The Effect of Tax Reform on Sectoral Structure in Vietnam

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Abstract

Based on general equilibrium framework, this research explores and examines the impact of tax reforms on sectoral structure in the context of Vietnam economy. For this purpose, a CGE Model and its corresponding Social Accounting Matrix (SAM) has been employed. The model, which features sixty – three sectors, twenty household groups and seven factors of production, elaborately investigates the impact of different tax policies upon sectoral structures and movements. The new version of SAM was constructed based on the latest 2012 I-O Table. Results of this research clarify that, tax reforms have various significant effect on sectoral structures and key macroeconomic indicators in six different scenarios. In each scenario, single tax category as well as combination of several tax categories is taken into consideration. Findings suggest that lowering all taxes at the same time results in positive sectoral structure from agriculture towards industry and service, from labor – intensive towards capital – intensive sectors as well as highest level of welfare. Meanwhile, budget deficit is inevitable and should be tackled by the government in solutions such as effective use of budget and cut – down on expenditure.

Keyword: *Tax reform, Sectoral structure, CGE Model, Vietnam*

1. Introduction

During the last 20 years, Vietnam has witnessed significant changes in sectors in the context of global economic integration. The country economy gradually transforms from an impoverished system during the war into a dynamic and export-oriented market by joining WTO in 2007 and recently TPP in 2016. This results in structural changes in sectors, shifting from agriculture to industry and service (McCaig & Pavcnik, 2013; Tisdell, 2011). Sectoral changes, in turn, have enormous effects on the movement of employment, income distribution among different households.

The driving force behind sectoral adjustment in Vietnam lies in the effective tax reform, which is considered as the most effective fiscal mechanism. By implementing different tax bases, the government can make changes to industrial structure, increase government revenue as well as capital accumulation for economic growth (Feraboli, 2008). Vietnam's government applies four distinct categories of tax on the economy: indirect tax (VAT), tariff, direct tax on labor and direct tax on capital. Altering indirect taxes can have considerable impact on relative prices, and consequently on consumption behaviors. Meanwhile, adjusting direct taxes directly affect income of households and investment decisions of corporations. Thus, tax policies can benefit some industries by expanding production while they may hurt others, which are not relatively competitive enough.

Several questions have been raised to central concerns. To which level can sectoral changes be measured by the effect of government's tax policies? Are sectoral changes in alignment with government's economic orientation? Are these tax policies and sectoral structure the most feasible solution for policy makers? Answers to these questions can be found in this research, which focuses on examining the influence of tax policies on sectors by looking into welfare. As welfare is the one of key macroeconomic indicators, it is of ultimate importance that any macroeconomic policy positively enhances welfare of the whole economy.

Computable General Equilibrium (CGE) model, which is dominantly used in policy analyses, is employed in this research with data from Vietnam Social Accounting Matrix 2012 (SAM). CGE model is a powerful tool in investigating the link between changes in policies on industrial structures, income and welfare (Oum, 2009; Aldelman and Robinson, 1978). Specifically, CGE model elaborately studies the impact of tax reform policies in various researches by Feltenstein, Lopes, Mendoza and Wallace (2013), Radulescu & Stimmelmayr (2010), Radulescu (2007), Amir, Asafu-Adjaye & Pham (2013).

The goal of this study is to develop a CGE model and corresponding SAM database for analyzing the impact of tax reform on sectoral changes in Vietnam, in the reference of

macroeconomic variables. The new version of 2012 SAM was constructed based on the latest 2012 I-O Table and other sources of data. The model includes sixty - three sectors of production, twenty household groups, in which labor are disaggregated into six categories. In the simulation, tariff is reduced, consistent with WTO, TPP and other international trade commitments, while indirect and direct tax rates are adjusted endogenously.

This study comprises of five parts as introduction, CGE model structure, simulation result analysis, discussion and conclusion, respectively. Upon introducing significance of the topic, section two outlines CGE model's fundaments and specific formulas. Simulation results are illustrated and examined in the next section, followed by an intensive discussion and conclusion.

2. The CGE Model in the context of Vietnam economy

2.1. Basic Structure of the Model

The CGE model provided in this paper is a standard, competitive small/price taking open economy model. The specification of the model equations and its theoretical structure follows closely that in Dervis, de Melo, and Robinson (1982); Vargas, Schreiner et al (1999); and Hosoe (2001). There are five subjects that form the economy, including producer, household, government, investment and the rest of the world.

2.1.1. Producer

Extracted from SAM table 2012, sixty three sectors are analysed in this study, each of which uses labour, capital and intermediate inputs for production. Seventeen of these sectors operate in agriculture and mining, thirty three are manufacturing sectors, and thirteen are service ones. The classification attempts to capture major features and interrelationships among important sectors of the economy. Factors include six types of labour and one aggregate capital. Labour was disaggregated using the following criteria: geography (urban, rural), and education levels (primary, secondary and tertiary).

The supply of each type of labour is fixed, but it is perfectly mobile across all the sectors. However, sectoral capital stock is assumed to remain unchanged. Producer takes the stock of capital, prices of input and output as given for identifying the optimal level of labours required to maximize the profit. It is assumed that value-added is generated through the Cobb-Douglass technology, using primary factors of labours and capital as follows:

$$V_j = \overline{A}_j \prod_t L_{tj}^{\beta_{tj}} \overline{K}_j^{\beta_{Kj}}$$

List of the model's variables and parameters are available in the appendix. Aggregate output of each sector is produced through the Leontief technology. All the production

technology is assumed to be homogenous of degree one. The demand for each of six labour categories in each sector is derived from the optimizing behaviour of the Cobb-Douglass and Leontief technology. This is determined by the value added generated in the sector and the relative price of value added to the wage rate:

$$L_{tj} = \left(\frac{PV_j}{W_t} \right) \beta_{tj} V_j$$

2.1.2. Government

It should be notes that, at present state-owned enterprises (SOEs) still play critical roles in capital intensive industries. Thus, capital in Vietnam is not owned solely by the private sector. The model assumes that, however, all the capital income is distributed to household as if all capital stock is owned by private sector. The income of SOEs then returns to the government through an incremental proportion on the direct capital tax rate. Therefore, direct tax on capital, which the households have to paid, also includes capital income distributed to the government from state-run companies. Based on the above assumption, the main function of government is to collect taxes, then spend all for the requirements of government activities, transfer to the households and saving for investment, according to fixed share parameters. In particular, the government income comprises of direct labour and capital taxes on households; indirect taxes on production activity; import tariffs; export duties; and transfer received from the rest of the world:

$$T = \sum_t W_t \bar{L}_t {t_{Lt}}^d + (\sum_j \pi_j) {t_K}^d + \sum_j X_j P_j^* {t_j}^i + \sum_j M_j PM_j {t_j}^m + \sum_j E_j PE_j {t_j}^e + ER.\bar{F}_g$$

Government demand on each category of goods is determined by government budget for consumption, fixed share of the good on the government consumption basket and the price (index) of the government purchasing basket:

$$G_j = \frac{k_j T (1 - tr^p)(1 - s^g)}{PG}$$

2.1.3. Household

The model contains twenty types of household, characterized by location (rural/urban), the employment area (agricultural/ non - agricultural) and five income quintiles (from the poorest – quintile 1 to the richest – quintile 5). The household is also assumed to own all the types of labour. Each household group receives income from twenty labour categories, capital, transfers from government and from abroad:

$$Y_r = \sum_t \bar{L}_t W_t (1 - {t_{Lt}}^d) {d_{rt}}^L + (\sum_j \pi_j)(1 - {t_K}^d) {d_r}^K + Ttr^p {d_r}^T + ER.\bar{F}_{pr}$$

Each household group spends all the disposable income for consumption and saving. The saving rates are assumed as fixed percents of the disposable income of each household

group. Consumer' problem is solved by using Linear Expenditure System (LES) function. Given a fixed amount of disposable income, each household group faces the following constrained maximization problem:

$$\text{Maximize } U_r = \prod\nolimits_j (C_{jr} - \eta_{jr})^{\alpha^{jr}}$$

$$\text{Subject to } (1 - s^{pr})Y_r = \sum_j P_j C_{jr}$$

Solving the first order condition of the Lagrangean to this problem produces the household demand function as follows:

$$C_{jr} = \eta_{jr} + \frac{\alpha_{jr}}{P_j}\left[Y_r(1 - s_{pr}) - \sum\nolimits_j P_j \eta_{jr}\right]$$

Because of lacking data on η_{jr}, the model is implemented with an assumption that all the minimum levels of consumption, η_{jr}, are equal to zero. Therefore, the household demand for each category of good is determined simply by the budget constraint, the average budget share and the composite price index:

$$C_{jr} = \frac{\alpha_{jr}(1 - s^{pr})Y_r}{P_j}$$

2.1.4. Investment

Because the model is a static one, it does not deal with issues of next period. Total savings, which are assumed to be spent all in investment activities, are determined by applying exogenous saving rates to the income of each household group and the government. Because foreign direct investment flow is also assumed to be determined exogenously, total investment depends endogenously on household and government incomes. The share of each commodity on total investment expenditure is assumed to be fixed. The investment demand on each category of commodity is thus a function of the budget constraint for investment, fixed share of the commodity on the investment basket and the investment price index.

$$I_j = \frac{h_j[\sum\nolimits_r s^{pr} Y_r + s^g T(1 - tr^p) + ER.FDI]}{PI}$$

2.1.5. Imports

Based on the standard small open/price taking economy assumption, the world prices of imported and exported goods remain exogenous fixed in term of foreign currency, while the price of domestic goods are endogenously generated from the model simulation. Beside factor and commodity markets, the model also consists of a foreign exchange one, in which the exchange rate is determined endogenously through the fluctuation of trade deficit. For simplicity the model also assumes that, foreign transfers to government and household are

fixed. Therefore, although the international prices of goods remain unchanged, the prices of imported goods in term of domestic currency are fluctuated according to the exchange rate adjustment. Follow Armington (1969), domestic and imported goods are imperfect substitutes. A constant elasticity of substitution (CES) function is used for representing the relationship between the demands for them. Each domestic institution allocates its total demand between the domestic and imported goods so that to minimize the total expenditure, subject to the CES function:

$$\text{Minimize } P_j Q_j = PD_j D_j + PM_j M_j$$

$$\text{Subject to } Q_j = \overline{B}_j \left[\delta_j D_j^{\frac{\sigma_j - 1}{\sigma_j}} + (1-\delta_j) M_j^{\frac{\sigma_j - 1}{\sigma_j}} \right]^{\frac{\sigma_j}{\sigma_j - 1}}$$

Price ratios and elasticity of substitution determine the demand levels for domestically produced and imported commodity:

$$M_j = \overline{B}_j^{\sigma_j - 1} (1-\delta_j)^{\sigma_j} \left(\frac{PM_j}{P_j} \right)^{-\sigma_j} Q_j$$

$$D_j = \overline{B}_j^{\sigma_j - 1} \delta_j^{\sigma_j} \left(\frac{PD_j}{P_j} \right)^{-\sigma_j} Q_j$$

2.1.6. Exports

Total sectoral outputs are sold in both domestic and foreign market. By assuming that there is no re-exporting of imported commodities, exported goods constitutes only of domestically produced ones. The exported price, in term of domestic currency, is also a function of the exchange rate and its fluctuation will affect the level of supply for export and for domestic consumption. The relationship between export and supply for domestic uses is assumed to represent by a constant elasticity of transformation (CET) function. Each firm allocates its output between the domestic and export markets so as to maximize revenue, subject to the CET function:

$$\text{Maximize } P_j^* X_j = PD_j S_j + PE_j E_j$$

$$\text{Subject to } X_j = \overline{N}_j \left[\gamma_j S_j^{\frac{1+\phi_j}{\phi_j}} + (1-\gamma_j) E_j^{\frac{1+\phi_j}{\phi_j}} \right]^{\frac{\phi_j}{1+\phi_j}}$$

Price ratios and elasticity of transformation determine the levels of output exported and sold in the domestic market

$$E_j = \overline{N}_j^{-1-\phi_j} (1-\gamma_j)^{-\phi_j} \left(\frac{PE_j}{P_j^*} \right)^{\phi_j} X_j$$

$$S_j = \overline{N}_j^{-1-\phi_j} \gamma_j^{-\phi_j} \left(\frac{PD_j}{P_j^*} \right)^{\phi_j} X_j$$

2.2. Market Clearing and Equilibrium Prices

In the model, there are six labour markets (l = 6), sixty three commodity markets (n = 63) and one foreign exchange market, where the wage rate for each type of labour, the domestic commodity prices and the exchange rate are determined. The equilibrium set of prices is obtained when all the markets are cleared. That is all the excess demands, which are functions of the wage rates, prices of domestic commodities and the exchange rate, become zero.

Because that Walras's law holds, if $l + n$ out of $l + n + 1$ excess demands are zero, the remaining one must be zero. As a result, the system can not be solved to give a unique solution. This is a problem that many CGE models face. In general, there are two ways to solve this. One is to choose one of the goods (or labour, foreign exchange) as a numeraire and fix its price to be one. The other is to introduce a price-normalization rule, in which it fixed the weighted average of all commodity prices to be one. The model takes the later way for solving to obtain a set of equilibrium prices. However, because all the excess demands are functions of relative prices and are homogenous of degree zero in prices, excess demands do not change when all prices change by the same proportion. Thus, obsolete price level can not be obtained and just only the relative prices are determined through simulation. The complete set of the model's equations is presented in the appendix.

3. The Model Simulation and Results

3.1 The Model Calibration

Applying the CGE model requires data on SAM and some other sources for calibrating process. Therefore, one of the important tasks of this study is identification and organization of data into a SAM. The availability of the 2012 Input-output table has provided the opportunity to construct SAM 2012, which is released by General Statistics Office of Vietnam in 2015. The structure and theoretical underlying of the new SAM 2012 follow closely that in Isard (1998), CIEM/NIAS (2001), Tarp (2002) and Nielsen (2002). In the SAM, there are sixty three production activities with sixty three counterpart commodities; seven factors; twenty household groups; one government account with four types of taxes included; one investment/saving accounts; and one account related to foreign trade and capital flows. All of these accounts are combined in a 162x162 matrix.

It is assumed that equilibrium is observed in the current economy and parameters in the model are computed so that general equilibrium is obtained when all the price variables are equal to one. Calibration for most of functions in the model is relative straight forward. All other parameters of the model, such as many kinds of tax rate, saving rate, distribution coefficients, average budget share for household consumption, production elasticity of labour and capital, and so on, have been determined completely, based on data from the SAM. The first three columns in the Table 1 illustrate the major tax rates by sector. The last two columns present the elasticity of substitution and transformation, obtained from Nguyen (2014).

The import tariff reflected in Appendix 2 reveals that, tariff rate is not levied on service sector. Most of consumption goods, which can be produced domestically, in the situation of harsh competition against foreign rivals, encounter high protected tariffs. Alcohol, beer and tobacco products, which are considered as discouraging consumption, also face with very high tax rates. On the other hand, as the process of industrialization accelerates, low tariff rates apply on raw materials and equipments.

3.2 Six different scenarios

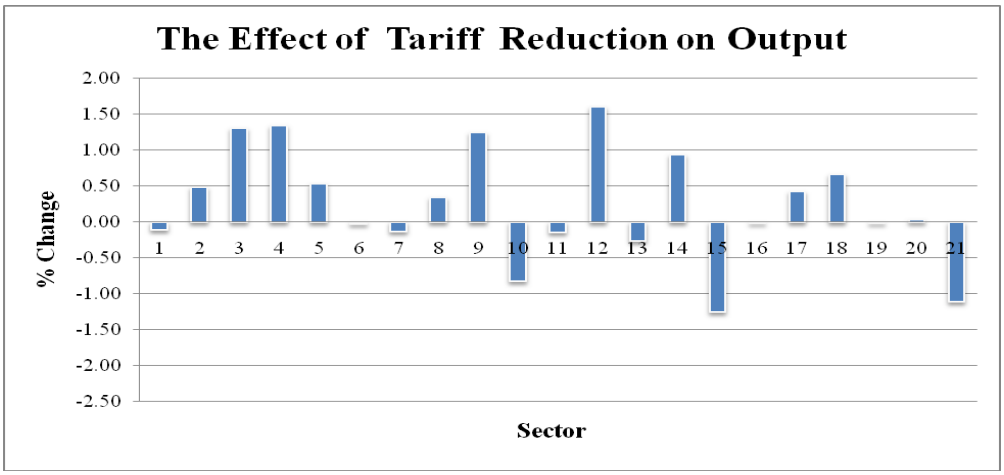
In this study, different scenarios of tax policies are taken into consideration, aiming to explore its effects on sectoral changes. The first scenario focuses on the impact of tariff reduction on all sectors. As aforementioned, the tendency to lower tariff rates is inevitable during global economic integration of Vietnam. All tariff rates which are higher than 5% are adjusted to 5%. Similarly, tariff rates of more than 3% and less than 5% are lowered to 3% meanwhile those of less than 3% are decreased to 0%. The second, third and fourth scenarios, in sequence, examine separately the influence of reduction tendency (by 20%) in VAT, direct tax on capital and direct tax on labor on structure of different sectors. Two other situations are proposed: the fifth scenario is lowering indirect tax by 20% while increasing direct tax by 20% and the sixth scenario is lowering four categories of taxes. For the purpose of brief and broader overview, sixty three sectors in SAM table are aggregated into twenty – one sectors and displayed as followed in each scenario.

3.2.1 Scenario 1: Reduction of Tariff rate and sectoral structures

In the first scenario, tariff reduction has significant impact on output of different sectors. Agricultural sector witnesses slight decrease in output of crop cultivation by 0.11%, meanwhile, output of livestock, forestry and fishery boosts relatively. Export – advantageous sectors such as textile, garment and food processing suffer from decrease in output, with high possibility of lack of competitiveness. On the other hand, industry sector illustrates contrasting trends, expanding wood and wooden products (1,25%) and machinery and

equipment (1.61%) while hurting chemical manufacturing (-0.82%) and construction (-1.26%). Service sector experiences a sudden plummet in public services output (-1.11%) and modest expansion in hotel, restaurant and tourism (0.43%) and transport services (0.67%). In addition, output changes in this scenario may indicate a shift from labour – intensive sectors (textile and garment, food processing) to capital – intensive sector (machinery and equipment).

Figure 1: **Effect of tariff reduction on output**



The impact of tariff reduction on important macroeconomic indicators is depicted in Table 1. At national level, GDP decreases modestly by 0.0039% and output of the whole economy rises 0.1752 %, respectively. The reduction of tariff favours import other than that of export. Obviously, upon trade barriers are lowered, international goods predictably become cheaper and more competitive compared to domestic goods. Thus, import value outweighs that of export, leading to a trade imbalance. Government budget deficit, due to revenue imbalance, is inevitable (- 4.2490 %). Welfare of the economy, on the other hand, proves to be positive with an increase of 1.3290%.

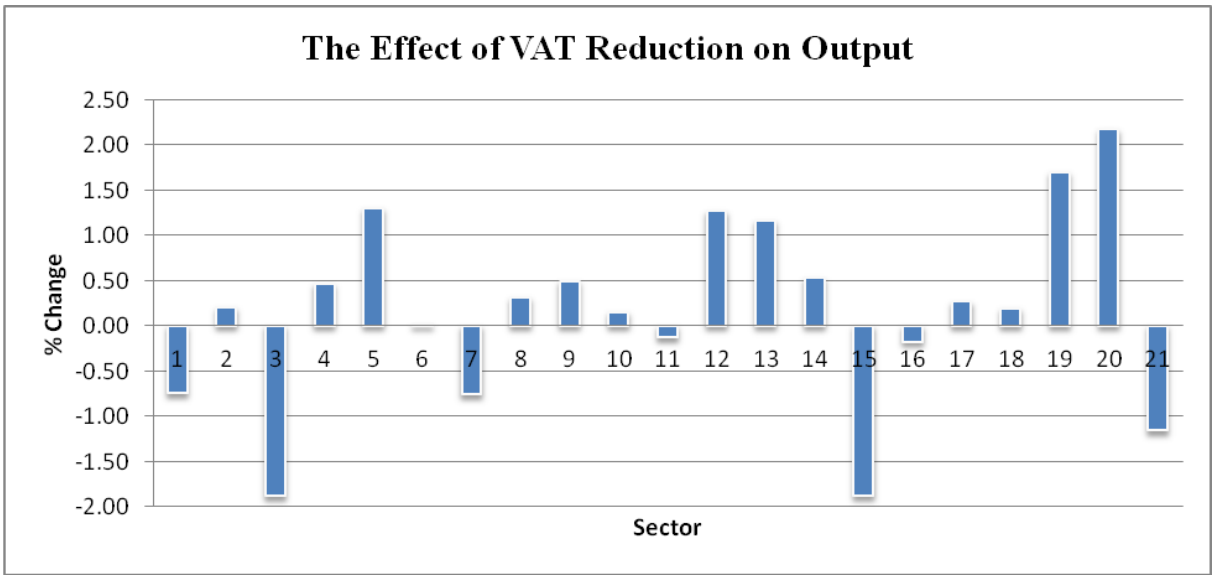
Table 1: **Macroeconomic impacts of tariff reduction in scenario 1**

Macroeconomic Figure	**Change**	**%**
GDP	-111	-0.0039
Output	15,923	0.1752
Export	26,469	1.0505
Import	30,640	1.2211
G_Budget		-4.2490
Welfare	26,762	1.3290

3.2.2 Scenario 2: Reduction of Value Added Tax (VAT) rate and sectoral structures

From simulation results, it is predicted that reduction of VAT tax by 20% hurts agriculture sector badly. Specifically, forestry sector decreases their output severely by 1.89%, and crop cultivation output drops by 0.75%. Meanwhile, mining and quarrying sector expands output by 1.3%. In terms of industry and sector, lowering VAT tax, as similar as scenario 1, results in a negative impact on textile garment (-0.76%) as well as construction (-1.88%). Machinery and equipment and vehicles sector outputs are expanded most significantly, due to lower prices of input. Service sector encounters two opposing trends of communication and financial services against public services. It can be explained that, reduction in VAT tax leads to greater deficit in government revenue as VAT tax is levied on the widest range of consumption goods and services. The deficit in revenue forces government to cut down on budget for public services.

Figure 2: **The effect of VAT reduction on output**



Macroeconomic indicators in scenario 2 are illustrated in table 2. Overall, cut – down in VAT does not considerable affect GDP, export and import value of the whole economy. However, government budget is heavily burdened, with a marked fall (- 6.7360%), whereas welfare is relatively doubled than that in the previous scenario.

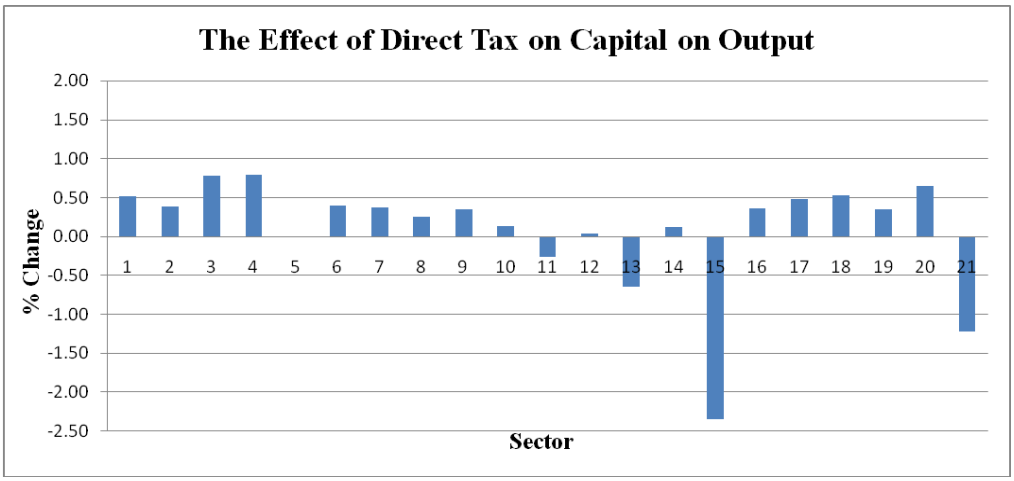
Table 2: **Macroeconomic impacts of VAT reduction in scenario 2**

Macroeconomic Figure	Change	%
GDP	-273	-0.0094
Output	16,368	0.1801
Export	9,040	0.3588
Import	9,533	0.3799
G_Budget		-6.7360
Welfare	44,608	2.2150

3.2.3 Scenario 3: Reduction of Direct tax on capital and sectoral structures

Lowering direct tax on capital (K – tax), interestingly, is predicted to favour the majority of sectors, except for vehicles (-0.64%), construction (2,34%) and public services (-1.22%). All agriculture sectors increase their output, significantly in fishery and forestry. Since agriculture still plays the most integral part in the economy, lowering K-tax can foster growth in pioneering sectors. Industry sector, however, does not expand output as much as expected. The reason is that industrial corporate, on which K – tax is levied, are still weak and unprofitable in recent situation. Thus, the influence of reduction in K – tax on industry sector is still neutral.

Figure 3: **The effect of Direct Tax on Capital on output**



In this scenario, GDP decreases insignificantly (-0.0030%), while export and import value both goes up by 0.1140% and 0.1119%. However, this scenario negatively affect government budget with a deficit of 8.1520 %. The welfare of economy increases by 2.1220%.

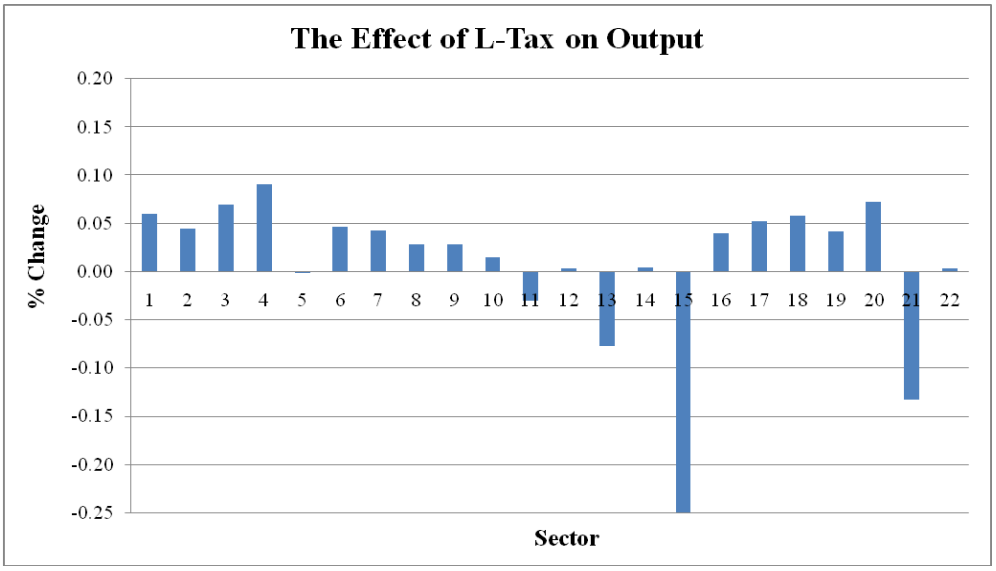
Table 3: Macroeconomic impacts of Direct Tax on Capital reduction in scenario 3

Macroeconomic Figure	Change	%
GDP	-87	-0.0030
Output	3,018	0.0332
Export	2,872	0.1140
Import	2,809	0.1119
G_Budget		-8.1520
Welfare	42,725	2.1220

3.2.4 Scenario 4: Reduction of Direct tax on labour and sectoral structures

In this scenario, reduction of direct tax on labour (L – tax) is predicted to generate little influence on sectoral structures. Specifically, agriculture sector output remains unchanged with % change of all sectors in agriculture less than 0.1%. Similar pattern is observed in industry and service sector.

Figure 4: **The effect of Direct Tax on Labour on output**



The scenario of lowering L – tax has inconsiderable influence (less than 0.02% change on several macroeconomic indicators, such as GDP, export and import value. On the other hand, government budget in this scenario is the most desirable (-0.8960%). The welfare grows modestly of 0.2350% at the same time.

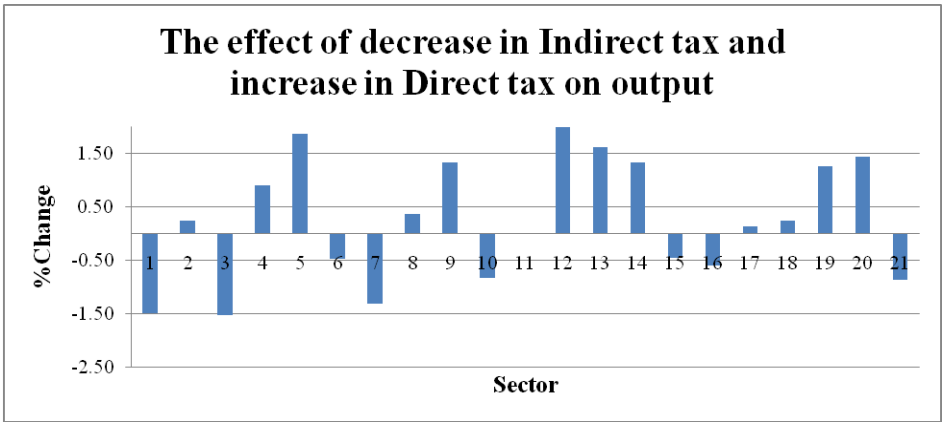
Table 4: **Macroeconomic impacts of Direct Tax on Labour reduction in scenario 4**

Macroeconomic Figure	Change	%
GDP	-1	0.0000
Output	290	0.0032
Export	287	0.0114
Import	279	0.0111
G_Budget		-0.8960
Welfare	4,722	0.2350

3.2.5 Scenario 5: Reduction of indirect tax, increase of direct tax and sectoral structures

This scenario shows two opposing trends in agriculture sector and negative impact on textile and garment output (-1.31%), which owns high competitive advantages in international markets. In agriculture sector, crops cultivation and forestry output shrinks sharply by 1.49% and 1.52% respectively. This may possibly be detrimental towards agriculture sector, which output depends heavily on crop cultivation. On the contrary, mining and quarrying sector seems to expand most, with output rise by 1.88%. Machinery and equipment sector output, along with vehicle sector, soars markedly by 2.76% and 1.62%.

Figure 5: **The effect of Indirect tax decrease and Direct tax increase on output**



From macroeconomic perspective, this scenario results in a limited impact on GDP (-0.0132%). Pressure on government budget relatively lessens with a fall of only 1.5930%. It is trade off by a slight improvement in welfare (1.1090%).

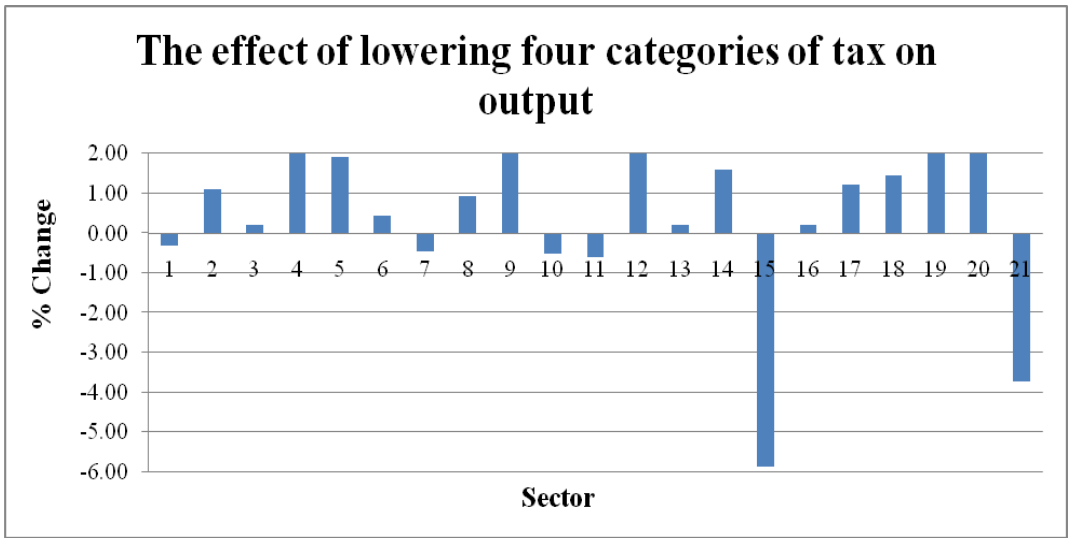
Table 5: **Macroeconomic impacts of decrease in Indirect tax and increase in Direct tax in scenario 5**

Macroeconomic Figure	Change	%
GDP	-382	-0.0132
Output	28,512	0.3138
Export	32,071	1.2728
Import	36,794	1.4664
G_Budget		-1.5930
Welfare	22,336	1.1090

3.2.6 Scenario 6: Reduction of four categories of tax and sectoral structures

By lowering all four categories of tax by 20%, an upward tendency in all three sectors (agriculture, industry and service) is obviously obtained. Output in livestock and poultry, fishery, mining and quarrying sectors grow vividly by 1.11%, 2.74% and 1.91%, compared to minor reduction in crop cultivation (-0.32%). In light of industry sector, wood and wooden products and machinery and equipment sectors expands their production the greatest whereas textile and garment and construction sectors follow a downward trend, which can be seen in previous scenarios.

Figure 6: **The effect of lowering four categories of tax on output**



Interestingly, this scenario seems not to significantly alter GDP and other macroeconomic variables but its impact on government budget and welfare is enormous. Government budget witnesses the greatest fall of -20.5150%, which probably leads to a severe deficit. Lowering all categories of taxes, certainly, is most beneficial towards welfare of the whole economy with a striking escalation of 6.0220%.

Table 6: **Macroeconomic impacts of lowering four categories of taxes in scenario 6**

Macroeconomic Figure	Change	%
GDP	-994	-0.0344
Output	34,698	0.3818
Export	38,881	1.5431
Import	43,500	1.7336
G_Budget		-20.5150
Welfare	121,263	6.0220

4. Discussion

Effect of tax policies on sectoral changes in six scenarios are summarized in table 14. In all scenarios, output of public services and construction sectors suffers from negative changes. The last scenario of lowing four types of tax has most adverse impact on these aforementioned sectors. It can be understood that, from government prospects, lowering taxes at the same time reduces budget and expenditure on public sectors. Machinery and equipment sector output increases in all scenarios, indicating a positive sign for production and development, notably in scenario 6 (2.86%). Expansion of this key sector is in alignment with government orientation of accelerating industrialisation process. Textile and garment, on the other hand, seems to be negatively influenced and may lose its competitiveness in both domestic and international markets, especially in scenario 2, 5 and 6. This may imply a shift in production from labour – intensive sectors such as textile and garment towards more capital – intensive sector such as machinery and equipment.

Scenario 2 and 5 also results in disastrous effect on output of crop cultivation sector with negative change of 0.75% and 1.49%, respectively. Although decrease is an expected tendency in the context of economic transformation from agriculture to industry and services, this sudden plunge would harm a growing economy like Vietnam, whose output still relies heavily on agriculture. In scenario 6, crop cultivation output is not as severely affected as aforementioned scenarios.

Scenario 4 does not prove to have significant impact on sectoral changes, with minor positive changes in output of all agriculture, industry and service sectors.

Table 7: **Summary of six scenarios on sectoral structures**

No	Sector	MTax		VAT		Ktax		LTax		IndT0.8 - DT1.2		4 Tax decrease	
		Change	%	Change	%	Change	%	Change	%	Change	%	Change	%
1	Crops cultivation	-675	-0.11	-4,428	-0.75	3,081	0.52	356	0.06	-8,796	-1.49	-1,883	-0.32
2	Livestock and poultry	1,564	0.48	651	0.20	1,246	0.38	144	0.04	777	0.24	3,618	1.11
3	Forestry	351	1.30	-508	-1.89	209	0.78	19	0.07	-409	-1.52	53	0.20
4	Fishery	3,882	1.34	1,341	0.46	2,287	0.79	262	0.09	2,604	0.90	7,911	2.74
5	Mining and quarrying	2,681	0.54	6,495	1.30	-11	0.00	-1	0.00	9,418	1.88	9,548	1.91
6	Food Processing	-369	-0.03	181	0.02	4,738	0.40	545	0.05	-5,549	-0.47	5,244	0.44
7	Textile, garment	-589	-0.13	-3,495	-0.76	1,731	0.38	196	0.04	-6,008	-1.31	-2,161	-0.47
8	Leather	932	0.35	830	0.31	677	0.25	77	0.03	978	0.36	2,512	0.93
9	Wood and wood products	2,769	1.25	1,093	0.49	783	0.35	63	0.03	2,981	1.34	4,745	2.14
10	Chemical manufacturing	-3,845	-0.82	705	0.15	648	0.14	69	0.01	-3,860	-0.82	-2,404	-0.51
11	Non metallic mineral, ferrous mineral	-236	-0.15	-209	-0.13	-415	-0.27	-47	-0.03	16	0.01	-930	-0.60
12	Machinery and equipment	12,531	1.61	9,858	1.27	322	0.04	27	0.00	21,476	2.76	22,294	2.86
13	Vehicles	-636	-0.27	2,788	1.16	-1,534	-0.64	-186	-0.08	3,886	1.62	486	0.20
14	Other manufacturing products	7,206	0.93	4,063	0.53	891	0.12	33	0.00	10,288	1.33	12,256	1.59
15	Construction	-7,760	-1.26	-11,626	-1.88	-14,455	-2.34	-1,599	-0.26	-2,742	-0.44	-36,325	-5.88
16	Trade	-104	-0.02	-887	-0.18	1,771	0.36	200	0.04	-2,964	-0.60	1,008	0.20
17	Hotels, restaurants and tourism	995	0.43	611	0.26	1,131	0.48	122	0.05	320	0.14	2,863	1.23
18	Transport services	2,232	0.67	633	0.19	1,768	0.53	195	0.06	831	0.25	4,853	1.45
19	Communication services	2	0.00	2,517	1.69	523	0.35	62	0.04	1,893	1.27	3,147	2.12
20	Financial services	138	0.03	11,168	2.17	3,317	0.64	372	0.07	7,407	1.44	15,186	2.94
21	Public services	-5,144	-1.11	-5,413	-1.16	-5,690	-1.22	-617	-0.13	-4,035	-0.87	-17,323	-3.72
	Total	15,923	0.18	16,368	0.18	3,018	0.03	291	0.00	28,512	0.31	34,698	0.38

Source: *Author's calculations from model simulation*

Conclusions on optimal scenarios may not be drawn solely based on impacts on sectoral changes. Thus, macroeconomic indicators are taken into consideration, as the ultimate purpose of any macro policies is to enhance the welfare of the whole economy. In terms of government budget, scenario of lowering L – tax would be desirable (-0.8960%). However, welfare in this scenario is the lowest in value (4,722) and percentage (0.2350%) as well.

Welfare is highest in the last scenario (121,263) with an increase of 6.0220%, yet government budget suffers from greatest loss of -20.5150%. The case of lowering all four categories of taxes is consistent with the Prime Minister's orientation on tax policies in Decision 3375 on May 18th 2011, based on Decree 118/2008/ND-CP of the government. Although welfare benefits the most in this scenario, government budget deficit is approximately 20 times higher than that in scenario 4.

It can be said that scenario 6 is the most feasible choice in terms of welfare and long term strategy of the government. However, the government deficit underlies serious consequences, thus encouraging policy makers to alter other taxes to tackle this situation. As in scenario 5, indirect taxes (tariff and VAT) are lowered while increasing direct taxes (K-tax and L-tax). The reason for this proposal is that tariff rate reduction is compulsory since the country's global economic integration. VAT rate, in addition, is expected to experience a fall as well, as enhancing VAT rate may destructively contradict with the impact of tariff reduction. Tariff and VAT should be simultaneously adjusted in the same direction as these taxes are closely linked with relative prices. Thus, the proposal is to increase direct taxes (K-tax and L-tax). In this scenario, there is a positive sign (-1.5930%) of government budget compared to that of scenario 6 (-20.5150%). Nevertheless, welfare increases modestly of only 1.1090% (22,336 in value), 5 times less than that of scenario 6 (6.0220%). Overall, weighing up the pros and cons, scenario 6 is still considered as optimal solution. Moreover, immediate measures should be implemented to overcome the consequences of government budget deficit.

Table 8: **Summary of macroeconomic indicators in all scenarios**

Figures	Scenario 1 (Tariff)	Scenario 2 (VAT)	Scenario 3 (K – Tax)	Scenario 4 (L – Tax)	Scenario 5 (Indirect tax decrease, Direct tax increase)	Scenario 6 (4 tax Decrease)
GDP	-0.0039	-0.0094	-0.0030	0.0000	-0.0132	-0.0344
Output	0.1752	0.1801	0.0332	0.0032	0.3138	0.3818
Export	1.0505	0.3588	0.1140	0.0114	1.2728	1.5431
Import	1.2211	0.3799	0.1119	0.0111	1.4664	1.7336
G_Budget	-4.2490	-6.7360	-8.1520	-0.8960	-1.5930	-20.5150
- **Tariff**	-47.1800	4.9410	4.7020	4.5330	-47.2060	-47.0960
- **VAT**	0.3810	-18.5770	0.2960	0.0320	-18.5570	-17.9890
- **Ktax**	1.6560	2.7500	-19.8750	0.0170	25.1020	-16.2900
- **Ltax**	1.3750	1.8060	-0.2800	-20.0250	24.2250	-17.6960
Welfare	**1.3290**	**2.2150**	**2.1220**	**0.2350**	**1.1090**	**6.0220**

5. Future implications and conclusion

Using CGE model, this study examines the linkage of tax reform and sectoral changes of the economy in the light of integral macroeconomic indicators. Tariff, VAT, direct tax on labour and direct on capital are employed in this research It is found that tax reforms have various significant impacts on agriculture, industry and service sectors in different scenarios. The case of lowering all four categories of taxes is the most feasible solution for several implications. First, it illustrates the trend of gradual transform from agriculture to industry and service sector of the economy. Second, it implies a dominant reallocation from capital – intensive sectors to labour – intensive ones. Third, it comes up with the greatest value of welfare generated, which is evaluated as the supreme objective of government in implementing tax policy.

Attempts should be made to readdress the imbalance in government revenue, consequently. The government is the central entity to take the responsibility for budget deficit. Sensible use of budget, cut – downs on government expenditures and downsizing as well as effective reallocation of human resources are recommended to tackle this situation.

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Appendixes

Appendix 1: COMPLETE SET OF THE MODEL'S EQUATIONS

The model can be described by the following $n^2 + 16n + 4 + (n+1)(h+l)$ equations, which are which are exactly as many as endogenous variables (h is the number of household groups, $h = 5$). The complete set of equations can be presented in the following order.

A. Production Block

$$L_{tj} = \left(\frac{PV_j}{W_t}\right)\beta_{tj}V_j \qquad (j=1,2,\ldots,n;\ t=1,2\ldots,l)$$

$$V_j = \overline{A}_j \prod\nolimits_t L_{tj}^{\beta_{tj}} \overline{K}_j^{\beta_{Kj}} \qquad (j=1,2,\ldots,n)$$

$$X_j = \frac{V_j}{v_j} \qquad (j=1,2,\ldots,n)$$

$$X_{ij} = a_{ij}X_j \qquad (i=1,2,\ldots,n;\ j=1,2,\ldots,n)$$

$$\pi_j = P^*_j X_j (1-t_j^{\,i}) - \sum\nolimits_i P_i X_{ij} - \sum\nolimits_t W_t L_{tj} \qquad (j=1,2,\ldots,n)$$

B. Government Revenue and Household Income Block

$$T = \sum\nolimits_t W_t \overline{L}_t t_{Lt}^{\,d} + (\sum\nolimits_j \pi_j) t_K^{\,d} + \sum\nolimits_j X_j P_j^{\,*} t_j^{\,i} + \sum\nolimits_j M_j PM_j t_j^{\,m} + \sum\nolimits_j E_j PE_j t_j^{\,e} + ER.\overline{F}_g$$

$$Y_r = \sum\nolimits_t \overline{L}_t W_t (1-t_{Lt}^{\,d}) d_{rt}^{\,L} + (\sum\nolimits_j \pi_j)(1-t_K^{\,d}) d_r^{\,K} + Ttr^p d_r^{\,T} + ER.\overline{F}_{pr}$$

C. Demand Block

$$C_{jr} = \frac{\alpha_{jr}(1-s^{pr})Y_r}{P_j} \qquad (j=1,2,\ldots,n;\ r=1,2,\ldots,h)$$

$$I_j = \frac{h_j\left[\sum_r s^{pr}Y_r + s^g T(1-tr^p) + ER.FDI\right]}{PI} \qquad (j=1,2,\ldots,n)$$

$$G_j = \frac{k_j T(1-tr^p)(1-s^g)}{PG} \qquad (j=1,2,\ldots,n)$$

$$Q_j = \sum\nolimits_i X_{ji} + \sum\nolimits_r C_{rj} + G_j + I_j \qquad (j=1,2,\ldots,n)$$

$$D_j = \overline{B}_j^{\sigma_j - 1} \delta_j^{\sigma_j} \left(\frac{PD_j}{P_j} \right)^{-\sigma_j} Q_j \qquad (j=1,2,...,n)$$

$$M_j = \overline{B}_j^{\sigma_j - 1} (1-\delta_j)^{\sigma_j} \left(\frac{PM_j}{P_j} \right)^{-\sigma_j} Q_j \qquad (j=1,2,...,n)$$

$$E_j = \overline{N}_j^{-1-\phi_j} (1-\gamma_j)^{-\phi_j} \left(\frac{PE_j}{P_j^*} \right)^{\phi_j} X_j \qquad (j=1,2,...,n)$$

D. Domestic supply block

$$S_j = \overline{N}_j^{-1-\phi_j} \gamma_j^{-\phi_j} \left(\frac{PD_j}{P_j^*} \right)^{\phi_j} X_j \qquad (j=1,2,...,n)$$

E. Market equilibrium block

$$\sum\nolimits_j L_{tj} - \overline{L}_t = 0 \qquad (t=1,2,...,l)$$

$$D_j - S_j = 0 \qquad (j=1,2,...,n\text{-}1)$$

$$\sum\nolimits_j P\overline{W}_j^m M_j - \left(\sum\nolimits_j P\overline{W}_j^e E_j + \overline{F}_p + \overline{F}_g + FDI \right) = 0$$

F. Price block

$$PM_j = ER.P\overline{W}_j^m (1+t_j^m) \qquad (j=1,2,...,n)$$

$$PE_j = ER.P\overline{W}_j^e (1-t_j^e) \qquad (j=1,2,...,n)$$

$$P_j = \overline{B}_j^{-1} \left\{ \delta_j^{\sigma_j} PD_j^{1-\sigma_j} + (1-\delta_j)^{\sigma_j} PM_j^{1-\sigma_j} \right\}^{\frac{1}{1-\sigma_j}} \qquad (j=1,2,...,n)$$

$$P_j^* = \overline{N}_j^{-1} \left[\gamma_j^{-\phi_j} PD_j^{\phi_j+1} + (1-\gamma_j)^{-\phi_j} PE_j^{\phi_j+1} \right]^{\frac{1}{\phi_j+1}} \qquad (j=1,2,...,n)$$

$$\sum\nolimits_j P_j \frac{Q_j}{\sum_j Q_j} = 1$$

$$PV_j = \frac{P^*_j (1-t_j^i) - \sum_i P_i a_{ij}}{v_j} \qquad (j=1,2,...,n)$$

$$PI = \sum\nolimits_j h_j P_j$$

$$PG = \sum\nolimits_j k_j P_j$$

Table A1: **List of Parameters Used in the CGE Model**

σ_j	Elasticity of substitution
δ_j	CES share parameter for domestic good consumed
$\overline{B}_j$	CES efficiency parameter
ϕ_j	Elasticity of transformation
γ_j	CET share parameter for domestic good supplied
$\overline{N}_j$	CET efficiency parameter
β_{tj}	Labour elasticity of production
β_{Kj}	Capital elasticity of production
$\overline{A}_j$	Production function efficiency parameter
a_{ij}	Input coefficient
v_j	Value added coefficient
α_{jr}	Household's budget share for consumption
s^{pr}	Household saving rate
s^g	Government saving rate
h_j	Share of investment expenditure
k_j	Share of government consumption expenditure
$t_L^{\ d}$	Direct tax rates on labour
$t_K^{\ d}$	Direct tax rates on capital
$t_j^{\ i}$	Indirect tax rates
$t_j^{\ m}$	Import tax rates
$t_j^{\ e}$	Export tax rates
Tr^p	Government transfer rate to household
d_{rt}^L	Distribution rate of labour
d_{rt}^K	Distribution rate of capital
d_{rt}^T	Distribution rate of government transfer

Table A2: **List of Endogenous Variable Used in the CGE Model**

X_j	Output of sector *j*
X_{ij}	Intermediate input
L_j	Labour input
V_j	Value added
π_j	Profit of sector *j*
Y_r	Household income
T	Government revenue

C_j	Household consumption
G_j	Government consumption
I_j	Investment
Q_j	Total domestic demand
D_j	Demand for domestic goods
M_j	Import
E_j	Export
S_j	Supply for domestic usage
W_t	Wage rate
PD_j	Price of domestic goods
PM_j	Price of imported goods
PE_j	Price of exported goods
P_j	Price of composite good
P_j^*	Aggregate price of output
ER	Exchange rate
PV_j	Price of value added
PI	Price index of investment basket
PG	Price index of government consumption

Table A3: **List of Exogenous Variable Used in the CGE Model**

$\overline{K}_j$	The stock of capital
$\overline{L}_t$	Labour supply
$\overline{F}_g$	Government borrowing
$\overline{F}_p$	Household borrowing
FDI	Foreign direct investment
$P\overline{W}_j^m$	World price of imported good
$P\overline{W}_j^e$	World price of exported good

Appendix 2: Base Year Tax rates and Elasticity Parameters

No	Sector	Import tax rate	Indirect tax rate	Elasticity	
				CES	CET
1	Paddy	1.52	0.29	1.472	2.199
2	Sugar cane	0.01	0.29	1.472	2.199
3	Other annual crops	3.67	1.57	1.472	2.199
4	Rubber	1.85	3.10	1.472	2.199
5	Coffee	0.00	2.89	1.472	2.199
6	Tea	0.00	2.36	1.472	2.199
7	Other perennial crops	0.67	4.53	1.472	2.199
8	Cattle, pigs	0.17	2.43	2.083	1.933
9	Poultry	1.75	2.38	2.083	1.933
10	Other livestock	3.57	2.50	2.083	1.933
11	Forestry	2.62	0.89	2.325	2.214
12	Fishing	6.55	2.84	1.985	2.047
13	Aquaculture	3.60	1.49	1.985	2.047
14	Coal	1.72	9.03	2.495	1.388
15	Crude oil	3.53	3.13	2.495	1.388
16	Natural gas	0.00	6.53	2.495	1.388
17	Other minings	0.84	10.14	2.495	1.388
18	Meat processing	4.85	0.61	1.977	1.577
19	Fish processing	8.30	0.75	1.977	1.577
20	Vegetable and fruit processing	13.16	0.74	2.205	1.358
21	Oils and fats processing	2.03	1.68	2.205	1.358
22	Dairy	7.94	1.43	2.205	1.358
23	Rice husking	4.22	0.14	2.205	1.358
24	Other flours	4.16	2.05	2.205	1.358
25	Other food processing	9.76	0.02	2.205	1.358
26	Non – alcoholic beverages	5.75	2.96	2.162	1.967
27	Alcoholic beverages	10.56	5.72	2.162	1.967
28	Tobacco processing	10.96	3.60	2.354	2.155
29	Yarn and other fibres	5.05	3.64	1.278	1.749
30	Textiles	7.11	2.83	1.278	1.749
31	Clothing	11.75	0.93	1.278	1.749
32	Leather products	1.02	2.21	0.981	0.563

33	Footwear	8.29	3.17	0.981	0.563
34	Wood products	3.36	0.53	2.173	1.945
35	Paper products	6.52	1.36	2.173	1.945
36	Printing products	5.13	0.52	2.942	1.413
37	Petroleum products	2.60	1.54	2.205	1.358
38	Other chemicals	2.63	1.28	2.205	1.358
39	Non-metallic minerals	6.26	3.02	1.961	2.08
40	Cement	5.39	3.43	1.961	2.08
41	Basic metals	1.10	1.07	1.961	2.08
42	Metal products	1.22	2.22	1.961	2.08
43	Machinery and equipment	2.02	7.05	2.942	1.413
44	Electrical machinery	3.68	1.89	2.942	1.413
45	Vehicles and transport equipment	4.20	10.02	1.956	2.296
46	Furniture	9.95	3.23	2.173	1.945
47	Other manufacturing	5.22	2.71	2.433	2.351
48	Electricity and gas distribution	0.34	5.46	2.544	1.663
49	Water distribution and utilities	0.00	5.00	2.544	1.663
50	Construction	0.00	0.92	2.433	2.351
51	Retail and wholesale trade	0.00	0.59	1.136	3.063
52	Hotels and catering	0.00	2.00	2.079	1.606
53	Road transport	0.00	2.00	2.126	2.012
54	Air transport	0.00	0.32	2.126	2.012
55	Other transport	0.00	1.95	2.126	2.012
56	Communications	0.00	9.92	2.059	1.703
57	Business services	0.00	4.82	2.008	1.919
58	Financial services	0.00	8.15	2.008	1.919
59	Real estate	0.00	33.66	2.008	1.919
60	Public administration	0.00	2.48	2.467	1.997
61	Education	0.00	1.11	2.467	1.997
62	Health	0.00	1.64	2.467	1.997
63	Other services	0.00	15.82	2.467	1.997

Source: *Author's calculations from the 2012 I-O Table (GSO, 2015) and 2012 SAM (CIEM, 2015).*

Appendix 3: Author's calculation from the model simulation

Table 1**: The Effect of Tariff Reduction on Output**

No	Sector	Output				Output Share			
		Initial Output	New Output	Change	%	Initial share	New share	Change	%
1	Crops cultivation	590,585	589,910	-675	-0.11	6.50	6.48	-0.02	-0.29
2	Livestock and poultry	325,525	327,088	1,564	0.48	3.58	3.59	0.01	0.30
3	Forestry	26,932	27,283	351	1.30	0.30	0.30	0.00	1.13
4	Fishery	289,177	293,059	3,882	1.34	3.18	3.22	0.04	1.17
5	Mining and quarrying	500,946	503,626	2,681	0.54	5.51	5.53	0.02	0.36
6	Food Processing	1,178,572	1,178,202	-369	-0.03	12.97	12.94	-0.03	-0.21
7	Textile, garment	457,372	456,783	-589	-0.13	5.03	5.02	-0.02	-0.30
8	Leather	268,680	269,612	932	0.35	2.96	2.96	0.01	0.17
9	Wood and wood products	221,736	224,506	2,769	1.25	2.44	2.47	0.03	1.07
10	Chemical manufacturing	469,084	465,238	-3,845	-0.82	5.16	5.11	-0.05	-0.99
11	Non metallic mineral, ferrous mineral	155,739	155,504	-236	-0.15	1.71	1.71	-0.01	-0.33
12	Machinery and equipment	779,278	791,809	12,531	1.61	8.58	8.70	0.12	1.43
13	Vehicles	239,734	239,098	-636	-0.27	2.64	2.63	-0.01	-0.44
14	Other manufacturing products	772,076	779,282	7,206	0.93	8.50	8.56	0.06	0.76
15	Construction	617,413	609,653	-7,760	-1.26	6.79	6.70	-0.10	-1.43
16	Trade	497,326	497,222	-104	-0.02	5.47	5.46	-0.01	-0.20
17	Hotels, restaurants and tourism	233,564	234,559	995	0.43	2.57	2.58	0.01	0.25
18	Transport services	334,204	336,436	2,232	0.67	3.68	3.70	0.02	0.49
19	Communication services	148,690	148,691	2	0.00	1.64	1.63	0.00	-0.17
20	Financial services	515,760	515,898	138	0.03	5.68	5.67	-0.01	-0.15
21	Public services	465,103	459,958	-5,144	-1.11	5.12	5.05	-0.07	-1.28
	Total	**9,087,494**	**9,103,418**	**15,923**	**0.18**	**100**	**100**		

Source: *Author's calculations from the model simulation*

Table 2: **The Effect of Indirect Tax (VAT) Reduction on Output**

No	Sector	Output				Output Share			
		Initial Output	New Output	Change	%	Initial share	New share	Change	%
1	Crops cultivation	590,585	586,157	-4,428	-0.75	6.50	6.44	-0.06	-0.93
2	Livestock and poultry	325,525	326,175	651	0.20	3.58	3.58	0.00	0.02
3	Forestry	26,932	26,424	-508	-1.89	0.30	0.29	-0.01	-2.06
4	Fishery	289,177	290,518	1,341	0.46	3.18	3.19	0.01	0.28
5	Mining and quarrying	500,946	507,440	6,495	1.30	5.51	5.57	0.06	1.11
6	Food Processing	1,178,572	1,178,753	181	0.02	12.97	12.95	-0.02	-0.16
7	Textile, garment	457,372	453,876	-3,495	-0.76	5.03	4.99	-0.05	-0.94
8	Leather	268,680	269,509	830	0.31	2.96	2.96	0.00	0.13
9	Wood and wood products	221,736	222,829	1,093	0.49	2.44	2.45	0.01	0.31
10	Chemical manufacturing	469,084	469,789	705	0.15	5.16	5.16	0.00	-0.03
11	Non metallic mineral, ferrous mineral	155,739	155,530	-209	-0.13	1.71	1.71	-0.01	-0.31
12	Machinery and equipment	779,278	789,136	9,858	1.27	8.58	8.67	0.09	1.08
13	Vehicles	239,734	242,521	2,788	1.16	2.64	2.66	0.03	0.98
14	Other manufacturing products	772,076	776,139	4,063	0.53	8.50	8.53	0.03	0.35
15	Construction	617,413	605,787	-11,626	-1.88	6.79	6.65	-0.14	-2.06
16	Trade	497,326	496,440	-887	-0.18	5.47	5.45	-0.02	-0.36
17	Hotels, restaurants and tourism	233,564	234,176	611	0.26	2.57	2.57	0.00	0.08
18	Transport services	334,204	334,837	633	0.19	3.68	3.68	0.00	0.01
19	Communication services	148,690	151,206	2,517	1.69	1.64	1.66	0.02	1.51
20	Financial services	515,760	526,928	11,168	2.17	5.68	5.79	0.11	1.98
21	Public services	465,103	459,690	-5,413	-1.16	5.12	5.05	-0.07	-1.34
	Total	**9,087,494**	**9,103,862**	**16,368**	**0.18**	**100**	**100**		

Source: *Author's calculations from the model simulation*

Table 3: **The Effect of Direct Tax on Capital (K-Tax) Reduction on Output**

No	Sector	Output				Output Share			
		Initial Output	New Output	Change	%	Initial share	New share	Change	%
1	Crops cultivation	590,585	593,666	3,081	0.52	6.50	6.53	0.03	0.49
2	Livestock and poultry	325,525	326,771	1,246	0.38	3.58	3.59	0.01	0.35
3	Forestry	26,932	27,141	209	0.78	0.30	0.30	0.00	0.74
4	Fishery	289,177	291,463	2,287	0.79	3.18	3.21	0.02	0.76
5	Mining and quarrying	500,946	500,935	-11	0.00	5.51	5.51	0.00	-0.04
6	Food Processing	1,178,572	1,183,309	4,738	0.40	12.97	13.02	0.05	0.37
7	Textile, garment	457,372	459,103	1,731	0.38	5.03	5.05	0.02	0.35
8	Leather	268,680	269,357	677	0.25	2.96	2.96	0.01	0.22
9	Wood and wood products	221,736	222,519	783	0.35	2.44	2.45	0.01	0.32
10	Chemical manufacturing	469,084	469,731	648	0.14	5.16	5.17	0.01	0.10
11	Non metallic mineral, ferrous mineral	155,739	155,324	-415	-0.27	1.71	1.71	-0.01	-0.30
12	Machinery and equipment	779,278	779,600	322	0.04	8.58	8.58	0.00	0.01
13	Vehicles	239,734	238,200	-1,534	-0.64	2.64	2.62	-0.02	-0.67
14	Other manufacturing products	772,076	772,967	891	0.12	8.50	8.50	0.01	0.08
15	Construction	617,413	602,959	-14,455	-2.34	6.79	6.63	-0.16	-2.37
16	Trade	497,326	499,097	1,771	0.36	5.47	5.49	0.02	0.32
17	Hotels, restaurants and tourism	233,564	234,695	1,131	0.48	2.57	2.58	0.01	0.45
18	Transport services	334,204	335,972	1,768	0.53	3.68	3.70	0.02	0.50
19	Communication services	148,690	149,212	523	0.35	1.64	1.64	0.01	0.32
20	Financial services	515,760	519,077	3,317	0.64	5.68	5.71	0.03	0.61
21	Public services	465,103	459,413	-5,690	-1.22	5.12	5.05	-0.06	-1.26
	Total	**9,087,494**	**9,090,513**	**3,018**	**0.03**	**100**	**100**		

Source: *Author's calculations from the model simulation*

Table 4: **The Effect of Direct Tax on Labour (L-Tax) Reduction on Output**

No	Sector	Output				Output Share			
		Initial Output	New Output	Change	%	Initial share	New share	change	%
1	Crops cultivation	590,585	590,941	356	0.06	6.499	6.503	0.004	0.057
2	Livestock and poultry	325,525	325,669	144	0.04	3.582	3.584	0.001	0.041
3	Forestry	26,932	26,950	19	0.07	0.296	0.297	0.000	0.066
4	Fishery	289,177	289,439	262	0.09	3.182	3.185	0.003	0.087
5	Mining and quarrying	500,946	500,945	-1	0.00	5.512	5.512	0.000	-0.003
6	Food Processing	1,178,572	1,179,116	545	0.05	12.969	12.975	0.006	0.043
7	Textile, garment	457,372	457,568	196	0.04	5.033	5.035	0.002	0.040
8	Leather	268,680	268,757	77	0.03	2.957	2.957	0.001	0.025
9	Wood and wood products	221,736	221,799	63	0.03	2.440	2.441	0.001	0.025
10	Chemical manufacturing	469,084	469,152	69	0.01	5.162	5.162	0.001	0.011
11	Non metallic mineral, ferrous mineral	155,739	155,692	-47	-0.03	1.714	1.713	-0.001	-0.034
12	Machinery and equipment	779,278	779,306	27	0.00	8.575	8.575	0.000	0.000
13	Vehicles	239,734	239,548	-186	-0.08	2.638	2.636	-0.002	-0.081
14	Other manufacturing products	772,076	772,109	33	0.00	8.496	8.496	0.000	0.001
15	Construction	617,413	615,815	-1,599	-0.26	6.794	6.776	-0.018	-0.262
16	Trade	497,326	497,526	200	0.04	5.473	5.475	0.002	0.037
17	Hotels, restaurants and tourism	233,564	233,687	122	0.05	2.570	2.571	0.001	0.049
18	Transport services	334,204	334,400	195	0.06	3.678	3.680	0.002	0.055
19	Communication services	148,690	148,751	62	0.04	1.636	1.637	0.001	0.038
20	Financial services	515,760	516,132	372	0.07	5.675	5.679	0.004	0.069
21	Public services	465,103	464,485	-617	-0.13	5.118	5.111	-0.007	-0.136
	Total	**9,087,494**	**9,087,785**	**291**	**0.00**	**100.00**	**100**		

Source: *Author's calculations from the model simulation*

Table 5: **The Effect of Indirect Tax Reduction and Direct Tax Increase on Output**

No	Sector	Output				Output Share			
		Initial Output	New Output	Change	%	Initial share	New share	Change	%
1	Crops cultivation	590,585	581,790	-8,796	-1.49	6.499	6.382	-0.117	-1.797
2	Livestock and poultry	325,525	326,302	777	0.24	3.582	3.579	-0.003	-0.075
3	Forestry	26,932	26,523	-409	-1.52	0.296	0.291	-0.005	-1.825
4	Fishery	289,177	291,781	2,604	0.90	3.182	3.201	0.019	0.585
5	Mining and quarrying	500,946	510,363	9,418	1.88	5.512	5.599	0.086	1.561
6	Food Processing	1,178,572	1,173,023	-5,549	-0.47	12.969	12.868	-0.101	-0.782
7	Textile, garment	457,372	451,364	-6,008	-1.31	5.033	4.951	-0.082	-1.622
8	Leather	268,680	269,658	978	0.36	2.957	2.958	0.001	0.050
9	Wood and wood products	221,736	224,717	2,981	1.34	2.440	2.465	0.025	1.027
10	Chemical manufacturing	469,084	465,224	-3,860	-0.82	5.162	5.103	-0.058	-1.133
11	Non metallic mineral, ferrous mineral	155,739	155,756	16	0.01	1.714	1.709	-0.005	-0.302
12	Machinery and equipment	779,278	800,754	21,476	2.76	8.575	8.784	0.209	2.435
13	Vehicles	239,734	243,620	3,886	1.62	2.638	2.672	0.034	1.303
14	Other manufacturing products	772,076	782,364	10,288	1.33	8.496	8.582	0.086	1.016
15	Construction	617,413	614,671	-2,742	-0.44	6.794	6.743	-0.051	-0.756
16	Trade	497,326	494,362	-2,964	-0.60	5.473	5.423	-0.050	-0.907
17	Hotels, restaurants and tourism	233,564	233,885	320	0.14	2.570	2.566	-0.005	-0.176
18	Transport services	334,204	335,035	831	0.25	3.678	3.675	-0.002	-0.065
19	Communication services	148,690	150,582	1,893	1.27	1.636	1.652	0.016	0.956
20	Financial services	515,760	523,167	7,407	1.44	5.675	5.739	0.064	1.119
21	Public services	465,103	461,067	-4,035	-0.87	5.118	5.058	-0.060	-1.178
	Total	**9,087,494**	**9,116,007**	**28,512**	**0.31**	**100.00**	**100**		

Source: *Author's calculations from the model simulation*

Table 6: **The Effect of Lowering Four Categories of Tax on Output**

No	Sector	Output				Output Share			
		Initial Output	New Output	Change	%	Initial share	New share	Change	%
1	Crops cultivation	590,585	588,702	-1,883	-0.32	6.499	6.454	-0.045	-0.698
2	Livestock and poultry	325,525	329,143	3,618	1.11	3.582	3.608	0.026	0.727
3	Forestry	26,932	26,985	53	0.20	0.296	0.296	-0.001	-0.184
4	Fishery	289,177	297,088	7,911	2.74	3.182	3.257	0.075	2.345
5	Mining and quarrying	500,946	510,494	9,548	1.91	5.512	5.596	0.084	1.518
6	Food Processing	1,178,572	1,183,816	5,244	0.44	12.969	12.977	0.008	0.063
7	Textile, garment	457,372	455,210	-2,161	-0.47	5.033	4.990	-0.043	-0.851
8	Leather	268,680	271,192	2,512	0.93	2.957	2.973	0.016	0.551
9	Wood and wood products	221,736	226,481	4,745	2.14	2.440	2.483	0.043	1.751
10	Chemical manufacturing	469,084	466,680	-2,404	-0.51	5.162	5.116	-0.046	-0.891
11	Non metallic mineral, ferrous mineral	155,739	154,810	-930	-0.60	1.714	1.697	-0.017	-0.975
12	Machinery and equipment	779,278	801,572	22,294	2.86	8.575	8.787	0.212	2.470
13	Vehicles	239,734	240,220	486	0.20	2.638	2.633	-0.005	-0.178
14	Other manufacturing products	772,076	784,332	12,256	1.59	8.496	8.598	0.102	1.201
15	Construction	617,413	581,088	-36,325	-5.88	6.794	6.370	-0.424	-6.241
16	Trade	497,326	498,335	1,008	0.20	5.473	5.463	-0.010	-0.178
17	Hotels, restaurants and tourism	233,564	236,427	2,863	1.23	2.570	2.592	0.022	0.841
18	Transport services	334,204	339,057	4,853	1.45	3.678	3.717	0.039	1.066
19	Communication services	148,690	151,837	3,147	2.12	1.636	1.664	0.028	1.728
20	Financial services	515,760	530,946	15,186	2.94	5.675	5.820	0.145	2.553
21	Public services	465,103	447,780	-17,323	-3.72	5.118	4.909	-0.209	-4.091
	Total	**9,087,494**	**9,122,192**	**34,698**	**0.38**	**100.00**	**100**		

Source: *Author's calculations from the model simulation*