Quantitative Impacts of East Asia Free Trade Areas: A Computable General Equilibrium Modelling

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Abstract: This paper analyses the relative economic effects of four East Asian FTA options. A particular feature of the model is the introduction of unemployment with the intention of assessing the changes in the real wage and unemployment in each region under each of those options. The results from the simulations show that the "EAFTA" multilateral agreement[1] would yield higher gains in welfare and greater economic impacts than any of the other possible bilateral agreements – ASEAN-China, ASEAN-Japan and ASEAN-Korea. However, such an 'ideal' multilateral economic integration might be deterred by the uneasy relationship between China and Japan, reflecting their economic and political differences.

Key words: Computable General Equilibrium, Free Trade Area, Trade liberalization, East Asia.

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1. Introduction

East Asia is probably the region that has been most active over the last decade in seeking the rapid expansion of Preferential Trade Agreements (PTAs). Establishing the East Asian Free Trade Area Agreement (EAFTA), which includes ASEAN (the Association of Southeast Asian Nations), China, Japan and Korea, is the major goal for the whole region.

Regionalism in East Asia has proliferated for three main reasons: (1) the failure of the Asia Pacific Economic Cooperation (APEC) group and the World Trade Organization (WTO) to have a substantial impact at both the continental and global levels; (2) the need of the East Asia economies to establish their own institutional identity in order to strengthen mutual co-operation following the adverse impacts on their economies of the Asian financial crisis in 1997; (3) the continued highly discriminatory nature of intra-regional trade in East Asia, which remains a major obstacle to expanding trade within the region.

Since 2000, there have been many attempts to negotiate a number of Free Trade Area (FTA) agreements within the region. However progress in the negotiation of the bilateral FTAs between ASEAN-Korea and ASEAN-Japan has proved to be fairly slow. In the meantime ASEAN and China have pursued their own trade agreement, their ambition being to remove most imported tariffs on trade with each other by 2010. The proposed ASEAN-China Free Trade Area (ACFTA) is the most ambitious and active initiative in East Asia at the moment. Its economic effects on both trading partners are expected to be substantial due to the increasing importance of China in world trade.

The intention of this paper is to analyze the economic effects of four different possible FTA options for the East Asian economies, using a 14-country, 14-sector Computable General Equilibrium (CGE) model as a tool. The paper is organised as follows: Section 2 describes the model specification. Section 3 extends the standard model to include labour market imperfections. Section 4 reports the model results under different policy simulations which can reflect to preferred strategy for each region, and then the sensitivity analysis is conducted to test for model robustness. Finally, the conclusions are presented in section 5.

2. Model Description

General outline

The data used in the CGE model are aggregated from Version 6 of the GTAP database, which reflects the global economy in 2001. The data are aggregated into fourteen regions, fourteen sectors, and three primary factors.[2] The regions are China, Japan, Korea, Indonesia, Malaysia, the Philippines, Singapore, Thailand, Vietnam, Other-ASEAN, North America Free Trade Area (NAFTA), European Union (EU), the Australia-New Zealand Closer Economic Relations (CER), and the Rest of the World (ROW).

The tradable sectors are a land-intensive sector, processed food, a natural-resource-intensive sector, textiles and apparel, shoes, wood and paper, petroleum, coal and metals, rubber and plastic, transport and motor equipment, electronics, machinery, other manufactures, transport, and other services. Three factors are unskilled labour, skilled labour and capital.

Labour and capital are assumed to be perfectly mobile across sectors in each region, but immobile internationally. The capital markets are assumed to be perfect, while the labour markets are imperfect. Unemployment is taken into consideration to capture the impact of trade liberalization under imperfect labour markets. All regions are linked by bilateral trade flows. Import tariffs, export subsidies, production taxes, consumption taxes, factor taxes, income taxes, and transport costs are included into the model. All tax/tariff/subsidy rates are ad valorem.

2 Details of the data aggregation are given in Appendix A1.

Production

Each firm maximizes its profit under perfect competition with constant return to scale technology. The problem is equivalent to minimising its production costs subject to the production technology. The production is characterised by two-level nesting. At the first level, a composite of value-adding factors and composite intermediate inputs are smoothly substitutable through CES total cost function. At the second level, the primary input factors of production are also assumed to substitute smoothly through a CES composite value-added function, while the composite of intermediate inputs is Leontief function.

Households

There is a representative household in each region. The household income comes from selling factors of endowment and receiving lump sum government transfers. Household disposable income is the total income less income taxes and saving, and is spent on consumption of commodities and services. Household saving is a fixed proportion of post-tax income. The household then makes the optimal allocation between consumption of commodities by maximizing a Stone-Geary Utility function (a Linear Expenditure System (LES) function[3] subject to the constraint of its disposable income.

[3] The exogenous parameters required for calibrating the level of subsistence consumption are the income elasticity of demand and the Frisch parameters. The main source of income elasticities of demand is the GTAP database (Dimaranan B. V. et al, Ch. 20, 2006). The Frisch parameters for some regions are obtained from literature review and, for other regions, from estimation and personal judgment.

Government

Government is an institutional sector and acts as a consumer in the economy. It receives revenue from taxes and tariffs. The government's expenditure, which is assumed to be a fixed proportion of its total revenue, is on consumption of commodities and services. Government consumption demand is then determined by maximizing a Cobb-Douglas utility function subject to its expenditure constraint. The residual between government revenues and expenditures is the lump-sum government transfer to the household. We assume that this real government transfer is paid to the household in the form of unemployment benefit. Government allocates the same per capita benefit to each unemployed individual regardless of their level of skill. We assume further that the unemployment benefit per capita is fixed under policy simulations.

Investment demand

The investment demand is determined by maximizing a Cobb-Douglas utility function subject to the budget constraint of total regional saving, i.e. regional household saving and foreign saving. As the capital endowment is assumed to be fixed at all times,[4] it implies that the value of capital depreciation value is determined exogenously.

International shipping industry

We assume that there is an artificial agent, the international shipping industry,[5] that transports products between regions. The cost of this international transport is paid by the importing country to the international shipping industry. The model assumes that each region allocates a fraction of the output of its transport sector to satisfy the demand for shipping.

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4 Under a static framework, capital stock is fixed in each region. In contrast, in a dynamic framework, the capital stock is endogenously accumulated through time which would capture the capital accumulation effect due to higher saving and investment. Therefore it should be noted that the results from a static model may underestimate the actual impacts as we ignore the dynamic effects.

5 The concept of an international shipping industry is based on the same concept of the global pool for trade and transport margins in the GTAP model. This pool supplies all the demands for (the import of) trade and transport margins, and then purchases all the supply of (the export of) trade and transport margins to balance the transport market. Of course, it is not necessary that the transport balance in each region has to be zero. However, the global pool for transport balance must be zero. (McDonald and Thierfelder, 2004).

The demand for international shipping of commodity i in region r is determined by a Leontief function, which implies that the transport costs/margins are route and commodity specific. The international shipping industry then allocates transports service to each region according to a Cobb-Douglas function.

Foreign trade

The standard approach to modelling international trade in CGE models is "the Armington assumption", which differentiates otherwise identical products by their country of origin (Armington, 1969). Therefore, on the supply side, outputs for the domestic market and for exports are imperfectly transformable; while, on the demand side, the domestic product sold on the domestic market and imports to that market are imperfectly substitutable.

The assumption is widely adopted because (1) it accommodates 'cross-hauling' or 'two-way' trade, which better reflects the realities of most countries trade pattern, and (2) it is still consistent with the perfect competition assumption. Here, the composite commodities are produced by the use of domestically produced and imported goods via a CES production function, while domestic production is allocated to the domestic market and to exports using a CET function.

Aggregate import and export demand

Products are differentiated according to their region of origin. On the demand side, the domestic consumers discriminate between the domestically produced and imported goods in the first level of Armington aggregation. They then discriminate between imported products from different sources in the second level of Armington aggregation; i.e. imports from different regions are imperfect substitutes. On the supply side, the domestic outputs delivered to domestic market are differentiated from products produced for export by the same sector. However, producers only differentiate output sold in domestic and foreign markets, i.e. they do not differentiate exports by destination.

Market clearing conditions

The commodity markets clear, i.e. demand for each commodity must equal its supply at the prevailing prices. Regional factor endowments are exogenously determined, and the factor markets must clear if full capital usage and full employment are assumed.

Model closure and numeraire

Saving-investment balance

Household saving is assumed to be a fixed proportion of disposable income. Assuming that there is no government saving, domestic investment is therefore determined by household saving plus foreign saving, which is exogenous.

Government balance

The value of government expenditure is a fixed proportion of government revenue. The difference between government revenue and expenditure is then a lump sum transfer paid to the household in the form of unemployment benefit. Under the assumed revenue neutral policy, the government funds any loss in import tariff revenue by adjusting income tax rates to maintain the balance. Thus, the income tax rate is endogenous.

External balance

The external balance, which is defined by the current account balance in foreign currency, is fixed. This implies that the exchange rate must adjust. The current account balance in each region can be positive or negative, but the global current account balance or global external balance must be zero.

Numéraire

The Consumer Price Index (CPI) in each region is selected as the numéraire price for that region. We also fix the exchange rate of China as an 'international' numéraire.[6]

3. Labour market imperfections

The standard factor market assumption leaves no room for the possibility of unemployment. However, in reality, there is unemployment in all countries, whether voluntary or involuntary. Incorporating unemployment in the CGE model yields two major advantages. First, the specification of the labour market better reflects reality. Second, it enriches the analysis of the impact of a Free Trade Area on employment for each type of labour in a particular region.

We would expect that the formation of a Preferential Trading Area, although discriminatory, will tend to promote convergence between the wages of both skilled and unskilled labour in the member countries, and reduce unemployment, particularly of the unskilled.

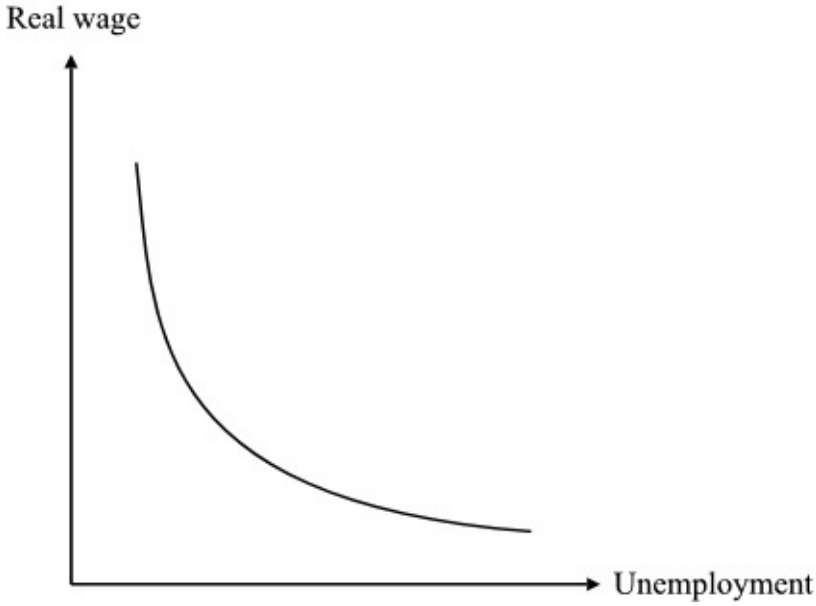
Unemployment is incorporated into the model by using the wage curve concept first introduced by Blanchflower and Oswald (1994). The wage curve for each type of labour implies a negative relationship between the real wage rate and the unemployment rate. The authors argue that the conventional unemployment theories illustrated by Phillips curve and Harris-Todaro model are misleading, and that stable (and common) wage curves are a better representation of the wage-unemployment relationship. The wage curve formula is logarithmic in form:

[6] A standard GTAP model specifies the exchange rate as the numéraire for each region. However, Lewis, Robinson and Thierfelder (1999) have proposed that, in the models in which regional trade balances at equilibrium are not zero, it is important to define 'international' numéraire of a reference country/region. The advantage of this technique will yield the solution of exchange rate in each region in real terms and can be viewed as equilibrium price-level-deflated exchange rates, by using the regional consumer price index as a deflator. More discussion on the role of real exchange rate can be found in De Melo and Robinson (1989) and Devarajan, Lewis, and Robinson (1993).

$$\ln w = -0.1 \ln U$$

where w is the real wage rate, U the unemployment rate, and -0.1 the (uniform) elasticity.[7]

Figure 1: The wage curve



4. Policy simulations, preferred strategy and sensitivity test

This study estimates the quantitative economic impacts of different Free Trade Area agreements in East Asia under four scenarios: (1) ASEAN-China, (2) ASEAN-Japan, (3) ASEAN-Korea and (4) "EAFTA", i.e. an ASEAN, China, Japan and Korea FTA.

[7] There are two main criticisms on wage curve concept. First, do country data would show an evidence to fit with the wage curve relation. Second, is a uniform elasticity of -0.1 robust enough. Blanchflower and Oswald (2005) pointed out that since wage curve is introduced in 1994, wage curve were reported in 43 countries around the world in both developed and developing countries. They showed that wage curve does exist even in the most controversial case of USA data. In addition, the authors are very positive with the estimation of the regular and uniform value of -0.1 of the elasticity of pay in different countries during different time periods. Recently, Nijkamp and Poot (2005) have done a meta-analysis on 208 elasticities and found that the 'unbiased' wage curve elasticity is about -0.07. Blanchflower and Oswald then concluded that "Most economists are unlikely to feel strongly about the possible difference between a wage curve elasticity estimate of -0.07 and one of -0.1. What matters more is whether there are countries in which a wage curve cannot reliably be found…"(p.4).

The elimination of import tariffs among member countries covers *all* trade in commodities and services based on a current implementation of the ACFTA agreement.[8] The special aspect of the ACFTA is the inclusion of agriculture products in the tariff elimination scheme.[9] Hence other simulations, under ASEAN-Japan, ASEAN-Korea, and EAFTA, are conducted in the same environment.[10] Due to time and data limitations, this study will ignore other aspects of economic cooperation among member countries under the proposed FTA agreement, e.g. the elimination of non-tariff barriers, investment facilitation, liberalization of trade in services, etc.

[8] There are more than 40,000 tariff lines at the 6 digit Harmonized Code under tariff elimination scheme by 2010 for ASEAN-6 and China, and by 2015 for CLMV countries. There are permanent exclusion lists, and sensitive and highly-sensitive lists of products proposed by each member countries. The import tariffs for products on the sensitive list will be reduced to zero by 2018 for ASEAN-6 and China, and by 2020 for CLMV, while the tariff for the highly-sensitive items will be reduced to 50% of the initial rates by 2015 for ASEAN-6 and China, and by 2018 for CLMV. Although the other 50% of tariff rates for highly sensitive items will remain after 2018, 99% of tariffs will be liberalized in the ACFTA (ASEAN Secretariat, 2004).

[9] Although most of the products on the sensitive and highly-sensitive lists are agricultural, a number of these items are almost insignificant. For example, China has 161 items on its sensitive list and 100 items on its highly-sensitive list. Malaysia has 242 items on its sensitive list and 100 items on its highly-sensitive list. Singapore has only 1 item on each list. (ASEAN Secretariat, 2004).

[10] Historically, Korea and Japan are much more protective of their agriculture products, and so negotiations in this area may prove to be very difficult in practice. However, this study seeks to show how much the two countries would gain under the different FTA scenarios based solely on an economic point of view.

4.1 Economic impacts of East Asia Free Trade Areas

4.1.1 Macro effects

Real GDP

Table 1 reports the economic effects on percentage change of real GDP under different East Asia FTAs. All four FTAs would result in growth in real GDP in the member economies, while the non-member countries would experience a decrease in their real GDP. The magnitudes of the changes in real GDP vary according to which trading partners are involved.

If we consider the ASEAN countries as a single region, the bilateral trade agreement would make ASEAN's real GDP grow at the highest rate when compared to the other members. In this study the ASEAN-China agreement would yield the highest real GDP growth rate at 1.15 percent, with a 0.70 percent growth rate under then ASEAN-Japan option and a 0.50 percent growth rate under an ASEAN-Korea agreement. Conversely, under the multilateral agreement, Korea would experience the highest real GDP growth rate at 4.09 percent, followed by ASEAN at 1.09 percent, Japan at 0.30 percent, and China at 0.29 percent.

The increases in the real GDP of individual ASEAN members also differ in magnitude under the various scenarios. All, except Thailand, Vietnam and Other-ASEAN, enjoy their highest real GDP growth rate under the ASEAN-China agreement. At this stage, the other three regions would prefer to pursue EAFTA to bring about the highest real GDP growth rate at 2.46 percent, 2.79 percent and 0.07 percent to their economies.

China, Japan and Korea also benefit from higher real GDP when liberalizing bilateral trade with ASEAN. However, without exception, their GDP growth would be greatest under the multilateral agreement; for example, China's real GDP will increase by 0.07 percent under ASEAN-China, but by 0.29 percent under EAFTA. Japan's real GDP will increase by 0.07 under ASEAN-Japan but this will rise to 0.30 percent under EAFTA. Finally, Korea's real GDP will increase by 0.28 percent under ASEAN-Korea, but will (remarkably) increase up to 4.09 percent under EAFTA.

Welfare

The economic welfare effects, measured by the equivalent variation (EV) in each region, are presented in **table 2**. The pattern of welfare gains or losses for member and non-member countries is very similar that of changes in real GDP. Member countries would experience welfare gains, while non-member countries would experience welfare losses. Overall, ASEAN, as a whole, would make the highest welfare gain of $US 4.94 billions under ASEAN-China agreement, compared to $US 3.0, $US 2.5, and $US 4.9 billions under ASEAN-Japan, ASEAN-Korea, and EAFTA, respectively. However, at the individual country level, Malaysia, Thailand, Vietnam and Other-ASEAN would consider EAFTA the most favoured choice.

For the large trading partners, i.e. China, Japan and Korea, the multilateral agreement would yield substantial welfare gain to their economies. According to the simulation results, Korea will make the highest gain, $US 18.21 billions, followed by Japan at $US 13.91 billions, and China at $US 1.31 billions.

Real wages

As trade liberalization generates higher economic growth in member economies, there will be a higher demand for both skilled and unskilled labour, typically increasing real wage rates. **Table 3** shows that real wage rates of both unskilled and skilled labour rise in all member countries. The opposite applies in non-member countries. The wage rates of unskilled and skilled labour of all member countries, taken together, reach the highest level under EAFTA.

The magnitudes of the changes in the wage rate of both skill types determine for each country whether it will experience greater or lesser wage inequality following trade liberalisation. We would expect that in countries which are abundant in unskilled labour, the pattern of sectoral production will shift towards the more unskilled-intensive sectors, implying that the gap between the wage rates of skilled and unskilled labour will be reduced.

This situation may be observed in ASEAN and China. For example, the unskilled wage rate in ASEAN rises by 2.10 percent, whereas the skilled wage rate increases by 1.83 percent. In Japan and Korea, by contrast, which are abundant in skilled labour, experiences greater wage inequality.

Unemployment

The wage curve suggests that, due to both types of labour having the same elasticities, the greater proportionate fall in unemployment of unskilled labour should be associated with a greater proportionate rise in the real wage of unskilled labour compared to skilled labour.

The various free trade agreements have a direct and beneficial impact on unemployment levels. As expected, **table 4** shows that the unemployment level drops dramatically in all member countries, while the opposite may occur in non-member countries. The magnitude of the decreases in unemployment level for both unskilled and skilled labour shows a similar pattern to the rises in their real wage rates.

EAFTA would bring the most desirable outcome in unemployment. ASEAN unemployment of unskilled labour under this multilateral agreement would fall by 20.97 percent, compared to unemployment reductions of 16.37 percent under ASEAN-China, 14.95 percent under ASEAN-Japan and 10.89 percent under ASEAN-Korea. The most striking result appears in Korea, when unemployment of unskilled labour under EAFTA would reduce by 60.75 percent, compared to a reduction of just 4.47 percent under the ASEAN-Korea scenario.

The changes in the unemployment are highly correlated with the changes in real wages. According to the wage curve formula, a 10 percent rise in real wage rate will be associated with a 100 percent drop in unemployment. Since member countries would experience different rates of change in unskilled-real wage rates, varying from only 0.41 percent in Japan up to 6.08 percent in Korea, it is unsurprising that the reductions in unemployment rates are vary even more considerably, ranging from 4.08 percent in Japan up to 60.75 percent in Korea.

The consequences for skilled labour are broadly similar to those for unskilled labour. For example, in China the unemployment of skilled labour under EAFTA would be reduced by 9.37 percent, compared to a reduction of only 4.51 percent under ASEAN-China. Again, the most remarkable result is for Korea, where unemployment of skilled labour under EAFTA would be reduced by 75.14 percent, but by only 4.30 percent under ASEAN-Korea.

In summary, economic growth biased towards unskilled-labour intensive sectors would lead to greater increases in the real wage rate and employment of the unskilled than those of skilled labour, so that the wage gap problem would be mitigated. The exception appears in Japan and Korea, where skilled labour tends to receive higher increases in its real wage rate than does the unskilled, and suffers less from unemployment.

Government transfer leftover

Government transfer leftover is presented in **table 5.** Once trade is liberalised, all government transfer, which once paid to the household in the form of unemployment benefit, will be leftover because of a large reduction in the level of unemployment.

As expected, the governments of FTA member regions have the budget leftover due to decreasing burden on unemployment benefit payment. In contrast, the government of FTA non-member regions would experience the opposite outcome.

Under the ASEAN-China agreement the government transfer leftover in ASEAN and China would be $US 6.94 and $US 2.40 billion respectively. The ASEAN-Japan agreement would make ASEAN and Japan government save up over $US 6.77 and $10.37 billion, while ASEAN-Korea would make ASEAN and Korea government save up to $US 4.50 and $1.53 billion. However, the greatest saving would be under EAFTA in which ASEAN, China, Japan and Korea government could save up to $US 9.24, $US 9.34, $US 29.17 and $US 22.69 consecutively.

The government transfer leftover vary considerably across ASEAN members. The highest leftover is in Thailand, followed by Vietnam, Malaysia, Indonesia, Other-ASEAN, Philippines, and Singapore. It should be noted that country with the highest reduction in unemployment may not necessarily save the greatest amount of transfer leftover. This is due to each country unemployment benefit per head is paid at different rate.

It is obvious that Free Trade Area could possibly reduce the unemployment pressure from the economies; the government can save up a great amount of budget on unemployment benefit payment. The saved government transfer is eventually transferred back to the household in general as an extra benefit.

International trade

Tables 6 and 7 report the absolute and proportional changes in each region's total exports and imports relative to the benchmark level. Overall, under all FTA options member countries would expand their exports and imports in agricultural and manufactured products. Conversely, in the services sectors the member countries would experience reduced total exports but increased total imports in services. This is because the services sectors are effectively tariff-free in the initial state; so that the FTA agreements have no direct effect on these sectors.

The magnitude of changes in total exports and imports is higher under EAFTA than under any other of the FTAs considered. For example, Korea's total exports in agriculture products would expand by 316.41 percent, while its total imports would also rises substantially, by 207.57 percent. Agriculture exports by China increase markedly, by 139.25 percent, while its imports increase by 15.57 percent. ASEAN and Japan experience moderate increases in both exports and imports of agriculture products, at around 20 to 30 percent.

The percentage changes in trade in manufacture products are lower than those of trade in agriculture products. However, in terms of value, the total exports and imports of manufacture are much greater than those of agriculture products. For example, Japan could expand its exports in manufactured products by 6.97 percent to the value at $US 438.23 billions. In contrast, ASEAN's import of manufactured products would increase by 7.78 percent to $US 337.98 billions.

Overall, under EAFTA, the member countries that would experience high percentage changes in both exports and imports are Korea, followed by China, ASEAN and Japan respectively.

4.1.2 Sectoral effects

Intra-regional trade

The more interesting issue would be how the composition of intra-regional trade will be affected by the various FTAs. Of course, the aim of Free Trade Area establishment is to boost trade among member countries by removing tariff barriers between members. Thus we should expect an increase in intra-regional trade when a FTA is in place.

A prediction of economic effects on intra-regional trade, measured by exports, under the different East Asia FTAs is displayed in **table 8**. Under the ASEAN-China FTA, China would increase its exports in all products to ASEAN, with significant expansions in processed food (143.07 percent) and motor equipment (385.91 percent). ASEAN would increase its exports to China, especially in other manufactures (262.45 percent) and rubber and plastic (241.70 percent).

However, ASEAN's exports to China from the natural-resource intensive sector, transport and other services sectors would decrease by 15.68, 3.74 and 5.93 percent, respectively. The expansions of intra-regional trade among ASEAN countries themselves are reasonably high, ranging from 20 to 90 percent, except in electronics, the natural-resource intensive sector, transport and other services sectors.

The composition of intra-regional trade under ASEAN-Japan and ASEAN-Korea differs slightly, depending on the trading partners involved. Japan's exports of textiles and apparel and of motor equipment to ASEAN expand markedly, while ASEAN's exports of processed food, and leather and shoe to Japan would increase significantly under the ASEAN-Japan FTA. Korea's exports of motor equipment and processed food to ASEAN would rise substantially, while ASEAN's export of processed food, and land intensive products to Korea would grow significantly under the ASEAN-Korea FTA.

Under EAFTA the pattern of change in intra-regional trade is more complex. ASEAN would experience a reduction in exports by the natural-resource intensive sector to China and Japan, but would export more to the Korea market. Japan's exports of land-intensive products to Korea would drop significantly; however this opens the opportunity for China and ASEAN to increase their exports. A reduction in Korea's exports of wood and paper products, motor equipment, electronic, and machinery to Japan is counteracted by a rise of exports from China and ASEAN, for example.

In general, the magnitude of changes in intra-regional trade under the multilateral agreement is greater than under any of the bilateral agreements. ASEAN could expand its exports mainly to the China market, while China would increase its imports from Japan and Korea. Japan would find China a more favourable market for its exports, while Korea would reduce its exports to Japan, but expand exports to China and ASEAN instead.

Domestic production

Table 9 reports changes in domestic production across sectors. Under the ASEAN-China FTA, those of ASEAN's industries that would expand are the land-intensive sector, processed food, textiles and apparel, petroleum and coal products, rubber and plastic, electronics, machinery and 'other services'. The ASEAN industries that would contract are the natural-resource intensive sector, leather and shoes, wood and paper, motor equipment, 'other manufactures' and transport.

The model predicts that China's domestic production would expand in processed food, the natural-resource intensive sector, textiles and apparel, leather and shoes, petroleum and coal products, motor equipment, electronics, machinery, transport and 'other services'. Contraction would occur in the land-intensive sector, wood and paper, rubber and plastics and the 'other machinery' industries.

The magnitudes of changes in domestic production under the multilateral agreement are, in general, greater than under the bilateral agreements. Korea would expand its domestic production of leather and shoes by 83.30 percent, of textile and apparel by 37.62 percent, and of processed food by 32.26 percent. Japan would expand its domestic production of textiles and apparel by 2.90 percent, of machinery by 2.44 percent, and of motor equipment by 2.12 percent. China would expand its domestic production in electronics by 7.84 percent, in land-intensive products by 7.42 percent, and in processed food by 3.46 percent. Last, ASEAN would expand its domestic production of rubber and plastics by 13.40 percent, of machinery by 10.82 percent, and of processed food by 7.30 percent.

In some sectors the domestic production of some member countries will shrink, but will expand in the remaining member countries. However there may be an expansion in some sectors in all member countries. This may occur in part because domestic prices fall due to increased trade within the FTA, encouraging an expansion of consumer demand, but also because the FTA discriminates against imports from non-member countries. A further stimulus to expansion in some sectors may be the reduction in the cost of imported intermediate inputs which reduces the prices of exports to non-member countries.

Formation of a Free Trade Area may also, of course, lead to a contraction of some sectors in some or all member countries. One obvious reason for this is that resources are reallocated from these sectors to those that have expanded, and/or that consumers have switched expenditure to products that are now lower-priced. The sectors which experience such contractions are wood and paper under all the bilateral agreements, and natural intensive products under the multilateral agreement. An alternative explanation, offered by Inkyo Cheong (2003) is that one of the member countries may act as an importer for the whole FTA region and then re-export these products to other members.

4.2 Preferred strategy

Each region's decision on which trade agreement is desirable is assumed to be based on the growth rate of real GDP and welfare. In this study, in order to compare policy choices, we use an index running from 1 to 4 to rank the most desirable (1) to least favourable (4) policies. **Table 10** indicates the preferred strategy based on the real GDP growth rate. ASEAN, as a whole, is indifferent between the ASEAN-China and EAFTA options, while the least favourable option is ASEAN-Korea. However, if we group the ASEAN members by income level, the high-income ASEAN countries would rank ASEAN-China first, whereas the low-income ASEAN members would prefer EAFTA. Japan would prefer a bilateral FTA with ASEAN to the multilateral FTA, while China and Korea would enjoy their highest real GDP growth rates under the EAFTA option.

Using economic welfare as an indicator, the preferred strategies reported in **table 11** for each region uniformly rank the EAFTA option as best. Even though the high-income ASEAN members would still a different FTA option to the low-income ASEAN countries, ASEAN as a whole would experience its highest welfare gain under the multilateral agreement.

4.3 Sensitivity analysis

One of the major criticisms of CGE modelling is the uncertainty about the reliability of a model's parameters. Since some of the parameters, e.g. elasticities, used in a CGE model cannot be calibrated directly from the benchmark data, these parameters have to be taken from outside sources. A sensitivity analysis is therefore conducted to assess the robustness of the results of policy simulations with respect to the choice of elasticity values. In this study, we test the sensitivity of the results to trade (Armington) elasticities and the elasticity of pay parameter in the wage curve.

Table 12 reports the effects on welfare, measured by the equivalent variation, of changing the elasticities. As would be expected, the higher (lower) the values of the elasticities the higher (lower) is the welfare gain.

The sensitivity analysis on welfare measured by EV of changing the elasticity of pay, reported in **Table 13**, also shows a consistent pattern. As trade liberalization reduces unemployment, a higher elasticity of pay will lead to a higher wage rate, and so, ceteris paribus, a lower demand for labour. However in both cases the sensitivity analysis results suggest that the simulation outcomes are robust to different elasticities.

5. Conclusion

This paper reports on the analysis of the economic effects of various East Asia FTA options. The model used includes unemployment as a means of capturing the changes in real wage and unemployment in each region due to trade liberalisation.

As trade is liberalised, the problem of real wage inequality is alleviated in countries abundant in unskilled labour, i.e. China and ASEAN. In contrast, real wage inequality worsens in Japan and Korea, where skilled labour is relatively abundant. The unemployment feature incorporated in the model gives both quantitative predictions of lower unemployment and higher real wages.

As fixed unemployment benefit per capita is assumed, government of FTA member regions can save a great amount of government transfer which was previously all spent on unemployment benefit payment. As a result, part of government transfer is leftover and eventually transferred back to the household. Eventhough income tax rates tend to increase according to the government neutral revenue closure, the extra benefit that household receives from the government transfer leftover can be viewed as income tax subsidy in this case.

The results from the model simulations have shown that the multilateral agreement (the EAFTA FTA) would yield higher economic welfare gains and a greater economic impact than any of the bilateral agreements – ASEAN-China, ASEAN-Japan or ASEAN-Korea. Undoubtedly, based on economic grounds, more member countries involved would definitely lead to more desirable outcome.

However, the ideal multilateral economic integration might be deterred due to many obstacles. First, Japan and Korea highly protect their agriculture sectors, while ASEAN and China wish to pursue the existing ASEAN-China Free Trade agreement, in which agriculture sectors are included, on member enlargement. Second, Japan's FTA strategy lately is more likely to initiate bilateral agreements on interested product coverage rather then comprehensive product coverage. Finally, uneasy relationships between Japan and other East Asian nations, especially China, during WWII period might be difficult to gain mutual trust on regional integration.

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Table 1: Economic impacts on real GDP under different East Asia FTAs

(% change from benchmark)

	ASEAN-China	ASEAN-Japan	ASEAN-Korea	EAFTA
ASEAN	1.15	0.70	0.50	1.09
Indonesia	0.83	0.42	0.44	0.61
Malaysia	2.52	1.23	1.20	1.94
Philippines	0.94	0.51	0.63	0.67
Singapore	2.34	1.24	1.35	1.91
Thailand	1.43	2.00	0.34	2.46
Vietnam	1.65	0.92	0.80	2.79
Other ASEAN	0.04	0.00	-0.01	0.07
China	0.07	-0.05	-0.03	0.29
Japan	-0.04	0.07	-0.02	0.30
Korea	-0.17	-0.08	0.28	4.09
NAFTA	-0.01	-0.01	-0.01	-0.01
EU	-0.02	-0.01	-0.01	-0.03
CER	-0.05	-0.07	-0.04	-0.18
ROW	-0.02	-0.02	-0.01	-0.08

Source: Author simulation

Table 2: Economic impacts on economic welfare under different East Asia FTAs

($US Billions)

	ASEAN-China	ASEAN-Japan	ASEAN-Korea	EAFTA
ASEAN	4.94	3.00	2.50	4.90
Indonesia	0.71	0.37	0.40	0.60
Malaysia	1.00	0.86	0.74	1.14
Philippines	0.73	0.35	0.50	0.48
Singapore	1.61	0.86	0.94	1.31
Thailand	1.05	1.44	0.32	1.87
Vietnam	0.61	0.39	0.32	0.95
Other ASEAN	0.11	0.07	0.08	0.14
China	0.49	-0.32	-0.22	1.37
Japan	-1.50	3.47	-0.58	13.91
Korea	-0.48	-0.25	0.90	18.21
NAFTA	-1.16	-0.88	-0.45	-1.72
EU	-1.22	-0.63	-0.39	-1.53
CER	-0.16	-0.22	-0.14	-0.53
ROW	-1.00	-0.74	-0.59	-3.24

Source: Author simulation

Table 3: Economic impacts on real wage under different East Asia FTAs

(% change from benchmark)

	ASEAN-China	ASEAN-Japan	ASEAN-Korea	EAFTA
			Unskilled labour	
ASEAN	1.64	1.49	1.09	2.10
Indonesia	0.90	0.68	0.54	0.92
Malaysia	4.90	5.08	3.90	6.44
Philippines	1.15	1.08	1.01	1.34
Singapore	1.95	1.01	1.15	1.54
Thailand	3.35	4.87	2.49	5.81
Vietnam	6.80	5.85	5.99	9.40
Other ASEAN	0.56	0.48	0.40	0.65
China	0.45	-0.04	-0.03	1.86
Japan	-0.03	0.12	-0.01	0.41
Korea	-0.10	-0.06	0.45	6.08
NAFTA	-0.01	-0.01	0.00	-0.01
EU	-0.01	-0.01	-0.01	-0.03
CER	-0.06	-0.07	-0.05	-0.18
ROW	-0.02	-0.02	-0.01	-0.06
			Skilled labour	
ASEAN	1.55	1.12	0.93	1.83
Indonesia	0.68	0.40	0.36	0.73
Malaysia	5.48	5.82	4.48	7.23
Philippines	0.52	0.43	0.44	0.57
Singapore	1.58	0.76	0.89	1.23
Thailand	2.47	2.61	1.40	3.75
Vietnam	6.33	5.11	5.39	8.30
Other ASEAN	0.37	0.24	0.27	0.35
China	0.42	-0.03	-0.02	0.87
Japan	-0.04	0.14	-0.01	0.48
Korea	-0.13	-0.06	0.43	7.52
NAFTA	-0.01	0.00	0.00	0.00
EU	-0.02	-0.01	0.00	-0.02
CER	-0.05	-0.06	-0.04	-0.12
ROW	-0.02	-0.01	-0.01	-0.03

Source: Author simulation

Table 4: Economic impacts on unemployment under different East Asia FTAs

(% change from benchmark)

	ASEAN-China	ASEAN-Japan	ASEAN-Korea	EAFTA
		Unskilled labour		
ASEAN	-16.37	-14.95	-10.89	-20.97
Indonesia	-8.96	-6.82	-5.40	-9.23
Malaysia	-48.98	-50.80	-39.04	-64.44
Philippines	-11.54	-10.77	-10.10	-13.42
Singapore	-19.53	-10.10	-11.49	-15.43
Thailand	-33.52	-48.69	-24.89	-58.11
Vietnam	-67.98	-58.50	-59.85	-94.04
Other ASEAN	-5.60	-4.81	-3.96	-6.51
China	-4.47	0.41	0.27	-18.56
Japan	0.30	-1.22	0.12	-4.08
Korea	1.02	0.61	-4.47	-60.76
NAFTA	0.08	0.07	0.04	0.14
EU	0.15	0.08	0.06	0.26
CER	0.60	0.69	0.46	1.79
ROW	0.20	0.16	0.12	0.65
		Skilled labour		
ASEAN	-15.46	-11.21	-9.34	-18.34
Indonesia	-6.82	-3.97	-3.56	-7.29
Malaysia	-54.80	-58.18	-44.83	-72.33
Philippines	-5.25	-4.28	-4.37	-5.74
Singapore	-15.79	-7.56	-8.92	-12.28
Thailand	-24.68	-26.05	-13.95	-37.53
Vietnam	-63.26	-51.06	-53.94	-83.00
Other ASEAN	-3.70	-2.41	-2.73	-3.48
China	-4.20	0.30	0.21	-8.73
Japan	0.36	-1.45	0.14	-4.79
Korea	1.30	0.58	-4.31	-75.24
NAFTA	0.09	0.04	0.03	0.02
EU	0.18	0.06	0.04	0.16
CER	0.49	0.61	0.36	1.23
ROW	0.17	0.10	0.07	0.33

Source: Author simulation

Table 5: Economic impacts on government transfer leftover under different East Asia FTAs

($US billion)

	ASEAN-China	**ASEAN-Japan**	**ASEAN-Korea**	**EAFTA**
ASEAN	6.94	6.77	4.50	9.24
Indonesia	0.71	0.50	0.40	0.75
Malaysia	2.67	2.51	1.91	3.58
Philippines	0.36	0.21	0.26	0.30
Singapore	0.24	0.20	0.13	0.25
Thailand	3.15	7.73	2.46	7.96
Vietnam	2.77	2.31	2.30	3.77
Other ASEAN	0.38	0.34	0.33	0.40
China	2.40	-0.24	-0.15	9.34
Japan	-1.63	10.37	-0.75	29.17
Korea	-0.33	-0.23	1.53	22.69
NAFTA	-0.78	-0.54	-0.32	-0.96
EU	-1.62	-1.06	-0.63	-2.84
CER	-0.23	-0.30	-0.15	-0.71
ROW	-0.84	-0.65	-0.44	-2.54

Source: Author simulation

Table 6: Economic impacts on exports under different East Asia FTAs

($US Billions, % change from benchmark)

	ASEAN-China	ASEAN-Japan	ASEAN-Korea	EAFTA
		Agriculture		
ASEAN	39.02	46.42	39.79	45.01
	15.04	36.87	17.32	32.72
China	16.72	15.28	15.61	37.82
	5.75	-3.37	-1.30	139.25
Japan	3.48	3.75	3.47	4.03
	-1.68	5.99	-2.06	13.81
Korea	2.56	2.43	2.72	10.69
	-0.29	-5.33	6.19	316.41
NAFTA	86.41	85.37	86.21	81.52
	-0.33	-1.52	-0.55	-5.96
EU	177.06	176.42	176.79	174.95
	-0.08	-0.44	-0.23	-1.27
CER	24.43	24.30	24.49	23.21
	-2.04	-2.53	-1.79	-6.90
ROW	125.89	125.38	125.89	123.42
	-0.49	-0.90	-0.50	-2.45
		Manufacture		
ASEAN	370.46	356.53	359.71	369.56
	6.03	2.04	2.95	5.77
China	356.53	340.91	340.82	374.88
	4.49	-0.09	-0.11	9.87
Japan	407.42	418.15	408.66	438.23
	-0.55	2.07	-0.25	6.97
Korea	155.64	156.16	160.06	180.01
	-0.61	-0.27	2.22	14.96
NAFTA	966.38	968.03	968.15	965.59
	-0.28	-0.11	-0.10	-0.36
EU	1,822.64	1,824.61	1,824.99	1,818.40
	-0.22	-0.11	-0.09	-0.45
CER	48.70	48.76	48.69	49.35
	0.44	0.56	0.41	1.79
ROW	1,075.34	1,076.72	1,076.58	1,071.12
	-0.20	-0.07	-0.08	-0.59
		Services		
ASEAN	59.72	61.51	61.70	60.30
	-5.74	-2.91	-2.61	-4.83
China	22.31	22.57	22.53	21.88
	-0.67	0.49	0.32	-2.56
Japan	40.18	39.31	39.96	37.79
	0.97	-1.21	0.43	-5.04
Korea	18.00	17.87	17.33	16.61
	1.34	0.60	-2.46	-6.50
NAFTA	266.96	266.71	266.49	268.38
	0.42	0.32	0.24	0.95
EU	512.34	511.79	511.56	514.84
	0.32	0.21	0.17	0.81
CER	17.61	17.66	17.63	17.87
	0.36	0.63	0.46	1.81
ROW	311.05	310.88	310.83	313.52
	0.22	0.16	0.15	1.01

Source: Author simulation

Table 7: Economic impacts on imports under different East Asia FTAs

(Upper: $US Billions, Lower: % change from benchmark)

	ASEAN-China	ASEAN-Japan	ASEAN-Korea	EAFTA
		Agriculture		
ASEAN	31.45	31.31	30.50	32.51
	19.39	18.85	15.77	23.40
China	20.77	19.33	19.37	22.46
	6.87	-0.54	-0.32	15.57
Japan	55.97	61.35	56.22	68.06
	-0.66	8.89	-0.21	20.80
Korea	17.98	18.05	18.95	55.75
	-0.78	-0.41	4.54	207.57
NAFTA	81.18	81.25	81.33	81.29
	-0.29	-0.21	-0.11	-0.15
EU	203.08	203.13	203.20	203.01
	-0.10	-0.08	-0.04	-0.14
CER	4.37	4.36	4.38	4.36
	-0.78	-0.84	-0.55	-0.88
ROW	177.25	177.50	177.61	177.33
	-0.36	-0.22	-0.16	-0.32
		Manufacture		
ASEAN	333.43	327.54	324.56	337.98
	6.33	4.45	3.50	7.78
China	269.40	254.04	254.31	309.88
	5.64	-0.38	-0.28	21.51
Japan	286.65	293.02	287.89	309.98
	-0.78	1.43	-0.35	7.30
Korea	130.12	130.47	133.75	146.67
	-0.64	-0.37	2.14	12.00
NAFTA	1,488.67	1,488.24	1,489.40	1,483.92
	-0.11	-0.14	-0.06	-0.43
EU	1,860.49	1,861.08	1,861.52	1,858.36
	-0.09	-0.06	-0.03	-0.20
CER	71.25	71.19	71.30	70.71
	-0.35	-0.44	-0.28	-1.10
ROW	1,142.69	1,142.99	1,143.13	1,138.30
	-0.10	-0.07	-0.06	-0.48
		Services		
ASEAN	63.66	62.49	62.35	63.38
	3.69	1.78	1.56	3.22
China	39.44	39.22	39.25	39.73
	0.35	-0.23	-0.15	1.07
Japan	84.50	85.45	84.72	87.31
	-0.46	0.66	-0.20	2.85
Korea	27.12	27.22	27.63	29.11
	-0.64	-0.27	1.24	6.66
NAFTA	208.83	208.95	209.03	208.41
	-0.22	-0.16	-0.12	-0.42
EU	526.05	526.38	526.46	525.40
	-0.15	-0.09	-0.08	-0.28
CER	16.20	16.18	16.19	16.09
	-0.22	-0.34	-0.25	-0.87
ROW	266.83	266.87	266.89	266.00
	-0.09	-0.08	-0.07	-0.40

Source: Author simulation

Table 8: Economic impacts on intra-regional trade under different East Asia FTAs

(Upper: $US billions, Lower: % change from benchmark)

	ASEAN-China			ASEAN-Japan			ASEAN-Korea		
Exporter	**China**	**ASEAN**	**ASEAN**	**Japan**	**ASEAN**	**ASEAN**	**Korea**	**ASEAN**	**ASEAN**
Importer	**ASEAN**	**China**	**ASEAN**	**ASEAN**	**Japan**	**ASEAN**	**ASEAN**	**Korea**	**ASEAN**
LINT	1.22	1.72	2.75	0.05	1.32	2.93	0.04	0.81	2.85
	28.99	84.40	94.04	43.98	18.65	107.00	29.93	155.58	100.88
FOOD	1.35	2.34	7.92	0.60	11.91	8.26	0.31	1.34	8.19
	143.07	81.24	80.49	62.82	183.06	88.27	152.08	131.02	86.80
NRTS	0.46	1.11	2.93	0.06	6.70	3.08	0.02	2.92	3.18
	52.33	-15.68	-5.95	37.12	-11.88	-1.18	8.26	21.65	1.83
TEXT	4.04	2.67	3.08	2.40	3.106	3.22	3.65	0.83	3.10
	85.01	228.19	30.23	154.06	62.19	36.28	127.90	93.23	31.01
SHOE	0.56	0.15	0.40	0.06	0.92	0.45	0.45	0.12	0.43
	52.14	90.87	23.66	82.67	108.25	41.33	64.53	114.39	32.74
WOPA	0.36	3.16	2.75	0.78	4.34	2.74	0.35	1.18	2.79
	44.90	44.47	20.47	48.92	9.03	20.12	44.92	26.01	22.29
PECO	4.70	2.88	8.82	10.24	2.96	8.47	2.87	1.13	9.07
	45.93	59.29	15.71	44.67	0.51	11.16	41.26	33.63	19.04
PLAS	2.62	12.76	10.49	7.09	3.19	9.94	2.99	1.50	10.31
	41.14	241.70	28.87	35.59	2.30	22.10	33.62	37.93	26.70
MOTR	5.21	0.46	3.19	12.26	0.78	2.74	3.30	0.16	3.50
	385.91	204.76	77.31	124.27	8.75	51.98	224.96	23.84	94.56
ELEC	8.55	21.91	36.95	19.00	18.16	37.60	7.19	6.37	37.62
	27.44	74.33	3.08	-0.20	0.06	4.91	5.88	5.21	4.97
MACH	4.95	6.92	13.34	18.81	5.41	13.03	2.90	1.26	13.56
	42.17	175.39	25.18	15.95	2.82	22.21	44.25	62.79	27.23
OMCH	0.82	0.34	1.10	0.95	0.94	1.11	0.46	0.18	1.14
	61.81	262.45	19.48	65.94	5.10	20.60	71.76	78.84	23.82
TRAN	0.18	0.25	0.41	0.51	1.07	0.42	0.22	0.35	0.42
	1.81	-3.74	-1.57	-0.22	-0.37	0.08	-1.08	-0.90	-0.57
SVCS	0.96	1.29	2.46	1.83	3.25	2.49	0.68	1.09	2.49
	3.29	-5.93	-2.56	0.73	-2.94	-1.64	-0.94	-1.53	-1.30

Source: Author simulation

Note: land-intensive sector (LINT), processed food (FOOD), natural-intensive sector (NRTS), textile and apparel (TEXT), leather and shoe (SHOE), wood and paper products (WOPA), petroleum and coal (PECO), rubber and plastic (PLAS), motor equipment (MOTR), Electronic (ELEC), machinery (MACH), other manufacture (OMCH), transport (TRAN), services (SVCS).

Table 8: Economic impacts on intra-regional trade under different East Asia FTAs (cont.)

(Upper: $US billions, Lower: % change from benchmark)

	EAFTA												
Exporter	**ASEAN**				**China**			**Japan**			**Korea**		
Importer	**China**	**Japan**	**Korea**	**ASEAN**	**Japan**	**Korea**	**ASEAN**	**China**	**Korea**	**ASEAN**	**China**	**Japan**	**ASEAN**
LINT	1.79	1.23	0.02	2.82	2.23	16.42	1.19	0.11	0.00	0.05	0.10	0.52	0.05
	91.41	10.10	-93.29	99.05	65.88	2,297.33	25.40	44.53	-96.73	36.97	145.83	49.46	73.44
FOOD	2.20	10.28	0.68	7.70	7.89	1.39	1.25	0.57	0.32	0.55	1.06	5.08	1.04
	70.52	144.25	16.61	75.67	124.52	81.87	125.66	139.20	50.55	50.19	689.11	438.97	751.54
NRTS	1.12	6.19	2.61	2.87	1.56	1.55	0.41	0.08	0.39	0.06	0.02	0.16	0.02
	-15.49	-18.61	9.04	-7.81	-1.18	28.74	35.27	32.58	393.77	24.61	88.10	47.18	-6.30
TEXT	1.65	2.29	0.68	2.57	23.79	4.86	3.33	12.92	0.75	1.84	10.60	1.58	3.46
	101.91	20.16	58.90	8.80	44.41	86.99	52.52	133.87	49.83	94.29	146.26	54.85	115.99
SHOE	0.10	0.62	0.11	0.35	4.10	0.63	0.47	0.11	0.04	0.04	2.40	0.60	0.64
	29.08	40.01	91.12	8.33	52.07	71.59	55.15	43.08	44.67	39.22	159.42	159.08	132.18
WOPA	2.93	4.33	1.22	2.69	2.42	0.38	0.34	0.94	0.26	0.74	1.39	0.25	0.33
	34.17	8.82	29.49	17.72	4.54	40.90	37.40	77.07	23.99	41.58	92.09	-1.93	35.69
PECO	2.62	2.96	1.08	8.16	3.63	2.47	4.18	8.15	6.03	9.58	6.26	3.80	2.55
	44.55	0.31	27.75	7.10	1.49	33.02	29.82	37.37	36.79	35.31	46.28	11.65	25.65
PLAS	11.21	3.20	1.41	9.90	2.83	1.50	2.40	8.95	6.02	6.76	9.42	1.68	2.90
	200.09	2.81	29.94	21.60	6.37	53.26	29.19	43.25	42.44	29.30	46.76	17.17	29.54
MOTR	0.29	0.80	0.16	2.36	1.04	0.68	3.72	8.54	1.34	9.91	1.82	0.24	2.01
	96.44	12.16	25.74	31.29	9.80	57.40	247.20	332.62	1.93	81.18	513.75	-2.36	98.04
ELEC	17.57	18.29	6.20	37.17	10.76	3.76	9.16	18.54	6.52	17.64	9.70	4.83	6.92
	39.82	0.76	2.38	3.71	20.31	42.01	36.67	45.00	35.08	-7.38	58.39	-4.14	1.91
MACH	5.69	5.53	1.15	12.93	8.36	2.32	4.61	24.64	11.15	17.62	6.27	1.88	2.57
	126.40	5.13	48.16	21.29	5.08	50.44	32.38	81.99	35.78	8.60	79.54	-4.73	27.83
OMCH	0.27	0.94	0.16	1.05	3.69	0.61	0.75	1.06	0.41	0.86	0.93	0.41	0.42
	180.81	5.52	56.54	13.87	6.11	53.81	47.08	182.37	1.10	49.20	167.32	14.21	55.47
TRAN	0.26	1.08	0.36	0.42	0.35	0.09	0.18	0.06	0.60	0.50	0.06	0.40	0.21
	-1.50	0.17	4.05	-0.19	-0.67	3.18	-1.02	-4.30	1.10	-3.02	-6.33	-4.74	-5.08
SVCS	1.30	3.24	1.11	2.46	1.44	0.23	0.94	1.09	0.47	1.78	0.21	0.71	0.66
	-5.10	-3.35	0.32	-2.59	0.03	3.83	0.81	-4.36	1.10	-1.84	-5.54	-3.79	-3.04

Source: Author simulation

Table 9: Economic impacts on domestic production under different East Asia FTAs

(% change from benchmark)

	ASEAN-China	ASEAN-Japan	ASEAN-Korea	EAFTA	ASEAN-China	ASEAN-Japan	ASEAN-Korea	EAFTA	ASEAN-China	ASEAN-Japan	ASEAN-Korea	EAFTA
	LINT				**FOOD**				**NRTS**			
ASEAN	2.13	5.05	2.28	4.53	1.44	9.65	2.28	7.30	-8.01	-5.67	-2.84	-7.45
China	-0.13	-0.13	-0.07	7.42	0.02	-0.37	-0.10	3.46	0.01	0.22	0.13	-1.63
Japan	0.16	-1.06	0.04	-3.16	0.03	-1.42	-0.01	-2.90	1.38	-0.22	0.58	-1.98
Korea	0.25	-0.17	-1.31	-59.04	-0.01	-0.37	-0.51	32.26	2.26	0.91	-3.19	-4.15
NAFTA	-0.02	-0.11	-0.08	-1.14	-0.01	-0.16	-0.04	-0.47	0.24	0.16	0.10	0.23
EU	0.05	-0.05	-0.03	-0.24	-0.02	-0.12	-0.06	-0.35	0.24	0.08	0.06	0.00
CER	-0.80	-0.67	-0.67	-3.15	-1.01	-1.58	-0.93	-3.27	1.59	1.61	1.00	3.70
ROW	-0.06	-0.08	-0.06	-0.33	-0.08	-0.18	-0.09	-0.49	0.60	0.35	0.23	1.03
	TEXT				**SHOE**				**WOPA**			
ASEAN	0.75	1.81	0.38	-1.85	-4.72	2.82	-0.48	-3.18	-0.15	-0.26	-0.25	1.70
China	0.33	-0.22	-0.19	-0.23	0.46	0.00	0.12	1.13	-0.64	0.14	0.10	-2.31
Japan	-0.18	0.88	-0.15	2.90	0.41	-1.88	0.06	-13.24	0.13	-0.13	0.04	-0.17
Korea	-0.35	-0.53	6.06	37.62	0.12	-0.38	3.46	83.30	0.14	0.11	-0.66	6.59
NAFTA	0.13	0.00	-0.03	-0.62	0.40	0.02	-0.02	-0.65	0.04	0.01	0.01	0.07
EU	0.06	-0.12	-0.15	-1.61	0.52	-0.19	-0.06	-2.15	0.06	0.00	0.00	0.01
CER	-0.06	-0.02	-0.15	-1.20	0.26	0.33	0.07	-2.47	0.02	0.02	0.03	0.25
ROW	-0.24	-0.24	-0.29	-2.40	0.14	-0.11	-0.14	-1.43	-0.04	-0.03	-0.01	0.01
	PECO				**PLAS**				**MOTR**			
ASEAN	0.40	-2.09	0.54	-1.71	16.54	0.83	2.67	13.40	-0.04	-4.64	2.37	-8.12
China	0.43	0.01	0.02	-1.77	-2.05	0.04	0.02	-4.59	6.47	-0.53	-0.20	-1.64
Japan	0.04	0.81	-0.03	1.40	-0.28	0.44	-0.07	1.22	-0.20	2.27	-0.21	2.12
Korea	0.07	-0.13	0.63	3.93	-1.72	-0.22	0.48	8.16	0.17	-0.59	3.69	2.18
NAFTA	0.00	0.00	0.00	0.12	-0.10	-0.01	-0.03	-0.11	-0.21	-0.21	-0.10	-0.08
EU	-0.03	-0.04	-0.02	0.00	-0.15	-0.08	-0.08	-0.20	-0.20	-0.14	-0.07	-0.04
CER	-0.12	-0.16	0.03	0.15	-0.36	-0.18	-0.13	-0.26	-0.46	-0.36	-0.09	0.25
ROW	-0.12	-0.10	-0.04	0.01	-0.54	-0.16	-0.12	-0.73	-0.23	-0.16	-0.06	-0.15

Source: Author simulation

Note: land-intensive sector (LINT), processed food (FOOD), natural-intensive sector (NRTS), textile and apparel (TEXT), leather and shoe (SHOE), wood and paper products (WOPA), petroleum and coal (PECO), rubber and plastic (PLAS), motor equipment (MOTR), Electronic (ELEC), machinery (MACH), other manufacture (OMCH), transport (TRAN), services (SVCS).

Table 9: Economic impacts on domestic production under different East Asia FTAs (Cont.)

(% change from benchmark)

	ASEAN-China	ASEAN-Japan	ASEAN-Korea	EAFTA	ASEAN-China	ASEAN-Japan	ASEAN-Korea	EAFTA	ASEAN-China	ASEAN-Japan	ASEAN-Korea	EAFTA
	ELEC				MACH				OMCH			
ASEAN	2.61	0.39	0.53	1.95	11.25	4.70	6.02	10.82	-1.43	-0.76	-0.13	-1.13
China	3.88	0.40	0.09	7.84	0.16	0.07	0.00	-3.27	-0.11	0.26	0.12	-1.88
Japan	-0.28	-0.74	0.12	-1.20	0.09	-0.16	-0.09	2.44	0.21	0.14	0.03	0.14
Korea	-0.24	0.52	-1.86	0.70	0.29	0.16	-0.79	-0.64	0.67	0.01	1.48	10.85
NAFTA	-0.29	0.27	0.08	0.01	-0.05	0.01	-0.03	0.26	0.26	0.06	0.02	0.57
EU	-0.47	0.16	0.05	-0.38	-0.22	-0.10	-0.10	-0.18	0.10	-0.01	-0.02	0.19
CER	-0.15	0.45	0.28	0.86	-0.15	-0.01	0.05	0.73	0.08	0.13	0.09	0.59
ROW	-0.78	0.09	-0.04	-0.54	-0.35	-0.17	-0.12	-0.15	0.03	-0.08	-0.06	0.34
	TRAN				SVCS							
ASEAN	-0.54	0.22	-0.16	0.54	0.01	-0.18	-0.11	-0.14				
China	0.01	0.07	0.05	-0.68	0.01	-0.01	-0.01	-0.37				
Japan	0.10	0.00	0.05	0.00	-0.02	0.03	-0.01	0.13				
Korea	0.61	0.37	-0.49	0.71	-0.06	-0.02	0.06	3.03				
NAFTA	0.05	0.03	0.03	0.16	0.00	0.00	0.00	0.01				
EU	0.15	0.10	0.08	0.56	0.01	0.01	0.01	0.03				
CER	0.01	0.02	0.04	0.22	-0.03	-0.03	-0.02	-0.07				
ROW	0.07	0.06	0.05	0.37	-0.01	0.00	0.00	0.01				

Source: Author simulation

Note: land-intensive sector (LINT), processed food (FOOD), natural-intensive sector (NRTS), textile and apparel (TEXT), leather and shoe (SHOE), wood and paper products (WOPA), petroleum and coal (PECO), rubber and plastic (PLAS), motor equipment (MOTR), Electronic (ELEC), machinery (MACH), other manufacture (OMCH), transport (TRAN), services (SVCS).

Table 10: Preferred strategy based on real GDP growth rate

(unit: index number)

	ASEAN-China	ASEAN-Japan	ASEAN-Korea	EAFTA
ASEAN	**1.57**	**3.29**	**3.57**	**1.57**
ASEAN-high income	**1.40**	**3.40**	**3.40**	**1.80**
Indonesia	1	4	3	2
Malaysia	1	3	4	2
Philippines	1	4	3	2
Singapore	1	4	3	2
Thailand	3	2	4	1
ASEAN-low income	**2.00**	**3.00**	**4.00**	**1.00**
Vietnam	2	3	4	1
Other ASEAN	2	3	4	1
Non-member	**2.50**	**2.75**	**1.00**	**3.75**
China	2	4	3	1
Japan	4	1	3	2
Korea	4	3	2	1
NAFTA	2	4	1	3
EU	3	2	1	4
CER	2	3	1	4
ROW	3	2	1	4
World	**2.21**	**3.00**	**2.64**	**2.14**

Source: Author calculation

Note: Index is ranked from 1 to 4, the most desirable to least desirable choice.

Table 11: Preferred strategy based on welfare

(unit: index number)

	ASEAN-China	ASEAN-Japan	ASEAN-Korea	EAFTA
ASEAN	**1.71**	**3.43**	**3.29**	**1.57**
ASEAN-high income	**1.60**	**3.40**	**3.20**	**1.80**
Indonesia	1	4	3	2
Malaysia	2	3	4	1
Philippines	1	4	2	3
Singapore	1	4	3	2
Thailand	3	2	4	1
ASEAN-low income	**2.00**	**3.50**	**3.50**	**1.00**
Vietnam	2	3	4	1
Other ASEAN	2	4	3	1
Non-member	**2.75**	**2.25**	**1.00**	**4.00**
China	2	4	3	1
Japan	3	2	4	1
Korea	4	3	2	1
NAFTA	3	2	1	4
EU	3	2	1	4
CER	2	3	1	4
ROW	3	2	1	4
World	**2.29**	**3.00**	**2.57**	**2.14**

Source: Author calculation

Note: Index is ranked from 1 to 4, the most desirable to least desirable choice.

Table 12: Sensitivity test of trade elasticities on EV under different FTAs

($US Billion)

	Low elasticity	Medium elasticity	High elasticity
ASEAN-China			
China	0.37	0.49	0.68
ASEAN	3.97	4.94	7.66
ASEAN-Japan			
Japan	3.45	3.47	3.78
ASEAN	2.17	3.00	5.07
ASEAN-Korea			
Korea	0.83	0.90	1.08
ASEAN	2.09	2.50	3.43
EAFTA			
China	0.74	1.37	3.90
Japan	12.74	13.91	22.69
Korea	7.73	18.21	41.51
ASEAN	3.55	4.90	8.73

Source: Author simulation

Note: Low elasticities are scaled by 0.5, while high elasticities are scaled by 2.0

Table 13: Sensitivity test of elasticity of pay on EV under different FTAs

($US Billion)

	Low elasticity	Medium elasticity	High elasticity
ASEAN-China			
China	0.92	0.49	0.23
ASEAN	5.90	4.94	4.26
ASEAN-Japan			
Japan	4.53	3.47	2.82
ASEAN	3.82	3.00	2.41
ASEAN-Korea			
Korea	1.09	0.90	0.78
ASEAN	3.12	2.50	2.06
EAFTA			
China	3.03	1.37	0.36
Japan	17.52	13.91	11.74
Korea	21.13	18.21	16.42
ASEAN	6.13	4.90	4.03

Source: Author simulation

Note: Low elasticities are scaled by 0.5, while high elasticities are scaled by 2.0

Appendix

A1 Data Aggregation

I. Region aggregation

No.	Code	Description	Description and code[11]
1	IDN	Indonesia	Indonesia (IDN)
2	MYS	Malaysia	Malaysia (MYS)
3	PHL	Philippines	Philippines (PHL)
4	SGP	Singapore	Singapore (SGP)
5	THA	Thailand	Thailand (THA)
6	VNM	Vietnam	Vietnam (VNM)
7	XSE	Rest of Southeast Asia	Rest of Southeast Asia (XSE)
8	CHN	China	China (CHN)
9	KOR	Korea	Korea (KOR)
10	JPN	Japan	Japan (JPN)
11	CER	the Closer Economic Relations	Australia (AUS), New Zealand (NZL)
12	NAFTA	North American Free Trade Area	Canada (CAN), United States (USA), Mexico (MEX)
13	EU	European Union	Austria (AUT), Belgium (BEL), Denmark (DNK), Finland (FIN), France (FRA), Germany (DEU), United Kingdom (GBR), Greece (GRC), Ireland (IRL) , Italy (ITA), Luxembourg (LUX), Netherlands (NLD), Portugal (PRT), Spain (ESP), Sweden (SWE)
14	ROW	Rest of the world	Rest of Oceania (XOC), Hong Kong (HKG), Taiwan (TWN), Rest of East Asia (XEA), Bangladesh (BGD), India (IND), Sri Lanka (LKA), Rest of South Asia (XSA), Rest of North America (XNA), Colombia (COL), Peru (PER), Venezuela (VEN), Rest of Andean Pact (XAP), Argentina (ARG), Brazil (BRA), Chile (CHL), Uruguay (URY), Rest of South America (XSM), Central America (XCA), Rest of FTAA (XFA), Rest of Caribbean (XCB), Switzerland (CHE), Rest of EFTA(XEF), Rest of Europe (XER), Albania (ALB), Bulgaria (BGR), Croatia (HRV), Cyprus (CYP), Czech Republic (CZE), Hungary (HUN), Malta (MLT), Poland (POL), Romania (ROM), Slovakia (SVK), Slovenia (SVN), Estonia (EST), Latvia (LVA), Lithuania (LTU), Russia Federation (RUS), Rest of Former Soviet Union (XSU), Turkey (TUR), Rest of Middle East (XME), Morocco (MAR), Tunisia (TUN), Rest of North Africa (XNF), Botswana (BWA), South Africa (ZAF), Rest of South African Customs Union (XSC), Malawi (MWI), Mozambique (MOZ), Tanzania (TZA), Zambia (ZMB), Zimbabwe (ZWE), Rest of SADC (XSD), Madagascar (MDG), Uganda (UGA), Rest of Sub-Saharan Africa (XSS)

[11] GTAP region codes are shown in brackets.

II. Sector aggregation

No.	Code	Description	Description and code
1	LINT	Land intensive sector	Paddy rice (PDR), Wheat (WHT), Cereal grains nec (GRO), Vegetables fruit nuts (V_F), Oil seeds (OSD), Sugar cane sugar beet (C_B), Plant-based fibers (PFB), Crops nec (OCR), Bovine cattle sheep goats horses (CTL), Animal products nec (OAP), Raw milk (RMK), Wool silk-worm cocoons (WOL)
2	FOOD	Processed food	Bovine meat products (CMT), Meat products nec (OMT), Vegetable oils and fats (VOL), Dairy products (MIL), Processed rice (PCR), Sugar (SGR), Food products nec (OFD), Beverages and tobacco products (B_T)
3	NRTS	Natural resource intensive sector	Forestry (FRS), Fishing (FSH), Coal (COA), Oil (OIL), Gas (GAS), Minerals nec (OMN)
4	TEXT	Textile and apparel	Textiles (TEX), Wearing apparel (WAP)
5	SHOE	Leather and shoes	Leather products (LEA)
6	WOPA	Wood and paper	Wood products (LUM), Paper products publishing (PPP)
7	PECO	Petroleum, coal and metals	Petroleum coal products (P_C), Mineral products nec (NMM), Ferrous metals (I_S), Metals nec (NFM), Metal products (FMP)
8	PLAS	Rubber and plastic	Chemical rubber plastic products (CRP)
9	MOTR	Transport and motor equipment	Motor vehicles and parts (MVH), Transport equipment nec (OTN)
10	ELEC	Electronic	Electronic equipment (ELE)
11	MACH	Machinery	Machinery and equipment nec (OME)
12	OMCH	Other manufactures	Manufactures nec (OMF)
13	TRAN	Transportation	Transport nec (OTP), Water transport (WTP), Air transport (ATP)
14	SVCS	Other services	Electricity (ELY), Gas manufacture distribution (GDT), Water (WTR), Construction (CNS), Trade (TRD), Communication (CMN), Financial services nec (OFI), Insurance (ISR), Business services nec (OFI), Recreational and other services (ROS), Public administration defense education health (OSG), Dwellings (DWE)

III. Factor aggregation

No.	Code	Description	Description and code
1	UKLAB	Unskilled labour	Unskilled Labour (UnSklab)
2	SKLAB	Skilled labour	Skilled Labour (SkLab)
3	CAPITAL	Capital	Land (Land), Capital (Capital), Natural resource (NatlRes)