel subsidy reduction.

Table 5.3. The Simulation Results of Reduction in Fuel Subsidy and Accompanied by the BLT on Income

Household	Change		
	Simulation 1_a	simulation 1_b	simulation 1_c
HUNPOOR	-0.3892	-1.2256	-2.4192
HUPOOR	-0.4024	-1.2694	-2.4618
HRNPOOR	-0.3640	-1.1587	-2.3256
HRPOOR	-0.3406	-1.0840	-2.1471

Note: HRPOOR = rural poor household; HRNPOOR = rural non-poor household; HUPOOR = urban poor household; HUNPOOR = non-poor urban household

The biggest negative impact of all of the simulations of this policy is experienced by poor households living in the urban. Although both the urban and rural poor are eligible to receive the BLT, the impact of a reduction on fuel subsidy is not the same for both categories of these people. The fuel subsidy reduction would have an impact on the price of goods and services. Households in the urban tend to be more purely as consumers for all basic needs than households in the rural. In addition, household in the urban consumes more fuel-related services such as transportation services than those people in the rural. In addition, many of the daily need such rice, vegetables, and other food items are produced in the rural area that need to be transported to urban consumers. So, the overall impact of fuel subsidy reduction policy has a bigger impact for urbanites than the rural communities.

The decline of income levels for all categories of households as a result of fuel subsidy reduction policy has a chain effect on the increase in the number of the poor. Household which is originally a little bit above poverty, before a reduction in fuel subsidy, tend to fall below the poverty line after a reduction in fuel subsidy. Therefore, it can be concluded that the impact of a reduction in fuel price coupled with the provision of the BLT for all simulations failed to reduce poverty level. The results of this study are in accordance to the results of the previous research conducted by Maipita (2009) that the granting of BLT cannot offset the decrease in consumption caused by the increase in prices due to reduction in fuel subsidies. Tables 5.4 to 5.6 show the results of the simulation based on Scenario I.

Table 5.4. The Results of Policy Simulation: Reducing the fuel subsidy by12.35% accompanied by the BLT amounted to Rp 100,000 per Poor Household per Month.

FGT Index	Baseline			Simulation 1_a			Δ		
	α=0	**α =1**	**α =2**	**α =0**	**α =1**	**α =2**	**α =0**	**α =1**	**α =2**
HUNPOOR	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000	0.00001	0.00000	0.00000
HUPOOR	1.00000	0.19158	0.05766	1.00000	0.19484	0.05875	0.00000	1.6980%	1.8881%
HRNPOOR	0.00000	0.00000	0.00000	0.00061	0.00000	0.00000	0.00061	0.00000	0.00000
HRPOOR	1.00000	0.19262	0.06203	1.00000	0.19536	0.06293	0.00000	1.4277%	1.4467%

The impact of policy simulation to reduce fuel subsidy amounted to 12.35 percent of the total fuel subsidy which is followed by the BLT to the poor amounted to Rp 100,000 per household per month are shown in Table 5.4. The results reveal that all of the indices of poverty have increased. The head count index, (P_0), poverty gap index or depth of poverty (P_1), and the poverty severity index (P_2) show an increasing result. For the non-poor households in urban areas there is a change in the value of P_0 from zero to 0.000010 percent. This indicates that as much as 0.0010 percent of non-poor households in urban areas have fallen into poverty after the policy simulation. Likewise, the group of non-poor households in rural areas, as much as 0.0160 percent was poor after the simulation. An increase in the number of poor people is as a result of a decrease in the households' income as shown in Table 5.3. Those people whose income was slightly above poverty line before a reduction in fuel subsidy will be fallen below poverty line after a reduction in fuel subsidy.

The average size of each income inequality of the poor against poverty line is called the poverty gap or the level of poverty or poverty gap index. The results show that this index has also increased. The poverty gap indices for urban and rural poor have increased by 1.6980 percent and 1.4277 percent, respectively. The simulation of this policy also raised the poverty severity index. These indices have increased by 1.8881 percent and 1.44467 percent for urban and rural, respectively. This indicates that poor household becomes poorer and far below the poverty line after the simulation.

Table 5.5. The Results of Policy Simulation: Reducing the fuel subsidy by43.2% accompanied by the BLT amounted to Rp 100,000 per Poor Household per Month.

FGT Index	Baseline			Simulation 1_b			Δ		
	α =0	**α =1**	**α =2**	**α =0**	**α =1**	**α =2**	**α =0**	**α =1**	**α =2**

HUNPOOR	0.00000	0.00000	0.00000	0.00086	0.00000	0.00202	0.00086	0.00000	0.00202
HUPOOR	1.00000	0.19158	0.05766	1.00000	0.20185	0.06117	0.00000	5.3564%	6.0849%
HRNPOOR	0.00000	0.00000	0.00000	0.00200	0.00001	0.00000	0.00200	0.00001	0.00000
HRPOOR	1.00000	0.19262	0.06203	1.00000	0.20137	0.06494	0.00000	4.5438%	4.6923%

Simulation 1_b which is reducing fuel subsidy by 43.2 percent of total fuel subsidy followed by the BLT amounted to 100,000 per poor household per month have a greater impact than those of simulation 1_a, as shown in Table 5.5. The Head count index for the group of non-poor households in urban and rural areas rose from zero to 0.00086 and 0.00200, respectively. This means that after the simulation, a total of 0.0860 percent of the originally non-poor households in urban areas fall into poverty and as much as 0.2000 percent of households previously rural non-poor become poorer after the simulation.

The poverty gap index also experienced a greater improvement than simulation 1_a. For the urban poor households, there is an increase in poverty gap index by 5.3564 percent. The poverty gap index for the rural poor increase by 4.5438 percent. In addition, the poverty severity index also is increased greater than those in simulation 1_a. The urban poverty gap index is increased by 6.0849 percent, while for the rural poor this index is increased by 4.6923 percent.

Table 5.6. The Results of Policy Simulation: Reducing the fuel subsidy by100% accompanied by the BLT amounted to Rp 100,000 per Poor Household per Month.

FGT Index	Baseline			Simulation 1_c			Δ		
	α =0	α =1	α =2	α =0	α =1	α =2	α =0	α =1	α =2
HUNPOOR	0.00000	0.00000	0.00000	0.00231	0.00002	0.00000	0.00231	0.00002	0.00000

HUPOOR	1.00000	0.19158	0.05766	1.00000	0.21149	0.06467	0.00000	10.3879%	12.1441%
HRNPOOR	0.00000	0.00000	0.00000	0.00415	0.00005	0.00000	0.00415	0.00005	0.00000
HRPOOR	1.00000	0.19262	0.06203	1.00000	0.20995	0.06795	0.00000	9.0000%	9.5433%

The third simulation is the abolishment of fuel subsidy followed by the BLT to the poor amounted to Rp 100,000 per household per month. The results of this simulation are presented in Table 5.6. If is found that both the number of urban and rural poor has increased because the marginally non-poor households is fallen to poor category after this simulation. The urban poor have increased by 0.231 percent, while the rural has increased by 0.415 percent.

This simulation policy does not only increase the number of poor households but also widens the gap and increases the severity of poverty. It is shown by an increase in the poverty gap and poverty severity indices of poor households in urban and rural areas. For the urban poor households, the poverty gap and poverty severity indices have increased by 10.387 percent and 12.1441 percent, respectively. In contrast, the poverty gap and poverty severity indices of the poor households in the rural have increased by 9.000 percent and 9.543 percent, respectively.

From the simulation results in Tables 5.4 to 5.6, it can be concluded that the policy of reducing fuel subsidy in stages until it reaches zero, followed by compensation to poor households in the form of the BLT amounted to Rp 100,000 per month per poor household (Scenario I) show an increasing in the number of poor households, poverty gap and severity of poverty. In other words, the compensation in the form of the BLT to the poor is not able to cope with the effects caused by the decrease of fuel subsidy to households. This finding is in line with the study Octaviani and Sahara (2005) who concludes that the government's policy to increase the fuel prices lead to an increase in the poverty level.

This finding was consistent with the real situation in Indonesia. When compared to the poverty level in 2005 with a year thereafter it was found that the number of poor people had increased.

For scenario I, the reduction in fuel subsidy is done gradually until it reaches zero and at the same time the amount of direct cash aid (BLT) remains constant. Tables 5.3 to 5.6 show that the greater the reduction in fuel subsidy, the greater the impact on the decreasing in the level of household income, rising poverty and increasing severity of poverty. This is due to a bigger percentage decrease in the fuel subsidy does not accompanied by a bigger amount of direct cash aid (BLT).

When the groups of households in the urban and rural areas are compared, it is found that the urban groups have a greater impact on increasing in the number of poor households, increasing poverty gap and increasing severity of poverty compared to those households in the rural areas for all simulations.

This is consistent with the findings as shown in Table 5.3 in which the impact of the decline in household income levels in urban areas is larger than those households in the rural area.

5.4.2 The Simulation Results of the Impact of Diversion of Fuel Subsidy to Food Crops Agriculture Sector (Scenario II) on Income and Poverty Level

Alternatively, the fuel subsidy may be diverted to the food crops agricultural sector, instead of giving the BLT to the poor households. There are several considerations that support this argument, among others are (1) most of the poor population in rural areas whose livelihoods are dominated by agriculture sector, (2) based on the experience during the 1998 monetary crisis that showed that agriculture sector was one of the few sectors that survived the crisis, (3) the agriculture sector produces food and raw materials for industry and services sectors, (4) the agricultural sector is able to generate or save foreign exchange from exports or import substitution products, (5) the agricultural sector has a potential market for industrial products, (6) the agricultural sector is one source of economic growth due to the transfer of surplus of labor from agriculture to industrial sector, and (7) the agricultural sector is able to provide capital for the development of other sectors (a net outflow of capital for investment in other sectors), and (8) the absorption of labor in the agricultural sector is very flexible, so that the agricultural sector plays a safety net (survival sector) function in case of an emergency.

In addition, the study of Suselo and Tarsidin (2008) stated that the agricultural sector, plantations, and fishery were the business sectors that possessed the highest level of poverty and also has the highest poverty elasticity towards economic growth.

Agriculture sector covered in this study is the sub-sectors of Food Crops and Other Crops. Food Crops Agriculture Sector is composed of Rice Farming and Other Agriculture Crop. The impacts of a diversion of fuel subsidy to the Food Crops (Scenario II) to the levels of household income for all groups of households are presented in Table 5.7.

Table 5.7. The Simulation Results of the Diversion of fuel Subsidy to the Food Crops on the Level of Income.

Household	Change		
	simulation 2_a	simulation 2_b	simulation 2_c
HUNPOOR	-0.0416	0.0340	0.8312
HUPOOR	-0.2056	-0.5260	-0.4964
HRNPOOR	0.0814	0.4511	1.8091
HRPOOR	-0.0226	0.0850	0.9000

It is found that the impacts of policy scenario II towards income levels varies for all households and simulations. Simulation 2_a, namely the transfer of fuel subsidy by 12.35 percent to the Food Crops sector, generally resulted in a reduction in household income levels for all groups, except for non-poor households in rural areas. The reduction in the levels of income for rural poor, urban poor and urban non-poor households is due to the amount of subsidy given to the Food Crops sector has not been able to compensate the impact of the reduction in fuel subsidy. Meanwhile, rising income among rural non-poor households is because this group of household controls more resources in the Food Crops sector, compared to those of other groups of household. In addition, non-poor rural households may be workers, and also at the same time are land owners. For this group of people, the amount of subsidy given to the Food Crops sector is able to compensate for the impact caused by the reduction in fuel subsidy. In other words, for all groups of households in the rural area, except the non-poor households, a policy to reduce fuel subsidy by 12. 5 percent provides a greater negative impact on their income compared to an increase in income resulting from the transfer of subsidy to the Food Crops sector.

The simulation results of the transfer of fuel subsidy by 43.2 percent (simulation 2_b) and 100 percent (simulation 2_c) to the Food Crops sector have a positive impact on income for all groups, except the urban poor households. The increase in rural household income is mainly because most of the Food Crops sector is in rural areas, thus the subsidy provided by the government can be realized directly by the households. The increase in household income of the non-poor in urban area is mainly due to the impact of agricultural production of food crops in rural areas. The products of this sector are mainly sold in urban area where the sellers are households in urban area who are classified as non-poor. Furthermore, the non-poor households in urban areas are also partly act as an owner of agricultural land. As for the urban poor households, this second scenario gives a negative impact to their income level for all simulations. It is because the urban poor have little access to Food Crops sector. In this case, the accessibility refers to as workers, investors or owners of farmland. In contrast, the other three groups of households most likely are land and capital owners, farm labors, and entrepreneurs in agricultural sector.

The simulation results of scenario II towards poverty rate for all households are presented in Tables 5.8 to 5.10.

Table 5.8. The Simulation Results of the Reduction in Fuel Subsidy by 12.35 Percent and Diverted to the Food Crops on the Level of Poverty

FGT Index	Baseline			Simulation 2_a			Δ		
	α =0	**α =1**	**α =2**	**α =0**	**α =1**	**α =2**	**α =0**	**α =1**	**α =2**

HUNPOOR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
HUPOOR	1.00000	0.19158	0.05766	1.00000	0.19325	0.05822	0.00000	0.8676%	0.9600%
HRNPOOR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
HRPOOR	1.00000	0.19262	0.06203	1.00000	0.19280	0.06209	0.00000	0.0947%	0.0952%

Simulation 2_a policy is reducing the fuel subsidy by 12.35 percent of total fuel subsidy and transfer it to the Food Crops in Agricultural sector has an impact on the increasingly wide gap of income among the poor as well as increasing poverty severity index as shown in Table 5.8. The poverty gap indices for poor households in urban and rural areas have increased by 0.8676 percent and 0.0947 percent, respectively. Meanwhile, the poverty severity indices for urban and rural poor have increased by 0.9600 percent and 0.0925 percent, respectively.

Although this policy resulted in a decrease in household income levels of all groups, except the group of non-poor households in rural areas (see Table 5.7), the reduction in the level of income does not increase the number of poor households. This is shown by the absence of a change in head count index value P_0 or α_0 before and after the simulation. In other words, a reduction in the income level is insignificant so that those households that are marginally non-poor (especially in the urban area) remain the same level of income.

Table 5.8 shows that this policy does not affect the number of poor households. In general, this policy only reduces the level of household income that contributes to further away from the average incomes of the poor to poverty line (poverty gap index increased). The increasing in the poverty gap index for poor households in urban area is larger than that of poor households in rural areas. It is because poor households in rural areas have better access to food crop agriculture sector compared to the urban poor, thus the reduction in the level of income of the urban poor is greater than the reduction in income among rural poor due to the reduction in fuel subsidy.

Reducing fuel subsidy by 43.2 percent accompanied by a transfer of subsidy to the Food crops sector (Simulation 2_b) affect the index of poverty for urban and rural poor. As shown in Table 5.7, this policy has resulted in increase household income levels of all groups, except the poor households in urban areas. The increase in the level of income has reduced the level of rural poverty by 0.422 percent or a reduction in head count index by 0.00422. The increase in income levels is also reducing the poverty gap index for poor households in rural area by 0.3554 percent and the poverty severity index by 0.3571 percent.

Table 5.9. The Simulation Results of the Reduction in Fuel Subsidy by 43.2 Percent and Diverted to the Food Crops on the Level of Poverty

FGT Index	Baseline			Simulation 2_b			Δ		
	α =0	α =1	α =2	α =0	α =1	α =2	α =0	α =1	α =2
HUNPOOR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
HUPOOR	1.00000	0.19158	0.05766	1.00000	0.19584	0.05909	0.00000	2.2195%	2.4757%
HRNPOOR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
HRPOOR	1.00000	0.19262	0.06203	0.99578	0.19193	0.06181	-0.00422	-0.3554%	-0.3571%

Unlike the rural poor, the urban poor experience a decline in income if the government transfers 43.2 percent of fuel subsidy to the agricultural sector. A decrease in income level has an impact on income gap and the severity of poverty. In this case, the poverty gap and poverty severity indices for urban poor have increased to 2.2195 percent and 2.4757 percent, respectively. However, for overall groups of household, policy simulation 2_b is able to reduce poverty by 0.3554 percent.

Table 5.10. The Simulation Results of the Reduction in Fuel Subsidy by 100 Percent and Diverted to the Food Crops on the Level of Poverty

FGT Index	Baseline			Simulation 2_c			Δ		
	α =0	**α =1**	**α =2**	**α =0**	**α =1**	**α =2**	**α =0**	**α =1**	**α =2**
HUNPOOR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
HUPOOR	1.00000	0.19158	0.05766	1.00000	0.19560	0.05901	0.00000	2.0946%	2.3346%
HRNPOOR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
HRPOOR	1.00000	0.19262	0.06203	0.95670	0.18554	0.05973	-0.04330	-3.6717%	-3.7029%

Policy 2_c simulation is the policy to reduce fuel subsidy by 100 percent of total fuel subsidy (abolishment of the fuel subsidy) and diverted the government saving to Food Crops sector have the same directional effects with those in simulation 2_b, but with greater values. The simulation results in the Table 5.7 show that the level of income for all household groups, except the urban poor, has increased. This increase in income is able to reduce poverty rate by 4.330 percent of the total poor households in rural areas. The poverty gap and severity of poverty among rural poor are decreased by 3.6717 percent and 3.7029 percent, respectively. Although this policy is able to reduce the overall poverty level, but for the urban poor this policy is precisely raise the poverty gap index by 2.0946 percent and the poverty severity index by 2.3346 percent.

Tables 5.8 to 5.10 show that the simulations based on scenario II policies are able to reduce poverty, except for the policy simulation 2_a. The simulation 2_c has a greater contribution to poverty reduction compared with the other two simulations. However, the simulation 2_c also provides the greatest contribution toward the widening of poverty gap and the increase in the severity of poverty for urban poor households. These findings are consistent with a study conducted by Yudoyono (2004), who concluded that in the short term, policies to increase government expenditure in agriculture has an impact on rural poverty reduction. Likewise, the study Simatupang and Dermorejo (2003), which concluded that the increase in GDP of agriculture sector resulted in a decrease in the level of rural poverty.

5.4.3 The Simulation Results of the Impact of Diversion of Fuel Subsidy to Other Crops in Agriculture Sector (Scenario III) on Income and Poverty Level

Other Crop Agricultural Sector set forth in this simulation has been described in the previous chapter, consisting of: (1) sugarcane and other sweeteners, (2) tobacco, (3) rubber and other latex-producing crops, (4) fiber crops for textile raw materials and the like, (5) medicinal plants and pharmaceutical crops, (6) essential oil crops, (7) plantation crops which are not classified elsewhere, (8) horticultural and vegetables that are harvested once, (9) horticultural and vegetables that are harvested more than once, (10) flower crops, (11) other ornamental plants, (12), seedling nurseries and horticulture of vegetables and flowers, (13) seasonal fruit crops, (14) orchard (fruit tress) harvested throughout the year, (15) coconut, (16) oil palm, (17) beverage crops, (18) cashew nut, (19) pepper, (20) clove, and (21) plantation crops other than spices.

Policy scenario III is reduction in fuel subsidy by 12.35 percent, 43.2 percent, 100 percent and at the same time the government uses this saving to subsidize the farmers in Other Crops in the agricultural sector. Table 5.11 reveals the simulation results of this scenario on household income levels.

Table 5.11. The Simulation Results of the Diversion of fuel Subsidy to the Other Crops on the Level of Income.

Household	Change		
	simulation 3_a	simulation 3_b	simulation 3_c
HUNPOOR	0.4674	1.2544	16.7885
HUPOOR	0.3224	0.5230	11.7780
HRNPOOR	0.5709	1.8104	20.5742
HRPOOR	0.4589	1.3746	17.4994

Overall, the policy scenario III gives an impact on increasing household income of all household groups. Most of the household groups have to do with Other Crops in Agricultural sector, either as worker, land owner, or entrepreneur in this sector. The rural households are affected by a larger increase in income compared to the income of the urbanites. As expected, most of the Other Crops in Agricultural sector are planted in rural area, thus the benefit of it can be realized by rural households. From Table 5.11, it can be seen that the greater the subsidy given to this sector, the greater the increase in income levels experienced by each household group.

Tables 5.12 to 5.13 show the impact of policy scenario III to the level of poverty, poverty gap and poverty severity for all groups of households.

Table 5.12. The Simulation Results of the Reduction in Fuel Subsidy by 12.35 Percent and Diverted it to Other Crops on the Level of Poverty

FGT Index	Baseline			Simulation 3_a			Δ		
	α =0	α =1	α =2	α =0	α =1	α =2	α =0	α =1	α =2

HUNPOOR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
HUPOOR	1.00000	0.19158	0.05766	0.98385	0.18900	0.05681	-0.01615	-1.3477%	-1.4855%
HRNPOOR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
HRPOOR	1.00000	0.19262	0.06203	0.97815	0.18896	0.06084	-0.02185	-1.8969%	-1.9095%

The simulations results of reducing fuel subsidy by 12.35 percent of total fuel subsidy and diverted them to the Other Crops in Agricultural sector are shown in Tables 5.11 and 5.12. This policy has an impact on the increasing household income of all groups as shown in Table 5.11. The increase in income is able to reduce of poverty level, poverty gap and severity of poverty as shown in Table 5.12. Poverty reduction can be seen from the reduction in head count poverty index by 1.615 percent for the poor household in urban area and 2.185 percent for the poor household in rural area. The reduction in the level of poverty is also followed by a decrease in poverty gap index by 1.3477 percent for the urban poor and 1.8969 percent for the rural poor. Thus, the total gap of all poor households to the poverty line has narrowed. Furthermore, the poverty severity index is also reduced by 1.4855 percent for the group of poor households in urban area, and 1.9095 percent in the group of poor households in rural area.

Table 5.13. The Simulation Results of the Reduction in Fuel Subsidy by 43.2 Percent and Diverted it to the Other Crops on the Level of Poverty

FGT Index	Baseline			Simulation 3_b			Δ		
	α =0	α =1	α =2	α =0	α =1	α =2	α =0	α =1	α =2
HUNPOOR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
HUPOOR	1.00000	0.19158	0.05766	0.97652	0.18742	0.05628	-0.02348	-2.1736%	-2.3977%
HRNPOOR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
HRPOOR	1.00000	0.19262	0.06203	0.93548	0.18196	0.05856	-0.06452	-5.5292%	-5.5882%

Simulation 3_b policy is related to a reduction in fuel subsidy by 43.2 percent and channeled the saving to the Other Crops in Agricultural sector. This policy gives a greater contribution towards poverty reduction, poverty gap and severity of poverty compared to those of in the simulation 3_a policy. Table 5.13 shows that the simulation results of this policy has reduced the head count poverty index for the urban poor by 2.348 percent, and for the rural poor the head count poverty index is reduced by 6.452 percent. The improvements in the poverty gap and poverty severity indices are 2.1736 percent and 2.3977 percent, respectively, for the urban poor. The poverty gap and poverty severity indices for the rural poor are 5.5292 percent and 5.5882 percent, respectively. The simulation results show that rural poverty reduction is much greater than the reduction of poverty in urban areas.

Table 5.14. The Simulation Results of the Reduction in Fuel Subsidy by 100 Percent and Diverted it to the Food Crops on the Level of Poverty

FGT Index	Baseline			Simulation 3_c			Δ		
	α =0	α =1	α =2	α =0	α =1	α =2	α =0	α =1	α =2
HUNPOOR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
HUPOOR	1.00000	0.19158	0.05766	0.64431	0.11906	0.03362	-0.35569	-37.8543%	-41.7008%
HRNPOOR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
HRPOOR	1.00000	0.19262	0.06203	0.51602	0.10067	0.03081	-0.48398	-47.7333%	-50.3329%

Table 5.14 shows the simulation results of the abolishment of fuel subsidy and the amount saved by the government is transferred to the Other Crops Agricultural sector. It is found that the head count index of the poor households in urban and rural areas experienced a sharp decline, by 35.569 percent and 48.398 percent, respectively. A decrease in the poverty level is followed by a decrease in poverty gap and poverty severity indices. The poverty gap and

poverty severity indices for the urban poor are decreased by 37.8543 percent and 41.7008 percent, respectively. The poverty gap and poverty severity indices for the poor rural households are decreased by 47.7333 percent and 50.3329 percent, respectively.

From Table 5.14, it is found that the policy to reduce fuel subsidy by 100 percent of the total fuel subsidy (abolish fuel subsidies) and transferred them into the Other Crops Agricultural sector is able to reduce poverty by 35.569 percent of the total poor households in urban area plus with a 48.398 percent of total households in rural area. In addition, the decrease in poverty gap index indicates that the total income gap between all poor households to the poverty line has narrowed. In other words, the average poor household income level is nearer to the poverty line.

From the simulations results 3_a, 3_b and 3_c, it is found that the policy scenario III generally has a significant impact on poverty reduction. However, the impact on rural poverty reduction is much greater than in urban areas. This is because rural people's access to the Other Crops Agricultural sector directly is bigger than the poor in urban areas, so the increase in household income that is realized by the rural poor is also greater compared to households in urban area.

Three simulations in scenario III, the simulation 3_c policy, provides the great of contribution in reducing poverty indicators compared to the other two simulations. This indicates that the larger the subsidy granted to Other Crops Agricultural sector, the better in terms of improving the household incomes and reducing poverty.

From the simulations, it is also found that the reduction or even elimination of fuel subsidy has no impact in the increasing number of poverty if the money saved from the reduction in fuel subsidy is transferred to Other Crops Agricultural sector. In other words, if the objective is reducing poverty, then the subsidy to Other Crops Agricultural sector can be taken as a policy.

This is in line with a study conducted by Abimanyu (2000) who found that the agricultural sector, especially the rubber plantation sub-sector, is able to provide greater benefits of a government subsidy. Furthermore, a subsidy is the most effective way to be applied for rural poverty alleviation. The results from The Research IPB (2002) found that agricultural development model based Agriculture Development Bank (ADB) to stimulate higher economic growth. Arndt *et al* (1998) in their study found that the development of the agricultural sector has an impact to reduce poverty. Ravallion and Datt (1999) stated that an increase in the growth of agricultural sector was believed to be the most efficient way to reduce income inequality and poverty. Mellor (1999) mentioned that the growth of the manufacturing sector was important to the overall growth for a country, but the growth of the agricultural sector was very important for employment growth and poverty reduction. Meanwhile, Bigsten and Levin (2000) stated that some strategic element that can reduce poverty, among others, is outward-oriented strategy of export-led economic growth, which was based on labor intensive manufacturing, agriculture and rural development. Suselo and Tarsidin (2008) concluded that the most appropriate step to reduce poverty was to give more attention on agriculture, plantations and fisheries sectors.

5.5 Income Distribution Analysis

To determine the impact of various scenarios on the distribution of income, the beta density distribution function, also known as the beta distribution function is employed as proposed by Decaluwe *et al* (1999), Cockburn (1999), and Agenor *et al* (2003).

The income distribution is obtained by comparing the results of the simulations to the Indonesian SUSENAS Table. To analyze the distribution of income by household groups, it is proposed that an income distribution formula is used in accordance to the characteristics of the household. This distribution depends on the maximum and minimum income and the skewness of income distribution.

To view the distribution of income in accordance with the purpose of this study, households are classified into four groups, consisting of (1) non-poor households in the urban area, HUNPOOR, (2) poor households in the urban area, HUPOOR, (3) rural non-poor household, HRNPOOR, and (4) poor households in the rural area, HRPOOR.

The characteristics of the four groups of households are presented in Table 5.15. The variation in the maximum household income among the groups ranges from Rp 117,258.80 to Rp 38,213,000.00 per month. The variation in the minimum income among the household groups ranges from Rp 27,261.90 to Rp 151,345.30 per month. The lowest average monthly income for poor household in rural area (HRPOOR) is Rp 94,673.15 per month. The non-poor household in rural area (HRNPOOR) consisted of the largest population (50.80 percent). This is followed by non-poor households in urban areas (HUPOOR) (32.73 percent). From Table 5.15 can be seen that the largest percentage of poor people in rural area (HRPOOR), (11.77 percent), while the poor population in urban area (HUPOOR) is only 4.71 percent of the population.

Table 5.15. The Income Distribution by Household Groups

Household	Income (Rp/Month)					Population	
	Mean	Max	Min	Total (000)	%	N	%
HUNPOOR	1,108,536.39	38,213,000.00	151,345.30	93,562,688	54.62%	84,402	32.73
HUPOOR	121,908.19	150,797.00	23,455.78	1,479,600	0.86%	12,137	4.71
HRNPOOR	560,244.68	16,605,113.00	117,266.60	73,395,415	42.84%	131,006	50.80
HRPOOR	94,673.15	117,258.80	27,261.90	2,872,952	1.68%	30,346	11.77
All	471,340,60	38,213,000.00	27,261.90	171,310,655	100.00%	257,891	100.00

Source: Susenas 2005 (processed)

The analysis of the income distribution in this study is seen from two angles. The first is the analysis of household income distribution between groups and the second is the analysis of income distribution among households in the group. The analysis of income distribution between groups is done by comparing the percentage of population with a percentage of total income for each group using the characteristics of household income data obtained from the SUSENAS 2005. This method is consistent to the theory underlying the Lorenz curve, in which perfect equality occurs if *X* percent of the population received *X* percent of total income. Based on Table 5.15, it can be seen that the inequality in income distribution between groups of households, both among groups of households residing in urban area and groups of households residing in rural area, and among non-poor household groups with group of poor households.

Of the total income, it is found that more than half or 54.62 percent of them is received by non-poor households in the urban area. But, the non-poor urbanites consisted of 32.73 percent of the total population. The poor households in the urban area, which consist of 4.7 percent of the total population receive 0.86 percent of total income. The non-poor rural households which represent 50.80 percent of the population control 42.84 percent of the total income. The remaining income (1.68 percent) is received by the rural poor that represent 11.77 percent of the population.

If a comparison is made between urban and rural households, it is found that there is 37.44 percent of population residing in the urban area and they control 55.48 percent of total income. The rural household which consisted of 61.97 percent of the total population control 44.52 percent of income.

The data show that the non-poor households (urban and rural) consisted of 83.53 percent of the population are command of 97.46 percent of the total income. The remaining 16.47 percent of the population is the poor who control 2.54 percent of total income.

Table 5.16 reveals the income distribution of three groups of households. The three groups are based on the World Bank criteria of income distributions: 40 percent low-income residents, 40 percent middle-income residents, and the remaining 20 percent of high-income population (Nanga, 2006).

It can be seen that 40 percent of the low-income households receive only 10.65 percent of total income. The next 40 percent is the middle-income households, who receive 34.22 percent of total income. The remaining 20 percent of the population is the high-income households that receive 55.14 percent of the total income.

Table 5.16. Household Income by Income Level

Income Level	Population		Income (Rp/Month)		
	%	N	Mean	Total	%
Low	40	103,156	176,798.92	18,237,869,873	10.65%
Medium	40	103,156	568,239.83	58,617,348,178	34.22%
High	20	51,579	1,831,277.01	94,455,436,721	55.14%
Total	100	257,891	664,275.43	171,310,654,772	100.00%

Source: Susenas 2005 (processed)

Furthermore, the World Bank also sets the criteria on the size of distribution or inequality in income that is calculated by the following considerations:

4. If 40 percent low-income residents have a share of income less than 12 percent of the total income, then it is said that there is a disparity in income or the inequity is "high".
5. If 40 percent low-income residents have a share of income between 12-17 percent of the share in total income, then it is classified that there is a moderate disparity in income or the inequity is "medium".
6. If 40 percent low-income residents have a share of income were than 17 percent of the total income, then there is a mild income disparity or the inequity is "low".

Referring to Table 5.16 and the World Bank criteria, it can be said that the existing category of inequality or disparity in income distribution is relatively high.

The analysis of the household income distribution among the group is using a beta distribution Function as shown in equation (4.37). Table 5.17 displays the parameters to be estimated for the distribution of income of each household group. The parameters *mx*, *mn*, *p* and *q* are estimated from the SUSENAS 2005 data. The income distribution shown in Table 5.17 is transformed to Figures 5.5 to 5.16. The transformation of the income distribution is done using Distributive Analysis / DAD version 4.5 software).

Table 5.17. Value of the Parameters of the Beta Density Distribution

No	Household	*p*	*q*	Stdev	*mn*	*Mx*
1	HUNPOOR	1,792,706.28	1,792,704.66	1,411,051.16	151,345.30	38,213,000.00
2	HUPOOR	3,923,053.75	3,923,085.93	21,831.74	23,455.78	150,797.00
3	HRNPOOR	1,226,933.03	1,226,930.84	513,576.09	117,266.60	16,605,113.00
4	HRPOOR	2,570,177.44	2,570,204.59	18,514.15	27,261.90	117,258.80

The parameters *mx* and *mn* are the maximum and minimum income in the household group while the parameters *p* and *q* are calculated using equations (4.38) and (4.39). The parameters *p* and *q* affect the disparity in income distribution for each household group. If $p > q$, then the relative income distribution is skewed to the left. This indicates that the inequality in income distribution has increased. If $q > p$, then the income distribution becomes more skewed to the right. This also indicates that there is inequality in income distribution. If $p = q$, the function is symmetric, this means that there is no inequality in income distribution.

Figures 5.5 to 5.16 are used to evaluate the distribution of income for each household group, with the assumption that if the average income in each group of households is increased by ψ, then the income of each household in the group will also increase by ψ. On this basis, income distribution will be shifted horizontally to follow the change in income for each household group.

5.5.1 The Results of the Policy Simulation on Income Distribution of the Non-Poor Urban Household (HUNPOOR)

Figures 5.5 to 5.8 show the simulated impact of policy scenarios I to III to the non-poor households in urban areas. Figure 5.5 shows that the policy scenario I (reduction in fuel subsidies in stages until it reaches zero level, followed by compensation to poor households in the form of the BLT amounted to Rp 100,000 per month per household) for all simulations do not have a significant effect on changes in income distribution. This can be seen by looking at the unshifted simulated curve from the baseline curve. Similarly, policy scenario II (transfer of the fuel subsidy at various rates as per scenario I and compensate the Food Crops agricultural sector) is shown in Figure 5.6. In contrast, the policy scenario III (transfer of fuel subsidy reduction to Other Crops Agricultural sector) has an impact on decreasing inequality of income distribution. This can be seen at a shift in the distribution curve from the baseline toward the right (Sim3) as shown in Figure 5.7. Table 5.10 shows that the scenario III had a significant impact on an increasing in income. This is a major factor in shifting the distribution curve towards the right. Thus, for the non-poor households in urban area, among the three scenarios, only the third policy scenario (Simulation 3_c) gives effect to the more equitable distribution of income.

The lack of impact of scenario I to non-poor households in the urban area is due to the fait that they are not the target group of the BLT. The intended target group of the BLT is the poor households. Scenario I resulted in a decrease in the level of household income as shown in Table 5.3, but the decline in this income level does not effect the distribution of household income. For scenario II, although the simulated transfer of fuel subsidy to the agricultural sector amounted to 43.2 percent for Food Crops (2_b simulation) and by 100 percent (simulation 2_c) are able to increase household income as shown in Table 5.7,they are not strong enough to affect income distribution.

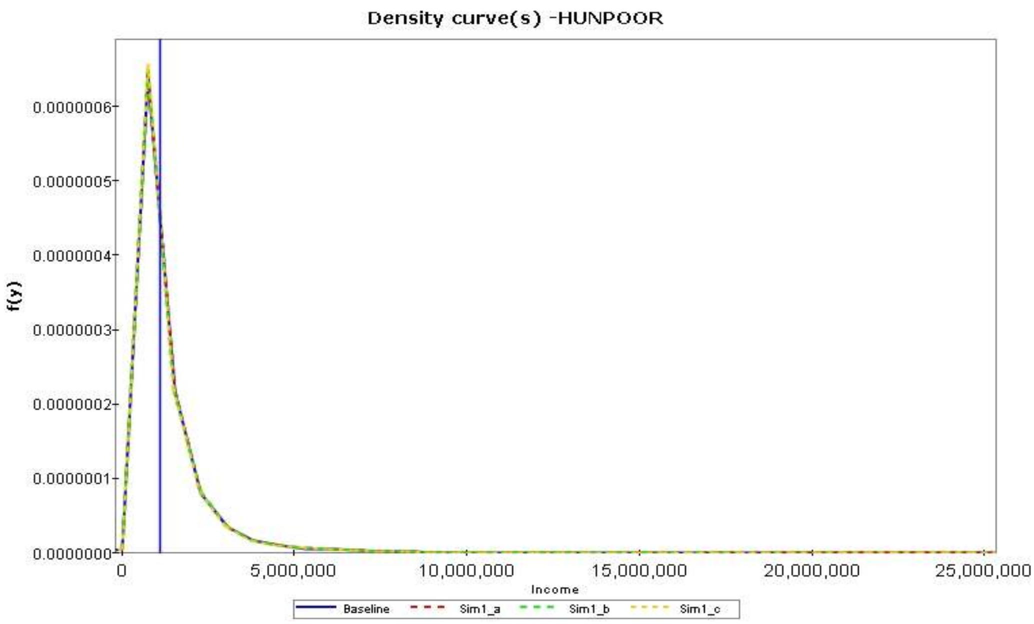


Figure 5.5. The impact of Scenario I on the non-poor household income distribution in Urban Areas

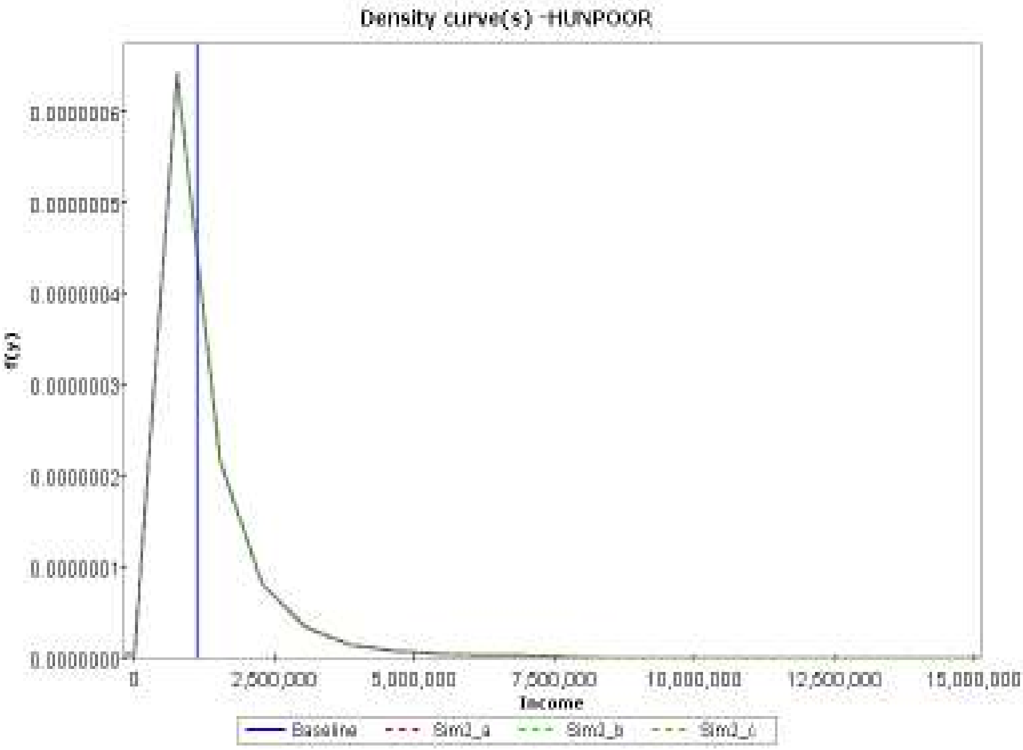


Figure 5.6. The impact of scenario II on non-poor household income distribution in urban area

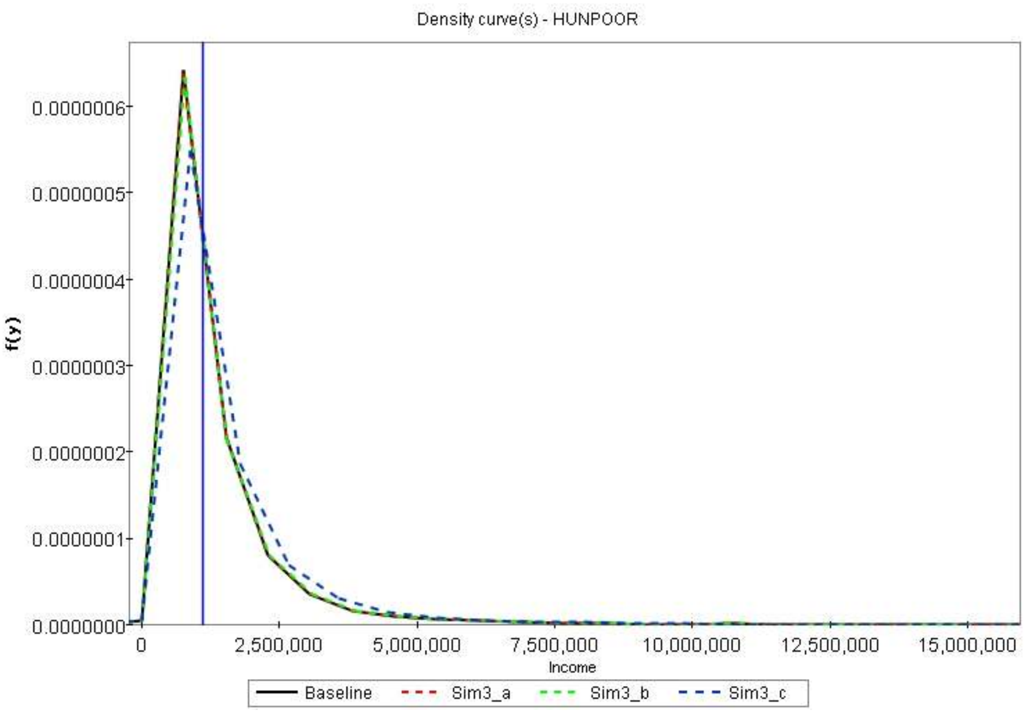


Figure 5.7. The impact of Scenario III on Non-Poor Household Income Distribution in Urban Area

5.5.2 The Results of the Policy Simulation on Income Distribution of the Poor Household in Urban Areas (HUPOOR)

Figures 5.8 to 5.10, respectively, show the simulated impact of policy scenarios I to III of the poor households in urban areas (HUPOOR). Figure 5.8 reveals the impact of policy scenario I for all simulations on income distribution improvement or decline in the inequality of income distribution to various groups of poor households in urban areas. As shown in Table 5.3, these scenarios lead to lower levels of household income. In Figure 5.8 the income distribution curve shifts from right to left towards the average level of income. The curve movement indicates that the policy to reduce fuel subsidy followed by the BLT to the poor on the one hand reduces the level of income and aggravates poverty level, but on the other hand this policy is effective in reducing the level of inequality of income distribution within the group. Further analysis on the same household group, it is found that any household that is marginally above poverty line before the simulation, now this household is located below poverty line which is closer to the rest of the poor households. This is what causes the more equitable income distribution, but poverty is deteriorating. The higher the level of household income in the urban area, the greater the access to the impacts caused by the reduction in fuel subsidy. In other words, households with lower income levels would use fewer goods and services that have direct impact on an increase in fuel price such as transportation. So the relative curve shifts to the left with a better level of distribution. Simulation 1_c provides the greatest impact followed by simulations 1_b and 1_a.

In scenario II, it is found that the impact to urban poor is small. This is because the urban poor has little access in terms of labor participation or engage in the Food Crops agri-business. Thus when the government adopted a policy of providing subsidy to the Food Crops agricultural sector (diversion of fuel subsidy), the impact on this household group is very small.

Scenario III precisely exacerbates the inequality in income distribution for the urban poor households. Simulations 3_a to 3_c as shown in Figure 5.10 reveals that the greater the level of fuel subsidy that is transferred to Other Crops Agricultural sector the greater the impact on raising the level of income, but at the same time the disparity becomes higher.

Figure 5.10 shows that the distribution curve shifts to the right away from the average level of income. This result shows that a policy intended to increase the level of household income is effective in reducing the level of poverty as shown in Table 5.11. But, on the other hand, this policy makes the disparity in income becomes higher as indicated by the shift of the distribution curve from left to right in Figure 5.10. This explained to this outcome is that as the government diverts fuel subsidy to Other Crops Agricultural sector, such as plantation crops, results in an increase in the production of this sector. An increase in the production will be followed by an increase in industrial downstream activities, such as furniture, vegetable oil and other oil derivatives industries. Thus, job opportunities are created and share is an increase in income for workers who live in the urban area. But due to limited employment opportunity to the urban poor, then the end result is an increase in income inequality of income distribution.

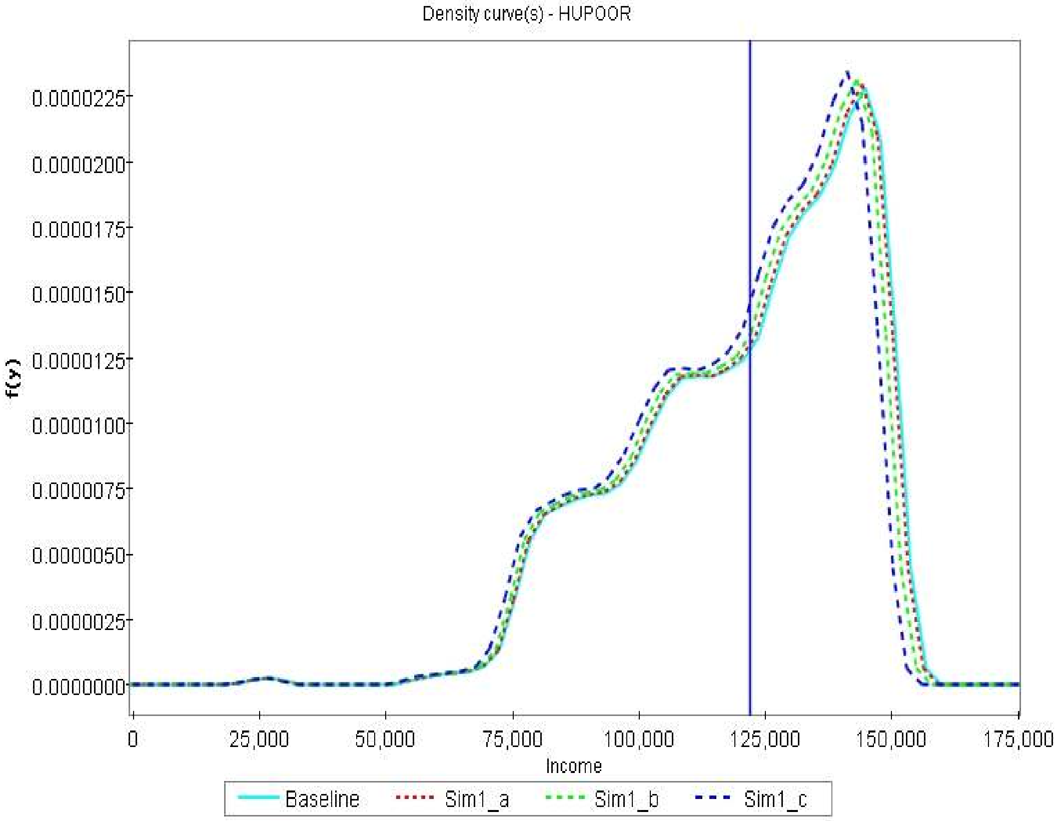


Figure 5.8 The Impact of Scenario I on Income distribution of the Poor Urban Household

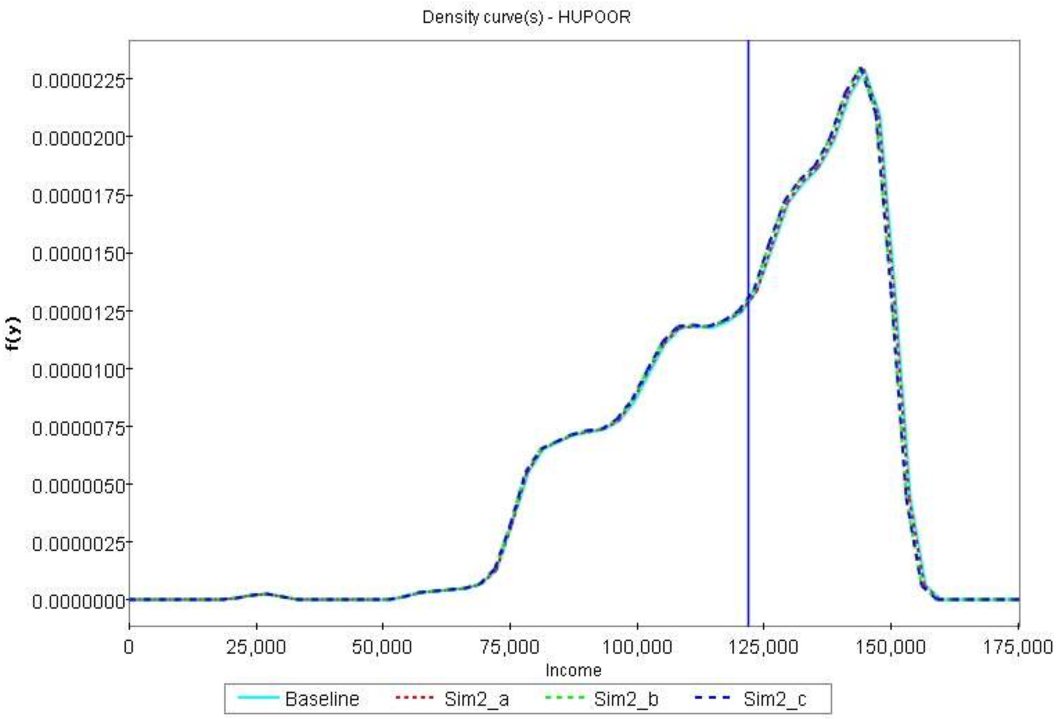


Figure 5.9 The Impact of Scenario II on Income Distribution of the Urban Poor Household

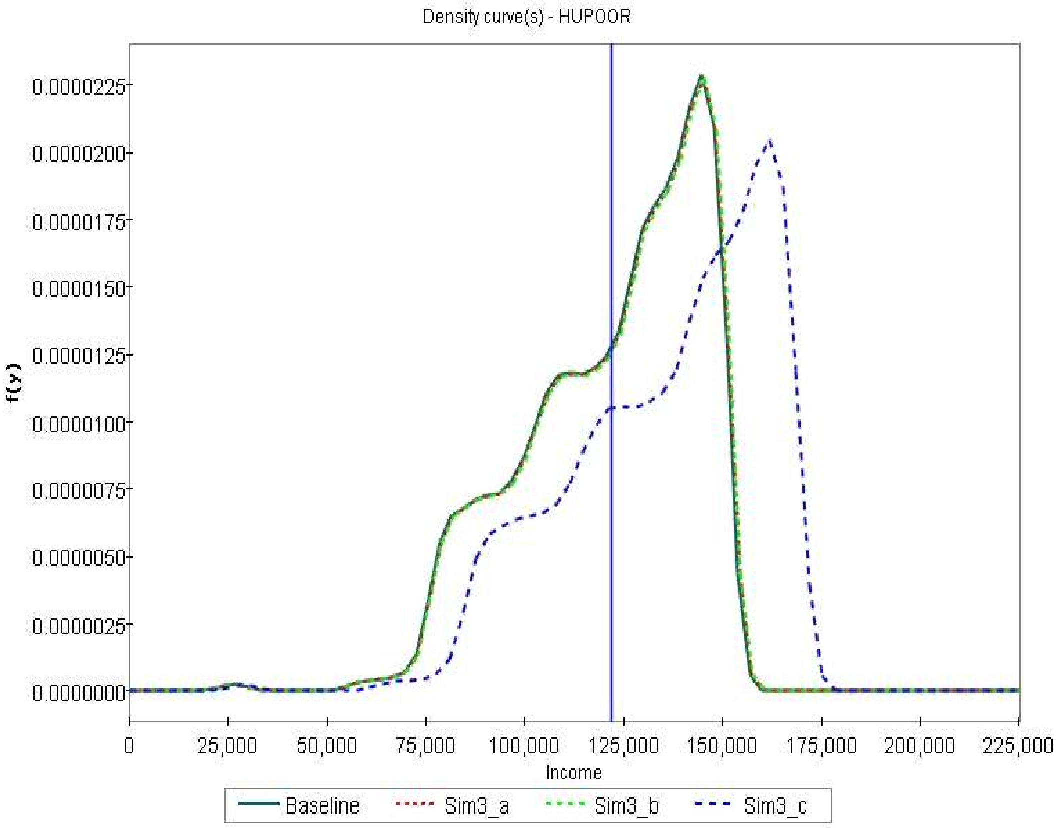


Figure 5.10. The Impact of Scenario III on Income Distribution of the Urban Poor Household

5.5.3 The Results of the Policy Simulation on Income Distribution of the Rural Non-Poor Household (HRNPOOR)

For the non-poor households in rural areas, policy scenarios I and II for all simulations do not have significant effects on in income distribution. Policy scenario I is effective in decreasing the level of income as shown in Table 5.3. The decline in income is unable to shift the income distribution curve as shown in Figure 5.11.

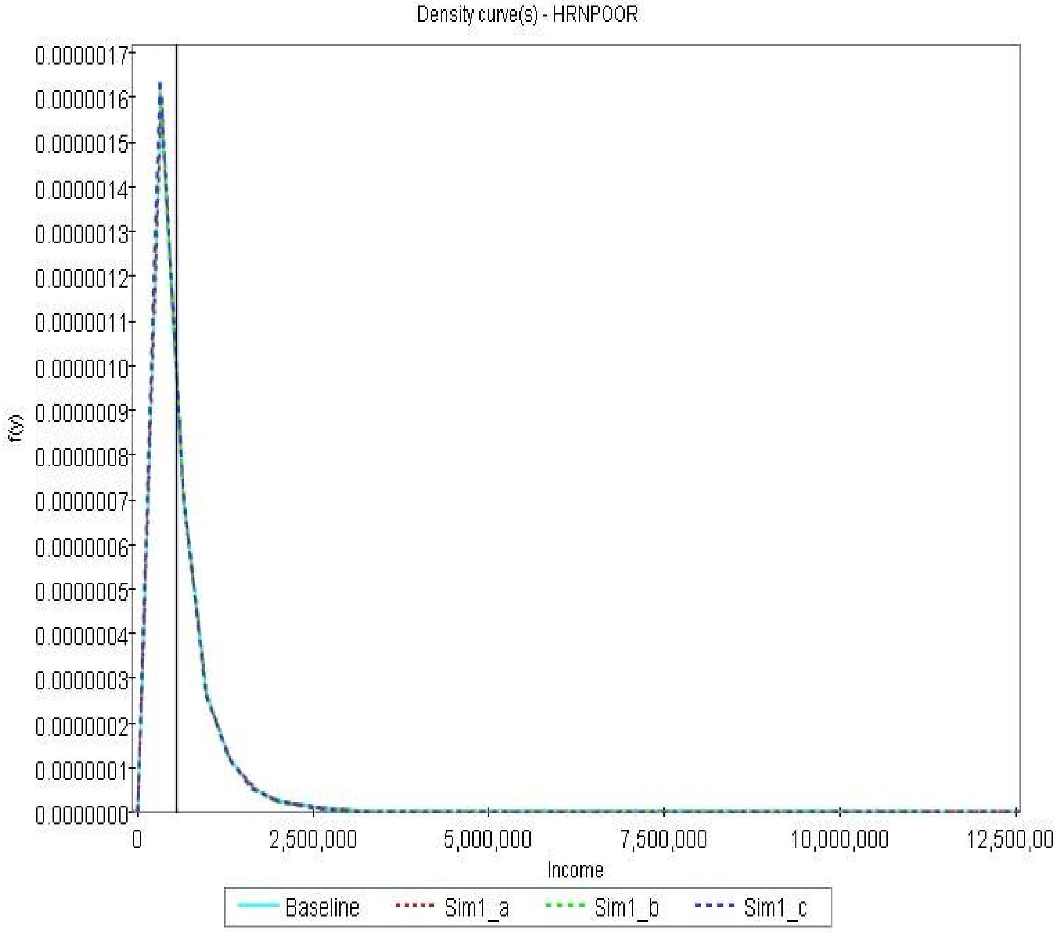


Figure 5.11. The Impact of Scenario I on Income Distribution of the Rural Non-Poor Household

Scenario II policy resulted in an improvement in the household income level as shown in Table 5.7, but this improvement is too small to affect income distribution, visually.

Unlike the previous two policy scenarios, scenario III policies have an impact on the improvement of income distribution for the non-poor household groups in rural areas. From Figure 5.13, it can be seen that distribution curve shifts to the right after the simulation, especially for Simulation 3_c.

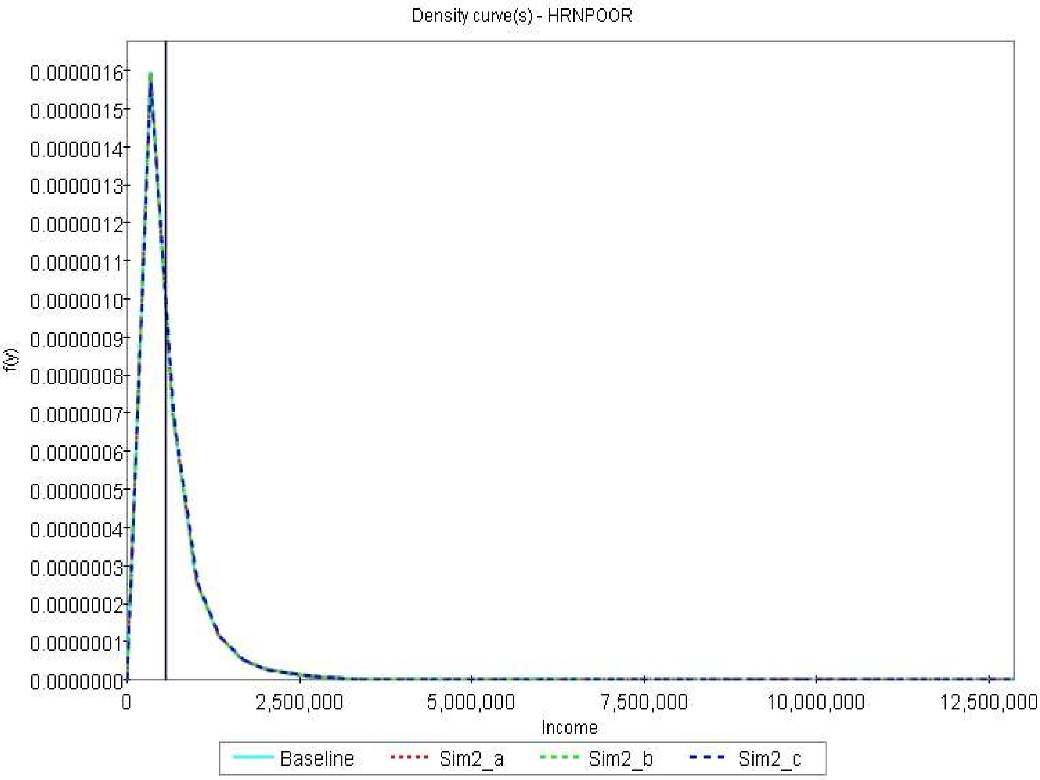


Figure 5.12. The Impact of Scenario II on Income Distribution of the Rural Non-Poor Household

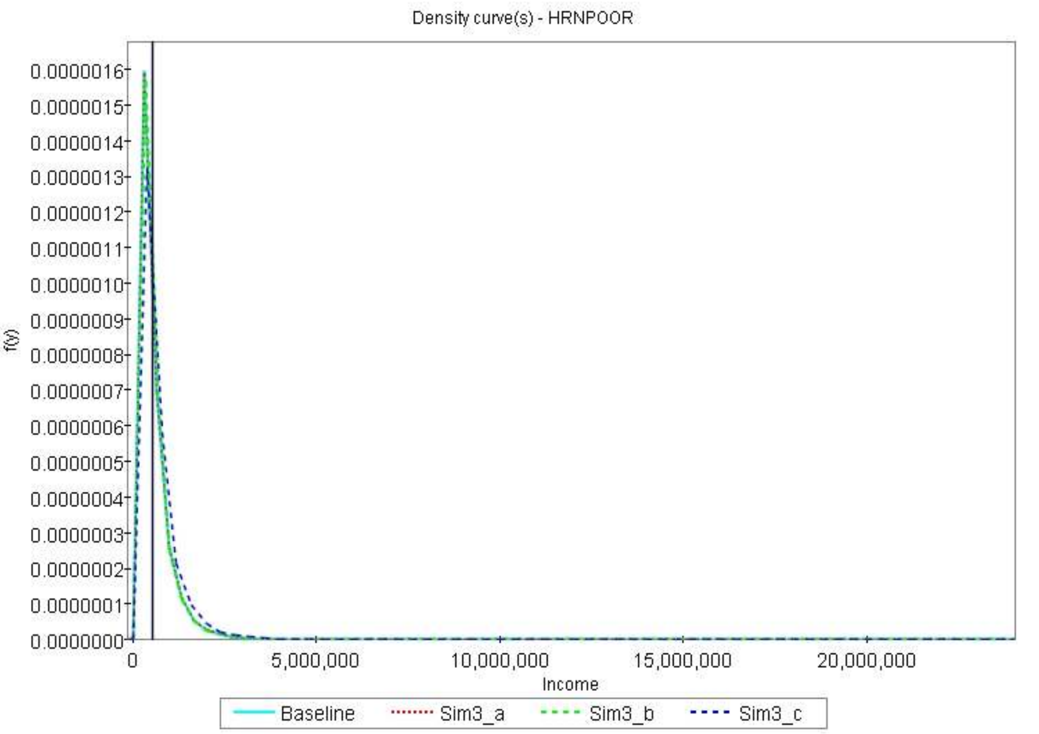


Figure 5.13. The Impact of Scenario III on Income Distribution of the Rural Non-Poor Household

5.5.4 The Results of the Policy Simulation on Income Distribution of the Rural Poor Household (HRPOOR)

Figures 5.14 to 5.16 show the simulation results of policy scenarios I to III on the distribution of income in poor rural household groups. Figure 5.14 shows that the policy scenario I has a positive impact on income distribution in the group. It is characterized by shifting the distribution curve to the left near the average income.

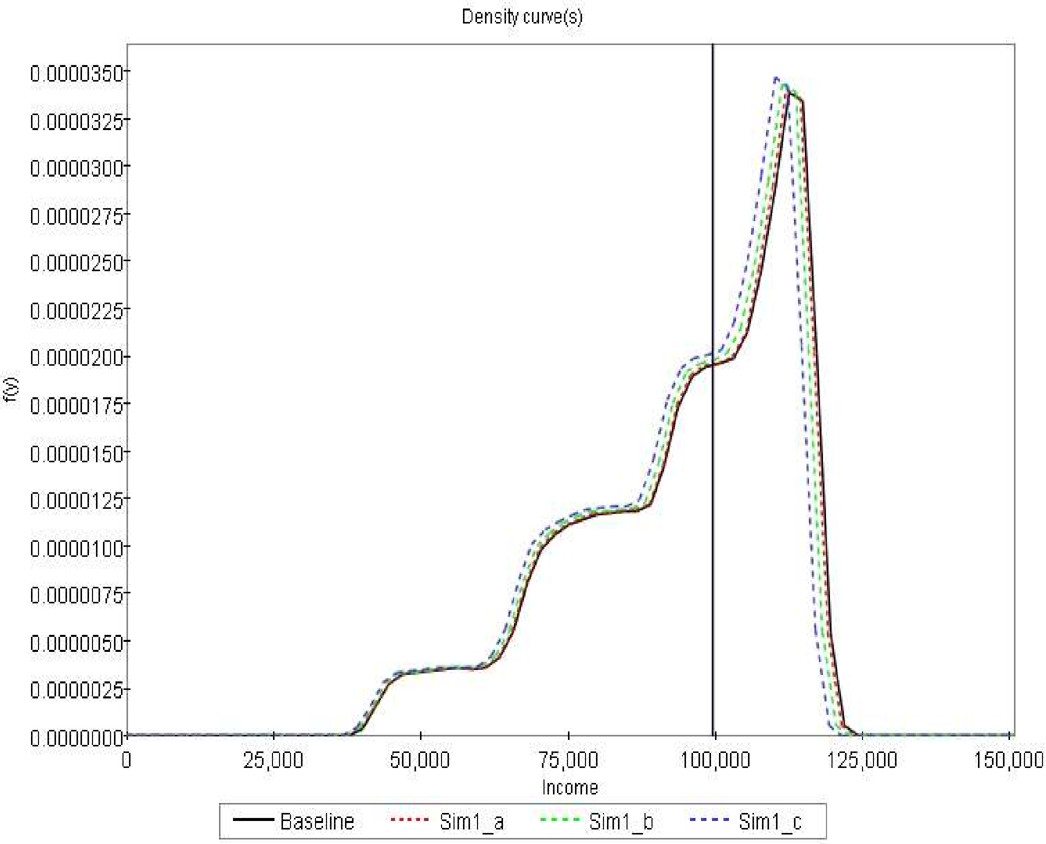


Figure 5.14. The Impact of Scenario I on Income Distribution of the Rural Poor Household

On the one hand, the government policy to reduce fuel subsidy followed by the BLT to poor households have an impact on reducing the level of household income and increase poverty levels as shown in Table 5.3. But on the other hand, this policy has an impact on reducing income inequality in the group of poor households in rural areas. Figure 5.14 also shows that, of the three simulations, simulation 1_c provides the greatest impact on reducing income inequality, followed by simulation 1_b and 1_a. The reduction in household income in simulation 1_c is greater than with simulated 1_b and 1_a.

In contrast to scenario I, scenario II produces precisely an opposite impact on income distribution in the group of poor households in rural areas. Figure 5.15 shows that the simulated curve shifts toward the right side further away from the line even though the average income shifts is relatively small. This shift is due to the increase in household income as a result of the said policy as shown in Table 5.7, especially 2_c simulation. The small shift is consistent with the small increase in income realized by households.

Scenario III provides the same effects as those in scenario II. Figure 5.16 reveals that, after the simulation, the distribution curve shifts to the right away from the average income, resulting in wider income inequality. This sharp imbalance caused by the increase in household income is high due to the policy scenario III as shown in Table 5.11.

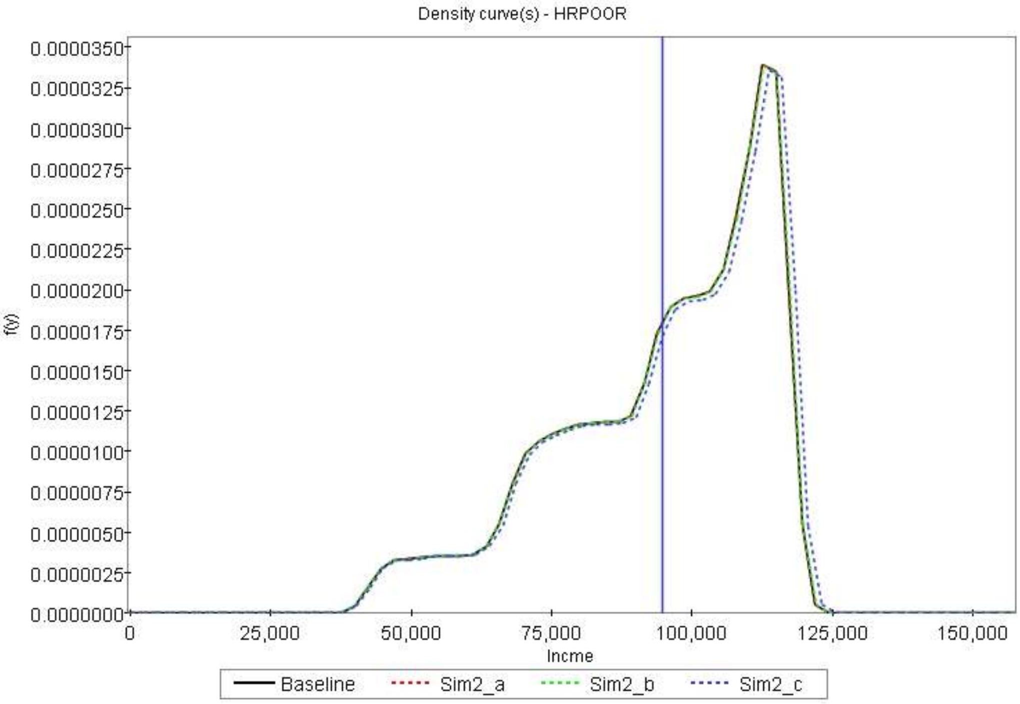


Figure 5.15. The Impact of Scenario II on Income Distribution of the Rural Poor Household

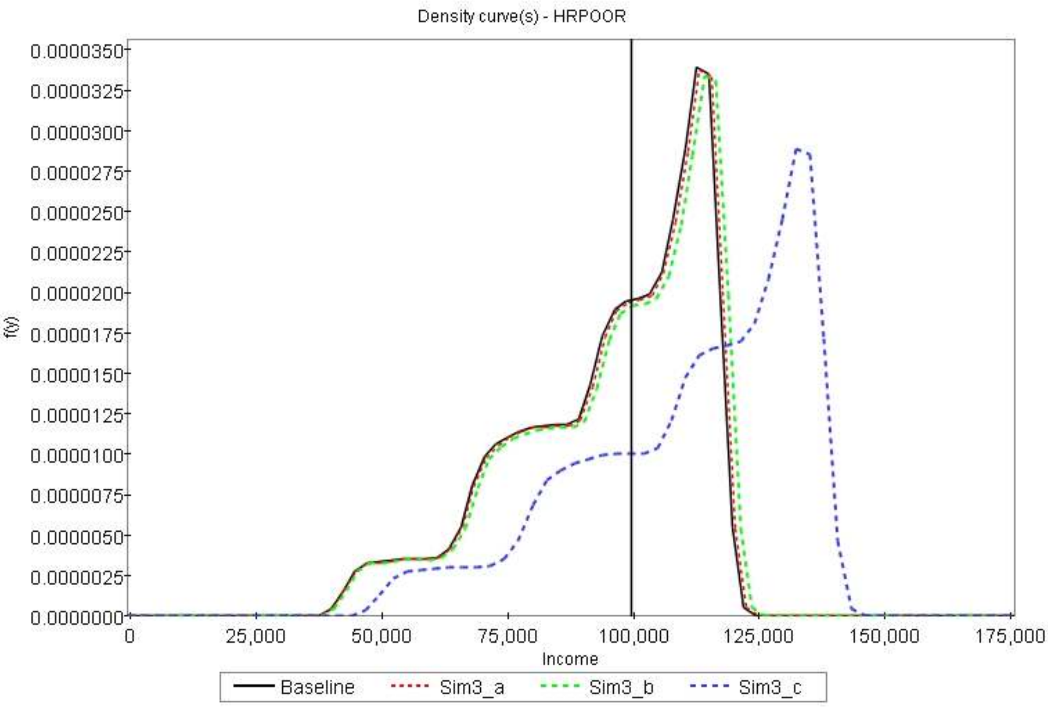


Figure 5.16. The Impact of Scenario III on Income Distribution of the Rural Poor Household

5.6 Conclusion

In general, the simulation results as per scenario I give a negative impact on various macroeconomic indicators, and increasing in the numbers of poverty, poverty gap and severity of poverty. It shows that the disbursement of the cash aid (BLT) does not able to compensate the impact of a reduction in fuel subsidy.

The simulations as per scenario II provide a better impact to the economy than those simulations as per scenario I. However, compared to the simulation as per scenario III, the latter produces a relatively better impact on economic performance such as an increasing in GDP, a reducing in poverty and income inequality, and a decreasing in the severity of poverty.

CHAPTER SIX
CONCLUSIONS AND SUGGESTIONS

6.1 Introduction

This primary objective of this study is to analyze the impact of fiscal policy on income distribution and poverty in Indonesia using a Computable General Equilibrium (CGE) approach. Specifically this study aims to (1) analyze the impact of a contraction and expansion of fiscal policy toward macroeconomic indicators, namely, government savings, government expenditure, consumption, exports, imports, investment, and GDP, (2) analyze the impact of fuel subsidy reduction (BBM) policy followed by a compensation to the poor in the form of direct cash aid (BLT) to the poverty level and income distribution, (3) analyze the impact of a change in policy from giving fuel subsidy for the general public to giving a subsidy for the Food Crop Agricultural sector on poverty level and income distribution, and (4) analyze the impact of a change in policy from giving fuel subsidy for the general public to giving a subsidy for the Other Crops in Agricultural Sector.

The policy simulations were conducted in three scenarios and each of them was simulated three times. The conclusions and suggestions obtained from the research are summarized as follows.

6.2 General Conclusions

There were 4.71 percent and 11.77 percent poverty rates in urban and rural areas, respectively. The income inequality existed not only between groups of households, but also between regions. From the total population sample of 257,891 households in the 2005 SUSENAS, urban non-poor households consisted of 32.73 percent while urban poor consisted of 4.71 percent. And, rural non-poor households consisted of 50.80 percent while rural poor households consisted of 11.77 percent.

The urban and rural non-poor households owned 54.62 percent and 42.84 percent, respectively, of the total national income. While the urban and rural poor only controlled 0.86 percent and 1.68 percent, respectively, of the total income.

There was an inequality in income distribution between urban and rural areas, as well as among the rich and the poor. It was found that 37.44 percent of the total urban households controlled 55.48 percent of the total revenues. And, 61.97 percent of the total rural households received the remaining 44.52 percent of the total revenues. A comparison between poor and non-poor households in terms of income distribution, reveals that the poor consisted of 16.47 percent of the population controlled a mere 2.54 percent of the total income, while the non-poor consisted of 83.53 percent of the population controlled 97.46 percent of total income. According to the World Bank criteria, the disparity in income distribution was high because 40 percent of the low income people controlled only 10.65 percent of the total income.

6.3 Specific Conclusions

Based on the first objective of this study:

(1) Scenario I: The simulation results of a reduction in fuel subsidy and followed by compensation in the form of direct cash aid (BLT) amounted to Rp. 100,000 per month per poor household show that there is a negative effect on macroeconomic performance for all simulations. All macroeconomic variables, except government saving and nominal exports, have declined. The greater the reduction in subsidies, the greater the resulting impact on macroeconomic variables.

(2) Scenario II: The diversion of fuel subsidies to the Food Crops Agricultural sector gives the same pattern as in scenario I, but the diversion policy of the entire fuel subsidy to the Food Crops Agricultural sector causes a rise in the consumption level as well as in the government spending level that eventually led to a decline in the government savings.

(3) Scenario III: The diversion of fuel subsidy to the other Crops Agricultural sector generally has a positive impact on macro-economic indicators, except for exports and government savings. The increase in GDP is due to the increase in investment, private consumption and government consumption. The increase of investment in this sector leads to an increase in production and ultimately increases people's income. The increase in revenue pushes the increase in consumption of goods, both domestically produced and imported goods. Thus, exports decrease and imports increase.

Based on the second objective of the study:

(1) The scenario of fuel subsidy reduction policy accompanied by a direct cash aid (BLT) to the poor impacts to the decrease in the level of household's income, both non-poor and poor groups of households. The granting of BLT to the poor is too small to compensate an increase in the price of goods and services as a result of a reduction in fuel subsidy. As mentioned earlier, a reduction in fuel subsidy has a chain effect on the price of other goods and services.

(2) The impact of the reduction in income levels experienced by the urban group of households is greater than that in the rural area. Among the entire household groups, the biggest impact of these policies is experienced by poor households living in the city.

(3) The decline in income levels to the entire groups of households causes the increase in the number of poor community. In other words, the fuel subsidy reduction policy accompanied by the provision of BLT failed to reduce poverty. In fact, the number of poverty incidences increase as shown by all of the poverty indicators; head count index, poverty gap index and poverty severity index. The policy to reduce fuel subsidies by 12.35 percent of the total of fuel subsidies and followed by BLT disbursed to the poor in the amount of Rp. 100,000 per household per month led an increase in the number of poor households by 0.001 percent out of the non-poor households in the city and 0.016 percent out of the non-poor households in village. On average, the inequality in the expenditure of the poor households relative to poverty lines or poverty gap index increases. Respectively, both groups of urban and

rural poor households increase by 1.698 percent and 1.428 percent. The poverty severity index, simultaneously, increases both for urban and rural poor households by 1.888 percent and 1.445 percent, respectively.

(4) The policy simulation to reduce fuel subsidy by 43.2 percent out of the total of fuel subsidies and followed by giving the BLT to the poor in the amount of Rp. 100,000 per household per month have a greater impact than the previous simulations. The head count index of the non-poor households in urban and rural areas rose from zero to 0.00086 and 0.00200. This results show that there are 0.086 percent of the originally urban non-poor household become poor than before and 0.2000 percent of the originally rural non-poor households fall into poverty. Poverty gap index became greater than those in the previous simulation. For poor households in the city, the poverty gap index increases by 5.3564 percent. And, the poverty gap index for the rural poor increases by 4.5438 percent. The poverty severity index shows a larger increase than those of the previous simulations. Respectively, both for poor households in the city and in villages have increased by 6.0849 percent and 4.6923 percent.

(5) The simulation results on the policy to reduce fuel subsidy by 100 percent subsidy (or to abolish the fuel subsidy), followed by the disbursement of BLT amounted to Rp. 100,000 per poor household per month provide the greatest impact on poverty as shown by all poverty indices. It is found that, the number of poor household increases, both in urban and rural areas. In the urban area, a total of 0.231 percent of the non-poor household becomes poor as a result of the abolishment of the fuel subsidy. In the rural area, a total of

0.415 percent of the non-poor becomes poor as a result of this policy. Thus, there is an incremental in the poverty gap and poverty severity indices for both urban and rural households. The poverty gap and poverty severity indices for the urban households increase to 10.387 and 12.144, respectively. While for poor households in the rural area, the poverty gap and poverty severity indices have increased to 9.000 percent and 9.543 percent.

(6) The urban household groups' experienced greater impacts as shown by an increase in the number of poor households, a widening poverty gap, and an increase in the severity of poverty compared to those in the rural area.

(7) The policy to reduce fuel subsidy, followed by the BLT to poor households have a positive impact on income distribution of both urban and rural poor households.

(8) Even though a reduction in fuel subsidy accompanied by the disbursement of BLT may increase the number of poor households, at the same time these policies are able to improve income distribution among poor households.

Based on the third objective of the study:

(1) The scenario of fuel subsidy diversion policy to the Food Crops in agricultural sector toward income and poverty level shows a mixed result for all households and simulation.

(2) If the government reduces fuel subsidy by 12.35 percent and divert this saving in subsidy to the Food Crops sub-sector, it is found that there is a reduction in the levels of income for all groups of household, except the non-poor household in rural area. However, this reduction in income does

not increase the number of poor households, but only increase in the poverty gap and poverty severity. The poverty gap and poverty severity indices for rural area increased by 0.868 and 0.960 percent, respectively. While for the urban households, the increase in poverty gap and poverty severity indices are 0.095 and 0.093 percents, respectively.

(3) The policies to reduce fuel subsidies up to 43.2 percent and divert it to the Food Crops sector can reduce poverty (head count index) up to 0.422 percent of poor households in the village. These policies are able to reduce poverty gap and poverty severity indices by 0.355 and 0.357 percent, respectively. But, for the urban poor, these policies pushed the poverty gap and poverty severity indices by 2.219 and 2.476 percent, respectively.

(4) The policies to abolish fuel subsidy by 100 percent and divert it to the Food Crops sector are able to reduce poverty level by 4.330 percent of the total poor households in the rural area while reducing the poverty gap and poverty severity by 3.6717 and 3.7029 percent, respectively. However, these policies have increased the gap and severity of the urban poor by 2.095 and 2.335 percent, respectively.

(5) Based on the three simulations in scenario II, i.e. to reduce fuel subsidies by 43.2 and 100 percent and divert those to subsidize the Food Crops sub-sector is found to be able to reduce poverty.

(6) The government policies to transfer 100 percent of the fuel subsidy to the Food Crops sub-sector resulted in the decrease in income level and reduce income inequality for the urban poor.

Based on fourth objective of the study:

(1) The policy of fuel subsidy diversion to Other Crops sub-sector has an impact in increasing household incomes of all groups as shown by a reduction in the head count, poverty gap, and poverty severity indices. The increase in income of the rural households is found to be bigger than those in the urban.

(2) The policy of fuel subsidy diversion by 12.35 percent to Other Crops sub-sector has an impact in reducing poverty level by 1.615 percent among poor households in the city and 2.185 percent for the poor households in the village. The urban poverty gap and poverty severity indices fell by 1.348 percent and 1.486 percent, respectively. While for the rural, the poverty gap and poverty severity indices fell by 1.897 percent and 1.909 percent, respectively.

(3) The policy of fuel subsidy diversion by 43.2 percent and transfer this amount to Other Crops sub-sector are able to reduce poverty levels by 2.348 percent for the urban poor households. But, for the rural poor these policies resulted in an increase in the number of poor households by 6.452 percent. The poverty gap and poverty severity indices fell by 2.174 percent and 2.398 percent, respectively, for the urban poor households. While for the rural poor, the poverty gap and poverty severity indices fell by 5.529 percent and 5.588 percent, respectively.

(4) An abolishment of the fuel subsidy and the diversion of the subsidy for the Other Crops sub-sector resulted in a reduction in the poverty levels by 35.569 for the urban poor and 48.398 for the rural poor. The poverty gap and poverty severity indices fell by 37.854 percent and 41.701 percent, respectively, for the urban poor. For the rural poor, the poverty gap and poverty severity indices dropped by 47.733 percent and 50.333 percent, respectively.

(5) It is found that the greater the transfer of fuel subsidies to Other Crops Agricultural sector, the greater the impact in rising households' income level and reducing poverty level. These policies also have an effect in the improvement of income equalization among non-poor households both in rural and urban areas. However, these policies worsen the income inequality among poor households.

(6) On one side, these policies are able to reduce poverty levels, but on the other side these policies raise the inequality of income among poor households.

6.4 Implications and Suggestions

Based on the findings of this study, it is suggested that:

(1) The government should stop the BLT scheme amounted to Rp. 100,000 per month per poor household as a compensation of the reduction in the fuel subsidy because this policy gives a negative impact to the entire of macroeconomic performance. In addition, this policy leads to the increase in poverty levels (as measured by head count index), income inequality (poverty gap index), and poverty severity index.

(2) The government policy pattern to increase the people's purchasing power as a result in the reduction in fuel subsidies by giving the BLT should be discontinued because it is suspected that a portion of the BLT is used for unproductive consumption. If the compensation is to be maintained, it should be directed to the other thing that could stimulate productive economic activities, such as infrastructure development in rural areas to open access between rural and urban economies. Thus, it is expected that a better rural-urban accessibility is able to reduce transportation cost and as such the price of agricultural inputs will decrease and the price of agricultural outputs will increase.

(3) It is found that for poverty alleviation, the best option for the government is to transfer fuel subsidy to Other Crops Agricultural sector. These policies would raise the income levels of all groups of households and ultimately reducing the poverty level (head count index), poverty gap index and poverty severity index.

(4) The diversion in policy from fuel subsidy to Food Crops agricultural sector is feasible to be undertaken by the government. The optimal level of fuel subsidy reduction is 43.2 percent and the saving from this reduction should be channeled to the Food Crops agricultural sector. However, this policy should be coupled with other policies intended for the urban poor. The result of this study shows that cutting fuel subsidy and transfer it to the Food Crops agricultural sector is a detrimental effect in the income level of the urban poor, even though the number of poor households remains the same.

6.5 Suggestion for Future Research

There are various limitations that need to be reviewed. Therefore, it is advised to do advanced research in the future, especially for those who are interested to further the study on the impact of fiscal policy on poverty and income distribution using CGE models. Here are several suggestions for further research:

(1) The model used in this current research can be expanded to other sectors other than the Food Crops and Other Crops in the Agricultural sector.

(2) Since the Food Crops and Other Crops Agricultural sector are divided into many subsectors, it is suggested that further research should explore other sub-sectors that has the greatest impact to the economy improvement and poverty reduction so that it can be used as a policy priority.

(3) It is important to do a further study on the mechanism on how the shift in fuel subsidies to the Food Crops and Other Food Crops sectors should be undertaken. These mechanisms may be through the development of infrastructure, empowering small medium enterprises (SMEs) of agriculture or other areas for the economy improvement and reducing poverty rate.

(4) It is suggested to the future researchers to modify the existing models to become dynamic models. A dynamic model is able to analyze the impact of the change in government policies from time to time. It is also recommended that money market is included into the dynamic model because it is an important factor in influencing economic performance.

(5) Other fiscal policy measures such as taxes, tariffs, and government spending can be studied as an alternative tool to the poverty alleviation.

(6) For future research, it is suggested to the researcher to estimate various parameters and elasticity using existing Indonesian cross section data.

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APPENDICES

Appendix 1

TABLE: SOCIAL ACCOUNTING MATRIX INDONESIA 2005 (107X107)

Factor of Production	Labor Force	Agricultural	Salaries and Wages Receiver	Rural	1
				Urban	2
			Non-Salaries and Wages Receiver	Rural	3
				Urban	4
		Production, Transport Equipment Operator, Manual, and Unskilled Workers	Salaries and Wages Receiver	Rural	5
				Urban	6
			Non-Salaries and Wages Receiver	Rural	7
				Urban	8
		Clerical, Services	Salaries and Wages Receiver	Rural	9
				Urban	10
			Non-Salaries and Wages Receiver	Rural	11
				Urban	12
		Administrative, Managerial, Military, Professional, and Technician	Salaries and Wages Receiver	Rural	13
				Urban	14
			Non-Salaries and Wages Receiver	Rural	15
				Urban	16
	Non-Labor				17
Institutions	Household	Agricultural	Labor		18
			Agricultural Employers	Employers have the land 0.000 ha – 0.500 ha	19
				Employers have the land 0.500 ha -1.00 ha	20
				Employers have the land 1.000 ha lebih	21
		Non-Agricultural	Rural	Casual employer low-income, clerical, sales, casual employee in transportation sectors, personal services, office employee	22
				Non-labor force and unacounted occupation	23
				High-income casual employer, non agricultural employer, manager, military, proffesional, technicial, teacher, clerical, and high-income sales	24
			Urban	Casual employer low-income, clerical, sales, casual employee in transportation sectors, personal services, office employee	25
				Non-labor force and unacounted occupation	26
				High-income casual employer, non agricultural employer, manager, military,	27

				proffesional, technicial, teacher, clerical, and high-income sales	
	Enterprises				28
	Government				29
Sector of Production		CROPS: Food Crops Agricultural			30
		OCROPS: Other Crops Agricultural			31
		LIVEST : Livestock and the Products			32
		FOREST : Forestry and Hunting			33
		FISHR : Fishery			34
		MINE : Mining and other Quarrying			35
		QUARY : Quarrying of Coal & Metal ores, Oil and Natural gas			36
		FOOD : Manufacture of Food, Beverage and Tobacco			37
		TEXT : Manufacture of Spinning, Textile, and Teather			38
		WOOD : Manufacture of Wood and Wood-Based Product			39
		PAPER : Manufacture of Paper, Printing, Metal-Based Transportation and other Industries			40
		CHEM : Manufacture of Chemical, Fertilizer, Cement and Fabricated Metal product			41
		ELEC : Electricity, Gas and Water Supply			42
		CONST : Construction			43
		TRADE : Wholesale Trade and Retail			44
		REST : Restaurant			45
		HOTEL : Hotel			46
		LNDTR : Land Transportation			47
		AIRTR : Air Transport and Water Transport, Communication			48
		Otherserv : Services Allied to Transport, and Ware Housing			49
		BANK : Bank and Insurance			50
		REAL : Real Estate and Corporate Service			51
		GOVSR : Government and Defense, Education, Health, other Social service			52
		SERV : Personal Service, Household and other Service			53
Trade Margin					54
Transport Margin					55
Domestic Commodities		CROPS: Food Crops Agricultural			56
		OCROPS: Other Crops Agricultural			57
		LIVEST : Livestock and the Products			58
		FOREST : Forestry and Hunting			59
		FISHR : Fishery			60
		MINE : Mining and other Quarrying			61
		QUARY : Quarrying of Coal & Metal ores, Oil and Natural gas			62
		FOOD : Manufacture of Food, Beverage and Tobacco			63
		TEXT : Manufacture of Spinning, Textile, and Teather			64
		WOOD : Manufacture of Wood and Wood-Based Product			65
		PAPER : Manufacture of Paper, Printing, Metal-Based Transportation and other Industries			66
		CHEM : Manufacture of Chemical, Fertilizer, Cement and Fabricated Metal product			67

	ELEC : Electricity, Gas and Water Supply	68
	CONST : Construction	69
	TRADE : Wholesale Trade and Retail	70
	REST : Restaurant	71
	HOTEL : Hotel	72
	LNDTR : Land Transportation	73
	AIRTR : Air Transport and Water Transport, Communication	74
	Otherserv : Services Allied to Transport, and Ware Housing	75
	BANK : Bank and Insurance	76
	REAL : Real Estate and Corporate Service	77
	GOVSR : Government and Defense, Education, Health, other Social service	78
	SERV : Personal Service, Household and other Service	79
Import Commodities	CROPS: Food Crops Agricultural	80
	OCROPS: Other Crops Agricultural	81
	LIVEST : Livestock and the Products	82
	FOREST : Forestry and Hunting	83
	FISHR : Fishery	84
	MINE : Mining and other Quarrying	85
	QUARY : Quarrying of Coal & Metal ores, Oil and Natural gas	86
	FOOD : Manufacture of Food, Beverage and Tobacco	87
	TEXT : Manufacture of Spinning, Textile, and Teather	88
	WOOD : Manufacture of Wood and Wood-Based Product	89
	PAPER : Manufacture of Paper, Printing, Metal-Based Transportation and other Industries	90
	CHEM : Manufacture of Chemical, Fertilizer, Cement and Fabricated Metal product	91
	ELEC : Electricity, Gas and Water Supply	92
	CONST : Construction	93
	TRADE : Wholesale Trade and Retail	94
	REST : Restaurant	95
	HOTEL : Hotel	96
	LNDTR : Land Transportation	97
	AIRTR : Air Transport and Water Transport, Communication	98
	Otherserv : Services Allied to Transport, and Ware Housing	99
	BANK : Bank and Insurance	100
	REAL : Real Estate and Corporate Service	101
	GOVSR : Government and Defense, Education, Health, other Social service	102
	SERV : Personal Service, Household and other Service	103
Capital Account		104
Indirect Tax		105
Subsidy		106
Foreign		107
Sum		

LIST OF VARIABLE IN MODEL

Variable	Dimension	Description
pq(c,s)	c~COM s~SRC	Consumer price for commodity c, source s
Xd(c,s)	c~COM s~SRC	Demand for commodity c, source s
pq_s(c)	c~COM	Consumer price of composite good c
Xd_s(c)	c~COM	Demand for commodity composites
xint_s(c,i)	c~COM i~IND	Demand for commodity by industry
xhou_s(c)	c~COM	Demand for commodity by household
xinv_s(c)	c~COM	Demand for commodity for investment
xg_s(c)	c~COM	Demand for commodity by government
xprim(i)	i~IND	Industry demand for primary-factor composite
xfac(f,i)	f~FAC i~IND	Demand for primary factor by industry i
xfacro(f)	f~FAC	Supply of factor f by rest of the world
pprim(i)	i~IND	Price of Primary factor composite
xtot(c)	c~COM	Output or supply commodity
ptot(i)	i~IND	Producer's price or unit cost of production
yh		Household income
trhogo		Transfer to household from central government
trhoco		Transfer to household from coorporate
trhoro		Transfer to household from rest of the world
trhoho		Transfer to household from inter household
eh		Household expenditure
ygc		government income
trgoco		Transfer to cental government from coorporate
trgoro		Transfer to cental government from rest of the world
trgogo		transfer from government to government
trrogo		Transfer to rest of the world from government
delSG		government saving
egc		government expenditure
yco		Coorporate income
trcoro		Transfer to coorporate from rest of the world
trcoco		Transfer to coorporate from cental government
eco		Coorporate expenditure
trroco		Transfer to rest of the world from corporate
delSCO		Coorporate saving
ximp(c)	c~COM	Demand for commodity by import
yro		Rest of the world income

Variable	Dimension	Description
pfac(f)	f~FAC	Price of factor f
trroho		Transfer to rest of the world from household
exr		Exchange rate
pfimp(c)	c~COM	International price of commodity
xexp(c)	c~COM	Total export for commodity
fxexp(c)	c~COM	q-shifter of export demand
delSRO		Rest of the world saving
ero		Rest of the world expenditure
trroro		transfer from ROW to ROW
delTX(c)	c~COM	Ordinary change in rate of commodity tax
delSC(c)	c~COM	Ordinary change in rate of commodity subsidy
delTM(c)	c~COM	Ordinary change in rate of com import tarrif
delTAXH		Ordinary change in rate of household tax
delMPSH		Ordinary change in rate of household saving
atot(i)	i~IND	all factors technical change
aprim(i)	i~IND	neutral technical change
afac(f,i)	f~FAC i~IND	factor saving technical change
wdist(f,i)	f~FAC i~IND	factor price distortion
xfacsup(f)	f~FAC	total factor supply
yfac(f)	f~FAC	factor income
fxg_s(c)	c~COM	government expenditure shifter by commodity
fxg_sc		overall government expenditure shifter
delCORTAX		corporate tax rate
delCORFINC		change in corporate factor income
cpi		consumer's price index
delTRHOGO		Transfer to household from government
delTRROGO		Transfer to rest of the world from government
delTRGOGO		transfer from government to government
delTRHOCO		Transfer to household from coorporate
delTRROCO		Transfer to rest of the world from corporate
delTRCOCO		Transfer to corporate from corporate
ftrco		shifter of corporate transfer to all institution
delTRHORO		Transfer to household from rest of the world
delTRGORO		Transfer to cental government from rest of the world
delTRCORO		Transfer to coorporate from rest of the world
delTRRORO		transfer from ROW to ROW
delTRHOHO		Transfer to household from inter household
delTRROHO		Transfer to rest of the world from household
wcon_c		nominal consumption

Variable	Dimension	Description
winv_c		nominal investment
wgov_c		nominal government spending
wexp_c		nominal export
wimp_c		nominal import
xcon_c		real consumption
xinv_c		real investment
xgov_c		real government spending
xexp_c		real export
ximp_c		real import
pcon_c		price of consumption
pinv_c		price of investment
pgov_c		price of government spending
pexp_c		price of export
pimp_c		price of import
gdpcompexp(i,j)	i~GDPEXP j~GDPITEM	GDP by expenditure
xgdpfac		gdp at factor cost
wgdpexp		gdp from expenditure side
pgdpexp		gdp deflator - expenditure side
xgdpexp		real gdp - expenditure side
wgdpinc		nominal GDP from income side
delINDTAXC(c)	c~COM	indirect tax by commodity
delINDTAX		net indirect tax
xgdpinc		Real GDP from the income side
continctax		Tax part of income side real GDP decomposition
contincteck		Tech change part of income side real GDP decomposition
delBUDGET(f,i)	f~FIS i~ITEM	Government Budget

LIST OF EQUATIONS IN THE MODEL

Equation	Dimension	Description
eq_xd(c,s)	c~COM s~SRC	domestic-import sourcing
eq_pq_s(c)	c~COM	zero profit in domestic-import sourcing
eq_pqdom(c)	c~COM	purchaser's price of domestic commodities
eq_pqimp(c)	c~COM	purchaser price of imported commodity
eq_xint_s(c,i)	c~COM i~IND	intermediate demand
eq_xhou_s(c)	c~COM	Household demand for commodities
eq_xg_s(c)	c~COM	government expenditure/demand
eq_xexp(c)	c~COM	export demand
eq_xd_s(c)	c~COM	total demand for composite commodities
eq_xfac(f,i)	f~FAC i~IND	demand for factors of production
eq_pprim(i)	i~IND	effective price of primary factors
eq_xprim(i)	i~IND	demand for primary factor composite
eq_ptot(i)	i~IND	zero profit in production
eq_xtot(c)	c~COM	market clearing for commodities
eq_pfac(f)	f~FAC	market clearing for factors
eq_yfac(f)	f~FAC	total factor income
eq_yh		household income
eq_eh		household disposable income
eq_ygc		government revenue
eq_egc		government expenditure
eq_sgc		government budget surplus/deficit
e_delCORINC		change in corporate factor income
eq_yco		coorporate income
eq_eco		corporate spending
eq_sco		corporate saving
eq_ximp(c)	c~COM	import by commodities
eq_yro		foreign income
eq_ero		foreign expenditure
eq_sro		foreign saving
e_cpi		consumer's price index
e_trhogo		gov't to household
e_trrogo		gov't to ROW
e_trgogo		gov't to gov't
e_trhoco		corporate to household
e_trgoco		corporate to gov't

Equation	Dimension	Description
e_trroco		corporate to ROW
e_trcoco		corporate to corporate
e_trhoro		ROW to household
e_trgoro		ROW to gov't
e_trroro		ROW to ROW
e_trcoro		ROW to corporate
e_trhoho		Household to household
e_trroho		Household to ROW
e_wcon_c		nominal consumption
e_winv_c		nominal investment
e_wgov_c		nominal government spending
E_wexp_c		nominal export
E_wimp_c		nominal import
E_pcon_c		price of consumption
E_pinv_c		price of investment
E_pgov_c		price of government spending
E_pexp_c		price of export
E_pimp_c		price of import
E_xcon_c		real consumption
E_xinv_c		real investment
E_xgov_c		real government spending
E_xexp_c		real export
E_ximp_c		real import
eq_xgdpfac		gdp at factor cost
eq_wgdpexp		gdp from expenditure side
eq_pgdpexp		gdp from expenditure side
eq_xgdpexp		real GDP - expenditure side
eq_delINDTAXC(c)	c~COM	indirect tax by commodity
eq_delINDTAX		net indirect tax
eq_wgdpinc		nominal gdp from income side
eq_xgdpinc		Decomposition of real GDP from income side

MINIMAL uses percent-change equations

Percent-Change Numerical Example

Levels form	Z = X*Y
Ordinary Change form	ΔZ = X*ΔY + Y*ΔX + ΔX ΔY
multiply by 100:	100*ΔZ = 100*X*ΔY + 100*Y*ΔX
define x = % change in X, so X*x = 100ΔX	
so:	Z*z = X*Y*y + X*Y*z
divide by Z=X*Y to get:	
Percent Change form	z = x + y

For computational reasons we prefer to write the model equations in small change form, that is instead of

A = B + C   or   Z = X*Y

we write

A*a = B*b + C*c   or   z = x+y

The notational convention here is that lower-case letters—a, b, c, x, y and z—represent small percent changes in the levels (original) values A, B, C, X, Y and Z. Thus:

A*a = 100ΔA = 100 times the ordinary change in A

Notice that the second of the above levels equations, Z=X.Y, is non-linear, while both small-change equations are linear in percent changes. Efficient computer techniques exist to solve systems of linear equations, while non-linear systems can be hard to solve.

We can represent a system of linear equations in matrix notation as:

$\mathbf{A.y + B.x = 0}$ (1)

Here **y** is the vector of endogenous variables (those variables explained by the model) and **x** is the vector of exogenous variables (the values are set outside the model). **A** and **B** are matrices of coefficients: each row of these matrices corresponds to a model equation; each column to a single variable. We can express **y** in terms of **x** by:

$\mathbf{y = - A^{-1}B.x}$ (2)

where $\mathbf{A^{-1}}$ is the inverse of **A** (**A** must be square, so the number of endogenous variable must equal the number of equations). Since a CGE model may have thousands or even millions of variables, the computation of $\mathbf{A^{-1}B}$ is non-trivial; GEMPACK speeds the task by exploiting the fact that nearly all of the elements of **A** and **B** are zero (because each single equation involves only a few variables).

The linearize d (or percent-change) form of an equation is of course only a local approximation to the underlying levels equation—it will be accurate only for small changes. Surprisingly, by solving the linear system a number of times, GEMPACK is able to deduce an exact solution to the levels equations. This is explained further in a later section.

Table Patterns for Percent-Change Equations

Pattern	(A) Original or Levels Form	(B) Intermediate Form	(C) Percent-Change Form
1	$Y = 4$	$Yy = 4*0$	$y = 0$
2	$Y = X$	$Yy = Xx$	$y = x$
3	$Y = 3X$	$Yy = 3Xx$	$y = x$
4	$Y = XZ$	$Yy = XZx + XZz$	$y = x + z$ *or* $y = x + 100(X/Y)\Delta Z$
5	$Y = X/Z$	$Yy = (X/Z)x - (X/Z)z$	$y = x - z$ *or* $100(Z)\Delta Y = Xx - Xz$ *or* $100\Delta Y = Y(x - z)$
6	$X_1 = M/4P_1$	$X_1x_1 = (M/4P_1)m - (M/4P_1)p_1$	$x_1 = m - p_1$
7	$Y = X^3$	$Yy = X^3 3x$	$y = 3x$
8	$Y = X^\alpha$	$Yy = X^\alpha \alpha x$	$y = \alpha x$ (α assumed constant)
9	$Y = X + Z$	$Yy = Xx + Zz$	$y = S_x x + S_z z$ where $S_x = X/Y$, etc
10	$Y = X - Z$	$Yy = Xx – Zz$	$y = S_x x - S_z z$ *or* $100(\Delta Y) = Xx - Zz$
11	$PY = PX + PZ$	$PY(y+p) = PX(x+p) + PZ(z+p)$ *or* $PYy = PXx + PZz$	$y = S_x x + S_z z$ where $S_x = PX/PY$, etc
12	$Z = \sum X_i$	$Zz = \sum X_i x_i$ *or* $0 = \sum X_i(x_i - z)$	$z = \sum S_i x_i$ where $S_i = X_i/Z$
13	$XP = \sum X_i P_i$ (adding up values)	$XP(x+p) = \sum X_i P_i (x_i+p_i)$ *or* $V(x+p) = \sum V_i(x_i+p_i)$ *where* $V_i = P_i X_i$ and $V = \sum V_i$	$x+p = \sum S_i(x_i+p_i)$ where $S_i = V_i/V$
14	$X = \sum X_i$ where all X_i have same price P	$Xx = \sum X_i x_i$ *or* $PXx = \sum PX_i x_i$ *or* $Vx = \sum V_i x_i$ *where* $V_i = PX_i$ and $V = \sum V_i$	$x = \sum S_i x_i$ where $S_i = V_i/V$
15	$XP = \sum X_i P_i$ (price and quantity indices)	$V(x+p) = \sum V_i(x_i+p_i)$ *where* $V_i = P_i X_i$ and $V = \sum V_i$	$Vx = \sum V_i x_i$ *or* $0 = \sum V_i(x-x_i)$ $Vp = \sum V_i p_i$ *or* $0 = \sum V_i(p-p_i)$

Appendix 5

SCENARIOS AND SIMULATION

SCENARIO		SIMULATION		SHOCK

1	The Government takes the fuel subsidy reduction until it reaches zero, followed by a BLT compensation of Rp 100,000 per month per RT poor. Fuel Subsidy Reduction Performed with 3 alternatives. (total = 19.263% subsidy): Alternative I: reduced for 12.35% of the total subsidy = 23.79%, alternative II is reduced by 43.20% of total = 83.22%, alternative III: minus 100% of the total (abolish of fuel subsidies)	**1-A**	- Reduction of fuel subsidies 12.35% of the total subsidy (= 0.02379)
			- Provision of BLT 12 months (2.251732)
				Shock delSC("BBM") = -0.02379;
				shock delTRHOGO("HRPOOR") = 2.251732;
				shock delTRHOGO("HUPOOR") = 2.251732;

		1-B	- Reduction of fuel subsidies 43.20% of the total subsidy (= 0.08322)
			- Provision of BLT 12 months 2.251732)
				Shock delSC("BBM") = -0.08322;
				shock delTRHOGO("HRPOOR") = 2.251732;
				shock delTRHOGO("HUPOOR") = 2.251732;

		1-C	- Reduction of fuel subsidies 100% of the total subsidy (= 0.19263)
			- Provision of BLT 12 months (2.251732)
				Shock delSC("BBM") = -0.19263;
				shock delTRHOGO("HRPOOR") = 2.251732;
				shock delTRHOGO("HUPOOR") = 2.251732;

2	The Government to reduce fuel subsidy and divert it to Food Crops Agricultural Sector (CROPS)	**2-A**	The diversion of fuel subsidy amounting to reduction of subsidies on the sim-1-1 (12.35% of total = 23.79%) to Food Crops sector (CROPS = 0.02493)	Shock delSC("BBM") = -0.02379; shock delSC("CROPS") = 0.02493;
		2-B	The diversion of fuel subsidy amounting to reduction of subsidies on the sim-1-2 (43.2% of total = 8.322%) to Food Crops sector (CROPS = 0.08583)	Shock delSC("BBM") = -0.08322; shock delSC("CROPS") = 0.08583;
		2-C	The diversion of fuel subsidy amounting to reduction of subsidies on the sim-1-3 (100% dari total = 19.263%) to Food Crops sector (CROPS=0.19797)	Shock delSC("BBM") = -0.19263; shock delSC("CROPS") = 0.19797;
3	The Government to reduce fuel subsidy and divert it to Other Crops Agricultural Sector (OCROPS)	**3-A**	The diversion of fuel subsidy amounting to reduction of subsidies on the sim-1-1 (12.35% of total = 23.79%) to Other Crops sector (OCROPS=0.06728)	Shock delSC("BBM") = -0.02379; shock delSC("OCROPS") = 0.06728;
		3-B	The diversion of fuel subsidy amounting to reduction of subsidies on the sim-1-2 (43.2% of total = 8.322%) to Other Crops sector (OCROPS=0.23534)	Shock delSC("BBM") = -0.08322; shock delSC("OCROPS") = 0.23534;
		3-C	The diversion of fuel subsidy amounting to reduction of subsidies on the sim-1-3 (100% dari total = 19.263%) to Other Crops sector (OCROPS=0.54476)	Shock delSC("BBM") = -0.19263; shock delSC("OCROPS") = 0.54476;

PARAMETER VALUE of p AND q
FOR ALL HOUSEHOLD AND SIMULATION

Household: HUNPOOR

Simulation	p	q	max	min	Mean	Variance	Stdev	n
Baseline	1,792,706	1,792,705	38,213,000	151,345	1,108,536	1,991,065,368,484	1,411,051	84,402
Sim1_a	1,785,729	1,785,727	38,064,275	150,756	1,104,222	1,975,597,075,645	1,405,559	84,402
Sim1_b	1,770,735	1,770,733	37,744,661	149,490	1,094,950	1,942,559,451,177	1,393,757	84,402
Sim1_c	1,749,337	1,749,335	37,288,551	147,684	1,081,719	1,895,894,938,405	1,376,915	84,402
Sim2_a	1,791,961	1,791,959	38,197,103	151,282	1,108,075	1,989,409,146,664	1,410,464	84,402
Sim2_b	1,793,316	1,793,314	38,225,992	151,397	1,108,913	1,992,419,523,102	1,411,531	84,402
Sim2_c	1,807,607	1,807,606	38,530,626	152,603	1,117,751	2,024,302,400,570	1,422,780	84,402
Sim3_a	1,801,085	1,801,084	38,391,608	152,053	1,113,718	2,009,721,344,913	1,417,646	84,402
Sim3_b	1,815,194	1,815,192	38,692,344	153,244	1,122,442	2,041,330,514,439	1,428,751	84,402
Sim3_c	2,093,675	2,093,673	44,628,390	176,754	1,294,643	2,715,724,307,786	1,647,945	84,402

Household: HUPOOR

Simulation	p	q	max	min	Mean	Variance	Stdev	n
Baseline	3,923,054	3,923,086	150,797	23,456	121,908	476,625,074	21,832	150,797
Sim1_a	3,907,267	3,907,299	150,190	23,361	121,418	472,796,914	21,744	150,797
Sim1_b	3,873,254	3,873,286	148,883	23,158	120,361	464,601,319	21,555	150,797
Sim1_c	3,826,474	3,826,507	147,085	22,878	118,907	453,446,819	21,294	150,797
Sim2_a	3,914,988	3,915,020	150,487	23,408	121,658	474,667,207	21,787	150,797
Sim2_b	3,902,418	3,902,450	150,004	23,332	121,267	471,624,166	21,717	150,797
Sim2_c	3,903,579	3,903,612	150,048	23,339	121,303	471,904,885	21,723	150,797
Sim3_a	3,935,702	3,935,734	151,283	23,531	122,301	479,703,307	21,902	150,797
Sim3_b	3,943,572	3,943,604	151,586	23,578	122,546	481,623,610	21,946	150,797
Sim3_c	4,385,118	4,385,151	168,558	26,218	136,267	595,510,681	24,403	150,797

Household: HRNPOOR

Simulation	p	q	max	min	Mean	Variance	Stdev	n
Baseline	1,226,933	1,226,931	16,605,113	117,267	560,245	263,760,401,452	513,576	131,006
Sim1_a	1,222,467	1,222,465	16,544,670	116,840	558,205	261,843,720,449	511,707	131,006
Sim1_b	1,212,717	1,212,714	16,412,710	115,908	553,753	257,683,430,003	507,625	131,006
Sim1_c	1,198,399	1,198,397	16,218,944	114,539	547,216	251,635,030,241	501,632	131,006
Sim2_a	1,227,932	1,227,930	16,618,630	117,362	560,701	264,189,978,152	513,994	131,006
Sim2_b	1,232,468	1,232,466	16,680,019	117,796	562,772	266,145,415,086	515,893	131,006
Sim2_c	1,249,129	1,249,127	16,905,516	119,388	570,380	273,390,104,931	522,867	131,006
Sim3_a	1,233,938	1,233,935	16,699,912	117,936	563,443	266,780,614,375	516,508	131,006
Sim3_b	1,249,145	1,249,143	16,905,732	119,390	570,387	273,397,086,810	522,874	131,006
Sim3_c	1,479,365	1,479,363	20,021,482	141,393	675,511	383,458,503,761	619,240	131,006

Household: HRPOOR

Simulation	p	q	max	min	Mean	Variance	Stdev	n
Baseline	2,570,177	2,570,205	117,259	27,262	94,673	342,773,698	18,514	30,346
Sim1_a	2,561,423	2,561,450	116,859	27,169	94,351	340,442,700	18,451	30,346
Sim1_b	2,542,316	2,542,343	115,988	26,966	93,647	335,382,642	18,313	30,346
Sim1_c	2,514,992	2,515,019	114,741	26,677	92,640	328,212,330	18,117	30,346
Sim2_a	2,569,597	2,569,624	117,232	27,256	94,652	342,618,782	18,510	30,346
Sim2_b	2,572,362	2,572,389	117,358	27,285	94,754	343,356,661	18,530	30,346
Sim2_c	2,593,310	2,593,337	118,314	27,507	95,525	348,971,390	18,681	30,346
Sim3_a	2,581,972	2,581,999	117,797	27,387	95,108	345,926,894	18,599	30,346
Sim3_b	2,605,508	2,605,535	118,871	27,637	95,975	352,262,001	18,769	30,346
Sim3_c	3,019,952	3,019,980	137,778	32,033	111,240	473,237,104	21,754	30,346

LISTING PROGRAM OF TABLO FILE

```
file database # database model agefis+ #;
!Develop from AGEFIS Model: BKFDK-RI-CEDS!

set
 COM # commodity # (CROPS, OCROPS, LIVEST, FOREST, FISHR, QUARY, MINE, FOOD,
 TEXTILE, WOOD, PAPER, BBM, CHEM, ELEC, CONST, TRADE, REST, HOTEL, LNDTR, AIRTR,
 WTRTRAN, COMMUN, SERVTR, BANK, REAL, GOVSR, SERV);
 FAC # factor # (lab, capital);
 SRC (dom, imp);
 IND = COM;
 HH # household # (HRPOOR, HRNPOOR, HUPOOR, HUNPOOR);

coefficient
 (all,c,COM) VXD_S(c) # Value of Demand Composite Import Domestic #;
 (all,c,COM)(all,s,SRC) VXD(c,s) # Value of Demand by sources #;
 (all,c,COM) VTX(c) # Indirect Taxes Revenue #;
 (all,c,COM) VXCIF(c) # Value of Import at CIF  #;
 (parameter) (all,c,COM) SIGARM(c) # Armingtong Elasticities #;
 (all,c,COM)(all,i,IND) VXINT_S(c,i) # Value of Intermediate Demand #;
 (all,c,COM)(all,h,HH) VXHOU_S(c,h) # Value of Household Consumption #;
 (all,c,COM) VXINV_S(c) # Value of fixed Investment #;
 (all,c,COM) VXSTK_S(c) # Value of stock #;
 (all,c,COM) VXG_S(c) # Value of Government Consumption by Commodities #;
 (parameter) (all,i,IND) SIGMAPRIM(i) # Elasticities of Factor Production  #;
 (all,f,FAC)(all,i,IND) SFAC(f,i) # Factor cost share #;
 (all,f,FAC) VXFACRO(f) # Value of Demand for Factor from Rest of The World #;
 (all,f,FAC)(all,i,IND) VXFAC(f,i) # Value of Demand for factor #;
 (all,f,FAC) VXFG(f) # Value of factor supply  from government sector #;
 (all,f,FAC) VXFCO(f) # Value of factor supply  from corporate sector #;
 (all,f,FAC) VXFRO(f) # Value of factor supply  from Rest of The World  #;
 (all,i,IND) VTOT(i) # Total value of output (Supply) #;
 (all,i,IND) VXPRIM(i) # Value of demand for factor of production #;
 (all,c,COM) VXEXP(c) # Value of total export by commodities #;
 (all,h,HH) VYH (h) # Value of household income #;
 (all,f,FAC)(all,h,HH) VXFACSH(f,h) # Value of factor pof production by HH  #;
 (all,h,HH) VTRHOGO (h) # Value of transfer from government to household #;
 (all,h,HH) VTRHOCO (h) # Value of transfer from corporate to household #;
 (all,h,HH) (all,g,HH) VTRHOHO (h,g) # Value of transfer from HH to HH #;
 (all,h,HH) VYTAX (h) # Household income tax revenue #;
 (all,h,HH) SAVH (h) # Saving from household #;
  VYGC # Value Government Revenue #;
 (all,c,COM) VTM(c) # Value of import tarrif by commodities #;
  VCORTAX # Value of transfer from corporate to government #;
  VTRGORO # Value of transfer from ROW to government #;
  VTRGOGO # Value of transfer from government to government #;
  VTRROGO # Value of transfer from Gov't to ROW #;
 (all,c,COM) VSC(c) # Value of subsidies by commodities #;
  VEGC # Value of Government Expenditure #;
  VYCO # Value of income by corporate sector #;
  VTRCORO # Value of transfer from ROW to corporate #;
  VTRCOCO # Value of transfer from corporate to Corporate #;
  VECO # Value of Corporate Expenditure #;
  VYRO # Value of income from Rest of The World #;
 (all,h,HH) VTRROHO (h) # Value of transfer from HH to Rest of The World #;
 (all,h,HH) VTRHORO (h) # Value of transfer from ROW to Household #;
  VERO # Value of expenditure by Rest of The World #;
  VTRRORO # Value of transfer from ROW to ROW #;
  VTRROCO # Value of transfer from corporate to ROW #;
 (parameter) (all,c,COM) EXPELAS(c) # Expenditure elas by commodities #;
 (all,c,COM) VXIMP(c) # Value of Import including tarrif #;
 (all,f,FAC) VXFACSUP(f) # Value of all factor supply #;
 (all,f,FAC) (all,h,HH) SXFACSH(f,h) # share of factor owned by household #;
 (all,f,FAC) SXFG(f) # share of factor owned by government #;
 (all,f,FAC) SXFCO(f) # share of factor owned by corporate #;
 (all,f,FAC) SXFRO(f) # share of factor owned by rest of the world #;
  VCORFINC # corporate factor income #;

read
 SIGARM from file database header "SIGA";
 SIGMAPRIM from file database header "SIGP";
```

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 EXPELAS from file database header "EELA";
 VXD from file database header "VXD";
 VTX from file database header "VTX";
 VTM from file database header "VTM";
 VXINT_S from file database header "VINT";
 VXHOU_S from file database header "VHOU";
 VXINV_S from file database header "VINV";
 VXSTK_S from file database header "VSTK";
 VXG_S from file database header "VXG";
 VXFAC from file database header "VFAC";
 VXFACRO from file database header "VFAR";
 VXFG from file database header "VFG";
 VXFCO from file database header "VFCO";
 VXFRO from file database header "VFRO";
 VXEXP from file database header "VEXP";
 VXFACSH from file database header "VFHO";
 VTRHOGO from file database header "VRHG";
 VTRHOCO from file database header "VRHC";
 VTRHOHO from file database header "VRHH";
 VYTAX from file database header "VYTX";
 SAVH from file database header "VSAV";
 VCORTAX from file database header "VRGC";
 VTRGORO from file database header "VRGR";
 VTRROGO from file database header "VRRG";
 VSC from file database header "VSC";
 VTRCORO from file database header "VRCR";
 VTRCOCO from file database header "VRCC";
 VTRROHO from file database header "VRRH";
 VTRHORO from file database header "VRHR";
 VTRGOGO from file database header "VRGG";
 VTRRORO from file database header "VRRR";
 VTRROCO from file database header "VRRC";

formula
 (all,c,COM)
 VXD_S(c) = SUM{i,IND,VXINT_S(c,i)} + SUM{h,HH,VXHOU_S(c,h)} + VXG_S(c)
          + VXINV_S(c) + VXSTK_S(c);
 (all,c,COM) VXIMP(c) = VXD(c,"IMP");
 (all,c,COM) VXCIF(c) = VXIMP(c) - VTM(c);
 (all,i,IND) VXPRIM(i) = SUM{f,FAC,VXFAC(f,i)};
 (all,f,FAC)(all,i,IND) SFAC(f,i) = VXFAC(f,i) / ID01[VXPRIM(i)];
 (all,i,IND) VTOT(i) = VXPRIM(i)+ SUM{c,COM, VXINT_S(c,i)};
  VYGC = SUM{i,IND,VTX(i)} + SUM{c,COM,VTM(c)} + SUM{h,HH,VYTAX(h)} + VCORTAX
         + VTRGORO + SUM{f, FAC,VXFG(f)} + VTRGOGO;
 (all,h,HH) VYH(h) = SUM{f,FAC,VXFACSH(f,h)} + VTRHOGO(h) + VTRHOCO(h)
         + VTRHORO(h) + SUM{g,HH,VTRHOHO(h,g)};
  VECO = VTRROCO + SUM{h,HH,VTRHOCO(h)} + VTRCOCO;
  VEGC = SUM{c, COM,VXG_S(c)} + SUM{h,HH,VTRHOGO(h)} + VTRROGO
       + SUM{c,COM,VSC(c)} + VTRGOGO;
  VYCO = SUM{f,FAC,VXFCO(f)} - VCORTAX + VTRCORO + VTRCOCO;
  VERO = SUM{c,COM,VXEXP(c)} + VTRCORO + VTRGORO + SUM{h,HH,VTRHORO(h)}
       + VTRRORO + SUM{f,FAC,VXFACRO(f)};
  VYRO = SUM{f,FAC,VXFRO(f)} + VTRROGO + SUM{h,HH,VTRROHO(h)}
       + SUM{c,COM,VXCIF(c)} + VTRRORO + VTRROCO;
 (all,f,FAC) VXFACSUP(f) =  SUM{h,HH,VXFACSH(f,h)} + VXFG(f)
                          + VXFCO(f) + VXFRO(f);
 (all,f,FAC)(all,h,HH) SXFACSH(f,h) = VXFACSH(f,h)/VXFACSUP(f);
 (all,f,FAC) SXFG(f) = VXFG(f)/VXFACSUP(f);
 (all,f,FAC) SXFCO(f) = VXFCO(f)/VXFACSUP(f);
 (all,f,FAC) SXFRO(f) = VXFRO(f)/VXFACSUP(f);
 VCORFINC = SUM{f,FAC,SXFCO(f)*VXFACSUP(f)};


variable
 (all,c,COM)(all,s,SRC) pq(c,s) # Consumer price for commodity c, source s #;
 (all,c,COM)(all,s,SRC) xd(c,s) # Demand for commodity c, source s #;
 (all,c,COM) pq_s(c ) # Consumer price of composite good c #;
 (all,c,COM) xd_s(c ) # Demand for commodity composites #;
 (all,c,COM)(all,i,IND) xint_s(c,i) # Demand for commodity by industry #;
 (all,c,COM)(all,h,HH) xhou_s(c,h) # Demand for commodity by household #;
 (all,c,COM) xinv_s(c ) # Demand for commodity for investment #;
 (all,c,COM) xstk_s(c) # Demand for commodity for investment #;
 (all,c,COM) xg_s(c ) # Demand for commodity by government #;
 (all,i,IND) xprim(i) # Industry demand for primary-factor composite #;
 (all,f,FAC)(all,i,IND) xfac(f,i) # Demand for primary factor by industry i #;
 (all,f,FAC) xfacro(f) # Supply of factor f by rest of the world #;
 (all,i,IND) pprim(i) # Price of Primary factor composite #;
```

```
(all,c,COM) xtot(c ) # Output or supply commodity #;
(all,i,IND) ptot(i)  # Producer's price or unit cost of production #;
(all,h,HH)  yh (h)# Household income #;
(all,h,HH)  trhogo (h) # Transfer to household from central government #;
(all,h,HH)  trhoco (h) # Transfer to household from coorporate #;
(all,h,HH)  trhoro (h) # Transfer to household from rest of the world #;
(all,h,HH)  (all,g,HH)trhoho(h,g) # Transfer household to household #;
(all,h,HH)  eh(h) # Household expenditure #;
 ygc #  govenrment income #;
 trgoco # Transfer to cental government from coorporate #;
 trgoro # Transfer to cental government from rest of the world #;
 trgogo  # transfer from government to government #;
 trrogo # Transfer to rest of the world from  government #;
 (change) delSG # govenrment saving #;
 egc #  govenrment expenditure #;
 yco # Coorporate income #;
 trcoro # Transfer to coorporate from rest of the world #;
 trcoco # Transfer to coorporate from cental government  #;
 eco # Coorporate expenditure #;
 trroco # Transfer to rest of the world from corporate #;
 (change) delSCO # Coorporate saving #;
(all,c,COM) ximp(c ) # Demand for commodity by import #;
 yro # Rest of the world income #;
(all,f,FAC) pfac(f) # Price of factor f #;
(all,h,HH) trroho(h) # Transfer to rest of the world from household #;
 exr # Exchange rate #;
(all,c,COM) pfimp(c ) # International price of commodity #;
(all,c,COM) xexp(c ) # Total export for commodity #;
(all,c,COM) fxexp(c) # q-shifter of export demand #;
(change) delSRO # Rest of the world saving #;
 ero # Rest of the world expenditure #;
 trroro # transfer from ROW to ROW #;
(change)(all,c,COM) delTX(c) # Ordinary change in rate of  commodity tax  #;
(change)(all,c,COM) delSC(c) # Ordinary change in rate of commodity subsidy #;
(change)(all,c,COM) delTM(c) # Ordinary change in rate of com import tarrif #;
(change)(all,h,HH)delTAXH(h) # Ordinary change in rate of household tax #;
(change)(all,h,HH)delMPSH(h) # Ordinary change in rate of household saving #;
(all,i,IND) atot(i) # all factors technical change #;
(all,i,IND) aprim(i) # neutral technical change #;
(all,f,FAC)(all,i,IND) afac(f,i) # factor saving technical change #;
(all,f,FAC)(all,i,IND) wdist(f,i) # factor price distortion #;
(all,f,FAC) xfacsup(f) # total factor supply #;
(all,f,FAC) yfac(f) # factor income #;
(all,c,COM) fxg_s(c) # government expenditure shifter by commodity #;
fxg_sc # overall government expenditure shifter #;
(change) delCORTAX # corporate tax rate #;
(change) delCORFINC # change in corporate factor income #;

update
 (all,c,COM)(all,s,SRC) VXD(c,s) = pq(c,s)*xd(c,s);
 (change) (all,i,IND) VTX(i) = 0.01*VTX(i)*[100*(VTOT(i)/ID01[VTX(i)])*delTX(i)
                             + ptot(i) + xtot(i)];
 (all,c,COM)(all,i,IND) VXINT_S(c,i) = pq_s(c)*xint_s(c,i);
 (all,c,COM)  (all,h,HH)VXHOU_S(c,h) = pq_s(c)*xhou_s(c,h);
 (all,c,COM) VXINV_S(c) = pq_s(c)*xinv_s(c);
 (all,c,COM) VXSTK_S(c) = pq_s(c)*xstk_s(c);
 (all,c,COM) VXG_S(c) = pq_s(c)*xg_s(c);
 (all,f,FAC) VXFACRO(f) = pfac(f)*xfacro(f);
 (all,f,FAC)(all,i,IND) VXFAC(f,i) = pfac(f)*wdist(f,i)*xfac(f,i);
 (change)(all,f,FAC) VXFG(f) = 0.01*SXFG(f)*VXFACSUP(f)*yfac(f);
 (change)(all,f,FAC) VXFCO(f) = 0.01*SXFCO(f)*VXFACSUP(f)*yfac(f);
 (change)  (all,f,FAC) VXFRO(f) = 0.01*SXFRO(f)*VXFACSUP(f)*yfac(f);
 (change)  (all,f,FAC)(all,h,HH) VXFACSH(f,h) =
                                    0.01*SXFACSH(f,h)*VXFACSUP(f)*yfac(f);
 (all,c,COM) VXEXP(c) = pq_s(c)*xexp(c);
 (all,h,HH)VTRHOGO(h)   = trhogo(h);
 (all,h,HH)VTRHOCO(h)   = trhoco(h);
 (all,h,HH)(all,g,HH)VTRHOHO(h,g)   = trhoho(h,g);
 (change)  (all,h,HH)VYTAX(h)=
                        0.01*VYTAX(h)*[100*(VYH(h)/VYTAX(h))*delTAXH(h)+yh(h)];
 (change)(all,h,HH) SAVH(h) = (VYH(h)-VYTAX(h))*delMPSH(h)
                              + [SAVH(h)/(VYH(h)-VYTAX(h))]
                 * [0.01*VYH(h)*yh(h) - delTAXH(h)*VYH(h) - 0.01*VYTAX(h)*yh(h)];
 (change)  (all,c,COM) VTM(c) = 0.01*VTM(c)*[100*(VXCIF(c)/ID01[VTM(c)])*delTM(c)
                           + exr + pfimp(c) + ximp(c)];
 VCORTAX = trgoco;
 VTRGORO = trgoro;
```

```
 VTRROGO = trrogo;
 VTRGOGO = trgogo;
 (change) (all,i,IND) VSC(i) = 0.01*VSC(i)*[100*(VTOT(i)/ID01[VSC(i)])*delSC(i)
                             + ptot(i) + xtot(i)];
 VTRCORO = trcoro;
 VTRCOCO = trcoco;
 VTRROCO = trroco;
 (all,h,HH)VTRROHO(h) = trroho(h);
 (all,h,HH)VTRHORO(h) = trhoro(h);
 VTRRORO = trroro;


equation

! domestic-import sourcing !
eq_xd # domestic-import sourcing # (all,c,COM)(all,s,SRC)
 xd(c,s) = xd_s(c) - SIGARM(c)*[pq(c,s) - pq_s(c)];

eq_pq_s # zero profit in domestic-import sourcing # (all,c,COM)
 VXD_S(c)*[pq_s(c) + xd_s(c)] = SUM{s,SRC,VXD(c,s)*[pq(c,s) + xd(c,s)]};

! purchaser's prices !
eq_pqdom # purchaser's price of domestic commodities #(all,c,COM)
 pq(c,"dom") = ptot(c) + 100*[VTOT(c)/(VTOT(c) + VTX(c) - VSC(c))]
              * [delTX(c) - delSC(c)];

eq_pqimp # purchaser price of imported commodity # (all,c,COM)
 pq(c,"imp") = pfimp(c) + exr + 100*[VXCIF(c)/ID01[VXCIF(c) + VTM(c)]]*delTM(c);


! demand for commodities !
eq_xint_s # intermediate demand # (all,c,COM)(all,i,IND)
 xint_s(c,i) - atot(i) = xtot(i);

eq_xhou_s # household demand for commodities # (all,c,COM)(all,h,HH)
 xhou_s(c,h) = eh(h) - pq_s(c);

eq_xg_s # government expenditure/demand #
 (all,c,COM) xg_s(c) = fxg_s(c) + fxg_sc;

eq_xexp # export demand # (all,c,COM)
 xexp(c) = fxexp(c)  - expelas(c)*[(pq(c,"dom") - exr) - pfimp(c)];

eq_xd_s # total demand for composite commodities # (all,c,COM)
 VXD_S(c)*xd_s(c) = SUM{i,IND,VXINT_S(c,i)*xint_s(c,i)}
                  + SUM{h,HH,VXHOU_S(c,h)*xhou_s(c,h)}  + VXG_S(c)*xg_s(c)
                  + VXINV_S(c)*xinv_s(c) + VXSTK_S(c)*xstk_s(c);

! production sectors !
eq_xfac # demand for factors of production # (all,f,FAC)(all,i,IND)
 xfac(f,i) - afac(f,i) = xprim(i)
                   - SIGMAPRIM(i)*[pfac(f) + wdist(f,i) + afac(f,i) - pprim(i)];

eq_pprim # effective price of primary factors # (all,i,IND)
 pprim(i) = SUM{f,FAC,SFAC(f,i)*[pfac(f) + wdist(f,i) + afac(f,i)]};

eq_xprim # demand for primary factor composite # (all,i,IND)
 xprim(i) - aprim(i) - atot(i) = xtot(i);

eq_ptot # zero profit in production # (all,i,IND)
 VTOT(i)*[ptot(i) + xtot(i)] = VXPRIM(i)*[pprim(i) + xprim(i)]
                             + SUM{c,COM, VXINT_S(c,i)*[pq_s(c) + xint_s(c,i)]};

! market clearing !
eq_xtot # market clearing for commodities # (all,c,COM)
 [VTOT(c) + VTX(c) - VSC(c)]*[xtot(c)] = VXD(c,"dom")*[xd(c,"dom")]
                                        + VXEXP(c)*[xexp(c)];

eq_pfac # market clearing for factors # (all,f,FAC)
 SUM{i,IND,VXFAC(f,i)*xfac(f,i)} + VXFACRO(f)*xfacro(f)
                   =  VXFACSUP(f)*xfacsup(f);

! factor income !
eq_yfac # total factor income # (all,f,FAC)
 VXFACSUP(f)*yfac(f) = SUM{i,IND,VXFAC(f,i)*[pfac(f) + wdist(f,i) + xfac(f,i)]}
                     + VXFACRO(f)*[xfacro(f) + pfac(f)];
```

```
! institution: household !
eq_yh # household income # (all,h,HH)
 VYH(h)*yh(h) = SUM{f,FAC,SXFACSH(f,h)*VXFACSUP(f)*yfac(f)}
        + VTRHOGO(h)*trhogo(h) + VTRHOCO(h)*trhoco(h) + VTRHORO(h)*trhoro(h)
        + SUM{g,HH,VTRHOHO(h,g)*trhoho(h,g)};

eq_eh # household disposable income # (all,h,HH)
 eh(h) = yh(h) - 100*[VYH(h)/(VYH(h) - VYTAX(h))]*delTAXH(h)
    - 100*[(VYH(h) - VYTAX(h))/(VYH(h) - VYTAX(h) - SAVH(h))]*delMPSH(h);

! institution: government !
eq_ygc # government revenue #
 VYGC*ygc = SUM{i,IND,VTX(i)*[100*(VTOT(i)/ID01[VTX(i)])*delTX(i) + ptot(i)
          + xtot(i)]} + SUM{c,COM,VTM(c)*[100*(VXCIF(c)/ID01[VTM(c)])*delTM(c)
          + exr + pfimp(c) + ximp(c)]}
          + Sum{h,HH,VYTAX(h)*[100*(VYH(h)/VYTAX(h))*delTAXH(h) + yh(h)]}
          + VCORTAX*trgoco+ VTRGOGO*trgogo + VTRGORO*trgoro
          + SUM{f, FAC,SXFG(f)*VXFACSUP(f)*yfac(f)};

eq_egc # government expenditure (pada shock tentukan transfer ke HH mana)#
 VEGC*egc = SUM{c, COM,VXG_S(c)*[pq_s(c) + xg_s(c)]}
          + Sum{h,HH,VTRHOGO(h)*trhogo(h)} + VTRROGO*trrogo + VTRGOGO*trgogo
          + SUM{c,COM, VSC(c)*[100*(VTOT(c)/ID01[VSC(c)])*delSC(c)
          + ptot(c) + xtot(c)]};

eq_sgc # government budget surplus/deficit #
 delSG = 0.01*[VYGC*ygc - VEGC*egc];


e_delCORINC # change in corporate factor income #
 delCORFINC = 0.01*SUM{f,FAC,SXFCO(f)*VXFACSUP(f)*yfac(f)} ;

! institution: corporate sector !
eq_yco # coorporate income #

 VYCO*yco = 100*delCORFINC - 100*[VCORFINC*delCORTAX
          + (VCORTAX/VCORFINC)*delCORFINC]
          + VTRCORO*trcoro + VTRCOCO*trcoco;


eq_eco # corporate spending #
 VECO*eco =  VTRROCO*trroco + Sum{h,HH,VTRHOCO(h)*trhoco(h)} + VTRCOCO*trcoco;

eq_sco # corporate saving #
 delSCO = 0.01*[VYCO*yco - VECO*eco];

! institution: rest of the world !
eq_ximp # import by commodities # (all,c,COM)
 ximp(c) = xd(c,"imp");

eq_yro # foreign income #
 VYRO*yro = SUM{f,FAC,SXFRO(f)*VXFACSUP(f)*yfac(f)}
          + VTRROGO*trrogo + Sum{h,HH,VTRROHO(h)*trroho(h)}
          + VTRRORO*trroro + VTRROCO*trroco
          + SUM{c,COM,VXCIF(c)*[exr + pfimp(c) + ximp(c)]};

eq_ero # foreign expenditure #
 VERO*ero = SUM{c,COM,VXEXP(c)*[pq(c,"dom") + xexp(c)]} + VTRCORO*trcoro
          + VTRGORO*trgoro + Sum{h,HH,VTRHORO(h)*trhoro(h)} + VTRRORO*trroro
          + SUM{f,FAC,VXFACRO(f)*(xfacro(f) + pfac(f))};

eq_sro # foreign saving #
 delSRO = 0.01*[VYRO*yro - VERO*ero];

! saving-investment check !
variable
 (change) delSAVH;
 (change) delSAV;
 (change) delINV;

equation
e_delSAVH
 delSAVH = SUM{h,HH,(VYH(h)-VYTAX(h))*delMPSH(h) + [SAVH(h)/(VYH(h)-VYTAX(h))]
               * [0.01*VYH(h)*yh(h) - VYH(h)*delTAXH(h) - 0.01*VYTAX(h)*yh(h)]};
e_delSAV
 delSAV = delSAVH + delSG + delSCO + delSRO;
```

```
e_delINV
 delINV = 0.01*sum{c,COM,VXINV_S(c)*[pq_s(c) + xinv_s(c)]}
        + 0.01*sum{c,COM,VXSTK_S(c)*[pq_s(c) + xstk_s(c)]};

! macro, aggregate, and other miscelanous !

variable cpi # consumer's price index #;
equation e_cpi # consumer's price index #
SUM{c,COM,Sum{h,HH,VXHOU_S(c,h)}}*cpi =
                                    SUM{c,COM,Sum{h,HH,VXHOU_S(c,h)*pq_s(c)}};

variable
 ! Government transfer to other institution !
 (change) (all,h,HH) delTRHOGO(h) # Transfer to household from  government #;
 (change) delTRROGO # Transfer to rest of the world from  government #;
 (change) delTRGOGO # transfer from government to government #;
 ! corporate transfer to other institution !
 (change) (all,h,HH) delTRHOCO(h) # Transfer to household from coorporate #;
 (change) delTRROCO # Transfer to rest of the world from corporate #;
 (change) delTRCOCO # Transfer to corporate from corporate #;
 ftrco # shifter of corporate transfer to all institution #;
 ! Rest of the World transfer to other institution !
 (change) (all,h,HH) delTRHORO(h) # Transfer to hh from rest of the world #;
 (change) delTRGORO # Transfer to cental government from rest of the world #;
 (change) delTRCORO # Transfer to coorporate from rest of the world #;
 (change) delTRRORO # transfer from ROW to ROW #;
 ! Household transfer to other institution !
 (change) (all,h,HH) (all,g,HH)delTRHOHO(h,g) # Transfer to hh from inter hh #;
 (change) (all,h,HH) delTRROHO(h) # Transfer to rest of the world from hh #;


equation
! government transfer to other institution !
 e_trhogo # gov't to household # (all,h,HH)
        trhogo(h) = cpi + 100*[1/VTRHOGO(h)]*delTRHOGO(h);
 e_trrogo # gov't to ROW # trrogo = cpi + 100*[1/VTRROGO]*delTRROGO;
 e_trgogo # gov't to gov't # trgogo = cpi + 100*[1/VTRGOGO]*delTRGOGO;

! corporate transfer to other institution !
 e_trhoco # corporate to household # (all,h,HH)
        trhoco(h) = 100*[1/VTRHOCO(h)]*delTRHOCO(h) + ftrco + yco;
 e_trgoco # corporate to gov't #
  VCORTAX*trgoco = 100*[SUM{f,FAC,SXFCO(f)*VXFACSUP(f)}*delCORTAX
          + (VCORTAX/SUM{f,FAC,SXFCO(f)*VXFACSUP(f)})*delCORFINC];
 e_trroco # corporate to ROW #
        trroco = 100*[1/VTRROCO]*delTRROCO + ftrco + yco;
 e_trcoco # corporate to corporate #
        trcoco = 100*[1/VTRCOCO]*delTRCOCO + ftrco + yco;
 ! Rest of the World transfer to other institution !
 e_trhoro # ROW to household # (all,h,HH)
                        trhoro(h) = cpi + 100*[1/VTRHORO(h)]*delTRHORO(h);
 e_trgoro # ROW to gov't # trgoro = cpi + 100*[1/VTRGORO]*delTRGORO;
 e_trroro # ROW to ROW # trroro = cpi + 100*[1/VTRRORO]*delTRRORO;
 e_trcoro # ROW to corporate # trcoro = cpi + 100*[1/VTRCORO]*delTRCORO;
 ! Household transfer to other institution !
 e_trhoho # Household to household # (all,h,HH)(all,g,HH)trhoho(h,g) =
                                    cpi + 100*[1/VTRHOHO(h,g)]*delTRHOHO(h,g);
 e_trroho # Household to ROW # (all,h,HH)
                        trroho(h) = cpi + 100*[1/VTRROHO(h)]*delTRROHO(h);


! GDP by expenditure components !
variable
 wcon_c # nominal consumption #;
 winv_c # nominal investment #;
 wgov_c # nominal government spending #;
 wexp_c # nominal export #;
 wimp_c # nominal import #;
 xcon_c # real consumption #;
 xinv_c # real investment #;
 xgov_c # real government spending #;
 xexp_c # real  export #;
 ximp_c # real  import #;
 pcon_c # price of  consumption #;
 pinv_c # price of investment #;
 pgov_c # price of government spending #;
 pexp_c # price of export #;
```

```
pimp_c # price of import #;

equation
 e_wcon_c # nominal consumption #
 SUM{c,COM,Sum{h,HH,VXHOU_S(c,h)}}*wcon_c =
           SUM{c,COM,Sum{h,HH,VXHOU_S(c,h)*[xhou_s(c,h) + pq_s(c)]}} ;
 e_winv_c # nominal investment #
 SUM{c,COM,VXINV_S(c)}*winv_c = SUM{c,COM,VXINV_S(c)*[xinv_s(c) + pq_s(c)]};
 e_wgov_c # nominal government spending #
 SUM{c,COM,VXG_S(c)}*wgov_c = SUM{c,COM,VXG_S(c)*[xg_s(c) + pq_s(c)]};
 e_wexp_c # nominal export #
 SUM{c,COM,VXEXP(c)}*wexp_c = SUM{c,COM,VXEXP(c)*[xexp(c) + pq(c,"dom")]};
 e_wimp_c # nominal import #
 SUM{c,COM,VXCIF(c)}*wimp_c = SUM{c,COM,VXCIF(c)*[ximp(c) + pfimp(c) + exr]};
 e_pcon_c # price of  consumption #
 SUM{c,COM,Sum{h,HH,VXHOU_S(c,h)}}*pcon_c =
                              SUM{c,COM,Sum{h,HH,VXHOU_S(c,h)*pq_s(c)}} ;
 e_pinv_c # price of investment #
 SUM{c,COM,VXINV_S(c)}*pinv_c = SUM{c,COM,VXINV_S(c)*pq_s(c)};
 e_pgov_c # price of government spending #
 SUM{c,COM,VXG_S(c)}*pgov_c = SUM{c,COM,VXG_S(c)*pq_s(c)};
 e_pexp_c # price of export #
 SUM{c,COM,VXEXP(c)}*pexp_c = SUM{c,COM,VXEXP(c)*pq(c,"dom")};
 e_pimp_c # price of import #
 SUM{c,COM,VXCIF(c)}*pimp_c = SUM{c,COM,VXCIF(c)*[pfimp(c) + exr]};

e_xcon_c # real consumption # xcon_c = wcon_c - pcon_c;
e_xinv_c # real investment #  xinv_c = winv_c - pinv_c;
e_xgov_c # real government spending # xgov_c = wgov_c - pgov_c;
e_xexp_c # real export #  xexp_c = wexp_c - pexp_c;
e_ximp_c # real import # ximp_c = wimp_c - pimp_c;

set
 GDPITEM (nominal, price, real);
 GDPEXP (consumption, investment, government, export, import, total);

coefficient VGDPEXP # Nominal GDP by expenditure #;
formula
 VGDPEXP =     SUM{c,COM,Sum{h,HH,VXHOU_S(c,h)}} + SUM{c,COM,VXINV_S(c)} +
               SUM{c,COM,VXG_S(c)} + SUM{c,COM,VXEXP(c)} -
               SUM{c,COM,VXCIF(c)};

variable (all,i,GDPEXP)(all,j,GDPITEM) gdpcompexp(i,j) # GDP by expenditure #;
equation

 e_gdpcompexpNOM1 gdpcompexp("consumption","nominal") = wcon_c;
 e_gdpcompexpNOM2 gdpcompexp("investment","nominal") = winv_c;
 e_gdpcompexpNOM3 gdpcompexp("government","nominal") = wgov_c;
 e_gdpcompexpNOM4 gdpcompexp("export","nominal") = wexp_c;
 e_gdpcompexpNOM5 gdpcompexp("import","nominal") = wimp_c;
 e_gdpcompexpNOM6 VGDPEXP*gdpcompexp("total","nominal") =
               SUM{c,COM,Sum{h,HH,VXHOU_S(c,h)}}*wcon_c
               + SUM{c,COM,VXINV_S(c)}*winv_c
               + SUM{c,COM,VXG_S(c)}*wgov_c + SUM{c,COM,VXEXP(c)}*wexp_c
               - SUM{c,COM,VXCIF(c)}*wimp_c ;

 e_gdpcompexpPRI1 gdpcompexp("consumption","price") = pcon_c;
 e_gdpcompexpPRI2 gdpcompexp("investment","price") = pinv_c;
 e_gdpcompexpPRI3 gdpcompexp("government","price") = pgov_c;
 e_gdpcompexpPRI4 gdpcompexp("export","price") = pexp_c;
 e_gdpcompexpPRI5 gdpcompexp("import","price") = pimp_c;
 e_gdpcompexpPRI6 VGDPEXP*gdpcompexp("total","price") =
               SUM{c,COM,Sum{h,HH,VXHOU_S(c,h)}}*pcon_c
               + SUM{c,COM,VXINV_S(c)}*pinv_c
               + SUM{c,COM,VXG_S(c)}*pgov_c + SUM{c,COM,VXEXP(c)}*pexp_c
               -SUM{c,COM,VXCIF(c)}*pimp_c ;

 e_gdpcompexpREA1 gdpcompexp("consumption","real") = xcon_c;
 e_gdpcompexpREA2 gdpcompexp("investment","real") = xinv_c;
 e_gdpcompexpREA3 gdpcompexp("government","real") = xgov_c;
 e_gdpcompexpREA4 gdpcompexp("export","real") = xexp_c;
 e_gdpcompexpREA5 gdpcompexp("import","real") = ximp_c;
 e_gdpcompexpREA6 VGDPEXP*gdpcompexp("total","real") =
               SUM{c,COM,Sum{h,HH,VXHOU_S(c,h)}}*xcon_c
               + SUM{c,COM,VXINV_S(c)}*xinv_c
               + SUM{c,COM,VXG_S(c)}*xgov_c + SUM{c,COM,VXEXP(c)}*xexp_c
               - SUM{c,COM,VXCIF(c)}*ximp_c ;
```

```
! GDP by income !
coefficient
 VGDPINC # GDP from income side #;

formula
 VGDPINC = SUM{i,IND,VXPRIM(i)} + SUM{c,COM,VTX(c)-VSC(c)+VTM(c)};

variable
 xgdpfac # gdp at factor cost #;
 wgdpexp # gdp from expenditure side #;
 pgdpexp # gdp deflator - expenditure side #;
 xgdpexp # real gdp - expenditure side #;
 wgdpinc # nominal GDP from income side #;
 (change) (all,c,COM) delINDTAXC(c) # indirect tax by commodity #;
 (change) delINDTAX # net indirect tax #;

equation
eq_xgdpfac # gdp at factor cost #
 xgdpfac =  [1/SUM{i,IND,VXPRIM(i)}]*[SUM{i,IND,VXPRIM(i)*xprim(i)}];

eq_wgdpexp # gdp from expenditure side #
 VGDPEXP*wgdpexp = SUM{c,COM,Sum{h,HH,VXHOU_S(c,h)*[pq_s(c) + xhou_s(c,h)]}}
                 + SUM{c,COM,VXINV_S(c)*[pq_s(c) + xinv_s(c)]}
                 + SUM{c,COM,VXG_S(c)*[pq_s(c) + xg_s(c)]}
                 + SUM{c,COM,VXEXP(c)*[pq(c,"dom") + xexp(c)]}
                 - SUM{c,COM,VXCIF(c)*[pfimp(c) + exr + ximp(c)]};

eq_pgdpexp # gdp from expenditure side #
 VGDPEXP*pgdpexp = SUM{c,COM,Sum{h,HH,VXHOU_S(c,h)*pq_s(c)}}
                 + SUM{c,COM,VXINV_S(c)*pq_s(c)}
                 + SUM{c,COM,VXG_S(c)*pq_s(c)}
                 + SUM{c,COM,VXEXP(c)*pq(c,"dom")}
                 - SUM{c,COM,VXCIF(c)*[pfimp(c) + exr]};

eq_xgdpexp # real GDP - expenditure side #
 xgdpexp = wgdpexp - pgdpexp;

eq_delINDTAXC # indirect tax by commodity # (all,c,COM)
 delINDTAXC(c) =  VTOT(c)*delTX(c) + 0.01*VTX(c)*(ptot(c)+xtot(c));

eq_delINDTAX # net indirect tax #
 delINDTAX = SUM{c,COM,VTOT(c)*(delTX(c)-delSC(c))
           + 0.01*(VTX(c)-VSC(c))*(ptot(c)+xtot(c))}
           + SUM{c,COM,VXCIF(c)*delTM(c)+0.01*VTM(c)*(pfimp(c)+exr+ximp(c))};

eq_wgdpinc # nominal gdp from income side #
 VGDPINC*wgdpinc = SUM{i,IND,VXPRIM(i)*[xprim(i) + pprim(i)]}
  + 100*delINDTAX;


Variable
 xgdpinc     # Real GDP from the income side #;
 continctax   # Tax part of income side real GDP decomposition #;
 contincttech # Tech change part of income side real GDP decomposition #;

equation

eq_xgdpinc   # Decomposition of real GDP from income side #
 xgdpinc = [1/VGDPINC]*[SUM{i,IND,VXPRIM(i)*xprim(i)}]
        + continctax + contincttech;

eq_continctax  continctax =
    sum{i,IND, [(VTX(i)-VSC(i))/VGDPINC]*xtot(i)}
  + sum{c,COM, [VTM(c)/VGDPINC]*ximp(c)};

eq_contincttech  contincttech =
 -SUM{i,IND,SUM{f,FAC,[VXFAC(f,i)/VGDPINC]*afac(f,i)}}
 -sum{i,IND,[VXPRIM(i)/VGDPINC]*aprim(i)}
 -sum{i,IND,[VTOT(i)/VGDPINC]*atot(i)};


set
 FIS # item in government budget #
 (INDTAX, TARIFF, HHINCTAX, CORPTAX, TRANGOV, FOREIGN, FACTOR,
  CONS, SUBSIDY, TRANHH, SAVING, TOTAL);
 FISTOT (TOTAL);
```

```
subset FISTOT is subset of FIS;
set
 FISNOTOT = FIS - FISTOT;
 ITEM (REVENUE, EXPENDITURE);
variable (change)(all,f,FIS)(all,i,ITEM) delBUDGET(f,i) # Government Budget #;
equation
e_bugrev01 delBUDGET("INDTAX","REVENUE") = 0.01*SUM{i,IND,VTX(i)*
                      [100*(VTOT(i)/ID01[VTX(i)])*delTX(i) + ptot(i)+ xtot(i)]};
e_bugrev02 delBUDGET("TARIFF","REVENUE") = 0.01*SUM{c,COM,VTM(c)*
             [100*(VXCIF(c)/ID01[VTM(c)])*delTM(c) + exr + pfimp(c) + ximp(c)]};
e_bugrev03 delBUDGET("HHINCTAX","REVENUE") =
          Sum{h,HH,0.01*[VYTAX(h)*[100*(VYH(h)/VYTAX(h))* delTAXH(h) + yh(h)]]};
e_bugrev04 delBUDGET("CORPTAX","REVENUE") = 0.01*[VCORTAX*trgoco];
e_bugrev05 delBUDGET("TRANGOV","REVENUE") = 0.01*[VTRGOGO*trgogo];
e_bugrev06 delBUDGET("FOREIGN","REVENUE") = 0.01*[VTRGORO*trgoro];
e_bugrev07 delBUDGET("FACTOR","REVENUE") =
                              0.01*[SUM{f, FAC,SXFG(f)*VXFACSUP(f)*yfac(f)}];
e_bugrev08 delBUDGET("CONS","REVENUE") = 0;
e_bugrev09 delBUDGET("SUBSIDY","REVENUE") = 0;
e_bugrev10 delBUDGET("TRANHH","REVENUE") = 0;
e_bugrev11 delBUDGET("SAVING","REVENUE") = 0;
e_bugrev12 delBUDGET("TOTAL","REVENUE") =
                                      SUM{f,FISNOTOT,delBUDGET(f,"REVENUE")};

e_bugexp01 delBUDGET("INDTAX","EXPENDITURE") = 0;
e_bugexp02 delBUDGET("TARIFF","EXPENDITURE") = 0;
e_bugexp03 delBUDGET("HHINCTAX","EXPENDITURE") = 0;
e_bugexp04 delBUDGET("CORPTAX","EXPENDITURE") = 0;
e_bugexp05 delBUDGET("TRANGOV","EXPENDITURE") = 0.01*[VTRGOGO*trgogo];
e_bugexp06 delBUDGET("FOREIGN","EXPENDITURE") = 0.01*[VTRROGO*trrogo];
e_bugexp07 delBUDGET("FACTOR","EXPENDITURE") = 0;
e_bugexp08 delBUDGET("CONS","EXPENDITURE") = 0.01*[SUM{c, COM,VXG_S(c)
                                              * [pq_s(c) + xg_s(c)]} ];
e_bugexp09 delBUDGET("SUBSIDY","EXPENDITURE") = 0.01*SUM{c,COM, VSC(c)
               *[100*(VTOT(c)/ID01[VSC(c)])*delSC(c) + ptot(c) + xtot(c)]};
e_bugexp10 delBUDGET("TRANHH","EXPENDITURE") =
                                        Sum{h,HH,0.01*[VTRHOGO(h)*trhogo(h)]};
e_bugexp11 delBUDGET("SAVING","EXPENDITURE") = delSG;
e_bugexp12 delBUDGET("TOTAL","EXPENDITURE") =
                                SUM{f,FISNOTOT,delBUDGET(f,"EXPENDITURE")};
```