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# The Impact of WTO Tariff Reduction Commitments on the Vietnamese Economy: A GTAP Model Analysis

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**Abstract**

Vietnam started its *Doi Moi* policy in 1986 and has shifted its economy to a market oriented system. In order to obtain official membership of the WTO in January 2007, the country committed itself to a new round of comprehensive trade liberalization measures, in particular, tariff reduction for foreign commodities. This paper utilizes the standard GTAP model which incorporated the HS tariff reduction rate and the results of the analysis of Vietnamese key sectors to evaluate the impact of trade liberalization on the Vietnamese economy after the WTO accession. It is concluded that without technical progress, Vietnam will lose its economic growth momentum and that if technical progress occurs and output of certain strategic industries increase, economic growth will be around 9% in the mid-term.

**Key words:** Vietnamese economy, WTO tariff reduction, GTAP model
**JEL codes:** O5, O1, F1

## 1. Introduction and Overview

Applying Computable General Equilibrium (CGE) model to analyze the trade liberalization in Vietnam has been extensively carried out by Nguyen and Ezaki (2005, 2007), Nguyen et al. (2001, 2005), Roland-Holst et al. (2004), Pham (2003). Microeconomic issues such as household income distribution and poverty alleviation are envisaged in those CGE models by incorporating detailed household survey data of 30 thousands households in the Vietnam Living Standards Survey (VLSS). Complementary macro policies for tariff reduction such as exchange rate devaluation, flexible capital inflow, or compensation through direct and indirect tax are also examined.

Concerning the *Doi Moi* policy of Vietnam in 1986, import liberalization is the most prominent reform policy due to the fact that free imports will promptly and greatly affect the "infant" industries. Under the globalization process, Vietnam has removed and stabilized non-tariff barriers in the way

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that is remarkable, notably by Decision 46 in 2001, in addition to lowering tariff binding by its regional trade agreements together with the other members of the Association of Southeast Asian Nations (ASEAN).[1]

Import and export volume has increased fast and the trade openness has jumped from less than 10% in 1986 to 167% in 2007, along with an increasing number and diversifying range of trade partners[2] worldwide. Together with ASEAN countries, whose share of total trade volume is 20%, China, Korea, and Japan account for about 50% of total trade volume. Although Vietnam has become one of the world's biggest exporter of rice, coffee, rubber, cashew nut, fishery, import protection is still in place for some main industries, such as petroleum, motorbikes and automobiles.

There have been some studies about Vietnam's tariff reduction commitment, such as the study on the ASEAN Free Trade Area (AFTA) by Fukase and Martin (1999), Toh and Gayathri (2004). The former applied GTAP model version 4.0 and simulated the static economic benefits of AFTA such as Inclusion List (IL) and Temporary Exclusion List (TEL) by 2003 for ASEAN-5 and by 2006 for Vietnam, plus Sensitive List (SL) by 2010 for ASEAN-5 and by 2013 for Vietnaml, plus General Exclusion List (GEL), plus non-discrimination to the ROW while Asian Pacific Economic Cooporation (APEC) members the same, and 2.3% tariff reduction of all APEC. They suggested that if Vietnam extends its AFTA commitments to all trading partners, its welfare increases substantially. Their modeling framework did not incorporate the dynamic effects of trade liberalization, effects of non-tariff barriers (NTBs), and export promotion measures. The later article also looked at the ASEAN countries, China, Japan, USA and the ROW with four scenarios: AFTA, ACFTA, AJAFTA, and ACJFTA following a four-step incremental simulation procedure. Though the article did not look at the change in structural output, its conclusion is that trade liberalization will benefit Vietnam greatly in terms of welfare effects and the volume of bilateral trade, terms of trade improvement, and lock-in economic reform process. So far, no study on the WTO actual tariff reduction rate has been made since the detailed tariff reduction, which includes more than ten thousands line of Harmonized System (HS) code, was promulgated only after Vietnam became an official member of WTO in January 2007. In addition, results of CGE studies tend to depend strongly on the data for the model, the assumptions for closure of the model, and the policy simulations.

Among the meaningful policy simulations for the Vietnamese economy, the simulation of technical progress of "key sectors" has hardly been executed partly due to the unavailability of detailed information on sectors, particularly the lack of a clear comprehensive industrial development strategy. Key sectors are identified by employing the input-output (I-O) table of Vietnam and by referring to the government plan for strategic industries.

Using the Global Trade Analysis Program (GTAP) model created by Hertel (1997), the present analysis will incorporate the actual WTO tariff reduction commitment of the whole tariff nomenclature of Vietnam from 2008 to 2019. Moreover, the impacts of the development of key industries will be

examined by the simulation of technical progress increasing the output of those industries. Apart from the analysis on GDP from expenditure side and its decomposition (private consumption, gross investment, government consumption, exports, and imports), current and capital accounts, and sectoral adjustments, changes of major trade partners of Vietnam will also be elaborated. GTAP model version 3.51 and GTAP database version 6.0 will be used. The standard model, parameters, and closure are kept since it reasonably satisfies the baseline of the Vietnamese and world economy in 2001.

This paper consists of five parts. The first part is an introduction and overview to this analysis. The second is the aggregation of WTO tariff reduction of Vietnam into the GTAP sectoral code. The identification of Vietnam's key sectors is the topic of part three. The fourth part is an explanation of the simulations and results. The last part comprises the conclusion and policy implications of the findings.

## 2. GTAP Coding for Vietnam's Tariff Reduction Commitments to WTO

Official membership in the World Trade Organization (WTO) after a long negotiation period of 11 years marked Vietnam becoming a full member of the global trading community. The country became the 150th member of WTO on January 11, 2007 and was classified as a developing country at low level of development and in the transition to a market economy.[3] In order to gain access to the WTO, Vietnam committed to reform its trade policy towards liberalization of which the most fundamental commitment is to bind the whole tariff nomenclature and reduce import tariff rates.

Vietnam became a member of World Customs Organization (WCO) on July 1st, 1993 participating in the WCO's International Convention on Harmonized Commodity Description and Coding System (HS Convention). To transfer the tariff reduction commitments in HS[4] code to GTAP sectoral code, the intermediate codes were used. Sectoral coding of the GTAP model is based on the Standard International Trade Classification (SITC) for trade and the United Nations' International Standard Industrial Classification (ISIC[5]) of all economic activities, except agricultural products follows the Central Product Classification (CPC). Vietnam's tariff reduction commitments for commodities under WTO accession are based on a total of 10,444 lines in Vietnamese Tariff Nomenclature, of which 1,216 lines are agricultural and 9,228 lines are industrial are bound and reduced[6] between 7 to 12 years since 2008. During this time, tariffs for agricultural products are reduced by 4.389% (from 25.386% to 20.997%) in the seven-year period, and by 3.742% for industrial products (from 16.461% to 12.719%) over 12 years.

The summary of WTO tariff reduction commitments of Vietnam is displayed in Appendix 1. Among agricultural goods, there are ten chapters unbounded for tariff reduction (mainly cereals, vegetables, skin, fur, silk, wool, and cotton). The interest of negotiating countries and the rate of tariff

reduction focus on the top eight chapters is shown in the Appendix 2. Among industrial goods, there are 24 chapters unbounded for tariff reduction (mainly textiles, metals, and railway). The interest of negotiating countries and the rate of tariff reduction focus on the top 15 chapters is detailed in Appendix 3. HS tariff reduction under WTO commitments of Vietnam according to aggregate sector of GSC2 is shown in the Table 1.

**Table 1 Conversion of HS Tariff Reduction Schedule to GTAP Model**

| Sec | New code | GTAP code | HS Chapter | Rate of reduction |
|---|---|---|---|---|
| 1 | Agriculture | Pdr, wht, gro, v_f, osd, c_b, pfb, ocr | 7 | 6.9 |
| 2 | Livestock | Ctl, oap, rmk, wol | 2–4, 15 | 9.4 |
| 3 | Forestry | For | 44 | 7 |
| 4 | Meat | Cmt, omt, vol | 2–3, 7–8, 15 | 10 |
| 5 | Food processing | Vol, mil, pcr, gsr, ofd | 2–4, 7–8, 15, 21–22 | 10 |
| 6 | Bevertoba | B_t | 22 | 16 |
| 7 | Fishing | Fsh | 24, 7-8, 34, 37, 44, 87, 94 | 11 |
| 8 | Coal | Col, omn | | 0 |
| 9 | Oil and gas | Oil, gas | | 0 |
| 10 | Textiles & clothes | Tex, wap | 2–3, 7–8, 15, 29–30, 32–34, 37–39, 44, 84–85, 94 | 8.8 |
| 11 | Leather | Lea | | 0 |
| 12 | Wood and paper | Lum, ppp | 44, 48, 84–85 | 8.7 |
| 13 | Non-metallic minerals | p-c, nmm | 15, 29, 32, 38–39, 44, 84–85, 94 | 7.5 |
| 14 | Synthetics | Crp | 29–30, 32–34, 37–39, 84–85, 94 | 8.4 |
| 15 | Metal | I_s, nfm, fmp | | 0 |
| 16 | Machinery | Fmp, ome, omf | 34, 37, 84–85, 87, 94 | 12 |
| 17 | Transport means | Mvh, otn | 84–85, 87 | 11 |
| 18 | Electronics | Ele | 84–85 | 8.4 |
| 19 | Electricity | Ely | 34, 37, 84, 87, 94 | 11 |
| 20 | Gas & water | Gdt, wtr | 22, 34, 37, 84, 87, 94 | 12 |
| 21 | Other services | Cns, trd, otp, wtp, atp, cmn, ofi, isr, osg, dwe | | 0 |
| 22 | Creation | Obs, ros | 34, 37, 85 | 10 |

Source: Author's compilation from GSC2 (2007) and Schedule CXL (2006)

Before joining WTO in 2007, Vietnam had entered into Most Favored Nation (MFN) status with 75 countries. This grew to 149 countries[7] after it became a WTO member on 11 January, 2007. China, Korea, Japan, and the USA are its main trading partners, while the ASEAN and the European Union (EU) is the main bloc trading partners of Vietnam. However, GTAP database version 6.0 incorporates data of only 87 countries and territories. The reclassification of GTAP region code, which divides the main trading partners of Vietnam into seven groups, is shown in the Appendix 4.

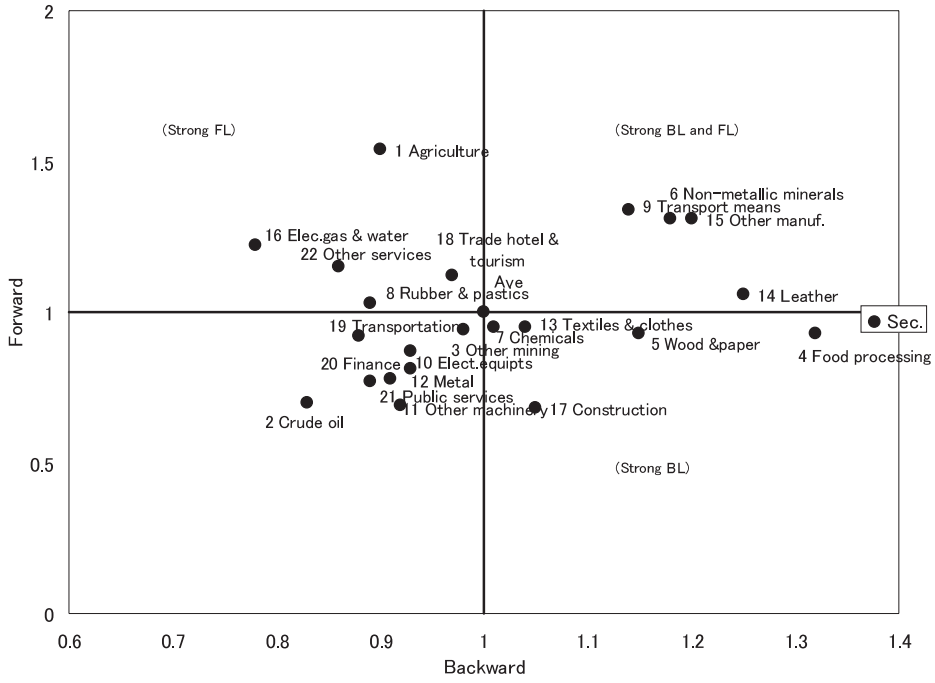
## 3. Vietnam's Key Economic Sectors

Key sectors are the sectors that are not only termed potentials in the future but were also important in the past, and will most likely be sensitive to WTO's tariff cuts. While it was impracticable to obtain information on all sectors, Vietnam's I–O table offers a wealth of information about the industries. The latest I–O table was compiled based on data for the year 2005 in non-completive import type which means the I–O table that has separated imported- and domestically produced products. Overall assessment to point out the industrial key sectors based on the I–O table includes the strength of backward and forward linkages, increase in productivity, and the role in the economy.

Figure 1 illustrates 22 sectors of Vietnam's economy in 2005 with two dimensions of backward and forward linkages[8] standardized by the average index. Sectors lying on the first quadrant that have both strong backward and forward linkages are: Non-metallic Minerals, Transport Means, Other Manufactures, and Leather. Sectors that have strong backward linkage located in the forth quadrant are more important than those that have strong forward linkage located in the second quadrant because backward linkage is more certain than forward linkage. Food Processing is the sector has the strongest backward linkage. These sectors also had the highest effective rate of protection in 2003, indicating the real protection for imported input for export industries, namely Leather and Food Processing, and the real protection for strategic industries, namely Non-metallic Minerals and Transport Means (Bui and Le 2005).

In Table 2, sectoral productivity is measured by the unit wage output and value added and sectoral role in the economy is specified by the share in total output and total exports. Unit wage value added is generally low reflecting the low technology level of Vietnamese industries. Similarly, the contribution of industrial sectors to total value added is generally lower than that of agricultural and service sectors. Regarding unit wage output, Leather, Non-metallic Minerals, and Food Processing are sectors which have above average while Transport Means is slightly below the average level. Vietnam's main exports are agricultural products, light manufactures, and crude oil. This export structure is also indicated by the large share of Leather and Food Processing in total exports. Non-metallic Minerals and Transport Means still have a smaller export share; however, these two

**Figure 1 Standardized Backward and Forward Linkage**




Source: Author's calculation from I-O 2005

sectors are the strategic industries of Vietnam's economic development plan for the period 2006-2010.

Therefore, it can be concluded that Leather, Non-metallic Minerals, Transport Means, and Food Processing are the Vietnam's key economic sectors and will be assumed to have an increase in output in GTAP model's simulation.

## 4. Policy Simulation Scenarios and Results

Table 3 summarizes the simulation codes and scenarios. S0 is the benchmark of the Vietnamese economy and is estimated by the standard GTAP model. The standard neoclassical closure of mobile capital across regions and exogenous capital investment are kept so that the global bank allocates investments according to the region's expected rate of returns.

We divided the scenarios for policy simulations into three groups: trade liberalization (AFTA and WTO), technical progress, and the combination of the first two groups. The under assumption for the first group is that the term of trade for Vietnam and other country/group of countries will adjust in response to the tariff reduction reciprocally for the goods exporting from Vietnam and importing to Vietnam, other things equal. The rate of tariff reduction will be simulated as the same as the actual tariff reduction commitments of Vietnam with ASEAN and the WTO. Meanwhile, the tentative reason

**Table 2 Sectoral Efficiency, Generation of Value Added and Exports in 2005**

| Sec. | X / W | VA / W | VA /ΣVA (%) | E /ΣE (%) |
|---|---|---|---|---|
| Agriculture | 1.99 | 1.35 | 21.55 | 13.50 |
| Crude oil | 3.30 | 2.47 | 11.06 | 6.26 |
| Other mining | 3.78 | 1.84 | 1.32 | 1.15 |
| Food processing | 12.58 | 2.91 | 7.09 | 12.95 |
| Wood and paper | 14.37 | 3.58 | 1.16 | 1.97 |
| Non-metallic minerals | 12.03 | 3.09 | 2.18 | 3.60 |
| Chemicals | 7.28 | 1.95 | 1.69 | 2.67 |
| Rubber & plastics | 7.41 | 2.02 | 1.26 | 1.95 |
| Transport means | 7.73 | 1.88 | 2.08 | 3.61 |
| Electrical &telecom. Equipments | 10.50 | 2.08 | 1.21 | 2.59 |
| Other machinery | 7.21 | 1.75 | 0.22 | 0.39 |
| Metal | 14.98 | 2.18 | 0.53 | 1.56 |
| Textiles & clothes | 18.45 | 2.93 | 2.44 | 6.52 |
| Leather | 17.66 | 2.54 | 1.36 | 3.99 |
| Other manufactures | 10.26 | 2.22 | 1.20 | 2.35 |
| Average | 7.98 | 2.21 | 4.55 | 4.55 |

Source: Author's calculation from I–O 2005

**Table 3 Scenarios for Policy Simulation**

| Code | Name of Simulation | Details of Simulations |
|---|---|---|
| S0 | Baseline | Standard GTAP model for 22 sectors and 9 regions[a] |
| **Trade Liberalization** | | |
| S1 | AFTA | Reciprocal free-import tariff between Vietnam and ASEAN countries |
| S2 | AFTA plus WTO | Reciprocal free-import tariff between Vietnam and ASEAN countries and Vietnam's unilateral tariff reduction according to its WTO commitments[b] |
| **Technical Progress** | | |
| S3 | Key sectors | Key sectors[c] improve technical progress and increase output by 10% |
| **Combination of Trade Liberalization and Technical Progress** | | |
| S4 | AFTA plus WTO Key sectors | Reciprocal free-import tariff between Vietnam and ASEAN countries and Vietnam's unilateral tariff reduction[b] plus output increase by 10% in key sectors[c] |

Note: [a] The aggregation of regions is shown in Appendix 4.

[b] The code and rate of tariff reduction of sectors are shown in Table 1.

[c] Key sectors are Food Processing, Leather, Non-metallic Minerals, and Transport Means

for hypothetical technical progress is to capture the effect of trade liberalization and technological progress, and to check the possibility of "immerizing growth" for the available statistical date of Vietnam. The former is refered to the work by Johnson (1955) and latter is often attributed to the seminal paper by J Bhagwati (1958). The combination scenario is assumed to perform the situation for Vietnamese economy beyond the WTO accession.

The first group of impact analysis is purely for trade liberalization composing of S1 and S2. Vietnam's tariff schedule has been based on the ASEAN Harmonized Tariff Nomenclature (AHTN) system since September 1st 2003. S1 simulates the CEPT/AFTA by reciprocally setting the target tariff of Vietnam and ASEAN to 0%. The results of S1 may reflect the situation of the Vietnamese economy when CEPT/AFTA completed in 2006. In fact, tariffs still remain for some industries at a very low level. However, for simplification, it is assumed that tariffs are totally removed for all sectors. S2 adds Vietnam's unilateral tariff reduction according to its commitments to join WTO.

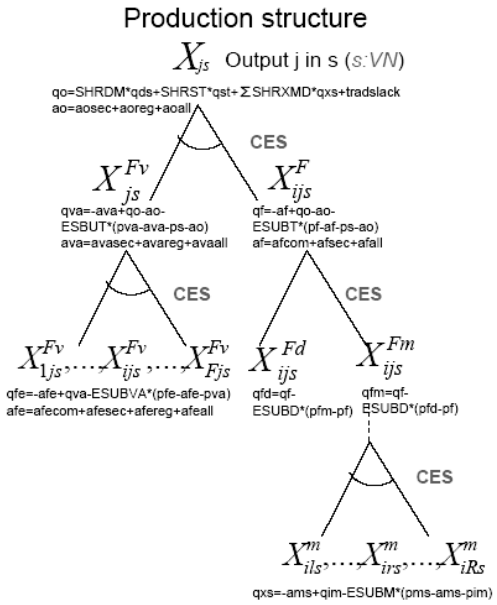
It is important to note that the regional trading agreement (RTA), here the CEPT/AFTA, is often considered to be offering liberalization measures broader than that under the WTO. Reckon that Vietnam is a new member; however, the country needs to streamline its trade regime according to the international regulation to get accession to WTO. Trade policy reform to adapt the WTO's rules are transparency, non-discrimination between status of MFN and national treatments (NT), free and fair competition by using safeguards and anti-dumping measures, and general system of preferential (GSP) for developing countries. As a result of WTO membership, Vietnam had to comply with a number of WTO's agreements namely General Agreement on Tariffs and Trade (GATT), General Agreement on Trade in Services (GATS), Agreement on Trade-Related Aspects of Interllectual Property Rights (TRIPs), Agreement on Trade-Related Aspects of Investment Measures (TRIM). However, it is impossible to quantify this liberalization in terms of tariff reduction, therefore, only tariff reduction commitment is investigated.

The rate of tariff reduction for WTO accession is the change between the initial year (2008) and the final year (2011) on average. Therefore, S2 will give an approximation of the Vietnamese economy over the next three years.

The second group in this study exclusively focuses on the impacts of the technical progress and output increase (S3). S3 assumes technical progress and output increase by 10%[9] in four key sectors (Food Processing, Leather, Non-metallic Minerals, and Transport Means). The rough assumption of technology progress (increase in parameter *aoall*) by 10% will give an approximate picture of output in about five to ten years.[10] The parameter aoall - output augmenting technical change, is assumed to increase by 10% for those four key sectors of Vietnam. Although there are three types of technical change introduced in the GTAP which is aoall (output augmenting technical change), ava (value added technical change), and afall (intermediate input augmenting technical change), the variable ao (j, r) is the most appropriate to shock in this case. Output is produced by a mix of primary factor inputs (land,

skilled labor, unskilled labor, capital, natural resources) and intermediate inputs which are domestically produced and imported (Armington structure). According to Armington structure, products are exogenously differentiated by sourcing countries; firms determine sourcing of imports independently of the price of domestic intermediate inputs (separability); and functional form is CES-constant elasticity of substitution at both levels (Dinh, 2009, pp. 120–121). The system of production function in GTAP can be illustrated in the Figure 2.

**Figure 2 Production Function Structure of GTAP**




Source: Hertel (1999) and the author edition.

In reality, technological development might spillover to other industries and the level of development could be different. However, for simplicity, we assume a 10% productivity (aoall) increase only in key industries.

Finally, the third group, S4, combines the previous two groups to see the impacts of both trade liberalization (the realistic situation is AFTA and WTO) and technological progress. S4 seems realistic since the technical progress and output increase in key sectors and trade liberalization are jointly carried out in Vietnam.

It has been widely recognized that the 'dynamic' effect of trade results from economies of scale, technological spillover, specialization, and increased investment (Lewis, Robinson, and Wang, 1995) whereas, 'static' effect of trade usually comes from trade creation, perfect competition, and production differentiation. A recursive dynamic CGE model that incorporated import-embodied technology transfer and physical capital accumulation is the best model to distinguish and compare the 'dynamic'

and 'static' effect of trade liberalization. Static liberalization is taken care of by tariff reduction. But, dynamic effect is not able to be endogenized in standard GTAP model. That is why we need to exogenously give the technical progress simulation and tried to have some dynamic impacts of trade liberalization, i.e. competition with imported goods will have pressure to domestic industry to improve their technical efficiency.

I applied the standard GTAP 'static' model to examine the effect of tariff reduction for Vietnamese economy. The effect of tariff reduction will simultaneously give impact to terms of trade which then impacts to domestic prices, import prices, and welfare. Domestic prices changes will affect investment, domestic supply, and exports while import prices changes will affect imports. The final outcome is the GDP growth rate and the welfare improvement/deterioration. Meanwhile, the effect of exogenous technology progress will change the usage of endowments, production methods, economies of scale, and specialization, i.e. 'dynamic' effects of trade liberalization.

**Macroeconomic Impacts**

Table 4 presents the Vietnamese macroeconomic accounts in comparison with the baseline scenario (percentage change for all coefficients, except the change of welfare and its decomposition is calculated in million 2001 US dollar). The results of S4 seem to be the most probable demonstration of the impact of trade liberalization (AFTA+WTO) and technical progress and output increase in Vietnamese economy.

As can be seen from the Table 4, the first group of policy simulation on trade liberalization (S1 and S2) has a negative impact on the GDP of Vietnam. The trade deficit of goods and services has increased slightly and is financed mainly by foreign "portfolio" investment (Net investment). Impacts of trade liberalization increase the prices, ie. GDP price index, export prices, import prices and decrease the total welfare. However, only the allocative efficiency declines sharply while the term of trade effect increases because the export prices increase more than import prices, and investment effect increases because of the higher net investment. Certainly, the impacts of WTO accession on different industries are different, but at the national level, joining WTO without change in technical level worsens the welfare of Vietnam. The loss of efficient allocation when Vietnam unilaterally lower her tariff to join the WTO indicates the inefficiencies of industries those had been protected by the tariff before the WTO accession and is an early alarming for Vietnamese enterprises to reform and improve their production technology.

The next group of policy simulation (S3) illustrates the results of technical progress and output increase in key sectors. The results of S3 indicate an extraordinary growth of the Vietnamese economy compared to that of the trade liberalization scenarios. GDP growth is 9.31%, investment inflow increases by 13.29%, and total welfare gains 1740.87 million USD, although GDP price increases by 15.8% indicating the issue of inflation. The impacts, of course, depend on the assumption

**Table 4 Macroeconomic Impacts of Vietnam (% Change from the Baseline S0)**

| Macro Economic Indicators | S0 | S1 | S2 | S3 | S4 |
|---|---|---|---|---|---|
| GDPEXP | 32722.7 | −0.91 | −0.35 | 9.31 | 8.77 |
| 1 Private consumption | 26774.15 | −1.07 | −0.47 | 9.82 | 9.15 |
| 2 Gross investment | 12734.62 | 2.96 | 3.59 | 10.90 | 14.06 |
| 3 Government | 2565.73 | −0.84 | −0.23 | 10.40 | 9.97 |
| 4 Exports | 15783.76 | 6.82 | 7.39 | 1.04 | 8.28 |
| 5 Imports | −25135.6 | 5.75 | 6.39 | 5.57 | 11.67 |
| CAPITALACCT | −9351.79 | 3.95 | 4.69 | 13.23 | 17.39 |
| 1 Savings | −210.22 | −0.82 | −0.22 | 10.42 | 9.99 |
| 2 Net investment | −9141.58 | 4.06 | 4.80 | 13.29 | 17.56 |
| PRICE | | | | | |
| 1 GDP price index | 1 | 9.55 | 10.14 | 15.58 | 15.83 |
| 2 Terms of trade | 1 | 0.34 | 0.60 | 0.21 | 0.74 |
| 3 Export prices | 1 | 10.39 | 10.68 | 10.22 | 10.82 |
| 4 Import prices | 1 | 10.02 | 10.02 | 9.99 | 10.11 |
| WELFARE ($ US million) | 0 | −95.17 | −11.22 | 1740.87 | 1703.61 |
| 1 Allocative efficiency effect | 0 | −165.77 | −154.04 | 224.7 | 53.37 |
| 2 Technical change effect | 0 | 0 | 0 | 1023.8 | 1031.38 |
| 3 Terms of trade effect | 0 | 54.6 | 96.63 | 32.96 | 116.29 |
| 4 Investment effect | 0 | 16 | 46.19 | 459.41 | 502.58 |

Source: Author's calculation

of technical progress. These results suggest the driving force of the Vietnamese economy in the past may have come from the progress in technology in addition to trade effects.

The last group of policy simulation of Table 4 (S4) presents the combination of trade liberalization and technical progress effects. The results of S4 are quite similar to those of S3 when technical progress is not affected by trade liberalization. In S4, GDP grows by 8.77%, and welfare improves by 1703.61 million USD. Gross investment increases remarkably (by 14.06%) while exports and imports become much more intensive (8.28% and 11.67%, respectively). As a result, net investment flow increases greatly (by 17.56%) and inflation is severe (at 15.83%). However, welfare increases by 1703.61 million USD thanks to improvements in technical effect, investment effect and the favorable terms of trade effect (respectively 1031.38, 502.58, and 116.29 million USD).

It is worth noting that the gains in technical effect and investment effect are strengthened remarkably when trade liberalization happens. In the meantime, the allocative efficiency effect is low (53.37 million USD), perhaps due to the unequal productive capacity of Vietnamese industries

compared to foreign industries. An analysis at sectoral level may indicate more clearly which sector lost or gain most in S4.

**Industrial Output Adjustments**

Table 5 provides a clear picture of how industrial output would be if trade liberalization, technical progress raising output, or combination of both, occurred.

**Table 5 Industries Simulated Output Adjustments (% Change from Baseline S0)**

| Sectors | S0 | S1 | S2 | S3 | S4 |
|---|---|---|---|---|---|
| 1 Agriculture | 4906.14 | 0.52 | 0.51 | −2.37 | −1.59 |
| 2 Livestock | 1096.67 | −1.68 | −1.52 | 3.84 | 2.21 |
| 3 Forestry | 483.73 | −2.94 | −3.13 | −5.11 | −8.03 |
| 4 Meat | 144.37 | −8.07 | −8.05 | −8.44 | −16.29 |
| 5 Food processing | 4619.47 | 3.6 | 3.87 | 13.98 | 19.08 |
| 6 Beverages & tobacco | 696.52 | −22.57 | −22.44 | 1.17 | −21.7 |
| 7 Fishing | 863.51 | 0.46 | 0.63 | 2.5 | 3.26 |
| 8 Coal | 1599.89 | −0.16 | −0.21 | −1.64 | −1.86 |
| 9 Oil and gas | 2186.34 | −0.79 | −1 | −3.62 | −4.64 |
| 10 Textiles & clothes | 2710.25 | 7.52 | 11.89 | −14.28 | −4.19 |
| 11 Leather | 2532.49 | 1.36 | −0.2 | 54.04 | 54.75 |
| 12 Wood and paper | 2031.47 | −3.85 | −4.17 | −9.45 | −13.44 |
| 13 Non-metallic minerals | 2799.32 | −3.08 | −3.3 | 7.23 | 4.03 |
| 14 Synthetics | 1630.86 | −0.24 | 0.97 | −9.53 | −8.82 |
| 15 Metal | 723.73 | 0.08 | −0.7 | −13.07 | −13.92 |
| 16 Machinery | 2566.18 | 17.62 | 17.05 | −14.51 | −1.66 |
| 17 Transport means | 403.77 | −7.47 | −6.45 | 34.95 | 28.44 |
| 18 Electronics | 1156.78 | −4.28 | −4.87 | −13.49 | −18.25 |
| 19 Electricity | 1879.42 | 0.62 | 0.85 | 0.55 | 1.06 |
| 20 Gas & water | 158.48 | −0.84 | −0.82 | −1.13 | −1.91 |
| 21 Other services | 28260.66 | 0.2 | 0.25 | 1.21 | 1.38 |
| 22 Creation | 2780.97 | −3.48 | −4.1 | −10.23 | −13.36 |
| Total | 66231.02 | −0.41 | 0.49 | 0.94 | −1.34 |

Source: Author's calculation

In the first group of policy simulation (S1 and S2), which shows the sectoral output of trade liberalization scenarios, a number of sectors contract, although the rate of change is minimal. The last row of the table, showing the change in total output, also indicates a small increase. It is not a very promising future for Vietnamese sectors if only trade liberalization comes into effect.

The next group (S3) presents the results of technical progress and output increase in key sectors. Recalling that key sectors are Food Processing, Leather, Non-metallic Minerals, and Transport Means, we can recheck the effectiveness of those industries. The results in S3 column demonstrate a significant increase in output of those four key industries (13.98%, 54.04%, 7.27%, and 34.95%, respectively); meanwhile most of other industries have either a big negative or very small increase in output. In contrast, in the 'static' effect of trade scenario–S2, output of those key sectors contracted notably while that of a number of other sectors increased. This clearly shows that when trade liberalization is constrained those four industries are government-supported but not particularly competitive ones, compared to other domestic industries.

The last group of policy simulation (S4) explains the combination of trade liberalization and technical progress effects. The presumptive scenario (S4) is quite similar to S3 but even worse since the total output is reduced by −1.34%. Four key sectors retain their strong increase in output (by 19.08%, 54.75%, 4.03%, and 28.44% respectively) while a number of industries may be closed down, namely: Meat, Beverage and Tobacco, Wood and Paper, Metal, and Electronics (their output declines by −16.29%, −21.7%, −13.44%, −13.92%, and −18.25% respectively). The results imply the low competitiveness of those industries compared to those other countries and raises the question of the success of the Electronics industry since this one is becoming as Vietnam's main export. The analysis on exports and imports may provide more information at the sectoral level.

In general, the results suggest the importance of the combination of trade liberalization policy with the technological improvement for the whole Vietnamese economy.

**Sectoral Exports and Imports**

Table 6 illustrates sectoral exports and imports of Vietnam. Since Vietnam exports crude oil, produces and consumes electricity, the data for Oil and Gas imports and Electricity exports and import are not applicable. The last row of the Table 5 shows the change of total exports or total imports compared to the baseline exports or imports. The order and meaning of columns are as the same as those in previous tables.

The scenarios of trade liberalization are shown in S1 and S2. In the CEPT/AFTA scenario (S1), total exports increase faster than total import volume thanks to the rapid export increase of Food Processing, Textiles and Clothes, and Machinery sector. Meanwhile, agricultural sectors see a decline in exports. The impact of WTO (S2–S1) is insignificant implying the tariff reduction commitment to the WTO seems to have small effect on Vietnamese sectoral exports and imports.

**Table 6 Sectoral Exports and Imports of Vietnam (% Change from Baseline S0)**

| Sectors | S0 | | S1 | | S2 | | S3 | | S4 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Ex | Im | Ex | Im | Ex | Im | Ex | Im | Ex | Im |
| 1 Agriculture | 1095.66 | 268.79 | −1.93 | 11.79 | −2.51 | 13.29 | −17.13 | 8.74 | −19.75 | 23.17 |
| 2 Livestock | 63.63 | 37.74 | −7.42 | 4.85 | −7.97 | 6.44 | −18.64 | 15.9 | −25.54 | 23.66 |
| 3 Forestry | 9.36 | 14.01 | −3.31 | 0.64 | −3.95 | 1.36 | −23.93 | 10.35 | −26.28 | 11.71 |
| 4 Meat | 33.12 | 27.22 | −9.99 | 22.26 | −9.15 | 24.28 | −34.63 | 22.3 | −40.4 | 50.33 |
| 5 Food processing | 1756.57 | 688.7 | 18.11 | 18.86 | 18.98 | 20.04 | 24.68 | −4.88 | 47.16 | 14.7 |
| 6 Beverages & tobacco | 22.44 | 380.53 | 8.07 | 39.7 | 11.72 | 40.25 | −9.67 | 7 | 1.2 | 49.79 |
| 7 Fishing | 49.2 | 5.62 | −4.31 | 5.69 | −5.41 | 7.12 | −22.62 | 22.24 | −27.72 | 32.03 |
| 8 Coal | 169.74 | 23.93 | 1.46 | −0.04 | 0.92 | 0.25 | −6.34 | 2.97 | −5.1 | 3.01 |
| 9 Oil and gas | 2126.13 | 0 | −0.83 | 0 | −1.04 | 0 | −3.73 | 0 | −4.79 | 0 |
| 10 Textiles & clothes | 2027.72 | 1357.81 | 10.59 | 12.17 | 15.9 | 14.79 | −16.48 | 1.15 | −2.75 | 14.87 |
| 11 Leather | 2415.04 | 394.07 | 1.53 | 3.17 | −0.04 | 2.57 | 54.07 | 19.68 | 55.03 | 23.11 |
| 12 Wood and paper | 560.8 | 437.98 | 2.46 | 13.19 | 1.94 | 13.81 | −20.28 | 8.05 | −18.11 | 22.21 |
| 13 Non-metallic minerals | 225.87 | 1820.52 | 0.14 | 4.09 | −0.17 | 4.53 | 26.09 | −4.35 | 26.74 | −0.26 |
| 14 Synthetics | 494.61 | 2629.71 | 5.54 | 2.26 | 10.31 | 2.58 | −17.64 | 4.39 | −8.68 | 6.82 |
| 15 Metal | 54.23 | 1128.79 | −0.72 | 3.34 | −2.58 | 3.54 | −26.31 | 1.5 | −27.53 | 4.14 |
| 16 Machinery | 1285.74 | 3269.94 | 40.12 | 6.14 | 39.52 | 6.49 | −23.39 | 5.72 | 7.8 | 11.45 |
| 17 Transport means | 102.11 | 1277.17 | 18.52 | 14.26 | 23 | 14.61 | 57.93 | 1.49 | 93.3 | 16.64 |
| 18 Electronics | 446.33 | 980.26 | 5.98 | 8.34 | 5.03 | 8.81 | −23.81 | 6.96 | −19.19 | 15.33 |
| 19 Electricity | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20 Gas & water | 3.19 | 8.69 | −6.58 | 1.96 | −8.15 | 2.99 | −31.03 | 15.77 | −36.36 | 18.87 |
| 21 Other services | 1365.77 | 6328.48 | −4.99 | 2.26 | −6.52 | 2.98 | −21.69 | 9.6 | −26.12 | 12.3 |
| 22 Creation | 715.39 | 3205.54 | −6.09 | 0.55 | −7.69 | 1.09 | −24.95 | 8.96 | −29.93 | 9.78 |
| Total | 15022.65 | 24285.5 | 6.76 | 5.57 | 7.11 | 6.21 | 0.72 | 5.7 | 7.78 | 11.62 |

Source: Author's calculation

The scenarios for technical progress and output increase are given in S3. If key sectors improve technical level as in S3, their exports expand remarkably from 24.68% to 57.93% as described in S3 columns. However, the rest of the sectors witness a great decline in exports volume. At the same time, imports increase moderately, notably for Synthetics and Electronics by 4.39% and 6.69% respectively in response to technical progress. In general, total import volume increase faster than total export volume when technical progress happens.

The last columns present the combination effects (S4). Total imports continue to increase much faster than total exports (11.62% compared to 7.78% in S4). Agricultural exports and exports of traditional manufactured goods decline while imports increase.

Different from the sectoral output results, the outcomes of sectoral exports and imports fluctuate greatly when the scenarios change due to the international competition which immediately affects the exports and imports of countries. More importantly, the Vietnamese trade deficit is still persistent in all scenarios. Unless Vietnamese economic structure changes fundamentally, the trade deficit is unlikely to be curbed.

**Trade Partners**

Finally, the change in bilateral trade of Vietnam with its major partners is shown in Table 7. In most of the scenarios, except S3 when trade liberalization does not occur, the region that has the highest increase in trade volume with Vietnam is the ASEAN bloc; the next highest is the EU followed by the USA. When just technological progress take places in key sectors in S3, both imports and exports with USA and EU27 increase while exports decline with other regions. This suggests that the USA and EU27 are the most important markets of those key industries, although imports

**Table 7 Vietnam's Trade Volume with Main Partners (% Change from Baseline S0)**

| | Trade | China | Japan | Korea | USA | AusNZ | ASEAN | EU27 | ROW |
|---|---|---|---|---|---|---|---|---|---|
| S0 | Exports | 1126.77 | 2616.93 | 408.64 | 1387.73 | 773.53 | 1760.8 | 5205.87 | 1742.38 |
| | Imports | 3089.68 | 2172.19 | 1818.74 | 2456.79 | 529.6 | 3782.14 | 6193.31 | 4243.05 |
| S1 | Exports | −2.89 | 0.63 | −0.70 | −4.69 | −1.44 | 64.56 | 0.09 | −1.78 |
| | Imports | −15.55 | −13.98 | −14.66 | −1.66 | −9.96 | 80.41 | −3.58 | −7.58 |
| S2 | Exports | 0.20 | 1.55 | 2.37 | −5.81 | −1.19 | 62.32 | −0.01 | 0.48 |
| | Imports | −15.11 | −13.46 | −14.09 | −1.03 | −9.23 | 81.43 | −3 | −7 |
| S3 | Exports | −7.74 | −5.27 | −4.40 | 4.00 | −2.74 | −8.39 | 10.02 | −3.24 |
| | Imports | 2.33 | 4.93 | 4.88 | 8.42 | 2.22 | 3.97 | 7.82 | 6.2 |
| S4 | Exports | −7.73 | −3.97 | −2.30 | −1.85 | −3.94 | 51.88 | 10.65 | −2.48 |
| | Imports | −13.27 | −9.75 | −10.26 | 6.97 | −6.98 | 87.09 | 4.29 | −1.5 |

Source: Author's calculation

from Japan, Korea, and ASEAN have also increased. In most scenarios, Vietnam's trade with China decreases mostly due to the decline in imports of agriculture, beverage and tobacco, non-metallic mineral, transport means. Vietnam's major exports to China are forestry (accounts for 51% of Vietnamese sectoral exports to the world), meat (45%), synthetics (25%), oil and gas (22%), while major imports from China are non-metallic mineral (accounts for 43% of Vietnamese sectoral imports from the world), transport means (21%), agriculture (29%), livestock (24%), fishing (13%), and coal (12%).

## 5. Conclusions and Policy Implications

This paper has applied the general equilibrium model (GTAP) for analyzing the impacts of trade liberalization (CEPT/AFTA and WTO accession) and technical progress on key sectors of the Vietnamese economy identified from the I–O analysis. This study also incorporated the actual commitment of tariff reduction under the WTO accession of Vietnam, which is converted from HS code to GTAP code through SITC, ISIC, and APC code, to see the impacts on the Vietnamese economy at aggregate level as well as at sectoral level.

With some reservations on the time frame for the technical progress of the Vietnamese economy and for the GTAP standard model, the study reveals that without technical progress, Vietnam's economy looses its growth rate momentum. If an increase in technical progress and output of 10% in key sectors occurs, Vietnam's economy can grow by about 9%. This may confirm the importance of the improvement in total factor productivity at the aggregate level.

Although the GTAP model has created the so-called global bank for pooling and directing the capital market according to the regional rate of returns or interest rate, the detailed financial structure of the Vietnamese economy is simply omitted, which is a common limitation of the CGE model. Instead, the terms of trade effect and investment effect are reflected in the welfare decomposition for Vietnam. Similar to GDP growth, Vietnam can gain in welfare if there is sectoral technical progress and output increase. However, persistent trade deficit, measured in terms of 2001 USD, may become more serious if it is reconverted into national currency.

At the sectoral level, industries' output generally increases, especially in scenarios which permit spillover effect. Sectoral imports and exports will be more sensitive to trade liberalization and very responsive to technical improvements. If trade liberalization occurs without technical progress, impacts on exports will be slightly higher than on imports. The technical progress without trade liberalization causes imports to increase and exports to decrease, but this is due to an optimistic assumption of a 10% increase in technical progress in key sectors. Moderate technical progress will not greatly push up growth and hence will not increase imports to a great extent. If trade liberalization and technical progress are combined, imports increase much faster than exports.

Moreover, the comparison of trade patterns which calculated the percentage change from baseline, not the actual level, has shown that ASEAN countries are still the main trading partners, while Vietnam's imports increase from Japan, Korea, USA, and China and exports increase to EU27 due to the complementary trade patterns.

**Appendix 1 Summary of Vietnam's Tariff Reduction Binding with WTO**

| Criteria | Agricultural Goods | Industrial Goods |
|---|---|---|
| Implementation period | 7 years (2008–2014) | 12 years (2008–2019) |
| Number of HS 8-digit lines | 1216 lines | 9228 lines |
| HS Chapters | 33 Chapters (Chapter 1, 2–24, and part of Chapter 29–53) | 76 Chapters (Chapter 3 and part of Chapter 16, 23, 25–98) |
| Maximum of initial tariff rate | 150% (Chapter 24) | 200% (Chapter 87) |
| Mean of initial tariff rate | 25.386% | 16.461% |
| Mean of final tariff rates | 20.997% | 12.719% |
| Mode of initial tariff rates | 40% (232 lines) | 10% (1595 lines) |
| Mode of final tariff rates | 5% (180 lines) | 5% (3531 lines) |
| Number of negotiation countries | 15 countries, 1384 times | 10 countries, 3053 times |
| Mode of negotiators | CA (222), DO (188), HN (188), US (176), AU (138), NZ (140), CE25 (91), CN (77) | US (1935), CN (261), CE25 (149), JP (140), AU (90), CA (90) |
| Mean of implementation year | 2011 | 2011 |
| Number of reduction lines | 492 lines | 3743 lines |
| HS Chapters of tariff reductions | 23 Chapters | 52 Chapters |
| Maximum reduction rate | 50% (Chapter 24) | 60% (Chapter 87) |
| Mean of reduction rates | 4.389% | 3.742% |
| Mode of reduction rates | 10% (160 lines) | 5% (1361 lines) |
| Mode of reduction chapter | Chapter 20 (57 lines) | Chapter 87 (531 lines) |

Source: Author's compilation according to Schedule CLX (2006)

**Appendix 2 Tariff Reduction Schedule for Agricultural Products**

| HS Chapter | Average reduction | Country of interest | Average initial | Average final | Number of HS | Ave. year of Implementation |
|---|---|---|---|---|---|---|
| 2 | 7.0 | 119 (CA, US, NZ) | 18.4 | 11.4 | 35 | 2011 |
| 4 | 6.6 | 179 (NZ, AU, US) | 26.9 | 20.3 | 29 | 2011 |
| 7 | 6.9 | 107 (CN, DO, HN) | 25.5 | 18.5 | 22 | 2010 |
| 8 | 13.9 | 97 (CN, DO, HN) | 37.8 | 23.9 | 48 | 2011 |
| 15 | 11.2 | 127 (DO, HN, CO) | 34.6 | 23.3 | 49 | 2011 |
| 21 | 10.0 | 159 (CA, CE25, AU) | 32.0 | 22.0 | 43 | 2010 |
| 22 | 15.9 | 137 (CE25, CA, US, MX) | 61.7 | 45.7 | 54 | 2012 |
| **Top 8** | **10.2** | **925** | **33.8** | **23.6** | **280** | **2011** |

Source: Author's compilation according to Schedule CLX, Section I (2006)

**Appendix 3 Tariff Reduction Schedule for Non-Agricultural Products**

| HS Chapter | Average reduction | Country of interest | Average initial | Average final | Number of HS | Ave. year of Implementation |
|---|---|---|---|---|---|---|
| 3 | 12.9 | 106 (NZ, DO, HN) | 29.9 | 17.0 | 130 | 2011 |
| 29 | 5.1 | 343 (US) | 10.3 | 5.1 | 327 | 2012 |
| 30 | 3.5 | 218 (US, CE25, CA, CH, AU) | 10.3 | 6.8 | 47 | 2010 |
| 32 | 6.0 | 111 (US) | 18.0 | 12.0 | 95 | 2011 |
| 33 | 16.3 | 58 (US, HN) | 34.3 | 18.0 | 29 | 2012 |
| 34 | 7.2 | 87 (US, HN) | 19.4 | 12.2 | 52 | 2010 |
| 37 | 13.3 | 40 (US) | 19.8 | 6.5 | 40 | 2012 |
| 38 | 5.0 | 68 (US, CH) | 14.7 | 9.8 | 40 | 2010 |
| 39 | 7.1 | 485 (US, JP) | 16.3 | 9.2 | 342 | 2012 |
| 44 | 7.0 | 51 (US, CN, PY) | 22.1 | 15.1 | 47 | 2009 |
| 48 | 11.1 | 122 (US) | 30.7 | 19.7 | 107 | 2011 |
| 84 | 7.0 | 354 (US, CN, EC25) | 21.0 | 14.0 | 374 | 2011 |
| 85 | 9.7 | 388 (US, CN, EC25) | 22.8 | 13.2 | 351 | 2011 |
| 87 | 16.6 | 328 (US, JP) | 62.5 | 45.9 | 531 | 2013 |
| 94 | 11.7 | 42 (US, CN) | 33.2 | 21.5 | 85 | 2012 |
| **Top15** | **9.3** | **2801** | **24.4** | **15.1** | **2597** | **2011** |

Source: Author's compilation according to Schedule CLX, Section II (2006)

**Appendix 4 Re-Aggregated GTAP Regions**

| Aggregate Region | New Code | GTAP Code | Description |
|---|---|---|---|
| 1 | Vietnam | Vnm | Vietnam |
| 2 | China | Chn, hkg | China, Hong Kong |
| 3 | Japan | Jpn | Japan |
| 4 | Korea | Kor | Korea |
| 5 | USA | Usa | USA |
| 6 | AusNZ | Aus, nzl | Australia, New Zealand |
| 7 | ASEAN5 | Idn, mys, phl, sgp, tha | Indonesia, Malaysia, Philippines, Singapore, Thailand |
| 8 | EU27 | Aut, bl, dnk, fin, fra, deu, gbr, grc, irl, ita, lux, nld, prt, esp, swe cyp, cze, hun, mlt, pol, svk, svn, est, lva, ltu, bgr, rom | Austria, Belgium, Denmark, Finland, France, Germany, UK, Greece, Ireland, Italia, Luxembourg, Netherlands, Portugal, Spain, Sweden, Cyprus, Czech, Hungary, Malta, Poland, Slovakia, Slovenia, Estonia, Latvia, Lithuania, Bulgaria, Romania |
| 9 | ROW | Rest of countries | Rest 47 countries |

Source: Author's compilation according to GSC2 (2007)

## Notes

1 ASEAN is making efforts to extend its economic relations with other countries through the conclusion of Free Trade Agreements with, for example, China (ACFTA 2004), Korea (AKFTA 2005), Japan (AJAFTA 2008), Australia and New Zealand, India, and the EU. ACFTA is projected to be completed by 2010 for ASEAN−6 (Brunei, Indonesia, Malaysia, Philippines, Singapore, and Thailand) and by 2015 for Cambodia, Laos, Myanmar and Vietnam (CLMV). AKFTA is also projected to be accomplished by 2010.

2 Vietnam was a member of COMECON (Council for Mutual Economic Assistance) from Independence until 1991. During that time, its economic partners were mainly former Soviet countries, China, Eastern European countries, and some socialist countries in Africa, Latin America, or the Middle East. When the Cold War ended with the collapse of Berlin Wall and Soviet bloc in 1991, Vietnam had to dissolve bilateral trade agreements (BTA) with a number of former socialist countries.

3 As with other members, Vietnam is obliged to conform to all obligatory statutory agreements of WTO such as the General Agreement on Tariffs and Trade (GATT), the General Agreement on Trade in Service (GATS), Trade-Related Investment Measures (TRIMs), Trade-Related Aspects of International Property Rights (TRIPS), Sanitary and Phytosanitary (SPS), Rules of Origin (ROO), and Technical Barriers to Trade (TBT).

4 To date, there have been four versions of HS: in 1988, 1996, 2002, and 2007. At the time of joining WTO, Vietnam's tariff nomenclature corresponded to HS 1996 at 8−digit code level and the summary of tariff reduction bases on HS 1996 but at level 2 of HS structure (by Chapter).

5 ISIC revision 4 was issued by the United Nations Statistics Division in 2006 to provide the most up-to-date classification for current economic activities, detailing and delineating up to 4−digit code. Vietnam's GSO issued Vietnam Standard Industrial Classification (VSIC) in 2007, developing up to 5−digit code from 4−digit code of VSIC1993 and corresponding to ISIC Rev. 4 and to ASEAN Common Industrial Classification (ACIC).

6 The average reduction rate is 4% (from 17.4% to 13.4%) over a period of 5 to 7 year since the year of accession (Le and Trinh 2007, p. 8).

7 According to Document 0622/BTM-PC dated 26 January, 2007, Vietnam has MFN treatment in trading goods with 164 countries and territories including 27 EU countries, of which 149 countries are WTO members. In addition, Vietnam has preferential treatments in trading with 11 countries, of which 9 countries are ASEAN members.

8 The backward linkage is generally the output multiplier of each sector, but the forward linkage can be simply the 'row sum' of the coefficients in the Leontief inverse Matrix, or being computed according to the Ghosh approach.

9 According to MOIT, during 2001−2007 the average annual growth rate of industrial output of food processing and beverage was 14.8%, leather 16.6%, non-metallic mineral 14.5%, and motor vehicles 24.2%. However, this is the data on gross output, not the productivity on which the author want to do the simulation.

10 Decision 30/2007/QD-BCN dated July 17th, 2007 has promulgated the development plan for the Southern economic zones by 2015 and vision by 2020. According to the plan, during 2006−2010 the industrial sectors were projected to increase production are mining (by 3.36% if oil is included and by 15.65% if it is excluded), aqua-forest-agriculture (by 16.05%), mechanics, electronics (by 28.1%), metallurgy (by 20.99%), chemical (by 18−19%), garment and textiles (by 10.87%), construction materials (by 13−14%), and electricity (by 16.98%). Decision 30/2007/QD-BCN dated July 17th, 2007 has promulgated the development plan for the Southern economic zones by 2015 and vision by 2020. According to the plan, during 2006−2010 the industrial sectors were projected to increase production are mining (by 3.36% if oil is included and by 15.65% if it is excluded), aqua-forest-agriculture (by 16.05%), mechanics, electronics (by 28.1%), metallurgy (by 20.99%), chemical (by 18−19%), garment and textiles (by 10.87%), construction materials (by 13−14%), and electricity (by 16.98%).

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