Assessing the Impacts of Deeper Trade Reform in Vietnam in a General Equilibrium Framework[*]

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Abstract: Vietnam is on the way to undertake deeper trade liberalisation, including both tariff reductions and reforms in other trade-related areas. In this paper, the impacts of Vietnam's trade reform on its economic welfare and sectoral adjustments are assessed using a dynamic computable general equilibrium (CGE) model. We consider the effects of goods and services trade liberalisation, an increase in foreign direct investment inflows, a reduction in administrative and technical barriers to trade, and a reduction in the trade and transport margins. When all effects are combined, Vietnam's economic welfare is projected to increase by 8.4 per cent in 2020 compared with the baseline. Many manufacturing sectors would expand, whereas agricultural, minerals and fuel sectors would contract. The output expansion is most significant in the textiles and wearing apparel sectors.

1. Introduction

Vietnam started comprehensive economic reform in the mid-1980s in which trade reform has played an important role. Since then, the country has initiated wide-ranging unilateral liberalization measures and implemented various bilateral and multilateral trade agreements, including the accession to the WTO in January 2007. After the WTO accession, Vietnam has continued its path of trade reform with the negotiations of several WTO-plus free trade initiatives, notably the Trans-Pacific Partnership (TPP) and the Regional Comprehensive Economic Partnership (RCEP), and has played an active role in the ASEAN Economic Community (AEC)'s building process. With the AEC scheduled to be established by the end of 2015, and negotiations of the TPP and RCEP are expected to be completed by soon thereafter, the sources of economic gain would come not only from tariff reduction but also from other trade facilitation measures and trade-related productivity growth, which are important features of these trade arrangements.

Further reform in the external sector is expected to result in wide-ranging social and economic impacts on the Vietnamese economy. Smaller differences between domestic and international prices, competition in the market for services and new institutions and regulations are predicted to lead to increased market efficiency. Trade liberalisation, especially with WTO-plus commitments, would result in efficiency gains and gradually transform the country's industrial structure to the one that is consistent with its comparative advantage. However, its effects generally differ greatly across industries and working groups, creating both winners and losers.

In this study, we evaluate the effects of Vietnam's trade liberalisation on its economic welfare and sectoral adjustments using a dynamic computable general equilibrium (CGE) model. We take into account the impacts of factors such as services liberalisation, an increase in FDI inflows, a reduction in administrative and technical barriers, and a reduction in the trade and transport margins as aspects of the trade liberalisation process. The effects of each factor are assessed separately, but the combined effects of all the factors are also provided. We make a contribution to the literature by providing a comprehensive assessment of the effects of trade liberalisation in both goods and services, as well as other accompanying features of trade reform.

The rest of this paper is organised as follows. Section 2 gives an overview of Vietnam's trade performance and policy. Section 3 reviews literature regarding empirical analysis of the impacts of trade liberalisation on the Vietnamese economy. Section 4 presents overview of the model, as well as the baseline and policy scenarios used in this study. Section 5 provides results of the experiments, followed by interpretations of the results. The final section offers concluding remarks.

2. Background of Vietnam's Trade Policy Reform and Performance
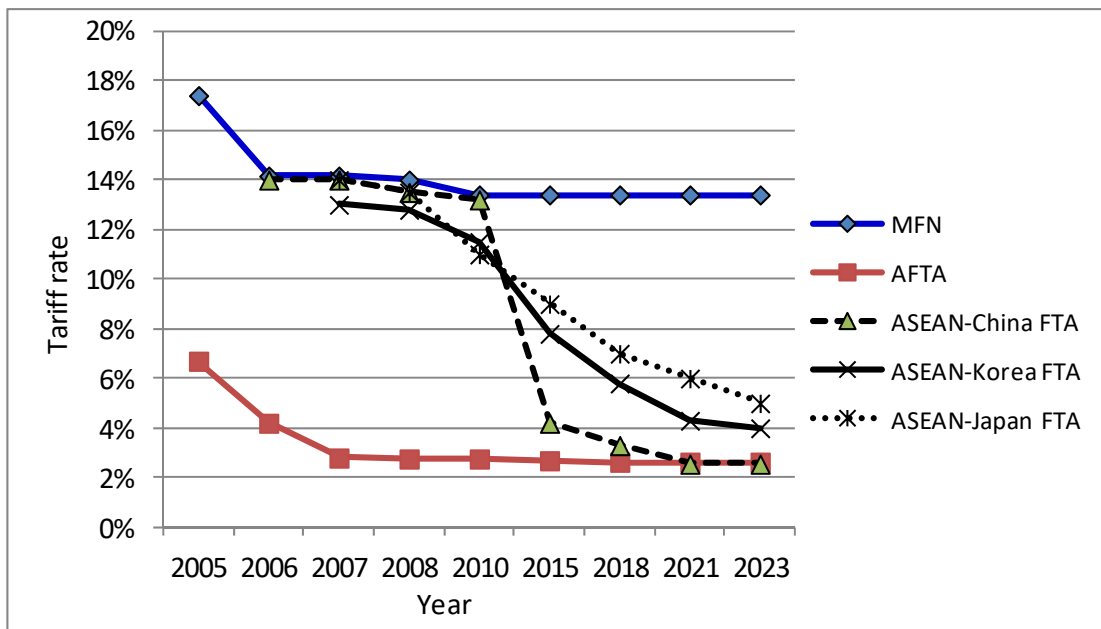
2.1. Trade policy

Vietnam's economic and trade reforms have fundamentally transformed the trading system of Vietnam from a centrally planned and state trading monopoly to a more market-oriented one. Major trade policy reform includes relaxation of controls over trading rights, unification of exchange rates, creation and amendment of a system of import and export tax, gradual removal of non-tariff barriers (NTB) and progressive deregulation of trade regimes. Import quotas have been removed except for some strategic products. The tariff system has been simplified and the tariff rates have gradually been reduced over the past two decades.

The tariff structure of Vietnam is designed with generally high tariff rates and non-tariff barriers applied to consumer goods, while capital goods and production inputs are subject to low tariffs and very few non-tariff barriers. Therefore, effective protection of many industries is higher than that offered by nominal protection (Athukorala, 2006). Protection of infant industries is also applied to some manufacturing sectors such as automobile and food processing. This protection raises the price of intermediate inputs, adversely affect production of downstream industries and export activities.

In addition to unilateral reform measures, Vietnam has sought to become and remain open by joining bilateral, regional and multilateral trade agreements. On a bilateral basis, the country signed trade agreement with the European Union (EU) in 1992, the United States (US) in 2000 and Japan in 2008. On a regional basis, Vietnam became a member of ASEAN and ASEAN Free Trade Agreement (AFTA) in 1995, and joined Asia Pacific Economic Cooperation (APEC) Forum in 1998. Together with other ASEAN members, Vietnam participated in the formation of a number of FTAs between ASEAN and partner countries,

specifically China, Japan, Korea, Australia and New Zealand, and India. In January 2007, after a decade of preparation and negotiation, Vietnam became the 150th member of the WTO with comprehensive and challenging commitments (World Bank, 2006, p. 54). Recently, Vietnam embarked on a new chapter of economic integration with negotiation of several WTO-plus FTAs. It is concurrently negotiating five FTAs, namely with Korea, with the European Free Trade Association (EFTA), with the Eurasian Economic Union (EAU), and most importantly the TPP and RCEP.[1] The implementation of these FTAs will require further changes in Vietnam's trade and trade-related policies and is expected to create a more liberal and efficient trading system. Figure 1 summarises past and future tariff reduction plans under MFN scheme and selected regional FTAs.

Figure 1: Vietnam's past and future tariff reduction plans under MFN and selected FTAs, 2005-2023

Note: All tariff rates are bound rates and not applied rates.

Source: Truong et al. (2011).

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[1] The members of the EFTA are Iceland, Liechtenstein, Norway and Switzerland; those of the EAU are Belarus, Kazakhstan and Russia; negotiating countries of the TPP are the US, Canada, Mexico, Chile, Japan, Singapore, Malaysia, Brunei, Vietnam, Australia and New Zealand, and those of the RCEP are the 10 ASEAN countries, China, Japan, Korea, India, Australia and New Zealand.

2.2. Trade Performance

Trade liberalisation, together with reforms in other areas, has had significant impacts on Vietnam's trade and economic performance. Since 1986, total export and import values have grown at an average annual rate of more than 20 per cent. As a result, export values in 2013 reached US$132 billion, about a hundred times that of 1986. This growth rate is remarkable even though it started from low starting values. From 1995 to 2006, the ratio of total imports and exports to GDP almost tripled from 54 to 150 per cent and remain around 160 per cent in recent years.

Table 1 shows Vietnam's exports by major products from 2002 to 2013. Until the mid-2000s, exports of crude oil made a large contribution to the export growth, comprising more than 20 per cent of total exports. Apart from oil, agriculture and aquaculture products and labour-intensive products such as garments and footwear are major export items, accounting for about 20 and 25 per cent of total exports. However, over the last decade, the export share of crude oil has declined sharply to just 5.5 per cent in 2013. Exports of garments and footwear continued to grow but their shares in total exports have contracted by 4-5 percentage

Table 1: Exports by major products

(% of total exports)

Product	2002	2006	2010	2013[a]
Crude oil	19.6	20.8	6.9	5.5
Coal	0.9	2.3	2.2	0.7
Rubber	1.6	3.2	3.3	1.9
Rice	4.3	3.2	4.5	2.2
Coffee	1.9	3.1	2.6	2.1
Marine products	12.1	8.4	6.9	5.1
Garments	16.4	14.6	15.5	13.6
Footwear	11.2	9.0	7.1	6.4
Handicrafts	2.0	1.6	0.3	0.2
Electronic goods and components	3.6	4.3	5.0	25.3
Other products	26.3	29.5	45.7	37.0

Source: IMF (2007) and General Statistics Office of Vietnam (2014).

[a] Preliminary.

points over the past decade. On the other hand, exports of electronic goods and components have dramatically increased in recent years, driven by foreign direct investment (FDI) and production networks in Asia. Overall, the exports structure has moved gradually from resource-intensive to unskilled-labour intensive and recently toward higher skilled-labour intensive products.

Looking at Vietnam's imports by major products (Table 2), imports of machinery and equipment have been constantly high to meet the demand for capital goods needed for high economic growth. Intermediate inputs for production, such as iron and steel, textiles, leather and garment material, petroleum products, and electronics parts are major import items. In general, the structure of trade of Vietnam is typical of a developing country at a relatively early stage of development with a large share of exports of labour-intensive and natural resource-intensive products and a large share of imports of capital and intermediate goods.

Table 2: Imports by major products

(% of total imports)

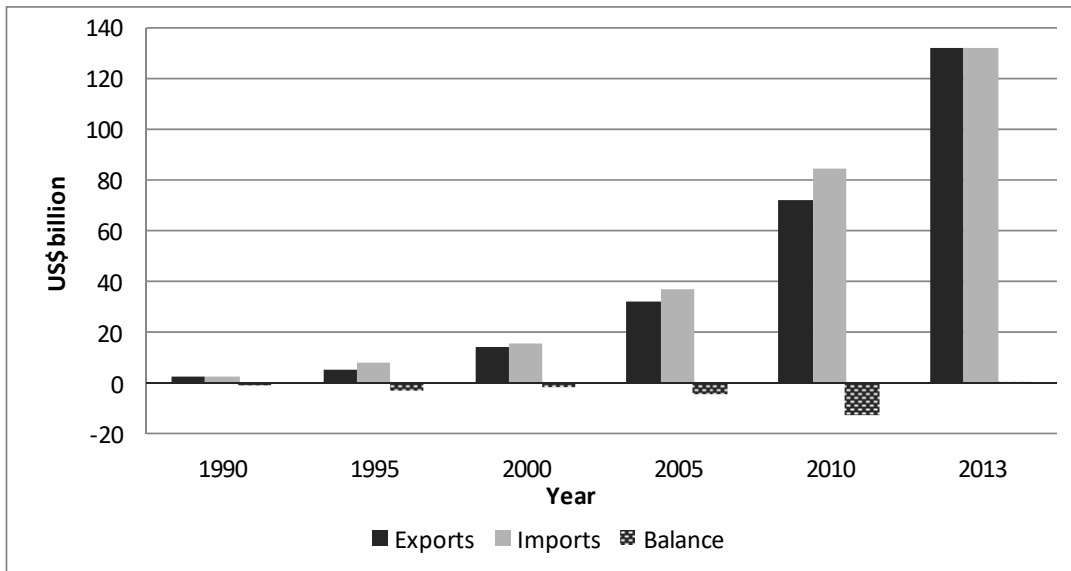| Product	2002	2006	2010	2013[a]
Petroleum products	10.2	13.3	7.2	5.3
Fertilisers	2.4	1.5	1.4	1.3
Pesticides	0.6	0.7	0.6	0.6
Iron and steel	6.8	6.5	9.4	7.2
Motorcycles	2.1	1.2	1.0	0.4
Motor cars and trucks	1.3	0.5	1.2	0.6
Textile yarn, cotton	2.0	1.7	2.2	2.1
Leather and garment material	8.7	4.3	9.4	9.2
Machinery and equipment	19.2	14.8	16.1	14.1
Other products	46.6	56.6	51.5	59.2

Source: IMF (2007) and General Statistics Office of Vietnam (2014).
[a] Preliminary.

As shown in Figure 2, since 1990 imports have been greater than exports except in 2013. The gap has been financed by inflows of FDI, official development assistance (ODA) and private transfers. Until 2006 this trade gap was considered quite acceptable as the majority of

imports were machinery, equipment and intermediate inputs for production. From 2007 to 2011, the trade gap became large, reaching US$18 billion or around 34 per cent of exports in 2008. An important culprit of this situation is the underdevelopment of Vietnam's supporting industries, which is unlikely to be improved anytime soon. Thus industrial development depends heavily on imported intermediate imports for production and exports. In addition, as many of Vietnam's trade liberalisation commitments are being realised, the possibility of large trade deficits remains.

Figure 2: Vietnam's trade performance, 1990-2013 (US$ billion)

Source: Computed from data obtained from General Statistics Office of Vietnam (2014).

Table 3 provides Vietnam's direction of trade, which shows diverse patterns. In 2013, about 75 per cent of Vietnam's imports originate from Asia, whereas only about 40 per cent[2] of its exports are shipped to the region. The EU, the US and Japan are the largest markets for Vietnam's exports. Vietnam's trade with the EU and the US has been in surplus in the last two decades. In 2013, Vietnam's trade surplus with the EU was US$5.4 billion and that with the US was US$9.2 billion. By contrast, East Asian countries, mostly China, Japan, Korea,

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[2] Calculated based on data from the General Statistics Office of Vietnam.

Taiwan and Singapore are major sources of Vietnam's imports. Among them, imports from China have increased most dramatically. In 2013, imports from China reached US$36.8 billion, an increase of 26.7 per cent from the previous year (equivalent to US$7.8 billion). As a result, Vietnam's trade deficit with China has risen rapidly, from US$11.0 billion in 2008 to US$23.7 billion in 2013. As a group, ASEAN is an important trading partner of Vietnam. With the AEC to be established soon, it is expected that the trade interdependence between Vietnam and other ASEAN member states will be further strengthened.

Table 3: Vietnam's direction of trade

(% of total exports/imports)

	Exports			Imports		
	2001	2008	2013	2001	2008	2013
Singapore	7.0	4.2	2.0	15.3	11.6	4.3
ASEAN-4	9.1	8.2	9.2	9.9	9.9	10.4
China	9.4	7.2	10.0	9.9	19.4	28.0
Japan	16.7	13.6	10.3	13.5	10.2	8.8
Korea	2.7	2.8	5.0	11.6	8.8	15.7
Taiwan	5.4	2.2	1.7	12.4	10.4	7.1
Australia	6.9	6.7	2.7	1.6	1.7	1.2
Unites States	7.1	18.9	18.1	2.5	3.3	4.0
European Union	20.7	17.3	18.4	10.0	6.7	7.2
ROW	15.0	18.6	22.6	13.7	18.1	13.4

Note: ASEAN-4 includes Indonesia, Malaysia, the Philippine and Thailand.

Sources: The 2001 data are calculated from IMF (2006); the 2008 and 2013 data are calculated using the data obtained General Statistics Office of Vietnam (2014).

3. Literature review

The impact of trade liberalisation in Vietnam has been under scrutiny by both domestic and international economists. A large number of qualitative analysis provides useful information to understand Vietnam's trade liberalisation process and the country-specific socio-economic framework (Le, 1996; Le et al., 2002; Nguyen, 2004; Thanh, 2005). Quantitative analyses are diverse and can be divided into two groups: sectoral and computable general equilibrium (CGE) studies. Existing sectoral studies employ different methodologies, such as

partial equilibrium models and household surveys. They cover Vietnam's main exports such as rice, textiles, sugar, coffee, tea, maize and fisheries (Rama and Le, 2005). Standard CGE models are applied in many studies.

Fukase and Martin's (2000, 2001) studies are the first that employ a CGE model in estimating the impacts of trade policy in Vietnam. Their first study (Fukase and Martin, 2000) investigates the impact of the US granting the Most Favoured Nation (MFN) status to Vietnam. It is predicted that total Vietnamese exports to the US would increase by 127 per cent. This increase is largely caused by 16-fold increase in clothing exports.[3] In the second study, Fukase and Martin (2001) evaluates the impact of Vietnam's accession to the AFTA. Modest effects are predicted on output in most industries, the largest expansion being in the apparel industry, where Vietnamese output is estimated to increase by 7-10 per cent. In contrast, the outputs of some import competing sectors are likely to contract due to increasing competition.

Roland-Holst et al. (2002) present a set of assessments of the long-term economic effects of Vietnam's accession to the WTO using a dynamic CGE model for the Vietnamese economy. Their results suggest that considerable gain for Vietnam could be multiplied with complementary domestic reform and particularly with negotiated bilateral or regional market access. Nguyen and Ezaki (2005) attempt to analyse the effects of Vietnam's ongoing regional economic integration focusing on growth, poverty reductions and income distribution using a CGE model with ten household groups in both urban and rural areas. Their results indicate that the regional economic integration generally has positive effects, which is both welfare enhancing and income-distribution improving for Vietnam. Household income and consumption would increase, and poor and rural households are predicted to benefit more than high-income urban households.

Dimaranan et al. (2005) examines the impacts of Vietnam's merchandise trade liberalisation under the WTO using GTAP-DD model developed by Ianchovichina (2003). They show an annual gain of US$376 million accruing to Vietnam in a deep trade liberalisation scenario.

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[3] Abbott et al. (2007) notes that Vietnamese exports to the US increased more than predicted even in the short period from 1996 to 2000 and more than ten times over the period from 1996 to 2004. The actual data do not support the huge increase in exports of clothing. Instead, exports of textiles increased. In addition, exports of electronics and machinery increased significantly, which was more than predicted.

Huong and Vanzetti (2006) also provide a CGE impact assessment of the WTO accession on the Vietnamese economy. Six scenarios are simulated using the GTAP model: Unilateral, bilateral, regional, multilateral liberalisation, as well as a harmonised tariff and global free trade. The results suggest only limited gains in the agricultural and resource sectors, but large effects on the textiles and apparel sectors. Boumellassa and Valin (2009) attempts to capture the impact of actual tariff commitments at a disaggregated level using MAcMap-HS6.[4] The research also takes into account other trade arrangement of Vietnam into the baseline and the role of textile and garment sectors. Their results are also in line with previous studies, showing that gains for Vietnam associated with the WTO accession are positive for merchandise commitments, but highly dependent on the evolution of textiles and apparel sectors, whose exports were boosted by the commitments.

Most of the existing CGE studies share the same prediction with regard to the expansion in the garment and textile sectors, while output gains are either limited or even negative in other industries, including agriculture, machinery and transportation equipment. However, different scenarios of tariff reduction results in different magnitudes of changes. Changes in aggregate output also vary greatly from 15 per cent increase in GDP (Huong and Vanzetti, 2006)[5] to a reduction of 0.68 per cent in Nguyen and Ezaki (2005).

Factors other than tariff are addressed in some studies. Huong and Vanzetti (2006) consider simulation that permits unemployment. Roland-Holst et al. (2002) allow for substantial productivity gains, while Dee et al. (2005) include pro-competitive effects of services sector reform and imperfect competition. Impacts of trade facilitation and sector-specific liberalisation are assessed in a number of studies. Ando (2009) separates the effects of trade facilitation and technical assistance from tariff liberalisation using a static GTAP model. The finding shows that the impacts of trade facilitation are more profound than impacts from tariff reduction in all countries. Technical assistance plays large role in developing countries, but not in developed countries such as Singapore or Japan. Otsuki

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[4] The MAcMap-HS6 database, constructed jointly by CEPII (Centre d'Études Prospectives et d'Informations Internationales, Paris) and ITC (International Trade Centre, Geneva), provides detailed protection data at the six-digit level of the harmonized system based on Market Access Map.

[5] This result is obtained when the assumption of full employment and endogenous wages is relaxed to account for unemployment and underemployment.

(2011) examines the impact of trade facilitation in ASEAN on both ASEAN and non-ASEAN countries using a gravity model. The study finds that within ASEAN, Vietnam, Cambodia and the Philippines tend to experience a greater percentage increase in their trade flows as a result of their own efforts to improve trade facilitation indicators. Yet, countries with no change in trade facilitation can still enjoy trade gains from their partners' improvements.

Vietnam's participation in regional FTAs are assessed in a number of studies. Toh and Vansudevan (2004) evaluates Vietnam's trade liberalization under four scenarios: AFTA, ASEAN-China FTA, ASEAN-Japan FTA and ASEAN-China-Japan FTA. The study, which employs GTAP model version 5 with the base year of 1997, indicates large welfare and trade impacts for Vietnam especially in regional trade agreements beyond AFTA due to the "economies of scale" effect in terms of lower cost of adjustment. To (2010) evaluates impacts of some current and hypothetical regional FTAs on Vietnam's welfare and sectoral output. The study, which treats rice as a "sensitive sector", reveals the importance of liberalizing the rice sector. When rice is excluded from regional trade liberalization, welfare gains of rice exporting and importing countries fall significantly. Vietnam's agricultural production would expand if rice is liberalized, but would contract otherwise.

Recent papers by Itakura (2013) and Itakura and Lee (2012) evaluate the impact of ASEAN economic integration, taking into account reduction in trading time resulting from ASEAN's regional economic integration. The results are positive for ASEAN countries in general and for Vietnam in particular. Vietnam's GDP is expected to increase as high as 12.1 per cent under five ASEAN+1 FTAs, 12.5 per cent in the ASEAN+3 FTA scenario and 13.4 per cent in the RCEP (ASEAN+6 FTA) scenario. Improvement in Vietnam's economic welfare is also significant, but at about 2 percentage points lower than the gain in GDP, which is caused by deterioration in its terms of trade.

4. Model description and scenarios

4.1. Model description

The model used in this study, known as the LINKAGE model, is a dynamic global CGE model developed by van der Mensbrugghe (2005), which has been used in assessments of

various trade policy scenarios and policy-induced price distortions (e.g. Anderson, Martin and van der Mensbrugghe, 2013).[6] A version of the model used in this study spans the period from 2004 to 2020. While the model is recursive dynamic and relies on sequential static computation of equilibria, intertemporal trends are specified for factor growth (labour) and accumulation (capital), as well as changes in productivity. Land is assumed to be price-responsive, with an overall upper limit to land availability.

On the supply side, all sectors are assumed to be perfectly competitive and operate under constant returns to scale. Firms employs capital, skilled labour, unskilled labour and intermediate inputs to produce output. Production is modelled using a nested constant elasticity of substitution (CES) structure. Factor inputs are chosen to minimize cost of any given output level. Firms enter and exit in response to profits and losses, and the prices will adjust until all firms earn zero economic profit in the long run.

On the demand side, products are differentiated by region of origin and modelled as imperfect substitutes. This is reflected by the implementation of the Armington (1969) assumption, where a nested CES specification is used to incorporate imperfect substitution between domestically produced products and an aggregate import bundle, as well as among imported products from different trading partners.[7]

Within each period, capital is classified as being either *old* or *new*. New capital is generated by the previous period's investment. This vintage structure of capital allows for differentiating the substitution possibilities across inputs by the age of capital.

The model distinguishes between four trade prices. First, producers receive price *PE* for exported goods. Second, the FOB price, *WPE*, includes domestic export taxes or subsidies. Third, the CIF price, *WPM*, includes the international trade and transport margins, represented by the ad valorem wedge ζ, as well as a non-monetary or frictional trade cost, represented by

[6] For detailed description of the LINKAGE model, see van der Mensbrugghe (2005). Version 7 of the model is used in this study.

[7] At the top nested level, each agent chooses to allocate aggregate demand between locally produced products and an aggregate import bundle, while minimizing the overall cost of the aggregate demand bundle. At the second level, aggregate import demand is allocated across different trading partners, again using a CES specification, where the aggregate costs of imports are minimized.

the iceberg parameter λ. Thus the relationship between the FOB price and the CIF price is given by

$$WPM_{r,r',i} = \left(1 + \zeta_{r,r',i}\right)WPE_{r,r',i} \Big/ \lambda_{r,r',i} \tag{1}$$

where subscripts r, r', and i denote exporting region/country, importing region/country, and commodity, respectively. Finally, the domestic price of imports, *PM*, is equal to the CIF price, *WPM*, plus tariffs (or tariff-equivalent). In our model, an increase in $\lambda_{r,r',i}$ represents a reduction in trade-related risks, lower administrative barriers to trade (e.g. customs procedures) and/or a fall in technical barriers. In other words, trade facilitation increase the value of $\lambda_{r,r',i}$.

Most of the data used in the model come from the GTAP database, version 7, which provides 2004 data on input-output, value added, final demand, bilateral trade, tax and subsidy data for 112 regions and 57 sectors. For the purpose of the present study, the database is aggregated into 12 regions and 20 sectors as shown in Table 4. These regional and sectoral groupings are chosen to cover Vietnam's major trade and investment partners as well as major trading commodities.

4.2. The Baseline Scenario

To evaluate the effect of Vietnam's unilateral trade liberalisation, we first establish a baseline, which shows the path of each economy over the period 2004-2020 in the absence of trade liberalisation, an increase in FDI inflows, a reduction in administrative and technical barriers, or a reduction in the trade and transport margins. Population and labour force growth are exogenous and obtained from the US Census Bureau's *International Data Base* and International Labour Organisation's *Economically Active Population Estimates and Populations*. Labour force growth is equal to the growth of the working age population (15-64). Capital accumulation depends on savings, investment and depreciation. Real GDP growth rates over the period 2010-2020 in the baseline are consistent with the IMF's *World Economic Outlook Database*. We assume that the trade and transport margins decline by 1 per cent per annum in every country/region.

Table 4: Regional and sectoral aggregation

A. Regional aggregation

Country/region	Corresponding economies/regions in the GTAP database
Vietnam	Vietnam
Singapore	Singapore
ASEAN-4	Indonesia, Malaysia, Philippines, Thailand
Other ASEAN	Brunei, Cambodia, Lao PDR, Myanmar
China	China and Hong Kong
Japan	Japan
Korea	Korea
Taiwan	Taiwan
Australia	Australia
United States	United States
European Union	28 member states of the European Union
Rest of world	All the other economies/regions

B. Sectoral aggregation

Sector	Corresponding commodities/sectors in the GTAP database
Rice	Paddy rice, processed rice
Other crops	Wheat, other grains, vegetables and fruits, oil seeds, sugar cane and sugar beet, plant-based fibres, crops nec
Other agriculture	Livestock, raw milk, wool, forestry, fishing
Minerals and products	Minerals, mineral products, coal, gas and coal products
Crude oil	Oil
Processed food	Meat products, vegetable oils and fats, dairy products, sugar, food products nec, beverages and tobacco products
Textiles	Textiles
Wearing apparel	Wearing apparel, leather products
Petroleum products	Petroleum products
Chemicals, rubber and plastics	Chemical, rubber and plastic products
Metals and products	Iron and steel, nonferrous metal, fabricated metal products
Machinery	Machinery and equipment
Electronic equipment	Electronic equipment
Transportation equipment	Motor vehicles, transport equipment nec
Other manufactures	Wood products, paper products, publishing, manufactures nec
Construction and utilities	Construction, electricity, gas distribution, water
Trade and transport	Trade, sea transport, air transport, transport nec
Financial services	Insurance, financial services nec
Other private services	Communication, business services, recreation and other services
Government services	Public administration and defence, education, health services

Note: nec = not elsewhere classified.

Several assumptions underline the calibration of productivity. Agricultural productivity is fixed in the baseline using results from previous studies. Sectoral productivity in non-agricultural sector is composed of three components: a uniform economy-wide factor that is calibrated to achieve the driven GDP target, a sector-specific factor related to openness, and a constant shifter. The sector-specific factor intended to capture openness-sensitive changes in productivity $\chi_{i,t}$, is given by

$$\chi_{i,t} = \phi_{i,i} \left(\frac{E_{i,t}}{X_{i,t}} \right)^{\eta_i} \tag{2}$$

where $E_{i,t}$ is exports of commodity i, $X_{i,t}$ is output of commodity i, $\phi_{i,t}$ is a shift parameter, and η_i is the elasticity of productivity with respect to openness. $\phi_{i,t}$ is calibrated in the baseline scenario so that the trade-sensitivity portion of sectoral productivity is some share of total productivity.[8]

4.3. Policy scenarios

Previous assessments of Vietnam's trade liberalisation are largely based on the removal of tariffs on traded goods. While liberalisation of trade in goods is the most visible, other reform processes are also important. This paper makes a contribution to the literature by taking into account and evaluating the impacts of other aspects of the trade liberalisation process in Vietnam. The simulation period is from 2010 to 2020, when Vietnam's tariffs under the currently participated regional trade commitments decline significantly. Major trade facilitation measures are also expected to take place during the 2010-2020 period. Specifically, the following six policy scenarios are considered in this study:

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[8] Openness has been linked to increased productivity via three main channels. These consist of the imports of technology-intensive intermediate inputs, imports of capital goods, and export market penetration. The third effect can arise because of the higher standards required to access and penetrate foreign markets, relative to those prevailing at home. There is considerable empirical work aimed at ascertaining the extent to which each one of these different channels operates. For example, Das et al. (2007) examine firm-level characteristics of export supply responses. Trefler (2004), Chen et al. (2009), and Joanna (2014) show that export and/or import penetration exerts a positive effect on productivity.

Scenario 1 (S1): Vietnam's unilateral removal of trade barriers on goods over the period 2010-2020.

Scenario 2 (S2): Vietnam's unilateral removal of trade barriers on services over the period 2010-2020.

Scenario 3 (S3): Increased FDI inflows to Vietnam during the period 2010-2020 resulting from further trade liberalisation.

Scenario 4 (S4): Reduction in administrative and technical barriers to trade (TBTs) by 2.5 per cent over the period 2010-2020.

Scenario 5 (S5): Reduction in the trade and transport margins by 10 per cent over the period 2010 to 2020.

Scenario 6 (S6): Combination of scenarios 1-5 simultaneously.

In addition to the above policy changes, in all policy scenarios, we allow for increased sectoral productivity with respect to openness following equation (2).

In Scenario 1, Vietnam's tariffs on all products are gradually removed from their initial levels in 2004 by an equal fraction from the year 2010 to reach 0 per cent in the year 2020. Table 5 provides the tariff rates on products for the year 2004, as well as tariff equivalents of NTBs on services, the capital-labour ratio, the ratio of skilled labour to unskilled labour and other key sectoral statistics in Vietnam at the base year.

Scenario 2 is included because the commitment to liberalise trade in services is a part of Vietnam's WTO accession commitments and is an important component of the FTAs in which Vietnam is a member. Free trade in services is expected to benefit the economy in many aspects. It would lead to lower prices and a higher quality of services, which benefit both consumers and producers. In addition, it would enhance competition in the services sectors and efficiency of the economy. Better services also make a country more attractive to foreign investors. Thus, it is important to include reductions in barriers ton services trade in the assessment of Vietnam's unilateral trade liberalisation. Under Scenario 2, the impacts of Vietnam's liberalisation in services trade are examined by linearly reducing tariff equivalents of non-tariff barriers during the 2010-2020 period.

Table 5: Some key statistics of Vietnam, 2004

	(1) Tariff rates (%)	(2) Capital-labour ratio ($ million / thousand persons)	(3) Ratio of skilled labour to unskilled labour	(4) Ratio of exports to total output	(5) Ratio of imports to total demand	(6) Ratio of imported intermediate inputs in total output
Rice	19.3	0.02	0.002	0.230	0.005	0.068
Other crops	11.2	0.02	0.001	0.445	0.291	0.191
Other agriculture	6.0	0.08	0.002	0.090	0.040	0.163
Minerals and products	8.8	1.51	0.037	0.192	0.165	0.159
Crude oil	-	5.43	0.060	1.000	0.000	0.066
Processed food	26.5	0.83	0.037	0.308	0.271	0.129
Textiles	30.7	0.86	0.032	0.345	0.615	0.408
Wearing apparel and leather	24.0	0.80	0.030	0.703	0.277	0.300
Petroleum products	14.5	2.45	0.069	0.002	0.922	0.164
Chemicals, rubber and plastics	4.6	1.41	0.079	0.206	0.576	0.333
Metals and products	4.5	0.87	0.073	0.186	0.658	0.350
Machinery and equipment	6.3	1.11	0.101	0.556	0.816	0.530
Electronic equipment	7.0	1.11	0.081	0.309	0.416	0.440
Transportation equipment	22.3	1.34	0.071	0.099	0.450	0.334
Other manufactures	13.5	1.11	0.047	0.434	0.369	0.249
Construction and utilities	6.0	1.28	0.034	0.011	0.018	0.074
Trade and transport	7.5	0.12	0.022	0.171	0.312	0.247
Financial services	17.7	0.42	0.069	0.156	0.250	0.267
Other private services	9.5	0.23	0.069	0.251	0.341	0.202
Government services	10.5	0.34	0.154	0.070	0.074	0.139

Notes: The tariff rates for five services sectors in column 1 are ad valorem equivalents of non-tariff barriers. Skilled labour includes managers and administrators, professionals and para-professionals. Unskilled labour consists of clerks, salespersons, personal service workers, plant and machine operators and drivers, trades-persons, labourers and farm workers.

Source: General Statistics Office of Vietnam (GSO), GTAP database, version 7, and the authors' calculation.
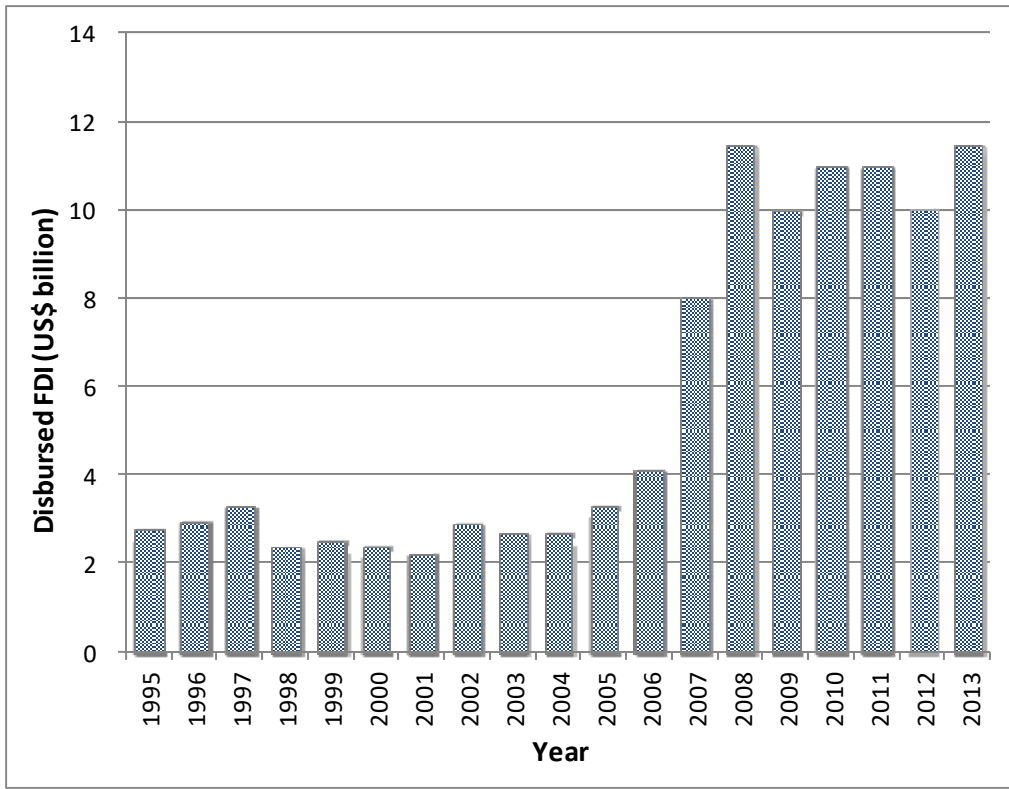
Trade liberalisation and the attraction of foreign direct investment (FDI) have been two important processes and sources of economic growth for Vietnam (Hoang et al., 2013; Petri, Plummer and Zhai, 2012). Vietnam has attracted large FDI inflows during the last two decades, and average annual inflows in the past several years are comparable to inflows to Malaysia and Thailand (UNCTAD, various years). Vietnam's success in attracting FDI has largely resulted from country-specific advantages.[9] Furthermore, its trade liberalisation and reforms have made it more attractive to foreign investors.

Since trade and FDI are closely related, it would be ideal to endogenise FDI flows in the model so that the interaction between trade, FDI and production can be captured. However, this would require extremely detailed FDI data by source, destination and sector, in the same way as trade data. Since such FDI data are unavailable, in Scenario 3 the difference between the growth rates of FDI inflows to Vietnam before and after its accession to the WTO is computed, and is used as the percentage increase in the growth rate of FDI inflows (relative to the baseline) resulting from further trade liberalisation. Using annual disbursed FDI data for Vietnam shown in Figure 3, the average annual growth rate of FDI inflows over the period 2006-2013 is calculated to be 12.4% higher than that of FDI inflows over the period 1995-2006 (the pre-WTO accession period). It is assumed that FDI inflows would continue to grow 12.4% higher from 2010 to 2020, compared with the baseline. Since the disbursement of FDI in Vietnam was $10.0 billion in 2009, additional FDI inflows of $1.24 billion was injected to Vietnam each year from 2010 to 2020. In addition, it is assumed that the increase in FDI inflows from each region during the period 2010-2020 is in proportion with the shares of Vietnam's FDI stock by source country/region in 2010.

Trade facilitation as a part of trade reform has been a continuing process in Vietnam. It includes streamlining of customs procedures, usage of modern technology in trade-related procedures, improved transparency and the acceptance of common technical standards. Over the past years, the Vietnamese government has undertaken various measures along this line. For example, with the World Bank's supports, the General Department of Vietnam Customs

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[9] Nguyen and Nguyen (2007) point out some advantages that make Vietnam an attractive host country, such as its strategic location in a rapidly growing region, stable economic and political environment, large natural resources, abundant, young and relatively well-educated labour force, large and growing domestic market and liberal investment policies.

Figure 3: Annual disbursed FDI in Vietnam, 1995-2013 (US$ billion)

Source: General Statistics Office of Vietnam (2014).

has been implementing a modernization project. In January 2013, Vietnam launched electronic customs covering electronics submission and processing of customs declarations. In terms of standards and technical regulation, as of 2012, Vietnam had 6,800 national standards,

Trade facilitation as a part of trade reform has been a continuing process in Vietnam. It includes streamlining of customs procedures, usage of modern technology in trade-related procedures, improved transparency and the acceptance of common technical standards. Over the past years, the Vietnamese government has undertaken various measures along this line. For example, with the World Bank's supports, the General Department of Vietnam Customs has been implementing a modernization project. In January 2013, Vietnam launched electronic customs covering electronics submission and processing of customs declarations. In terms of standards and technical regulation, as of 2012, Vietnam had 6,800 national standards, of which 40% have been harmonized with international, regional, or foreign standards (WTO, 2013, p. 10). The process of standard harmonization is still ongoing, thus the ratio of

harmonized standards would be higher, making it easier for traders to deal with technical barriers. The above cases and similar trade facilitation measures are expected to lead to reductions in administrative and technical barriers to trade, thereby reducing real trade cost. In Scenario 4, reductions in these barriers are represented by an increase in the iceberg parameter $\lambda_{r,r',i}$ in equation (1). It is assumed that the value of $\lambda_{r,r',i}$ is increased by the same percentage for all trading partners and all products. Following Smith and Venables (1988) and Lee, Owen and van der Mensbrugghe (2009), administrative and technical barriers to trade are reduced by 2.5 per cent over the period 2010-2020.[10]

The fifth factor that is taken into consideration in the model is transport costs. Reductions in transport costs have been a major factor contributing to the high growth of international trade over the last half-century. For developing countries that export low-value and bulk goods, transport costs often comprise a large percentage of export prices. Due to poor infrastructure, particularly those that serve international transport of goods such as ports and harbours, transport costs from Vietnam have been higher than that of other neighbouring countries.[11] Such high transport costs have seriously affected the price competitiveness of Vietnamese goods in both overseas and domestic markets. It is expected that with further reform in Vietnam, infrastructure would be improved, thereby lowering the shipping cost. A reduction in transport costs would have a direct impact on the competitiveness of the industry, facilitating trade and investment. Scenario 5 aims at evaluating these impacts.

Statistics on international transport margins show that they tend to remain quite stable over time or decline at a low rate. Data on ad valorem freight costs in the US show a declining trend of more than 30 per cent over the period 1974-2004. By contrast, that of New Zealand fluctuated between 7 and 11 per cent of import values during 1963-1997 (Hummels, 2007). Stone and Strutt (2009) review several studies that assess the effects of improvements in infrastructure and associated reductions in transportation costs in the Greater Mekong

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[10] The value of $\lambda_{r,r',i}$ is increased by $1/(1 – 0.025) – 1 = 0.0256$ or 2.56 per cent during 2010-2020.

[11] For example, the fee to transport goods in a 40-foot container from Vietnam to the US is US$3,000 on average, which is relatively higher than China ($2,700) and Thailand ($2,500). Costs for transportation and communications services in Vietnam also account for a relatively large share in enterprises' total production costs (20%, compared with 5% in Japan, 8.4% in the US and 9% in Australia, 10% in China and 15% in Brazil. See http://vietnambusiness.asia/transport-fees-hurt-business-performance/

Subregion (GMS) and find the median value to be 45 per cent. This figure may be justified in the context of the GMS since transportation has been the highlight of the GMS's regional cooperation and has received large investments from regional governments and international donors. Transport costs between Vietnam and its trading partners are likely to be reduced at a much lower rate. We have chosen to examine the effects of a 10 per cent reduction in the trade and transport margins between Vietnam and its partners over the period 2010-2020. The 10 per cent reduction over the ten-year period is comparable to that of the US during the period 1974-2004.

We evaluate the effects of each factor mentioned above on economic welfare, trade and sectoral outputs. The purpose is to disentangle from one another the effects of the removal of tariffs on goods, the removal of NTBs on services, an increase in FDI inflows, a reduction in TBTs and a fall in trade and transport margins. All these policy changes are then combined in Scenario 6 to assess the overall impact of trade liberalisation.

5. Results

5.1. Aggregate results

In this section, we examine changes in economic welfare, total trade and gross output of Vietnam. Since these scenarios present independent policy options, the results of each scenario are analysed separately.

Scenario 1: Vietnam's unilateral removal of trade barriers on goods

As indicated in Table 6, the removal of tariffs on traded goods has strong effects on trade and production in Vietnam. Exports and imports are predicted to be 40.2 and 32.0 per cent higher compared with the baseline for the year 2020. Under Scenario 1, real output rises by 8.8 per cent, but economic welfare increases by only 1.0 per cent.[12] These results are consistent with the standard trade theory, which suggests that a unilateral tariff liberalisation would result in relatively large allocative efficiency gains and deterioration in the liberalising

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[12] Huff and Hertel (2000) show that in the GTAP model the aggregate welfare effect is equal to the sum of the contributions of allocative efficiency effect, terms-of-trade effect and investment-savings effect. Since the contribution of the investment-savings effect is rather small, the aggregate welfare effect is approximately equal to the sum of the first two terms.

country's terms of trade. When Vietnam removes tariffs, its import demand increases substantially, while the foreign export supply does not change, resulting in a worsening of the terms of trade.[13]

At the same time, the removal of tariffs would also increase Vietnam's exports. Since Vietnamese goods and other countries' goods in the same product category are treated as imperfect substitutes, increases in Vietnam's exports would result in lower world prices of its exports, further worsening Vietnam's terms of trade. When the Armington assumption is used in the model, trade liberalisation leads to large terms-of-trade effects because monopoly power is implicit in the assumption of national product differentiation (Brown, 1987).

Table 6: Changes in Vietnam's major economic indicators

(Percentage deviations from the baseline in 2020)

	S1	*S2*	*S3*	*S4*	*S5*	*S6*
Economic welfare	1.0	0.1	1.3	3.1	2.8	8.4
Exports	40.2	1.8	0.3	3.9	4.0	54.7
Imports	32.0	1.5	2.2	5.8	5.5	52.2
Total output	8.8	0.3	1.6	1.2	1.2	14.0

Notes: Hicksian equivalent variation is used as the measure of economic welfare. Total output includes output of both intermediate and final goods and services.

Source: Simulation results.

Scenario 2: Vietnam's unilateral removal of trade barriers on services

Liberalisation of the services sectors in Scenario 2 has a limited impact on trade and output. Since the services sector is still underdeveloped in Vietnam, accounting for only 7.9 per cent of exports, 10.8 per cent of imports and 28 per cent of total output in the base year 2004, the removal of NTBs on services is predicted to increase exports and imports by only 1.8 and 1.5 per cent respectively. The allocative efficiency effects are modest, hence output

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[13] Vietnam's terms of trade is approximately equal to the ratio of a trade-weighted average of the world prices of Vietnam's exports to a trade-weighted average of the world prices of Vietnam's imports.

only increases by 0.3 per cent. At the same time, the unilateral removal of NTBs on services worsens Vietnam's terms of trade in the same way as the removal of tariffs on goods. The terms-of-trade loss offsets gains in output, resulting in only 0.1 per cent increase in welfare.

However, these results need to be interpreted with caution. Greater competition in the services sectors is expected to result in an improvement of quality in many service activities, such as communication, distribution and transportation, leading to efficiency gains and cost reductions for firms that use services in the production processes. However, since a quality improvement is not modelled in our study, the output and welfare estimates are likely to be underestimated.

Scenario 3: Increase in FDI inflows to Vietnam

In Scenario 3, additional FDI inflows increase investment and demand for intermediate goods. Thus, production and imports rise. Since tariffs are unchanged, the terms of trade are not significantly affected. Changes in relative prices are also rather small. The model predicts that economic welfare and total output would increase by 1.3 and 1.6 per cent, respectively. However, these projections are likely to be underestimated because positive spillovers between FDI inflows and productivity are not incorporated in the model. Javorcik (2004) shows that spillovers from foreign affiliates to their suppliers in host countries are positive and significant. While there is a large body of literature examining spillover effects of the activities of multinational firms, such effects vary substantially among host countries and industries (Blomström and Kokko, 1998). Since the incorporation of spillover effects in a general equilibrium framework is challenging, it is left for future research.

Scenario 4: Reduction in administrative and technical barriers to trade

In Scenario 4, a reduction in administrative and technical barriers to trade is modelled by an increase in the parameter $\lambda_{r,r',i}$ in equation (1), which represents an improvement in trade facilitation and thus lowers real trade cost between Vietnam and its trading partners. This has direct impacts on both export and import prices, causing changes in both foreign and Vietnam's export supply and import demand. The direction of change in the terms of trade would depend on the relative magnitudes of changes in supply and demand of both exports and imports. It is possible for Vietnam's terms of trade to increase. The real output gain of 1.1

per cent and welfare gain of 3.0 per cent indicates that Vietnam experiences a terms of trade gain under this scenario.

Scenario 5: Reduction in trade and transport margins

A reduction in trade and transport margins has a similar effect to a reduction in TBTs and can affect the terms of trade in either direction. The results under this scenario show a welfare gain of 2.8 per cent, which is greater than the real output gain of 1.2 per cent. Trade expands because of lower trade and transport costs.

In Scenarios 4 and 5, an improvement in the terms of trade resulting from lower TBTs and trade and transport margins is a reasonable outcome. Because Vietnam's share of imports and exports constitutes a very small part of total world trade, the increase in its import demand would be small compared with the increase in foreign export supply. Thus the world price of Vietnam's imports tends to decline. At the same time, lower real trade costs between Vietnam and its trading partners would lead to an increase in foreign demand for Vietnamese goods, which is likely to outweigh the increase in Vietnam's export supply, leading to a higher world price of Vietnam's exports.

Scenario 6: Combination of Scenarios 1-5

When policy scenarios 1-5 are combined, the percentage increases in economic welfare, aggregate exports and imports, and total output are all quite large. The combined effects of the five scenarios are slightly higher than the sum of five individual effects, which is caused by non-linear model equations.

The aggregate results suggest that the removal of merchandise trade barriers has a strong impact on Vietnam's trade volume and total output, but a relatively small effect on its economic welfare largely because of deterioration in its terms of trade. Reductions in TBTs and the transport margins have large positive effects on economic welfare. Increases in FDI inflows lead to similar percentage gains in output and welfare since the change in relative prices is rather small.

5.2. Sectoral results

The empirical results reveal that trade liberalisation will have a strong impact on many sectors in Vietnam. Some sectors which can explore Vietnam's comparative advantage will expand their productions and exports greatly, while some other sectors are forced to contract due to competition from imported goods or from the expanding sectors. Table 7 presents the effects on sectoral output under Scenarios 1-6, which are discussed below.[14]

Scenario 1: Vietnam's unilateral removal of trade barriers on goods

The simulation results reveal that the removal of tariffs has a strong impact on the composition of sectoral output. The output of manufacturing sectors expands at the expense of other sectoral groups. The expansion of output is particularly large in textiles and wearing apparel. These results are consistent with those suggested by the Heckscher-Ohlin (H-O) model. Vietnam is both labour-abundant relative to capital, and unskilled-labour-abundant relative to skilled-labour. Thus, one would expect that output of labour-intensive and unskilled-labour-intensive goods to increase after trade reform, provided that the level of technology across country and sector is identical. Since wearing apparel has the lowest ratios of capital to labour and skilled to unskilled labour among the manufacturing sectors (columns 2 and 3 of Table 5), it is reasonable that output increases the most in these sectors. Among the services sectors, output increases most in the trade and transport sector for the same reason.

The H-O model assumes that countries have identical technology in order to isolate the effects of differences in relative factor endowments between countries and sectors. Given that technology among countries and sectors differ substantially, changes in sectoral output resulting from unilateral trade liberalisation cannot be explained by the H-O model alone. In the case of the agricultural sectors, except for other crops, average labour productivity, measured by the ratio of output to the number of workers, is substantially smaller in Vietnam than in most of its trading partners. Given that Vietnam requires a greater number of workers

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[14] Since the percentage changes in sectoral value-added are quite similar to those in sectoral output, we only report the effects on sectoral output in Table 7. One of the limitations of the GTAP database is that it only provides the data on the values of wage payments to skilled workers and unskilled workers by industry; it does not provide the actual number of skilled and unskilled workers employed in each industry. Due to this data limitation, we are unable to provide the impact on employment (the actual number of skilled and unskilled workers employed), either at the sectoral level or for the entire economy.

Table 7: Effects on sectoral outputs
(Percent deviation from the baseline in 2020)

Sector	S1	S2	S3	S4	S5	S6
Agriculture and food	**-11.1**	**0.1**	**-0.2**	**-0.4**	**-0.3**	**-13.0**
Rice	-5.4	0.2	-0.6	0.3	0.5	-6.1
Other crops	3.6	0.5	-2.0	-1.3	-1.4	-0.8
Other agriculture	-9.1	-0.4	0.7	0.1	0.2	-9.6
Processed food	-17.5	0.2	0.2	-0.5	-0.4	-19.7
Mineral and fuel	**-9.5**	**1.3**	**1.7**	**-1.0**	**-2.1**	**-12.1**
Minerals and products	-5.9	1.0	1.5	-0.5	-1.8	-8.4
Crude oil	-18.2	1.9	2.0	-2.2	-3.0	-21.2
Manufactures	**24.4**	**1.1**	**1.8**	**2.5**	**2.5**	**35.6**
Textiles	31.5	1.2	1.2	3.3	4.1	43.5
Wearing apparel	94.1	1.1	1.3	7.1	8.0	125.9
Petroleum products	-49.6	1.4	2.4	-10.8	-11.4	-60.3
Chemicals, rubber and plastics	1.1	1.0	1.3	-0.2	-0.6	1.0
Metals and products	-2.8	1.3	2.6	-0.7	-1.5	-2.0
Machinery	11.8	1.6	1.6	4.3	2.4	22.3
Electronic equipment	-1.1	0.8	2.6	2.7	3.0	6.9
Transportation equipment	-11.6	0.7	2.5	-0.2	-0.1	-9.0
Other manufactures	-5.7	1.1	1.8	0.3	0.0	-3.7
Services	**-0.7**	**-1.0**	**2.0**	**0.7**	**0.8**	**1.1**
Construction and utilities	-1.4	-0.4	4.9	1.5	1.2	5.4
Trade and transport	13.7	-1.9	1.2	1.8	2.3	17.8
Financial services	-5.6	-3.9	1.5	-0.7	-0.3	-10.3
Other private services	-7.1	-2.1	0.8	-0.4	0.0	-10.0
Government services	-2.4	0.4	-0.8	0.1	0.1	-3.5
All sectors	**8.8**	**0.3**	**1.6**	**1.2**	**1.2**	**14.0**

Source: Simulation results.

to produce the same units of agricultural output than its trading partners, contraction of output of rice and other agriculture can be explained by the Ricardian model. In addition, low shares of imported intermediate inputs in total output in these sectors imply that the extent of reduction in the intermediate input cost in the rice and other agricultural sectors is rather small.

Fuel and minerals also contract as trade is liberalised. This sector consists mainly of coal and crude oil, which are extracted, then exported or used in other sectors as raw materials. Like agriculture, these resource-based sectors have low ratios of imported intermediate inputs in their total outputs (0.159 and 0.066, as shown in column 6 of Table 5). Thus the benefit from cheaper intermediate inputs is small and the sectors become less competitive compared with manufacturing sectors. In a general equilibrium framework, factor constraint plays an important role in resource allocation. As the wearing apparel and leather, textile, and trade and transport sectors all expand output, they draw resources from other sectors by bidding up the factor prices (e.g. the wage rate and the rental rate on capital). As a result, other sectors' marginal cost will increase and their output levels are likely to decrease. One notable exception is the machinery and equipment industry, where a large share of imported intermediate inputs in total output (0.53) result in a considerable fall in the intermediate input cost after trade liberalisation, more than offsetting an increase in the factor prices and thus resulting in an output expansion.

Scenario 2: Vietnam's unilateral removal of trade barriers on services

When trade barriers on services are removed, imports of services expand substantially (16.7%), while exports grow at only 3 per cent, leading to a reduction in output (-1.0%). Output of other sectors expands slightly as the results of lower costs of intermediate services.

Scenario 3: Increase in FDI inflows to Vietnam

An increase in FDI inflows lead to higher output levels in all sectors other than rice and other crops. This is because the additional FDI will be used for additional capital goods, which mainly consist of plants, buildings and machinery. Electronic equipment (such as computers) and transportation equipment purchased by firms for their intermediate inputs are also classified as capital goods. Demand for construction will increase substantially when new plants and buildings are constructed following additional FDI inflows. Demand for other

capital goods, such as machinery, electronic equipment and transportation equipment are also expected to rise. Increases in the output of non-capital goods sectors mainly result from increases in intermediate demand. For example, output expansion in construction, machinery, electronic equipment and transportation equipment requires additional intermediate inputs of steel, other metal, fuel, and other goods and services. Compared with the baseline scenario, the increase in FDI inflows over the period 2010-2020 leads to an expansion of nearly 5 per cent in the construction and utilities sector, 2.6 per cent in the metal and electronics equipment sector and 2.5 per cent in the transportation equipment sector. By contrast, some goods such as rice and other crops are hardly used as intermediate inputs for capital goods sectors. When the wage rate increases as a result of higher demand for labour, the production cost will increase, leading to a reduction in the output of rice and other crops.

Scenarios 4 and 5: Reduction in TBTs and trade and transport margins

The effects on sectoral output resulting from reductions in TBTs and trade and transport margins are quite modest. This is mainly because the reductions in TBTs and transportation costs are not sector-specific. When TBTs and trade and transport margins decrease, percentage reductions in trade costs are relatively uniform across sectors. However, since the elasticities of substitution between domestic and imported products are different among sectors, the percentage increases in imports vary from sector to sector. More importantly, the ratios of imports to total demand vary greatly across sectors (column 5 of Table 5). In particular, Vietnam is extremely dependent on imports of refined petroleum products. When real trade cost decreases, the price of imported petroleum products falls and the domestic refined petroleum sector is forced to contract.[15] By contrast, some export-oriented sectors which are heavily dependent on imported intermediate inputs, such as wearing apparel, textiles, machinery and electronic equipment, would expand owing to the reduction in trade and transport related costs.

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[15] However, the simulated reduction in outputs of petroleum products is small in absolute term due to the small size of the sector.

Scenario 6: Combination of scenarios 1-5

Sectoral adjustment is most significant in scenario 6 when all policy changes are combined together. Changes in sectoral outputs are close to the sum of the changes under scenarios 1 to 5. The manufacturing sector as a whole is predicted to expand by 35.6 per cent compared with the baseline. The output of service sectors increase by 1.1 per cent, mainly due to the positive impact of the additional foreign investment in scenario 2. On the other hand, agriculture and food, minerals and fuel all suffer significant contractions, largely as a result of the removal of tariffs on traded goods. In this scenario, the strong growth of wearing apparel leads to a less diversified export structure in which wearing apparels are projected to account for 42.9 per cent of total exports in 2020, compared with 25.2 per cent in the baseline for the same year.

The different impacts on sectoral outputs lead to changes in the output structure. It is clear that trade liberalisation would be an important catalyst for industrialisation. When all the factors are combined (scenario 6), the share of manufacturing sectors in total output increases by nearly 9 per cent compared with the baseline. At the same time, the shares of agriculture, minerals and fuel decline. A very large impact on sectoral adjustments would come from the removal of tariffs as this reduces distortion in the economy, so that resources are moved to unskilled labour-intensive sectors as predicted by the Heckscher-Ohlin model or to sectors with relatively high labour productivity as predicted by the Ricardian model. A structural shift towards a higher share for manufacturing sectors is predicted. However, a reduction in protection for agriculture, where more than half of the workforce is working, could raise some concerns. In this model, the assumptions of the homogeneity of unskilled labour, perfect labour mobility across sectors within a region and full employment guarantee that returns to factors employed in agricultural sectors improve and farmers benefit from trade liberalisation. In the reality, however, farmers and unskilled labour in non-agricultural sectors are not homogeneous, unemployment and underemployment are common, and costs involved in changing jobs need to be considered. Thus, a large number of farmers may not benefit from unilateral trade liberalisation.

It is vital that trade liberalisation is supported by domestic policy reforms and assistance to ease the transition and facilitate the adjustments. If the domestic goods and labour markets

do not function properly, then changes in relative prices from tariff reductions will not lead to optimal resource allocation. Poor infrastructure and communication can hamper movements of resources in the domestic market, hindering the benefits from trade reform. Thus, economic policies that enhance the functioning of markets and additional investment to improve infrastructure should be implemented to support the transition.

In addition, for agricultural workers to benefit from reform, they need to be accommodated in the new environment. Provisions of adequate education, job training and healthcare services would be crucial. When these assistances are not provided, there would be farmers who become unemployed resulting from agricultural contraction but would not be able to find new jobs in manufacturing sectors. This is the area where social supports are needed, so that the negative impacts of trade reforms would be reduced.

6. Conclusion

This paper has examined the effects of Vietnam's unilateral trade liberalisation in a dynamic general equilibrium framework, taking into account additional elements of the liberalisation process. In particular, it provides the economy-wide effects of an increase in FDI inflows, a reduction in TBTs and lower trade and transport margins. Several points can be made from the simulation results.

First, the removal of tariffs on traded goods has a strong positive impact on total output, exports and imports. Welfare gains, however, are much lower than the output expansion. The limited gain in welfare is caused by deterioration in the terms of trade, which are partly due to Vietnam's high initial tariffs and partly due to the model structure which assumes imperfect substitution between domestic and imported products. The results of tariff liberalisation in this study are in line with those of the unilateral trade liberalisation scenario in prior studies (e.g. Dimaranan et al., 2005; Boumellassa and Valin, 2009).

Second, greater inflows of foreign direct investment would result in higher output and economic welfare. In addition, foreign investment would facilitate further industrialisation as it creates higher demand for capital goods. It should be noted that if it were possible to incorporate spillover effects and/or to endogenise FDI flows by source, destination and sector,

the impacts on trade, particularly trade in intermediate goods, would be enlarged. Thus, the benefits of FDI inflows are expected to be even greater.

Third, since administrative and technical barriers to trade and transportation costs hinder flows of exports and imports, reductions in these barriers and costs lead to positive welfare gains. Our results suggest that improvements of physical infrastructure, streamlining of customs procedures and reductions in other administrative and technical barriers to trade would be an important channel for generating higher economic welfare.

Fourth, at the sectoral level, manufacturing sectors expand at the expense of the agricultural and minerals and fuel sectors. The output expansion is most significant in the textiles and wearing apparel sectors, which is unskilled-labour-intensive and low value-added. Exports are predicted to become heavily dependent on these sectors. Although an analysis of dynamic structural development is not within the scope of this study, the results point to the need to enhance the efficiency of the economy by moving its industrial structure up the value-added ladder from garment and textiles to electronics, machinery and other industrial sectors. This process requires, apart from an open trade policy, on-going foreign investment as a vehicle for attracting capital and technology. In addition, a policy designed to encourage children and young people to increase the number of years of schooling, which would in turn increase the endowment of skilled labour, would be important. This would help build up the ability to catch-up and make the best of its trade liberalisation process.

Finally, the contraction of agriculture is in line with our prior expectations and Vietnam's development policies. However, since more than half of the working population in Vietnam are employed in agriculture, the distributional impact would be significant. If workers in the agricultural sectors can find new jobs with higher salaries in manufacturing sectors, the contraction can be positive as it will lead to industrialisation and higher income for workers. However, those who cannot be retrained and adapt to the new environment would see their incomes worsen. Therefore, on one hand, job training for agricultural workers should be further developed to facilitate the adjustment process. On the other hand, a social safety net should be created to help those who would not be able to find a job outside agriculture.

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