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EVALUATING TAX REFORM IN VIETNAM USING GENERAL EQUILIBRIUM METHODS¹

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Abstract

In this paper we use a general equilibrium model of Vietnam, calibrated to 1995 data, to analyze tax reform options for Vietnam. We focus on aggregate welfare impacts as well as welfare of household groups ranked by income. The main focus is on indirect tax reform (VAT), but we also examine reforms in the external sector given both the revenue importance of the tariff and the role of tariffs in protecting domestic industry. Our numerical general equilibrium model is used to perform a series of counterfactual experiments around the 1995 base data, and we use a small country assumption with Armington differentiation between imports and domestic products. Results indicate that there are gains to Vietnam from indirect tax reform, but the redistributive effects associated with these reforms are large and tend to swamp the aggregate effects. There is a sharp redistribution against those with lower income and who spend a significant fraction of their income on previously non-taxed products, and redistribution in favour of those spending larger fractions of their income on earlier high taxed products; especially the richer households. This theme of regressivity of indirect tax reform comes through even more strongly in the case of international trade based reforms involving the tariff than is the case for domestic sales tax reform.

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I. INTRODUCTION

Vietnam like other transition economies inherited a somewhat chaotic and narrowly based tax structure when the transition period started in the early 1990's. A significant portion of tax revenues had been generated from the profits of state-owned enterprises, along with a narrowly based and cascading commodity tax which applied to sales of products but with no allowance for crediting of taxes on intermediate transactions. In addition the tax rates on a product by product basis differed substantially. There were also numerous problems of administration, which ultimately involved an administered system of negotiated tax contracts between enterprises and the tax authorities on a month by month basis. One of the highest priorities in the early stages of the transition process was to achieve a more consistent tax structure for Vietnam, which would allow for enhanced revenue raising capability. Tax revenues in the early 1990s were little more than 10% of GDP, and growth and development requiring major infrastructure investment inevitably involve more revenues making, introducing uniformity and consistency into the tax structure a top priority. Reflective of this situation is the introduction of a Value Added Tax (VAT) in 1999.

Given this background, the purpose of our paper is to present numerical results from a model based evaluation of the impacts of tax reform options in Vietnam both at aggregate level and household level on different expenditure class. The focus is on indirect tax reform, but also includes reforms in the external sector given the revenue importance of the tariff, and the role being played by tariff in protecting domestic industry. We use numerical general equilibrium models calibrated to data for 1995 for Vietnam, and perform a series of counterfactual experiments with the model. The structure is fairly standard following along the lines of previous literature in the area (Dervis, et. al. (1985), Devarajan and Lewis (1990), Shoven and Whalley (1992) and Harrison, Rutherford

and Tarr (1993)), but we apply it to the Vietnamese situation in a novel way in terms of its treatment of foreign trade and the application of an Armington structure which we maintain within a small open economy variant of the model.

Results indicate that there are gains to Vietnam from indirect tax reform, but that the redistributive effects associated with these reforms are large and tend to swamp the aggregate effects. There is sharp redistribution against lower income groups who spend a significant fraction of their income on previously non-taxed products as tax reform occurs, and redistribution in favour of those spending larger fractions of their income on taxed products, especially the rich. This theme of regressivity comes through strongly in the results, and is more sharply displayed in the case of international trade based reforms involving the tariff.

We then look at small and marginal incremental changes in policy, which show large effects from small changes, emphasizing that small incremental reform may be as important in achieving a significant portion of the gains from Vietnam as overall reform itself. We also look at restricted tax reform experiments where agriculture is excluded from the new tax base; results are somewhat more muted.

The paper is organised as follows. Background to ongoing policy reform in Vietnam (renovation or doi moi) is discussed in Section 2. We set out our model structure in Section 3. Section 4 focuses on the data, parameter, and calibration. We present results for various tax changes in Section 5. Finally, in Section 6 we indicate our broad conclusions.

II. BACKGROUND

More than a decade has passed since Vietnam embarked in 1986 on policy reform; renovation or doi moi. The objective of doi moi was to overhaul Vietnam's centrally planned system and move towards a market oriented economy. Under this program, a wide range of macroeconomic and structural adjustment measures have been put in place creating a vibrant small scale market oriented sector alongside slowly changing state owned enterprises (The World Bank Group, 1996).

During this period of renovation, the national economy has performed well. The average growth rate for the last seven years has been 8.2% per year (Merrill Lynch, 1997). A former importer of rice, Vietnam has become one of the world's largest rice exporter (30,6 million tones in 1997). The inflation rate has dropped from 67.4% in 1991 to 12.5% in 1995 and to 3.6% in 1997, the lowest for many decades.

An important feature of the ongoing economic reforms has been the opening up of the Vietnamese economy to the international market, and a speeding up of the international integration process. Exports have grown at about 30% a year on average; foreign direct investment increased substantially after 1987 when the Law on Foreign Investment was introduced. By the end of 1997, total registered foreign capital of licensed projects was US\$ 33 billion (an increase of US\$ 6 billion in 1997, GSO, 1997). By the end of 1996, Vietnam had trade relationships with more than 100 countries. Vietnam became the seventh member of ASEAN in July 1995, and requested APEC participation and formally applied for WTO membership.

Notwithstanding the successes of this reform program, the state owned enterprises (SOEs) characterized by low efficiency and lack of competitiveness still remain the backbone of the

Vietnamese economy. There has been a widening gap between urban and rural areas, and persistent problems in the country's external economic activities.

To take the reform process further the Vietnamese Government needs substantial financial resources. For the last few consecutive years Government budget revenue plan has not been fulfilled. Thus fiscal reform has now become one of the crucial components of the policy agenda in Vietnam.

Until 1987, transfers and taxes from State Owned Enterprises (SOEs) were the primary source of government revenue, contributing more than 2/3 of the total Government budget revenue. The existing tax system was inefficient and was intended to serve too many purposes. The turnover tax for example, had 16 rates varying from 0.5% to 40%, the import tariff had 28 different rates, and there were very high rates for some taxes (65% in the case of personal income taxes, even though they covered only a small portion of the population). These taxes distorted consumption and investment decisions, and the tax system was complicated to administer and was therefore inefficient, leading to corruption and tax evasion.

Faced with this situation, in 1990 a basic tax system was established, decreasing the dependence of the national economy on transfers and taxes from state owned enterprises (in 1996, revenues from the State sector accounted for only 43% of the total budget revenue). During last few years both taxes and fees revenue have increased substantially; between 1990 and 1994 revenues from these sources have increased by more than fivefold, and between 1990 and 1997 by a factor of little over eight. These now represents 95% of total Government revenue.

In 1995, the government started a further extensive reform of the tax system, referred to as the second phase of the tax reform. The aim was to improve the tax system and accelerate regional

and international integration of Vietnam's economy. The three main components of the reform measures to be implemented in January 1, 1999, are the introduction value added tax (VAT) as a substitute for turnover tax, income tax reform and trade reform particularly to comply with the requirements for the accession to AFTA². We in this paper focus our analysis only on indirect tax reform particularly tax and tariff reforms.

In the model simulations presented in Part V, we will try to give some quantitative analyses of possible impacts of some of these tax reforms on household revenue distribution and welfare.

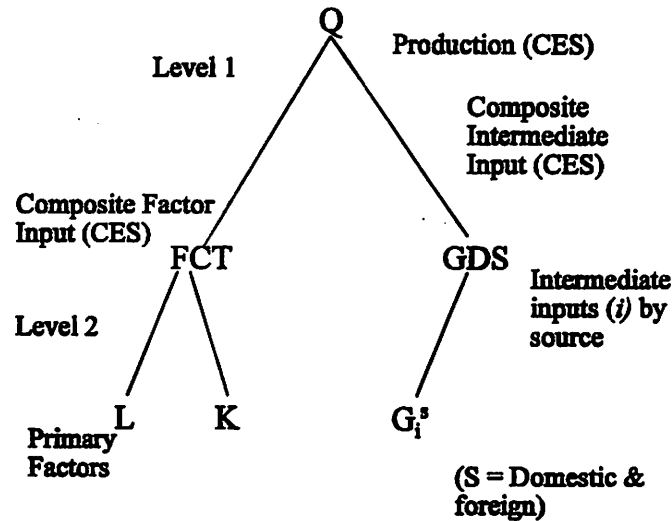
2. Corporate income tax will replace profits tax. It is a uniform tax rate (32%) applied to domestic and foreign investors alike in all fields of the economy. As a member of AFTA, Vietnam will have to reduce tariffs to below 5% level by the year 2006.

III. A TAX REFORM GENERAL EQUILIBRIUM MODEL FOR VIETNAM

We use a small open economy model of the Vietnamese economy to evaluate the impacts of alternative tax reforms both at the household level and at the national level. The model is similar to that found in Shoven and Whalley (1992). We calibrate the model to a 1995 base case data set, and perform various counterfactual experiments for alternative tax structures. We use an Armington (1969) product differentiation treatment between domestic product and imports treated as qualitatively different. The model incorporates all the existing taxes in Vietnam; these include sales tax, corporate profit tax, tariffs, input tax, factor tax and income tax. On the supply side double nested CES production functions are used. The model covers 5 household groups ranked by quintile from poor to rich in the Living Standard Survey (1992-93) and 6 tradeable and 3 non-tradeable sectors. The treatment of industries in the sectoral classification of the 9 sector model is given in Table A.

Production Side

Each of the sectors in the model produces either traded or non-traded goods using both primary factors and intermediate inputs. Primary factors include labour and capital. Each intermediate input is a composite of comparable domestically produced and imported goods, with an Armington aggregation function. We use a double nested CES production function. At the bottom level primary factors are combined to form composite factor inputs through a CES aggregation function and similarly intermediate inputs (both domestic and foreign) form composite goods inputs by a CES function. At the upper level these composite factor inputs and composite goods inputs are aggregated by a CES function (see Figure 1).

Figure 1**Nesting Structure of Production Functions**

For the traded goods sectors, production is destined either for export or for domestic sale. In general, both supply and demand sides of the model in terms of imports and exports adopts the small country assumption. But on the demand side goods are differentiated and thus this provides a compromise between the extreme assumptions of perfect substitution and perfect complementarity between domestically produced and imported goods.

Household demand side

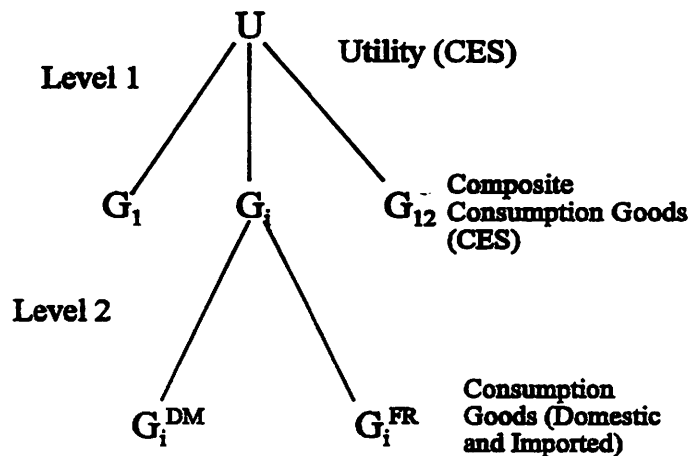
In the model, five household groups are identified according to the classification in the Vietnam Living Standard Survey (VLSS) over the period 1992-1993 (MPI and WB, 1996, Appendix A)³.

3. The five expenditure quintiles are constructed by dividing the 480 households surveyed into five equal size groups and arranged in ascending order of household expenditure; Quintile 1 consists

This classification of households allows the model to be used to evaluate the impacts of alternative tax reform policies on richer and poorer groups, emphasizing changes in welfare for the most disadvantaged groups of population. Final demands for each of the household groups are generated by maximizing a durable nested CES utility function subject to the household budget constraint. A schematic representation of this nested structure of the household utility functions is given in Figure 2.

Figure 2

Nesting Structure of Utility Functions used in the Model



Note: *DM* denotes for domestically produced goods and *FR* denotes for imported goods.

of people with the lowest per capita household expenditures.

Each household is endowed with both fixed and mobile (across sectors) factors, i.e. labour and capital. Besides income from factor endowments, households also receive transfers from the Government. Because for now our model is static, it considers neither saving nor investment, and household disposable (post-tax) income is devoted to consume the 15 goods (9 domestic and 6 foreign) identified in the model.

Table 1
Sectoral Aggregation Used in the 9 Sector Tax Reform Model of Vietnam

Model Sector	Industries included
1. Agriculture, Forestry and Fishing	Cultivation, Breeding Animal, Forestry and Fishing
2. Electricity, Gas, Water Supply and Construction	Electricity, Gas, Water Supply and Construction
3. Export Oriented Industries	Mining, Foodstuff Processing, Leather and Textiles
4. Import Oriented Industries	Construction Material, Steel, Chemical, Pharmaceuticals, Electrical Equipment, and other Processing
5. Transport, Post & Telecommunications	Transportation, Postal Services and Telecommunication
6. Culture, Education & Health	Culture, Education & Health
7. Finance, Banking & Insurance	Finance, Banking & Insurance
8. Public Administration	Public Administration
9. Other	Trade, Material Supply, Hotel and Restaurant, Other

Table 2

**Value Added, Output and Trade Data Used in Model Calibration
(Bill Vietnamese Dong)**

Model Sector	Value added (labour)	Value added (capital)	Gross output	Import	Export
1. Agriculture, Forestry and Fishing	3423	47167	80397	7790	21715
2. Electricity, Gas, Water Supply and Construction	5682	13053	31402	-	-
3. Export Oriented Industries	7716	5214	44343	21220	23426
4. Import Oriented Industries	5244	7722	88193	57012	2682
5. Transport, Post & Telecommunications	3443	3513	19215	2654	1111
6. Culture, Education & Health	9588	640	14181	867	178
7. Finance, Banking & Insurance	1008	2670	7508	-	-
8. Public Administration	8189	485	10412	-	-
9. Other	32347	13756	74417	5410	15456

Taxes

The model incorporates the taxes which correspond to those in the current fiscal system in Vietnam (see Chan et. al. (1998), Part II : Background to Vietnam Tax Reform and Appendix A for more details). Taxes are imposed on production activities defined as a percentage of the capital used by the sector. In the actual tax system of Vietnam, this corresponds to the corporate profits tax. Consumption (sales) tax apply to both domestically produced goods and imports. This includes the turnover tax, special consumption tax and some other indirect taxes and fees in Vietnam. Factor (capital and labour) use taxes approximate to capital use and social insurance fees in Vietnam.

Commodity input taxes are consumption tax. Import tariffs and export taxes also enter domestic & foreign sources. In reality, the export tax in Vietnam is small.

Table 3
Tax Data Computed from Various Sources
(in percentages)

Model Sector	Sales Tax	Export Tax	Tariff rate	Corporate Tax	factor tax	
					Lab	cap
1. Agriculture, Forestry and Fishing	3.6	1.7	17	0	5.5	0
2. Electricity, Gas, Water Supply and Construction	2.6	-	-	7.6	2.2	3.2
3. Export Oriented Industries	20	1.8	29.8	31.7	8.2	4.1
4. Import Oriented Industries	5.9	1.1	10	7.3	8.3	3.1
5. Transport, Post & Telecommunications	6.5	0	0	7.4	5.9	8.9
6. Culture, Education & Health	0.1	0	0	7.1	21.2	0
7. Finance, Banking & Insurance	15.4	-	-	34.3	9.7	0
8. Public Administration	0	-	-	0	21.2	0
9. Other	6.9	0	0	25.9	9.1	1.7

Household income taxes also enter in the model. Two kinds of taxes currently applied in Vietnam enter in this category; personal income tax and rent tax. As in many other developing countries, the personal income tax is not an important source of revenue in Vietnam.

Government

Government in the model has the role of collecting and transferring the revenue to the public in a lump sum manner according to fixed share parameters estimated obtained from data from various sources.

Equilibrium conditions

An equilibrium in the model is characterized by full market clearing, endogenously determined prices for factors and domestic goods, and zero profit conditions. In equilibrium the government budget will balance as a property of Walras law in the model.

IV. DATA, PARAMETERS, AND CALIBRATION

Data

The benchmark data set used in the model for calibration has been constructed for a base year of 1995. As in any other developing countries, the difficulty that confronts modelers in Vietnam is both the quality and availability of data. To overcome these obstacles, in our modeling work we have used different sources of information.

The principal sources of information used for the construction of the benchmark data set are the 25 sector input-output Table (1995) and the Vietnam Living Standards Survey (VLSS) 1993 both published by the General Statistical Office (GSO), the Ministry of Finance and these were combined to build a 9 sector 5 household social accounting matrix (SAM) for Vietnam⁴. Besides we have used tax data from the General Department of Taxes (Ministry of Finance), the General Department of Customs, the Ministry of Trade, and our own estimations⁵. Our calculations include estimates of tax on factor use, corporate tax and indirect taxes by production sectors, and income taxes on household

4. The SAM is composed from 6 accounts: factors (labour and capital), households (5 household groups), enterprises, Government, Rest of the World (ROW), activities (9 production sectors), domestic consumption and export, and capital account.

5. Although data on tax revenues and tax structure are available, there is no disaggregation of data by sector or household group. The problem is to distribute revenues from tax items among different sectors and household groups. To do this, we have made use of a variety of sources.

income both by household group and sources of income. Details about the methodology used to prepare the data set can be found in Chan, Dao, Hai and Dung (1998).

Model parameters and elasticities

After constructing the benchmark equilibrium data set and specifying the elasticity parameters, the parameter values of the model, such as scale parameters and share parameters in production and utility functions at different nest levels, as well as in the CET and Armington functions, have been determined through the calibration procedure elaborated in Mansur and Whalley (1984) and discussed later.

Due to lack of any estimates on elasticities of substitution in consumption and production for the Vietnamese economy we have chosen the elasticity parameters to be used in the model from the central tendency values following Piggott and Whalley (1985) and Shoven and Whalley (1992) and from our assumptions after discussing with some modelers from developing countries. We also consulted Orcutt (1950) and Marques (1990) as a reference for these estimates. We present the elasticity configurations we use in central case specification of the model in Appendix B. We have undertaken several sensitivity tests around the elasticity parameters later.

Calibration

To make the model operational the values of the parameters of the model must be specified. We did it by using calibration to a benchmark Vietnamese data set prepared for the year 1995. Calibration is a deterministic approach in which it is assumed that an equilibrium is observed in the economy under consideration in the presence of existing policies. Therefore, the procedure

used in applied general equilibrium modelling is first to use the observed equilibrium to solve the model for parameter values consistent with the observed equilibrium. Thus calibration has the property that once specified the model will reproduce the original equilibrium. Finally a replication test was applied to check for consistency before running counterfactual experiments. We make these model computations by using the GAMS (Generalized Algebraic Modelling System) Software due to Brooke, Kendrick and Meeraus (1996).

V. RESULTS

We have used the model and data described in the previous two sections to analyze the effects of indirect and trade based tax reforms in Vietnam using the 1995 base case data. We have done this by performing a series of counterfactual equilibrium experiments with the model. As described earlier, the model is calibrated to the 1995 base case data as a reference point, and the calibration ensures that the parameter values chosen for all the functions in the model make it capable of reproducing the base case data as a model solution. We are then able to introduce different tax reforms and compute counterfactual equilibria and compare them with the original base case equilibrium from the model structure. In computing counterfactual equilibria we place heavy stress on equal yield tax comparisons which maintain the revenue of the government constant in real terms in equal yield comparisons. The tax rate for the replacement tax structure is endogenously determined so as to satisfy government budget balance, given the revenue requirements of the government budget. In the model structure, for simplicity, all revenues are redistributed to the household groups in proportion to the base case distribution; we abstract from the structure of real

government expenditures in our analyses. This procedure is used for the purposes of simplification, since our analysis is of different tax structures, not government expenditure patterns.

In Table 4, we set out our estimates of the welfare impacts in aggregate and by household for indirect tax reforms in Vietnam using the 1995 data. In these experiments all existing indirect taxes at final consumer demand level in the 1995 data set have been replaced by an equal-yield tax rate on all commodities except agriculture, with indirect tax rates endogenously determined so as to preserve the yield in the tax system. The welfare gains/losses are in terms of money metric measures of utility, namely Hicksian Equivalent Variations (EVs) and Hicksian Compensating Variation (CVs). The results indicate a modest welfare gain of 0.29% of national income from indirect tax reform for the economy as a whole. However, this modest gain is accompanied by sharp redistribution. The bottom two quintiles of households in the population lose approximately 1% of their income, whereas the top three quintiles gain ½% of their income. This different pattern of redistribution occurs because of the sharp differences in expenditure patterns across the household groups across taxed and non taxed commodities in the base case data. By broadening the base of the tax and including previously untaxed commodities, lower income households suffer and rich households gain. These redistribution effects occur not through formal redistribution of income as conventionally measured, but because of the redistribution occurring through the expenditure side of household budget constraints.

Table 5 sets out the economy wide adjustments for the indirect tax reforms considered in Table 4. Changes in output, intermediate inputs, capital, and labour are reported along with changes in producer and consumer prices. Significant effects occur because of the change in the pattern of

tax rates involved. Agriculture, export oriented industries, transport and communication, finance and banking and other industries expand. Public administration, electricity, gas, water supply and construction, culture, education and health contract. There are also sharp differences in gross output responses, and those of intermediate usage.

Table 4
Welfare Impacts From Indirect Tax Reforms in Vietnam (1995 Data)

A. Experiment Specification

- Replace all indirect tax rates at final consumer demand level in 1995 data set by equal yield tax rates across all commodity
- Indirect tax rates endogenously determined so as to preserve the yield of the system in total

B. Welfare Impact by Household Group: In terms of Hicksian Equivalent Variation (EV)

Household Groups by Consumption Expenditure (Living Standard Survey)	Only commodity tax on Final consumption (Agricultural tax is set at zero)
H1 (poorest Group)	-0.69
H2	-1.16
H3	1.06
H4	0.86
H5 (Richest)	0.26
<i>C: Aggregate Welfare Measure</i>	
Sum of EV over household as % of base income	0.29
Sum of CV over household as % of base income	0.28

Table 5
Adjustment Impacts of Indirect Tax Reform

A. Industry Adjustment Effects				
Industry	% change in output	% Change in input demand	% Change in Capital use	% Change in Labour use
1. Agriculture	1.59	4.18	0.1	-0.2
2. Electricity, Gas, Water supply and Construction	-1.61	5.71	-5.78	-5.83
3. Export oriented industries	1.92	-0.14	5.73	5.76
4. Import oriented industries	-0.37	-1.07	3.25	3.29
5. Transport and commu.	3.45	6.4	-1.21	-1.13
6. Culture, education & health	-1.39	-5.88	-0.94	-0.68
7. Finance and banking	5.39	7.06	3.91	3.84
8. Public administration	-2.34	-	-2.63	-2.33
9. Others	2.35	8.43	-0.19	-0.08
B. Relative price effects				
			% change in consumer price	
			Domestic	Imports
1. Agriculture			-3.5	-3.5
2. Electricity, Gas, Water supply and Construction			4.9	-
3. Export oriented industries			-10.3	-10.3
4. Import oriented industries			1.7	1.7
5. Transport and communications			1.1	1.1
6. Culture, education and health			7.1	7.1
7. Finance and banking			6.6	-
8. Public administration			7.7	-
9. Others			0.8	0.8

Table 6
Effect of Indirect Tax Reform on Trade

Tradable Sectors	Sales Tax Reform		Sales Tax and Tariff Reform	
	% change in Export volumes	% change in Import volumes	% change in Export volumes	% change in Import volumes
1. Agriculture	-3.31	3.01	5.79	27.2
2. Export oriented industries	-0.33	9.19	15.01	30.79
3. Import oriented industries	14.69	-1.26	196.6	6.47
4. Transport and communications	65.92	-0.76	-1.09	-4.32
5. Culture, education and health	56.76	-5.43	308.3	-9.08
6. Other	7.96	-0.51	18.23	-4.08
Overall Impact	2.55	0.98	21.97	8.46

Table 6 reports the effects of indirect tax reforms on trade volumes, with again significant changes in composition occurring. Exports increase by 2.6 percent as against 1 per cent increase in imports. Import of agricultural products increase by 3 per cent and exports fall by 3.3 percent. Because agriculture is outside the replacement VAT base, the relative price of agricultural goods falls, and as a result there is a strong substitution in consumption in favour of agriculture products. Increases in domestic production are not large enough to meet increased demands for agriculture as a result exports of agricultural products also fall. Similarly, imports of agricultural products increase as their relative price falls due to tax reform (see Table 3 for the price changes involved). Exports of export oriented industries fall marginally by 0.3 per cent, and the corresponding Armington imports increase by around 9 per cent for the same reason as with agricultural goods. Exports of goods produced by import oriented industries increase by around 15 per cent and the

corresponding imports fall by 1.2 per cent. This can once again be explained by price effects. The domestic consumer price of goods produced by import oriented industries and their substitutes from abroad increase by 1.68 percentage points, implying a fall in domestic demand and a corresponding increase in exports. Exports of goods and services produced by the transport and communication and culture, education and health sectors increase at a higher rate but with only small base period. Results thus suggest that the trade impacts of the indirect tax reforms are significant, and are more significant with joint sales tax and tariff reform.

Table 7
Welfare Impacts From Indirect Tax Reforms in Vietnam (1995 Data)

A. Experiment Specification

- Replace all indirect tax rates at final consumer demand level in 1995 data set by equal yield tax rates across all commodity (except agriculture)
- Indirect tax rates endogenously determined so as to preserve the yield of the system in total

B. Welfare Impact by Household Group: In terms of Hicksian Equivalent Variation (EV)

Household Groups by Consumption Expenditure (Living Standard Survey)	Only Commodity Tax on Final consumption replaced	Commodity Tax and Tariffs both replaced
H1 (poorest Group)	-0.69	-4.74
H2	-1.16	-4.63
H3	1.06	3.19
H4	0.86	3.14
H5 (Richest)	0.26	1.4
C: Aggregate Welfare Measure		
Sum of EV over household as % of base income	0.29	0.89
Sum of CV over household as % of base income	0.28	0.8

Table 8
Welfare Impacts From Indirect Tax Reforms in Vietnam
A 12 sector model version (1995 Data)

A. Experiment Specification

- Replace all indirect tax rates at final consumer demand level in 1995 data set by equal yield tax rates across all commodity
- Indirect tax rates endogenously determined so as to preserve the yield of the system in total

B. Welfare Impact by Household Group: In terms of Hicksian Equivalent Variation (EV)

Household Groups by Consumption Expenditure (Living Standard Survey)	Replace commodity tax on Final consumption (Agricultural tax is set at zero)
H1 (poorest Group)	-1.36
H2	-0.23
H3	0.29
H4	0.68
H5 (Richest)	0.56
C: Aggregate Welfare Measure	
Sum of EV over household as % of base income	0.35
Sum of CV over household as % of base income	0.34

In Table 7 we compare joint indirect tax reforms and trade reforms, again using equal yield tax replacements; agriculture is again outside the base of the replacement tax. In this case, the welfare gains to the economy are larger by a factor of 3 and the redistributive effects are even sharper; with large negative effects against the lowest two quintile groups of approximately 5% of their income and large significant positive effects for the richer groups. These results occur for the same reason as in the earlier experiments, namely the differences in the pattern of expenditures by household across taxed and non taxable commodities in the base case equilibrium.

In Table 8 we report welfare effects in aggregate and by household quintile group using a 12 sector version of the model. This is a slightly more disaggregated version of the model. This provides aggregate welfare results similar to those in Table 4 (a little higher), but with somewhat less pronounced redistributive results. Here, only the first household group suffers losses under indirect tax reform. The main themes of results, however, remain as in earlier tables.

Table 9 reports on the sensitivity of aggregate results in Tables 4 and 6 to different elasticity specifications used in the model. Not surprisingly, there is significant sensitivity, which is common in numerical equilibrium analyses of this form. Here the sensitivity is approximately linear in elasticity values as we increase the elasticities from .25 to .5 to 1.5 to 3; base case results are presented for comparative purposes. The ambiguity of what the most plausible elasticity values to use is thus a factor to be kept in mind in evaluating these model results, and especially so given the sparsity of elasticity estimates for the Vietnamese economy. However, the behaviour of the model to different elasticity estimates is approximately consistent with findings for other models elsewhere in the literature.

Table 9
Sensitivity Analysis of Results from Table 4

	Sum over Households EV as percentage of base year income	
A. Elasticity Sensitivity	Sales Tax only	Tariff and sales tax
Setting all demand and production elasticities to 1.5	0.36	0.87
Setting all demand and production elasticities to 3.0	1.49	2.13
Setting all demand and production elasticities to 0.5	0.1	0.27
Setting all demand and production elasticities to 0.25	0.12	0.16
C. Base Case Result (for comparison)	0.29	0.89

Table 10
The Social Cost of Alternative Financing Vehicles for Extra Government Revenue in Vietnam

	Marginal Excess Burden (Welfare cost (sum of EVs) of extra revenue raised) of various Tax instruments
Indirect Taxes	0.55
Trade Taxes	0.34

Table 10 presents estimates of the marginal social costs associated with use of alternative tax financing vehicles which would potentially be used to raise extra government revenues in Vietnam in the future. In these cases, a small perturbation is made in the tax rate for the instruments reported, which both raises additional revenues and imposes additional social costs. These costs are

then measured in terms money metric welfare effect in Dong, and calculated in terms of Hicksian equivalent or compensated variations summed across households per extra Dong of tax revenues raised. Results indicate significant marginal excess burdens in the region of 0.55 Dong per extra Dong of revenue raised for indirect taxes, and 0.34 for trade taxes. These results stress the importance of small marginal changes in existing tax distortions within the system. The higher rates for indirect taxes indicate the role of the variance in the tax rates in the indirect tax system, compared to trade taxes and also stress the importance of incremental reform in these areas.

In sum then, these results suggest small but significant gains to Vietnam from the implementation of indirect tax reforms through sales tax reform and the introduction of VAT, but sharp redistributive effects and significant regressivity along with these changes. Much larger effects occur with trade policy changes, but with similar compositional and redistributive effects and sharper redistribution against the poor. Results are sensitive to elasticity parameters, but in ways which are consistent with previous literature discussions and marginal effects appear as significant, stressing the importance of incremental reform if larger scale policy reform in these areas proves infeasible.

VI. CONCLUSIONS

In this paper we evaluate reforms of indirect taxes and trade based taxes in Vietnam using a numerical general equilibrium model calibrated to 1995 data. The use of this model reflects the current drift of policy discussion in Vietnam which is focussed on broadening the base of indirect taxes and putting in place new tax vehicles which can be used for raising significant amounts of revenue in the future. 1990 Vietnamese tax revenue levels ran at around 10% of GDP, but the financing requirements for infrastructure in Vietnam suggest that tax rates in the region 20% or more of GDP may be needed within the next 10-15 years. This form of analysis allows not only the impacts of current tax reform to be assessed but also the implications for alternative financing vehicles.

Results suggest small if modest gains from indirect tax reform, but sharp redistribution with regressivity of the change because the items which are currently non-taxable and would be included on a broadened tax base are more heavily bought by the poor. These redistributive effects are even larger with a trade tax reform, while aggregate effects on the economy are larger. Results also highlight the role which could be played by incremental reform of a type which makes small adjustments in more extreme tax rates, suggesting that even if wholesale reform is politically unattainable, small incremental reform is a direction to be strongly favoured.

Finally, as is often the case with these exercises model results are sensitive to elasticity parameters, but in ways which are compatible with the literature suggesting a potential benefit in future work from efforts to more carefully refine elasticity estimates for Vietnamese economy.

Appendix A
Classification of Household Groups: Vietnam Living Standard Survey

Household Quintiles	Monthly per capita consumption expenditure in Vietnamese Dong (1 USD=13000 Vietnamese Dong) (in thousand VND)
H1	99.69-651.28
H2	651.32-867.17
H3	867.60-1125.02
H4	1125.20-1625.91
H5	1626.01-14002.25

Source: Living Standard Survey (1992-93).

Appendix B
Elasticities used in the model

Elasticities	Value
Elasticity of substitution in production nest level 1	0.8
Elasticity of substitution in production nest level 2	1.2
Elasticity of substitution in consumption nest level 1	0.8
Elasticity of substitution in consumption nest level 2 (substitution between domestically produced and imported consumer goods)	1.2

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