Tax Reform, Sectoral Restructuring and Household Welfare in Vietnam

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ABSTRACT

This study investigates the effects of Vietnam's recent tax reform on changes in sectoral structures, household welfare, and other key macroeconomic variables across scenarios. A Computable General Equilibrium framework in connection with the most updated Social Accounting Matrix of 2012, was developed to simulate the Vietnam economy. The results reveal that a reduction in the tax rates causes positive changes in the sectoral structure. This is proven by the transfer from labour-intensive towards capital-intensive sectors, increasing the output proportion of manufacturing and service sectors in the direction of industrialization and modernization, initiated by the 1986 *Doi Moi* reforms. We also find that when all categories of taxes are simultaneously diminished, the positive impact of the tax reform is strongest and the highest level of household welfare is created, though the benefits of cutting taxes are not evenly distributed among the household groups. In addition, a budget deficit is inevitable and should be tackled by the government through effective budgeting strategies and a relevant plan to cut government spending. The study implies that Vietnam needs to analyse the benefits of the tax reform over the opportunity cost of implementing the tax reform, while maintaining competitive and reasonable tax rates in accordance with international commitments and practices.

INTRODUCTION

A country's tax system is a fiscal policy instrument designed to achieve a number of objectives (e.g. economic growth, income redistribution, and government spending). A rich body of literature has emphasized the important role of tax reform in fostering a country's economic development, though the findings remain unclear (Lee and Gordon, 2005; Kraay, 2006; and Amir *et al*., 2013). Eicher *et al*. (2003) illustrated that the association among tax reform, income redistribution, sectoral restructuring, and economic growth is complicated. Thus, understanding the influence of tax reform on a particular economy can provide a better opportunity for assessing fairness, administrability, and the role of taxation on growth. The existing research focusses on the impact of one or two tax categories on several important economic indicators (e.g. GDP, national welfare). To date, the literature is quite silent on the interactions among tax reforms, economic sectors, and national welfare in the context of developing and transition economies, where tough challenges in establishing efficient tax systems exist.

We employ a Computable General Equilibrium (CGE) model to analyse the impact of tax reforms on the small transition economy of Vietnam. This is important, as Vietnam has witnessed significant changes in sectors stimulated by global economic integration over the last 20 years. The Vietnamese economy gradually transforms from a centrally planned system, during periods of wars, into a dynamic and export-oriented market motivated by institutional and economic reforms. The milestones lead to strong sectoral structural changes, reducing agriculture, forestry and fishery and increasing manufacturing and services, in the direction of industrialization and modernization, initiated by the 1986 Doi Moi reforms (McCaig and Pavcnik, 2013). In addition, Vietnam has been a member of all major international organizations (i.e. World Trade Organization (WTO), ASEAN Economic Community, 16 free trade agreements (FTA)). These commitments require a roadmap to sharply cut Vietnamese tariffs and taxes. This, in turn, may have numerous impacts on the Vietnamese economy (e.g. welfare, economic growth, sectoral production structure).

This study will attempt to answer several questions. How should tax reform impacts on sectoral restructuring and household welfare be measured? How does sectoral structure and household welfare align with the Vietnamese Government's economic orientation? How can Vietnam develop an efficient tax reform policy to carefully consider national budget deficit and government spending cuts, while maintaining competitive and reasonable tax rates to comply with international commitments?

A CGE model will be used to indicate the impact of the Vietnamese Government's recent tax reform on the economy. The model includes sixty-three sectors, twenty household groups, and seven factors of production, to enable the simulation of changes to a single tax category, as well as the combined variations of multiple taxes in various scenarios to analyse the influence of tax reform on sectoral restructuring, household welfare, and other key macroeconomic indicators.

For this purpose, the latest version of the Social Accounting Matrix (SAM) is constructed, based on employing the most up-to-date Input-Output Table published by the General Statistics Office of Vietnam, as well as other data sources. In our simulation, tariffs and the other tax categories are adjusted. This procedure is consistent with many FTAs and other international trade commitments. Our study adds to the limited literature on developing economies, and provides new evidence on the relationship between tax policy reform, sectoral restructuring and household welfare in a transition country under pressure to maintain competitive and reasonable tax rates in accordance with international commitments and practices.

The remainder of the paper is organized as follows. The next section presents a detailed review of the existing literature, along with a brief review of Vietnamese tax reforms. Section 3 describes the data and methodologies used to examine the research questions. Section 4 reports the simulation results and Section 5 concludes the paper.

THEORETICAL BACKGROUND

Tax reform in developing economies

An effective tax system has been widely recognized as one of the determinants of a successful economic transition. The transition to a market economy raised the central question of what tax policy reforms and tax rates should be relevant and adopted in the context of transition economies. Prior studies illustrate the weakness of tax administration systems in transition and developing economies, such as the lack of modern business accounting standards, tax reform strategy (Tanzi, 1994), and the demand for a modern tax system (Tanzi and Zee, 2000). Chen (2003) investigated the impact of the 2008 Law on Enterprise Tax in China and found that the tax burden on domestic firms is more severe than that on foreign firms, suggesting the need to replace overseas trade taxes with domestic taxes, as well as the formulation of a sound tax policy. Soewardi *et al*. (2017) examined the effect of tax reform on fiscal policy in Indonesia, and found a positive relation between tax reform and the country's economic growth, though tax reform significantly has adverse impact on government spending.

In a similar vein, Tanzi and Zee (2000) suggest that the ideal tax system in developing countries needs to promote revenue, rather than encourage excessive government borrowing. More importantly, the existing evidence suggests that countries with efficient tax policy reforms tend to receive more foreign funds and attract advanced technology and administrative experiences (Ji *et al*., 2013). They also generally achieve better economic growth (Amir *et al*., 2013).

To date, few studies have investigated the connections between tax reform, sectoral restructuring, and household welfare. The existing research also provides little evidence regarding the combination of multiple taxes in a study and investigates their role in national welfare and shifts in economic sectors.

CGE models and their use in economic policy analysis

The existing literature illustrates the importance of employing Computable General Equilibrium (CGE) models in estimating how an economy may respond to changes in policy. CGEs also capture sectoral effects and inter-sectoral linkages. Meng (2009) and Amir *et al*. (2013) suggest that CGE models are suitable for investigating the impacts of economic policies, accounting for numerous inter-relationships between all factors in the economy, grasping the complicated interactions among economic variables and policy instruments, and therefore, providing more accurate simulated results, relative to partial equilibrium methodologies.

More importantly, CGE models have typically been employed to investigate the effect of changes in policy on the economy through a number of scenarios or controlled experiments. Many researchers have used CGE models to analyse the diverse impact of various tax policies on the national economy. The in-depth research by Emran and Stiglitz (2005) investigated the importance of indirect tax reforms in selected developing countries. They found that value-added tax (VAT) adjustments negatively affect total household welfare, thus questioning the validity of VAT reform widely pursued by many developing economies. In a similar vein, Sajadifar *et al*. (2012) find a negative impact of VAT reforms in Iran on GDP and national welfare, in contrast to a noticeable improvement in total revenue.

Whalley and Wang (2007) examined the impact of the new Law of Enterprise Tax in China on national welfare and found a 0.26% welfare loss under the new tax system. Similarly, Hooshmandi *et al*. (2015) employed a static CGE model and found a negative relationship between income tax and overall economic growth in Iran. Matovu *et al*. (2009) examined the effect of tax reform, mainly focusing on VAT and excise taxes, on household welfare in Uganda, and indicated that households in lower income groups tended to receive better benefits than the prior tax reform. Tarp and Arndt (2009) studied the case of Mozambique and found a positive relationship between economic growth and the new VAT system.

The Case of Vietnam

Since the 1986 Doi Moi reforms, tax reform is one of the most pressing policy improvements that the Vietnamese Government has achieved to be more in line with international practice and law, and in the wave of institutional reform, especially its broader integration into the international economy. Recent tax policy reforms in Vietnam have brought positive results. Figure 1 shows an overall upward trend in the contribution of total tax revenue to Vietnam's GDP from 1994 to 2013. Since 2001, tax revenue has increased markedly. However, since 2011, consistent with the Strategy for Reform of Vietnam's Tax System for the 2011-2020 period,[1]   the tax-to-GDP ratio has been declining.

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[1]This strategy aims to promote economic growth, encourage exports, and accelerate the shift of the economic structure from agriculture to industry and services and from labour-intensive industries to capital-intensive industries, along the direction of industrialization and modernization.
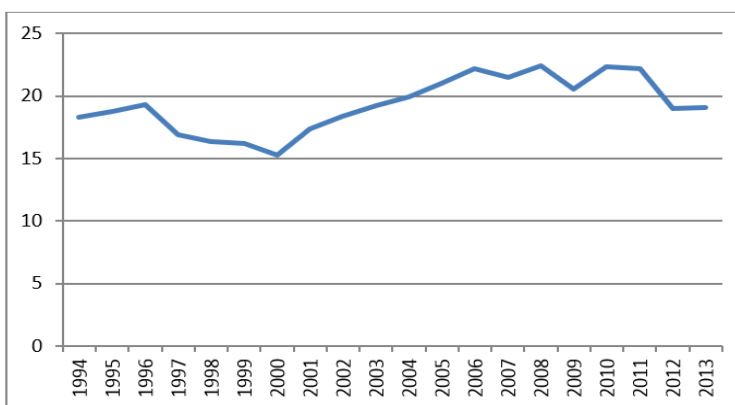
Source: The General Statistics Office of Vietnam

Figure 1: The tax-to-GDP ratio in Vietnam in the period of 1994-2013

Panel A of Table 1 describes the contribution of tax revenue and each individual tax to the total state budget for 2007 and 2012. The results illustrate that taxes account for 66.8% of the total national budget, representing the tax burden and pressure on entities in the economy. In addition, the share of indirect taxes (e.g. tariffs, VAT) is much higher than the direct taxes (e.g. corporate income tax, personal income tax). In a similar vein, Panel B presents the proportion of taxes in the tax structure. The results indicate that there is a tendency to gradually reduce the structure of indirect taxes and shift to direct taxes.

Table 1: Tax revenue statistics, tax structures and national budget in Vietnam

Panel A: Tax revenue and national budget in 2007 and 2012 (*in bil VND*)			
#	Tax revenue and national budget	2007	2012
1.	Total national budget	431,057	1,038,451
2.	Tax revenue	287,917	709,361
	- VAT	136,625	308,598
	- Tariff	32,006	69,762
	- Corporate income tax	111,158	298,177
	- Personal income tax	8,129	32,824
3.	Percentage of tax in the national budget (%)	66.79	68.31
Panel B: Proportion of taxes in the tax structure in 2007 and 2012			
1.	VAT	47.45	43.50
2.	Tariff	11.12	9.83
3.	Corporate income tax	38.61	42.03
4.	Personal income tax	2.82	4.63

Source: The 2012 SAM

Many studies have investigated the influence of changes in tax policies on the economy. Giesecke and Tran (2010) employ a CGE model with respect to the 2005 SAM database. Their study finds that tax reform causes a significant increase in investments, private consumption, and production for most sectors. Coxhead *et al*. (2013) examine the impact of carbon taxes on household welfare and find that new environment taxes reduce employment and increase poverty, leading to possible conflicts with other development policy objectives.

Our research differs from the previous studies in several important ways. First, our study does not focus on one particular type of tax; instead, we investigate a wide range of tax categories. We aim to better understand the effect of a set of tax categories on national economic growth, in general, and on the sectoral structure. We analyse whether tax reform is in line with the government's economic orientation.

Second, many studies have addressed the significance of tax reform using advanced econometric models and a qualitative approach. However, the existing research in developing countries often lacks the large-scale data sources necessary to investigate the impact of macroeconomic policies, especially the role of tax policy reform. Some Vietnam-based studies have applied the CGE model, but have not focused on analysing the impact of tax reform on sectoral restructuring and household welfare. These studies have employed the 2007 SAM; hence, their simulation results may no longer be relevant to the current context. In contrast, our study employs a CGE model, one of the most powerful tools in macroeconomic policy analysis, in connection with the most updated SAM of 2012, to answer the main research question of whether tax reform significantly affects sectoral structure, welfare, and other key macroeconomic variables across different scenarios.

RESEARCH METHODOLOGIES

Tax reform and scenarios

In this study, tax reform is defined as the changes in the tax rates of individual taxes. It is undertaken based on analysing trends. It is the roadmap for the implementation of international commitments and FTAs that Vietnam has signed with its trading partners.

Based on analysing the context and trends of tax reform, following the Strategy for the Reform of the Vietnamese Government's Tax System for the 2011-2020 period (also see the previous section), we developed six scenarios. The first four scenarios simulate the individual changes in each type of tax: import taxes, VAT, corporate income tax, and personal income tax. The other two scenarios simulate the combination of such taxes to study the pooled effect of tax policies on the structural shift in economic sectors, household welfare, and other macroeconomic indicators.

Scenario 1: Reduction in import tax rates. The tendency to lower tariff rates is inevitable and an indispensable trend in Vietnam's global economic integration process. However, the cuts should not be made immediately. The cuts follow a roadmap up to 2025. Thousands of specific items are detailed. In this paper, to simulate the tendency of gradually cutting tariff rates, we assume that all tariff rates above 5% will be adjusted to 5%. Similarly, rates above

3% and below 5% will be adjusted to 3%, while rates below 3% approached 0%.

Scenario 2: Reduction in VAT rates by 20%. According to the current VAT Law of 2008, there are three prescribed rates: 0%, 5%, 10%, where the majority is 10%-rated commodity groups. The average VAT rate for all groups is currently around 8.6%. According to the Strategy for Reform of Vietnamese Government's Tax System for the 2011-2020 period, the new tax rate should be around 7% in 2020. In our paper, we assume that the VAT rate is reduced by 20%, corresponding to a cutting down from 8.6% to 7%.

Scenario 3: Reduction in corporate income tax rates by 20%. Reduction in corporate income tax rates by 20%. This is a direct tax which is currently rated at 20% in Vietnam. The Vietnamese Government aims to lessen it to 17% or 15% by 2020. Thus, this rate could be reduced by 20%. The scenarios reduce the corporate income tax rate by 20% over the base year. In our paper, we assume that the corporate income tax rate is reduced by 20%, corresponding to a decline from 20% to an average of 16%.

Scenario 4: Reduction in personal income tax rates by 20%. We assume that the decline in personal income tax, which is another direct tax, would be the same as the rate of corporate income tax cuts.

Scenario 5: Reduction in indirect tax (Tariffs and VAT) rates while increasing direct tax (corporate income tax and personal income tax) rates. In the past decade, the proportion of direct taxes and indirect taxes in the total tax revenue of Vietnam has been substantially balanced. For instance, in 2012, direct taxes accounted for 52% of the total tax revenue, while the remaining 48% is indirect taxes.

Scenario 6: Reduction in all tax categories. In this scenario, we simulate the situation where all taxes are decreased. The rate of reduction of each tax corresponds to Scenarios 1 through 4. This is a combined scenario that examines its impact on sectoral restructuring and household welfare, relative to the decreased rate of each individual tax.

Basic structure of the model

In this paper, we follow the work by Dervis *et al*. (1982) and Hosoe *et al*. (2004) to build a standard, competitive, small/price taking, open economy CGE model with the assumption that the economy is formed by five entities: producers, governments, households, investments, and the rest of the world: [2]

Producers

In this model, the economy is comprised of sixty-three production sectors, each of which uses labour, capital and intermediate inputs for production. It is assumed that the value-added is generated through the Cobb-Douglass production function, using the primary factors of labour and capital, as follows:

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

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[2] The system of equations of the CGE model, variables, and parameters are available in the Appendix. The GAMS software was used to solve the CGE model.

Aggregate output of each sector is produced through the Leontief technology. The demand for each of six labour categories in each sector is derived from the optimizing behaviour of the Cobb-Douglass and Leontief technology, and given as:

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

Government

The main function of government is to collect taxes to cover government activities, transfer to the households, and saving for investment, according to fixed share parameters. It can be summarized as follows:

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

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

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

Households

The model contains twenty types of households, characterized by location (i.e. rural, urban), employment area (i.e. agricultural, non-agricultural) and five income quintiles, where the poorest is quintile 1 and the richest is 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 the government and from abroad, and is given as:

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

Each household group spends all of its disposable income on consumption and savings. The consumer problem is solved by using a Linear Expenditure System (LES) function. Each household group faces the following constrained maximization problem:

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

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

We employ Hicksian Equivalent Variations (EV) approach to measure the welfare change of each household group:

$$EV_r = \frac{U_{1r} - U_{0r}}{U_{0r}} Y_{0r}$$

where: r represents a particular category of household; U_{0r}, U_{1r} are utilities before and after the tax reform, respectively; and Y_{0r} denotes the budget for consumption at the base year. National welfare, a key indicator in assessing the overall impact of macroeconomic policies, is measured as the sum of individual household Equivalent Variations:

$$EV = \sum_r EV_r$$

Investment

Total savings, which is assumed to be all spent in investment activities, are determined by applying exogenous savings rates to the income of each household group and the government.

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

Imports

Following Armington (1969), domestic and imported goods are imperfect substitutes. Each domestic institution allocates its total demand between the domestic and imported goods, so as to minimize the total expenditures, subject to the CES function:

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

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

Exports

The relationship between exports and the supply for domestic use is assumed to be represented 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:

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

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

The Model Calibration

In the calibration stage, it is crucial to select the data input from the SAM and other information sources to run the CGE model. Accordingly, we constructed the SAM 2012 for the model calibration. It is assumed that the equilibrium is observed in the current economy. Model parameters are computed so that the general equilibrium is obtained when all price variables are equal to one. Calibration for most functions in the model is relatively straight forward. All other model parameters (i.e. tax rates, saving rates, distribution coefficients, average budget share for household consumption, production elasticity of labour, capital) have been determined, based on the SAM data. The CES and CET parameters were based on the work by Nguyen and Nguyen (2014).

RESULTS

Tax reform and key macroeconomic indicators

Table 2 presents the impacts of tax reform on key macroeconomic indicators across six scenarios. The results indicate that the output of the economy tends to increase in all scenarios, especially Scenarios (5) and (6). In addition, the tax reduction has put tremendous pressure on the government's total budget, particularly Scenario (6), when the government's budget decreases by 20.51%. In terms of trade balance, the import and export values increase in all scenarios, especially Scenarios (1), (5), and (6). This suggests that under the impact of the tax scenarios, Vietnam's economy integrates deeper into the world economy with higher import and export values. This aligns with the government's orientation. Tax reform plays an important role in encouraging competitiveness, expanding production, and minimizing the adverse effects of price fluctuations. However, it is also worth noting that there are signs of an increased shift in the trade deficit across six scenarios, as the increase in total exports could not offset the surge in total imports.

We also find that household welfare is more inclined to rise. This is especially true for Scenario (6), with the highest household welfare of 6.02%, as compared to the other scenarios, though there is a significant fall in government revenue. Hence, the government is questioned to consider cutting all tax rates, along with cutting government spending in Scenario (6), or lowering indirect tax rates, while raising direct tax rates in Scenario (5). This raises the need for Vietnam to carefully consider either cutting tariffs (Scenario 6), along with cutting government spending, or reducing the indirect tax rates, in combination with increasing the direct tax rates (Scenario 5).

Overall, these results are consistent with Chen (2003), who shows that the tax reduction policy tends to cause a national budget deficit, and thus, puts pressure on the fiscal policy of the government. Furthermore, our results are in line with those of Matovu *et al*. (2009), indicating that household benefits tend to increase, relative to the tax system, prior to the reforms.

Table 2: The impacts of tax reform on key macroeconomic indicators across six scenarios

Indicators	(1)	(2)	(3)	(4)	(5)	(6)
Outputs	0.175	0.180	0.033	0.003	0.314	0.382
Export	1.050	0.359	0.114	0.011	1.273	1.543
Import	1.221	0.380	0.112	0.011	1.466	1.734
National Budget	-4.249	-6.736	-8.152	-0.896	-1.593	-20.515
- Tariff	-47.180	4.941	4.702	4.533	-47.206	-47.096
- VAT	0.381	-18.577	0.296	0.032	-18.557	-17.989
- Ktax	1.656	2.750	-19.875	0.017	25.102	-16.290
- Ltax	1.375	1.806	-0.280	-20.025	24.225	-17.696
Welfare	1.329	2.215	2.122	0.235	1.109	6.022

Source: The 2012 SAM

Tax reform, sectoral restructuring, and household welfare

In this section, we examine the effects of tax reform on sectoral restructuring and household welfare across all simulated scenarios. Table 3 illustrates that construction and public service sectors experience the greatest decline in their outputs. More specifically, Scenario (6) had declines of 5.88% in construction and 3.72% in the public service sectors. This trend suggests that tax reform is in line with Vietnam's current tightening fiscal policy, cutting public investment and services, and reducing the state budget deficit, in accordance with Resolution No.11/NQ-CP by the Vietnamese Government in 2011 on controlling inflation, stabilizing the macro-economy, and ensuring social welfare. Furthermore, financial services, communications services, mining, and fishing, also benefit from the tax reform, while the tax reform causes adverse impacts on the output of the crop cultivation sector (i.e. loss of 1.49% in Scenario (5)).

The textile and garment sector, on the other hand, appears to be negatively influenced, and may lose its competitiveness in both domestic and international markets, especially in Scenarios 2, 5, and 6, with a decline of 0.76%, 1.31%, and 0.47%, respectively. The reason might be caused by an increase in the wage rate, which then lead to the shift in production from labour-intensive sectors (e.g. textiles, garments) towards more capital-intensive sectors (e.g. machinery, equipment).

In general, the results in Table 3 show that the tax cuts across all scenarios, especially Scenario (6), illustrate a shifting tendency in the structure of the economic sectors from agriculture to manufacturing and services. In addition, in the manufacturing sector, there is a clear shift from labour-intensive industries to capital-intensive and high-tech industries. Furthermore, the results of Scenario (6) show that the impact of tax reform on sectoral restructuring appears to be the strongest. These changes are consistent with the industrialization strategy, and the expansion of the manufacturing and service sectors, which the Vietnamese Government targets by 2020. These results suggest that the reduction in all tax categories should be the best solution for Vietnamese policymakers.

The results expand the works of Tanzi and Zee (2000) and Amir *et al*. (2013). The results also add to the limited evidence in transition economies and suggests that the reduction in tax rates causes positive changes in the sectoral structure. This was proven by the transfer from

labour-intensive towards capital-intensive sectors, increasing the proportion of manufacturing and services, in the direction of industrialization and modernization.

Regarding Vietnam's current situation, considering the correlation between the budget deficit problem and the implementation of international commitments, the Vietnamese Government is currently very sceptical about whether to increase, decrease or maintain current tax rates for both direct taxes and indirect taxes in response to a new tax law draft for the purpose of restructuring the tax system and balancing the budget revenue. Many countries around the world tend to reduce direct taxes (e.g. corporate income tax, personal income tax) to create favourable conditions for enterprises to improve their income and international competitiveness. Subsequently, it is customary to regulate indirect taxes (VAT and import tax), alongside the restructuring of government spending. Our results support this trend and suggest that indirect taxes should also be reduced, as the reduction in tax rates causes positive changes in sectoral structures. This was proven by the transfer from labour-intensive towards capital-intensive sectors, increasing the proportion of manufacturing and services in the direction of industrialization and modernization. We also find that, in the scenario in which all categories of tax are diminished, the impact of tax reform is strongest and the highest level of household welfare is created.

Figure 2 clarifies the impacts of reducing tax across all four tax categories by industry (Scenario 6). It clearly illustrates that, by lowering the tax rates, there are positive changes in the sectoral structure. This is proven by the transfer from labour-intensive (e.g., crop cultivation, textiles, and garments) towards capital-intensive sectors and the upward tendency in the proportion of manufacturing and services.
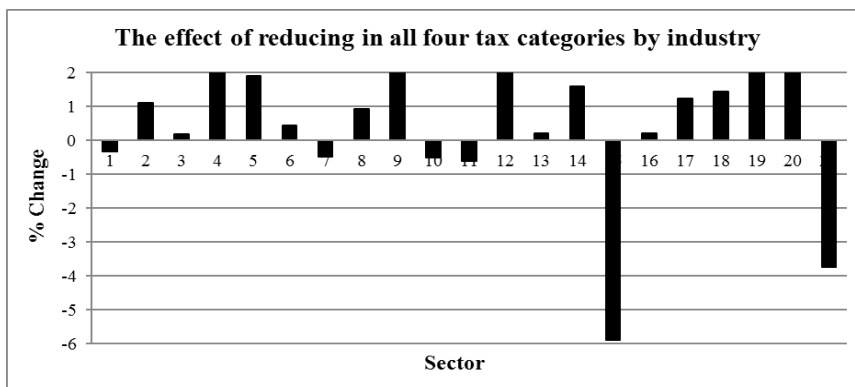
Figure 2: Scenario (6) and changes in sectoral structure

Tax cuts are more likely to cause income inequality and a distortion in household welfare. Consequently, we examine the impacts of tax reform on household welfare by household groups across six scenarios. In our model, households are disaggregated into twenty groups, where the first ten groups are located in urban areas, while the other ten groups are based in rural areas. In each area, we categorize household groups into agricultural and non-agricultural activities. In Table 4, the simulation results show that total national welfare increases in all six scenarios, where the highest level is in Scenario (6). However, the benefits of cutting taxes are

not evenly distributed among household groups. We also find that household groups in urban areas clearly gain more benefits from tax reductions than rural households. More importantly, non-farm households tend to receive higher benefits than farm household groups in urban areas. In contrast, in rural areas, groups of households involved in agricultural activities are more likely to obtain higher welfare than non-agricultural groups.

Our results expand upon the works by Emran and Stiglitz (2005), Whalley and Wang (2007), Matovu *et al*. (2009), and Sajadifar *et al*. (2012). We indicate that tax reform has a different impact on household welfare in rural and urban areas. Hence, we recommend that Vietnam provide a reasonable support mechanism to create fairness in the income distribution between urban and rural areas, as well as between agricultural and non-agricultural activities.

CONCLUSION

To boost production and business, and encourage investment, tax incentives are widely applied in both developed and developing countries. Theoretical and practical evidence suggests that, in some cases, and in some economic development stages, tax incentives can help boost economic growth and industrial restructuring. This is also a policy that reduces state budget revenue, distorts the allocation of resources and income, and increases the complexity of the tax policy system. In this paper, we develop several scenarios to investigate the relationship between tax reform and sectoral restructuring, household welfare, and other key macroeconomic variables using a CGE approach, in association with Vietnam's 2012 SAM. Tariffs, VAT, corporate income tax, and personal income tax are taken into consideration.

Our results reveal that a tax reduction policy causes a national budget deficit, raising the need for Vietnam to cautiously consider cutting tariffs and/or VAT, along with cutting government spending, or reducing indirect tax rates, in combination with increasing direct tax rates. We find that the reduction in tax rates causes positive changes in sectoral structures. This was proven by the transfer from labour-intensive towards capital-intensive sectors, increasing the proportion of manufacturing and services in the direction of industrialization and modernization. We also find that, in the scenario in which all categories of tax are diminished, the impact of tax reform is strongest and the highest level of household welfare was created. Furthermore, our study indicates that total household welfare increases across all six scenarios, though the benefits of cutting taxes are not evenly distributed among the household groups. This suggests that tax reform has a different impact on household welfare in rural and urban areas. Overall, our findings provide new evidence in the ongoing effort to understand the relationship between tax policy reform, industrial restructuring and household welfare in the context of a typical transition economy.

Our results have important implications for policymakers and regulators. Firstly, prior to the promulgation of a tax reduction policy, Vietnam needs to analyse its costs and benefits. Priority needs to be placed on comparing the benefits of the tax reform over the opportunity cost of implementing such a policy, in accordance with international commitments and practices. Secondly, Vietnam should continue to accelerate their reform of the tax system and apply best international practices. The reform of tax incentives must be in line with the tax policy system, must be consistent with the country's growth model, and must focus on expanding the tax base.

Table 3: The impacts of tax reform on sectoral outputs across six scenarios (in bil VND)

#	Sector	(1) Diff	(1) %	(2) Diff	(2) %	(3) Diff	(3) %	(4) Diff	(4) %	(5) Diff	(5) %	(6) Diff	(6) %
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

Table 4: The impacts of tax reform on household welfare across six scenarios (in bil VND)

			(1)		(2)		(3)		(4)		(5)		(6)	
			Diff	%	Diff	%	Diff	%	Diff	%	Diff	%	Diff	%
Urban	Farm	HOH_1	73	1.265	135	2.355	94	1.639	22	0.384	88	1.530	331	5.764
		HOH_2	203	1.413	319	2.218	292	2.036	61	0.425	157	1.091	893	6.219
		HOH_3	469	1.532	786	2.570	782	2.557	132	0.432	310	1.014	2,218	7.249
		HOH_4	616	1.410	1,133	2.596	1,169	2.677	177	0.404	359	0.823	3,168	7.253
		HOH_5	563	1.193	1,206	2.558	1,245	2.639	156	0.330	321	0.680	3,249	6.887
	Non-Farm	HOH_6	56	1.679	90	2.727	97	2.919	14	0.430	31	0.943	263	7.937
		HOH_7	168	1.448	288	2.487	330	2.847	43	0.372	70	0.607	849	7.324
		HOH_8	504	1.281	1,064	2.703	1,179	2.996	130	0.331	213	0.540	2,946	7.487
		HOH_9	1,397	1.087	3,128	2.435	3,160	2.460	403	0.314	841	0.654	8,286	6.451
		HOH_10	6,170	0.968	15,237	2.390	15,925	2.498	1,852	0.291	3,040	0.477	40,162	6.299
Rural	Farm	HOH_11	1,740	1.690	1,745	1.694	1,612	1.565	197	0.191	1,610	1.563	5,365	5.210
		HOH_12	2,605	1.534	3,147	1.853	2,248	1.324	309	0.182	3,109	1.831	8,416	4.956
		HOH_13	2,991	1.512	3,539	1.789	2,733	1.382	341	0.172	3,356	1.696	9,738	4.922
		HOH_14	3,104	1.515	3,874	1.891	3,055	1.491	347	0.169	3,468	1.693	10,535	5.143
		HOH_15	2,561	1.790	3,453	2.413	3,353	2.344	235	0.164	2,306	1.612	9,781	6.835
	Non-Farm	HOH_16	131	1.596	132	1.609	120	1.456	15	0.179	124	1.510	404	4.907
		HOH_17	290	1.416	335	1.636	302	1.476	30	0.145	281	1.373	970	4.743
		HOH_18	513	1.400	755	2.060	618	1.687	57	0.156	571	1.557	1,976	5.390
		HOH_19	767	1.282	1,364	2.280	986	1.649	82	0.138	1,031	1.723	3,256	5.443
		HOH_20	1,842	1.701	2,878	2.657	3,425	3.163	119	0.110	1,051	0.971	8,460	7.812
		Total	26,762	1.329	44,608	2.215	42,725	2.122	4,722	0.235	22,336	1.109	121,263	6.022

At the same time, it should maintain a competitive and reasonable tax rate, in accordance with international commitments and practices, and create a rational mechanism to compensate for the household groups negatively affected by the policy.

This study has some limitations. The CGE model employed is a static model and the tax rate used for the study is the average rate across all sectors. Therefore, the trend of the reduction in tax rates over time was not included. In the static mode, the analysis regularly emphasises the influence of specific policy changes. It is unable to incorporate changes in all exogenous factors which alter (or are expected to change) over some period of actual time.

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REFERENCES

Amir, H., Asafu-Adjaye, J. and Pham, T.D. (2013), "The impact of the Indonesian income tax reform: A CGE analysis", *Economic Modelling*, Vol. 31, pp. 492-501.

Armington, P.A. (1969), "A theory of demand for products distinguished by place of production", *International Monetary Fund Staff Papers*, Vol.16 No.1, pp.159-178.

Chen, M.C. (2003), "The Effects of Tax Incentives on Tax Burden of Profit - Seeking Enterprises", *Management Review,* Vol. 22, No. 1, pp. 127-151.

Coxhead, I., Wattanakuljarus, A., Nguyen, C.V. (2013), "Are Carbon Taxes Good for the Poor? A General Equilibrium Analysis for Vietnam", *World Development,* Vol. 51, pp. 119-131.

Dervis, K., de Melo, J. and Robinson, S. (1982), *General equilibrium models for development policy,* Cambridge University Press, Cambridge.

Eicher, T.S. *et al*. (2003), "The impact of tax policy on inequality and growth: an empirical and theoretical investigation", in: Eicher, T.S., Turnovsky, S.J. (Ed.), *Inequality and Growth: Theory and Policy Implications,* MIT Press, Cambridge, MA.

Emran, M.S., Stiglitz, J.E. (2005), "On selective indirect tax reform in developing countries", *Journal of Public Economics,* Vol. 89 No.4, pp. 599-623.

Giesecke, A.J., Tran, H.N. (2010), "Modelling value – added tax in the presence of multi – production and differentiated exemptions", *Journal of Asian Economics,* Vol. 21 No 2, pp. 156-173.

Hosoe, N., Gasawa, K., Hashimoto, H. (2004), *Textbook of Computable General Equilibrium Modeling: Programming and Simulations,* University of Tokyo Press. (in Japanese).

Ji. J., Ye.Z., Zhang, S. (2013), "Welfare analysis on optimal enterprise tax rate in China", *Economic Modelling,* Vol. 33, pp. 149-158.

Kraay, A. (2006), "When is growth pro- poor evidence from a panel of countries", *Journal of Development Economics,* Vol. 80, No. 1, pp. 198-227.

Matovu, J.M., Twimukye, E.P., Nabiddo, W., Guloba, M. (2009), "Impact of Tax Reforms on Household Welfare", Research Series No. 54801, Economic Policy Research Center (EPRC).

McCaig, B. and Pavcnik, N. (2013), "Moving out of Agriculture: Structural Change in Vietnam", Working paper No. 19616, National Bureau of Economic Research (NBER), November 2013.

Meng, L. (2009), "A CGE analysis of oil price change 2009". Journal of Quantitative & Technical Economics 4, pp. 45-56.

Nguyen, M.T., Nguyen, T.H. (2014), "Estimating CES and CET parameters for Vietnam economy using maximum entropy approach", *Journal of Science and Technology,* The University of Danang, Vol. 6, pp. 45 - 53.

Sajadifar, S.H., Khiabani, N., Arakelyan, A. (2012), "A Computable General Equilibrium model for evaluating the effects of Value – added Tax reform in Iran", *World Applied Sciences Journal,* Vol. 18 No. 7, pp. 918-924.

Soewardi, T.J., Ananda, C.F. and Khusaini, M. (2017). "Local Taxes and Pro-cyclical Fiscal Policy in Indonesia", *International Journal of Economics and Management,* Vol. 11, pp. 261-269.

Tanzi,V. (1994), "Reforming Public Finances in Economies in Transition", *International Tax and Public Finance,* Vol. 1, No. 2, pp. 149-163.

Tanzi, V., Zee, H.H. (2000), "Tax Policy for Emerging Markets: Developing Countries", working paper number 35, International Monetary Fund, March 2000.

Tarp, F., Arndt, C. (Eds), 2009. Taxation in a Low-Income Economy: The Case of Mozambique. Routledge Studies in Development Economics. Routledge, New York.

The General Statistics Office of Vietnam (2015), Vietnam Input-Output table 2012. Hanoi.

VCCI (2017), Report on the implementation of the Vietnamese Government's Resolution No. 35 / NQ-CP on enterprise support and development till 2020. Hanoi.

Whalley, J., Wang, L. (2007), "The Unified Enterprise Tax and SOEs in China", Working Paper No. 12899, National Bureau of Economic Research (NBER), February 2007.

APPENDIX

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(n is the number of sectors, $n = 63$; l is the number of labor factors , $l = 6$; h is the number of household groups, $h = 20$). The complete set of equations can be presented in the following order.

A. Production Block

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

$$V_j = \bar{A}_j\prod_t L_{tj}{}^{\beta_{tj}}\bar{K}_j{}^{\beta_{Kj}} \qquad\qquad (j=1,2,\dots,n)$$

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

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

$$\pi_j = P^*{}_j X_j(1-t_j{}^i) - \sum_i P_i X_{ij} - \sum_t W_t L_j \qquad\qquad (j=1,2,\dots,n)$$

B. Government Revenue and Household Income Block

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

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

C. Demand Block

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

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

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

$$Q_j = \sum_i X_j + \sum_r C_{jr} + G_j + I_j \qquad\qquad (j=1,2,\dots,)$$

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

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

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

D. Domestic supply block

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

E. Market equilibrium block

$$\sum_j L_{tj} - \bar{L}_t = 0 \qquad (t=1,2,\ldots,l)$$

$$D_j - S_j = 0 \qquad (j=1,2,\ldots,n-1)$$

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

F. Price block

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

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

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

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

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

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

$$PI = \sum_j h_j P_j$$

$$PG = \sum_j k_j P_j$$

Table A1: List of parameters used in the CGE model

σ_j	Elasticity of substitution
δ_j	CES share parameter for domestic good consumed
$\bar{B}_j$	CES efficiency parameter
ϕ_j	Elasticity of transformation
γ_j	CET share parameter for domestic good supplied
N_j	CET efficiency parameter
β_{tj}	Labour elasticity of production
β_{kj}	Capital elasticity of production
$\bar{A}_j$	Production function efficiency parameter
a_{ij}	Input coefficient
ν_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 Variables used in the CGE Model

	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

Table A2 (Cont.)

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 Variables used in the CGE Model

$\bar{K}$	The stock of capital
$\bar{L}_t$	Labour supply
F_g	Foreign transfer to government
F_p	Foreign transfer to household
$\overline{FD}_i$	Foreign direct investment
$\overline{PW}^m$	World price of imported good
$\overline{PW}^e_j$	World price of exported good