Deep integration and its impacts on non-members: EU enlargement and East Asia

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Abstract

Ten countries—most completing their transition from socialist-based economies to market economies—became the EU members in 2004, two additional countries are slated to join the Union in 2007, and a few others are expected to become members at some future dates. Despite a relatively small economic size of the new member, acceding and candidate countries, this type of deep integration can have non-negligible effects on countries outside of the preferential zone as the reduction in barriers across partners leads to a re-orientation of trade. In this study, we evaluate the extent of trade adjustments and the economic impacts it will have on the East Asian economies using a dynamic computable general equilibrium (CGE) model. The overall macroeconomic effects on East Asia are small. There is some trade diversion, but there may be an opportunity to increase market penetration in some sectors of the expanding EU for which East Asia has a marked comparative advantage. This paper also assesses the relative importance of linking trade openness to productivity and lowering trade costs between the new member, acceding and candidate countries and the EU-15.

JEL classifications: F13, F15, F17

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1. Introduction

As the Iron Curtain fell in the early 1990s, it was clearly expected at the outset that many of the Central and Eastern European countries (CEECs) would join their Western counterparts in an enlarged EU, but the question was when. The moment arrived in 2004 with 8 CEECs—the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, and Slovenia—along with Cyprus and Malta joined the world's biggest customs union. It was the largest expansion of the EU in terms of the number of countries, jumping in a single bound from 15 to 25 countries, and also increasing dramatically the number of different customs and languages. The process of integration started well before actual accession, with all acceding countries transforming their domestic and external policies to align with the EU's so-called *acquis*. In a next phase, Romania and Bulgaria are scheduled to follow suit in January 2007. Croatia, Macedonia and Turkey have received the candidate status from the European Commission and are expected to become members at some future dates.

The 2004 enlargement of the EU was preceded by the establishment of the "Single Market," which called for removal of all intra-EU barriers to the movement of goods, services, people and capital by 1992 (Baldwin and Venables, 1995). Although it has not been completely implemented, trade barriers on most goods and services within the EU have largely been eliminated, and establishments of EU firms, financial institutions and other service providers have proliferated—through mergers, acquisitions and cross-border investments—in the past 15 years**.** The past negotiations among the member countries have included harmonization of standards, coordinating regulatory requirements, and cooperation in migration policy matters. Of course, the foundation of the EU itself was based on EU-wide regulation of entire sectors—coal and steel initially—but even more importantly agriculture.

In 2004, the 10 new member states only represented 4.7 percent of the combined 12.8 trillion dollar economy consisting of the 25 member states, though 16 percent of the combined population of 457 million. Thus, there is a 4 to 1 ratio in per capita incomes between EU-15 and the 10 new member states.[1] Bulgaria, Romania, Croatia, Macedonia and Turkey are somewhat smaller in economic importance, but contain a population of 108 million, compared with 74 million for the 10 new member states. Despite the relatively small economic size of the new member, acceding and candidate countries, this type of deep integration can have non-negligible effects on countries outside of the

[1] The average per capita GDPs of the EU-15 and the new member states were respectively $31,974 and $8,094 in 2004.

preferential zone as the reduction in barriers across partners leads to a re-orientation of trade.

Empirical evidence on benefits and costs of the EU and other regional integration agreements (RIAs) suggests that trade creation dominates trade diversion in almost all RIAs (Robinson and Thierfelder, 1999). The positive effect on economic welfare resulting from eastern enlargement of the EU is supported by Baldwin et al. (1997), Keuschnigg and Kohler (2002), and Kohler (2004). Lejour, de Mooij and Nahuis (2004) evaluate the effects of EU enlargement by taking into consideration three policy aspects: the creation of a larger customs union, the enlargement of the internal market, and free movement of labor. When all three aspects are combined, GDP per capita of CEECs is predicted to increase by more than 8 percent in the long run. By contrast, GDP per capita of the present EU members is predicted to increase by only about 0.1 percent. Fuller et al. (2002) analyze the impact of accession of three CEECs (Czech Republic, Hungary and Poland) on agricultural markets and find that domestic prices of many agricultural commodities increase dramatically in the three CEECs while those in the EU decrease moderately. The CEECs' exports to third countries decline, but the impact on world agricultural markets is limited. Using a gravity equation, Nahuis (2004) estimates the impact of EU enlargement to the internal market for different industries and different countries. Not surprisingly, the impact of accession is highly asymmetric across industries and the accession countries would experience large adjustments, which necessitates a flexible labor market.

Based on empirical evidence, Deardorff and Stern (2004) suggest that the effect of European integration on long-run growth rates is minimal. Using a theoretical model of trade with increasing returns to scale, they show that the current members that are able to expand into the increasing-returns sector would realize gains in income from the enlargement of the EU. By contrast, the acceding countries' gains would be limited because they initially specialize in the constant-returns sector. While their theoretical model provides good insights into what might take place when increasing returns to scale play an important role in manufacturing, their model appears too simple to predict what might actually happen to economic welfare of the current and acceding countries resulting from EU enlargement.

For East Asian countries, the EU is an extremely important export market. Thus, whether the accession of CEECs to the EU would result in reductions of their exports to the EU is a great concern for them. Using a dynamic global computable general equilibrium (CGE) model, we evaluate the effects of EU enlargement on economic welfare, trade flows and sectoral output of the EU-15, the 10 new member states, the

acceding and candidate countries, and East Asian countries, paying particularly close attention to the implications for East Asia.

The rest of the chapter is organized as follows. The next section provides an overview of the model, followed by a description of the baseline and policy scenarios in section 3. Section 4 presents the assessments of computational results and policy implications. The final section summarizes the main conclusions.

2. Overview of the Model

A CGE model is an empirical tool that is well suited to evaluating policies that have regional and sectoral ramifications. First, it captures extensive indirect effects, such as inter-industry linkages between sectors and trade linkages between countries and regions. Second, it can evaluate the effect of removing trade barriers on resource allocation and structural adjustment in each country. Third, it can detail the impacts on both member and nonmember countries and thereby better elucidate implications for the negotiating environment. Thus, a CGE model is an ideal tool to examine the impact of EU enlargement on the current members, the acceding countries, and the East Asian economies.

The model used in this study is based on the dynamic global CGE model developed by van der Mensbrugghe (2003). All sectors are assumed to be perfectly competitive and operate under constant returns to scale.[2] Production in each sector is modeled by a series of nested constant elasticity of substitution (CES) production functions, which are intended to represent the different substitution and complementarity relations across the various inputs in each sector. Labor can have three different skill levels: unskilled, skilled, and highly skilled. The first two are substitutable and combined in a CES aggregation function as a single labor bundle. Highly skilled labor is combined with capital to form a physical plus human capital bundle.

In each period, the supply of primary factors—capital, labor, and land—is generally predetermined. The supply of land is assumed to be sensitive to the contemporaneous price of land, however. Land is assumed to be partially mobile across agricultural sectors. Thus rates of return are sector-specific, but sectoral land supply reacts

[2] The assumption of constant returns to scale is a simplification and generally biases downwards the gains from trade reform because expansion of trade provides scale efficiencies. The introduction of scale economies raises a number of important issues, each of which could significantly modify the results, but we prefer to leave out of the current study. They include the lack of data on the minimum efficient scale and the specification of market structure (e.g., Cournot versus Bertrand competition), the number of firms, conjectural variations, and whether there is free entry and exit.

to changes in relative rates of return**.** Some of the natural resource sectors also have a sector-specific factor whose contemporaneous supply is price sensitive. The model includes adjustment rigidities. An important feature is the distinction between *old* and *new* capital goods. In addition, capital is assumed to be partially mobile, reflecting differences in the marketability of capital goods across sectors. Labor and population growth are exogenous. Labor within each skill category is perfectly mobile across sectors.

All income generated by economic activity is assumed to be distributed to consumers. A single representative consumer (or household) allocates optimally his/her disposable income among the consumer goods and saving. The consumption/saving decision is static: saving is treated as a good and its amount is determined simultaneously with the demands for the other goods. The price of saving is set arbitrarily equal to the average price of consumer goods. Investment is driven by aggregate saving, or the sum of household, government, and foreign savings. We assume that foreign saving is exogenous and that the ratio of government expenditures to GDP remains constant in each region over time.

Products are differentiated by region of origin and modeled as imperfect substitutes. On the import side, this is reflected by the implementation of the so-called Armington assumption, where a nested-CES specification is used to incorporate imperfect substitution of imported goods with respect to domestically produced goods**.** At the top level, agents choose the optimal combination of an aggregate import bundle and demand for the domestically produced good. At the second level, agents choose the optimal combination of imports across all trading partners. A symmetric specification is used to model export supply, the latter being implemented with nested constant elasticity of transformation (CET) functions.

Tariffs are fully bilateral and the model captures both direct and indirect trade and transportation costs. The CIF price of imports into region *r*' originating in region *r*, $WPM_{r,r',i}$, 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 $WPE_{r,r',i}$ is the FOB price of commodity *i* in region *r* for exporting to region *r*'. Between the originating port in region *r* and the destination port in region *r*', the price of the commodity is adjusted by a trade and transport margin represented by the ad valorem adjustment $\zeta_{r,r',i}$. The model also allows for non-monetary trade and transport cost, which

is represented by the efficiency parameter $\lambda_{r,r',i}$.[3] In our model, an increase in $\lambda_{r,r',i}$ represents a reduction in trade-related risk, lower administrative barriers to trade (e.g., customs procedures) and/or a fall in technical barrier (e.g., mutual recognition of product standards).

Most of the data used in the model come from the GTAP database, version 5.4, which provides 1997 data on input-output, value added, final demand, bilateral trade, tax and subsidy data for 78 regions and 57 sectors.[4] For the purpose of the present study, the database is aggregated into 10 regions and 15 sectors as shown in Table 1. The present and prospective future EU member states are divided into three regions: (i) EU-15, (ii) the countries that became EU members in 2004 (CEEC-10 hereafter), and (iii) the acceding and candidate countries (Bulgaria, Romania, Croatia and Turkey: BRCT). Macedonia is excluded from the third region because it is aggregated into the rest of the world in the GTAP 5.4 database. In addition, we have chosen to aggregate the acceding countries (Bulgaria and Romania) and the two candidate countries (Croatia and Turkey) because each pair's trade with the present EU members is extremely small relative to the total EU trade.

[Insert Table 1 around here]

3. The Baseline and Policy Scenarios

3.1 The Baseline Scenario

To assess the implications of the enlargement of the EU, we first establish a baseline, which shows the path of each economy in the absence of the enlargement over the period 1997-2015. In the baseline, several key variables, including GDP growth rates, population and labor supply, are predetermined by the exogenous assumptions. Projections of real GDP, population and labor supply are broadly consistent with the World Bank's long-term forecast.

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[3] This type of cost is referred to as "iceberg" transport cost. If $\lambda_{r,r',i}$ is equal to 0.9 for some transport node, it implies that if 100 units leave port *r*, the destination port, *r'*, receives only 90 units. Iceberg transport costs were developed by Samuelson (1952) based on a concept developed earlier by von Thünen. More recently, these have been used in work by Helpman and Krugman (1985) and Fujita, Krugman and Venables (1999).

[4] Dimaranan and McDougall (2002) give detailed descriptions of the GTAP database, version 5.0. The number of regions is increased from 66 to 78 in Version 5.4, which disaggregates the Central and Eastern European regions into single countries (with some exceptions).

Several assumptions underline the calibration of productivity. Agricultural productivity is fixed and is assumed uniform across factors of production. Sectoral productivity (outside of agriculture) is assumed to be labor-augmenting and is composed of three components: a uniform economy-wide factor that is calibrated to achieve the given 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

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

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-sensitive portion of sectoral productivity is some share of total productivity.[5]

Ideally, the baseline should include policies that are already agreed upon, such as Uruguay Round commitments and China's WTO accession. Because our baseline does not include these policy commitments, we need to be cautious when interpreting policy results. However, with the exception of the textile and apparel sectors, the incorporation of post-Uruguay Round tariff rates and China's post-WTO accession tariff rates in the baseline is likely to change our results only slightly for several reasons. First, because the EU's tariff rates on industrial products were already quite low in 1997, additional reductions in the tariff rates committed under the Uruguay Round are relatively small.[6] Second, given that the main reference period used (1986-88) for tariffication of nontariff measures corresponds to peak farm protection in the EU, it makes effective agricultural liberalization

[5] Three main channels have been identified linking openness with productivity: imports of technology-laden intermediate inputs (for example fertilizers in agriculture), imports of capital goods, and export market penetration (with the requirement to produce to a higher standard than at home to be able to penetrate new markets; expanding foreign markets can also lead to scale economies). Much empirical work is ongoing trying to identify the extent to which each one of these channels operates. At a macro level, there are to some extent observationally equivalent to the extent that current account balances are more or less exogenous. de Melo and Robinson (1990) and Dessus, Fukasaku and Safadi (1999) take an approach similar to ours. Das, Roberts and Tybout (2001) have explored some firm-level characteristics of export supply response.

[6] Although the EU maintains significant tariff peaks in some so-called sensitive sectors, their impacts are hard to assess at the level of aggregation of our model. However, not incorporating the Uruguay Round's Agreement on Textiles and Clothing (ATC), which gradually phased out import quotas on textiles and apparel between January 1995 and December 2004, in the baseline scenario is likely to overestimate the effects of EU enlargement, particularly for the textile and apparel sectors.

minimal for the Union (Messerlin, 2001). Third, post-Uruguay Round average tariff rates are only slightly lower than the average tariff rates in 1995 for CEECs (Francois and Strutt, 1999).[7] Fourth, the omission of China's WTO accession from the baseline is likely to have only a minimal effect on the consequences of EU enlargement because China's trade policy remains unchanged in our policy scenarios.

Table 2 provides the export shares by product category for the 10 regions of the model for the year 1997. With the exception of crops in the acceding and candidate countries (BRCT), agricultural products and natural resources constitute small export shares of the EU-15, CEEC-10 and BRCT. The products with relatively high export shares are machinery (17.7%), chemical products (12.6%) and transport equipment (12.0%) for the EU-15, machinery (13.1%), other manufactures (11.4%) and metals and products (10.2%) for the CEEC-10, and apparel (13.3%), metals and products (9.5%) and textiles (9.2%) for BRCT.[8]

[Insert Table 2 around here]

The most striking difference in the export patterns between the three (present and prospective future) EU regions and four East Asian regions is the export orientation of electronic equipment. The export shares of this product are 34.6 percent in Asian NIEs, 29.6 percent in ASEAN, 21.7 percent in Japan and 12.8 percent in China, which are significantly greater than 7.5 percent in the EU-15, 5.2 percent in the CEEC-10 and 1.2 percent in BRCT. For the rest of the products in which the export shares are relatively high in at least one of the East Asian regions, they are also relatively high in at least one of the EU regions – e.g., apparel in China (18.0%), machinery in Japan (25.8%), Asian NIEs (12.8%) and China (12.8%), transport equipment in Japan (18.8%), and other manufactures in China (12.5%).

Although not shown in the table, 56.1 percent of the EU-15's exports in 1997 went to the other EU-15 countries, 3.9 percent of its exports went to the CEEC-10, 1.7 percent to BRCT, and 10.9 percent to the four East Asian regions. In the same year, 55.6 percent of the CEEC-10's exports and 50.0 percent of BRCT's exports were destined to the EU-15 market. While 19.2 percent of East Asia's exports were shipped to the EU-15, its exports to the CEEC-10 and BRCT were only 0.8 and 0.5 percent respectively of its total exports. Hence, changes in East Asia's exports to the new member states and the acceding and

[7] Francois and Strutt (1999) provide post-Uruguay Round average tariff rates for 45 regions and 50 product categories for the GTAP version 4 database.

[8] The export shares of the aggregated services are large in all regions mainly because the services sector includes the trade sector.

candidate countries resulting from EU enlargement would have an extremely small impact. By contrast, if East Asia's exports to the EU-15 were to be reduced substantially, it might lead to significant trade adjustments.

3.2 Policy Scenarios

To assess the consequences of EU enlargement, we consider four policy scenarios. In scenario 1, we assume that the EU-15 and the CEEC-10 will remove bilateral tariffs and the latter will adopt the EU's common external tariffs (CET) with respect to third countries over the 1998-2005 period.[9] This is followed by the elimination of bilateral tariffs between the EU-25 and the acceding and candidate countries (BRCT) and the adoption of CET by BRCT over the 2005-2015 period. In this scenario, we assume that the sector-specific productivity factors related to openness ($\chi_{i,t}$) are fixed at the baseline levels. In scenario 2, we extend scenario 1 by reducing iceberg or non-monetary trade costs (e.g., administrative and technical barriers) between the EU-15 and the CEEC-10 by 5 percent over the 1998-2005 period, followed by the same rate of reduction in these costs between the EU-25 and BRCT over the 2005-2015 period.[10] Again, we fix $\chi_{i,t}$ at the baseline levels. Scenario 3 is the same as scenario 2 except that $\chi_{i,t}$ are now endogenous and determined by equation (2). We set $\eta_i = 0.75$ in agricultural sectors and $\eta_i = 1.0$ in all other sectors.

With respect to adoption of the Common Agricultural Policy (CAP), there will eventually be full integration of the enlarged EU within a transition period. We assume that the CEEC-10 and subsequently BRCT will adopt the EU's external tariffs on agricultural products as they do on all other products. After the adoption of CET, these regions' tariff rates of agricultural products to third countries would increase. The controversial part is whether direct payments would be extended to agricultural producers in these regions. In addition, the new member states are required to implement supply controls. Because the issues of direct payments and supply controls have been investigated elsewhere (e.g., Fuller et al., 2002), we do not incorporate them in this study. It should be

[9] The bilateral tariffs on most manufacturing products between the EU-15 and CEECs were largely removed before the CEEC-10 became new members in 2004. In addition, the CEEC-10 started changing their tariff structures to conform to the EU's CET before 2004. To the extent that the process had already been initiated, the estimated effects of EU enlargement reported in this study include those resulting from the changes in the tariff structures between 1997 and 2004.

[10] Smith and Venables (1988) use a 2.5 percent reduction in intra-EU trade cost in their study of the Single Market program's possible pro-competitive effects. Keuschnigg and Kohler (2002) and Madsen and Sorensen (2002) use a 5 percent reduction in real trade cost between EU-15 and CEECs, whereas Baldwin et al. (1997) assume a 10 percent reduction in real trade cost. We use a 5 percent reduction in scenarios 2 and 3, but report the welfare results with three different values of the trade efficiency parameter (2.5, 5 and 10 percent) in the Appendix Table.

reminded, however, that the omission of the production quotas is likely to overestimate the new member countries' exports of agricultural products and processed food to the present EU members. In its recent proposed changes to the CAP, the EU continues to move away from a system of direct price support towards income support through so-called decoupled payments. Part of the motivation of these changes is to make the CAP more WTO-friendly, though the extent of decoupling is still widely debated both within and outside of the EU. It would be perhaps logical that over the longer term, the EU may consider devolving agricultural income support back towards national governments if it truly becomes direct income support.

It is also beyond the scope of this study to model the movement of labor between the EU-15 and CEECs, which is incorporated in the study by Lejour, de Mooij and Nahuis (2004). They find that GDP per capita increases in CEECs by 0.6-1.1 percent and decreases slightly in the EU-15, whereas GDP decreases in CEECs (because of the labor outflow) and increases in the EU-15.[11]

4. Results

4.1 Effects on Welfare

Aggregate income gains and/or losses summarize the extent trade distortions are hindering growth prospects and the ability of economies to use the gains to help those whose income could potentially decline. We compared the EU enlargement scenario with the baseline situation in the terminal year, 2015, using Hicksian equivalent variation (EV) as the welfare measure. This represents the income consumers would be willing to forego to achieve post-EU enlargement well-being compared to baseline well-being at baseline prices. The model uses the extended linear expenditure system (ELES), which incorporates savings in the consumer's utility function (Lluch, 1973; Howe, 1975). The ELES expenditure function is easy to evaluate at each point in time.

Table 3 presents the welfare results for the four policy scenarios as deviations in equivalent variations (EVs) from the baseline in 2015. In scenario 1, EVs of the CEEC-10 and the acceding and candidate countries (BRCT) increase by $9.8 billion (2.15%) and $2.4 billion (0.59%), respectively, whereas EV of the EU-15 increases only very slightly

[11] World Bank (2006) is largely devoted to the movement of workers from developing to developed countries and the development impacts of remittances. While the aggregate gains from labor movements are relatively small, the migrants themselves gain significantly because of the huge wage differentials, and the sending countries can benefit substantially from remittances. The gains increase with the level of remittances because migrant households can benefit from the lower prices in their home countries.

in percentage terms (0.04%). These estimates include the effects of the removal of bilateral tariffs between the EU-15 and CEECs that has already taken place since 1997. In many products CEEC-10 and BRCT's exports to the EU-15 increase significantly, replacing some of the East Asian exports and causing trade diversion in products which East Asian countries have a competitive advantage. All four regions in East Asia (Japan, China, Asian NIEs and ASEAN) incur losses in welfare, but they are extremely small. China's loss is larger than the other three regions because of a relatively large fall in the exports of wearing apparel and leather products, where 15 percent of its exports were shipped to the EU in 1997.

[Insert Table 3 around here]

When a 5 percent reduction in trade costs between the EU-15 and CEECs is added (scenario 2), the magnitudes of welfare gains for the EU-15, CEEC-10 and BRCT increase by a factor of 4.4, 3.7 and 4.3, respectively. A greater access of the internal market resulting from a reduction in trade-related risk and lower administrative and technical barriers would further facilitate trade among the three regions. While it would increase welfare losses of East Asian regions slightly, the world welfare gain increases five-fold in scenario 2 compared with scenario 1 ($53.6 billion versus $10.9 billion). Thus, trade creation resulting from a reduction in trade costs between the EU-15 and CEECs is likely to be far greater than trade diversion.[12]

In the next scenario, we allow the sector-specific productivity factors to change in response to changes in sectoral export-output ratios. A comparison of the results in scenario 3 with those in scenario 2 shows that endogenizing $\chi_{i,t}$ leads to an increase in welfare gains for the EU-15 and BRCT, but not for the CEEC-10. It should be noted that the CEEC-10's welfare and real GDP gains are larger under scenario 3 in earlier years (e.g., before 2005). Its export growth in some of the products becomes smaller after the latecomers (BRCT) accede to the EU and their exports to the Union increase significantly. In 2015, the CEEC-10's export-output ratios become smaller in scenario 3 than in scenario 2 in a number of sectors, including natural resources, energy, chemical products, metals and products, machinery, electronic equipment, other manufactures and services, which altogether account for a large share of GDP.[13]

[12] It should be noted that while trade creation always raises welfare, trade diversion may or may not reduce welfare.

[13] The relative decline in productivity is a possible consequence of our specification. Its plausibility depends on whether productivity changes are derived from scale economies—in which case a decline is possible if output declines, or whether one believes productivity is more driven from learning by doing,

The East Asian region as a whole no longer suffers from a welfare loss under scenario 3 because the export-output ratios increase slightly in some of the key sectors, particularly in Japan and China. For example, Japan's export-output ratios in machinery, electronic equipment and services are slightly larger in scenario 3 than in scenario 2. This is primarily caused by an increase in exports to the EU-15, whose welfare and real GDP gains are larger when productivity is endogenous. The world welfare gain also increases when productivity becomes endogenous ($75.6 billion versus $53.6 billion).

The Appendix Table presents the sensitivity of a change in the trade efficiency parameter $\lambda_{r,r',i}$ on economic welfare. A change in trade efficiency between the EU-15 and CEECs has a large impact on their welfare gains. For example, the CEEC-10's welfare gains increase from 6.9 percent to 12.4 percent when a trade cost reduction is increased from 5 percent to 10 percent. By contrast, economic welfare of the four East Asian regions is barely affected by the change in the value of $\lambda_{r,r',i}$.

4.2 Effects on World Trade Flows

Table 4 summarizes world trade flow adjustments resulting from EU accession in scenario 3, which combines an enlargement of the customs union and a 5 percent reduction in trade costs among the EU-15, CEEC-10 and BRCT assuming endogenous productivity. The adjustments are expressed as percent deviations from the baseline for the year 2015. Not surprisingly, intraregional trade within the enlarged EU would increase drastically. For example, the EU-15's exports to the CEEC-10 and BRCT would be 52.4 and 42.3 percent higher, whereas the CEEC-10 and BRCT's exports to the EU-15 would be 74.8 and 53.9 percent higher, under this scenario compared with the baseline in 2015. The reductions in East Asian countries' exports to the EU-15 appear to be relatively small in percentage terms. In order to determine whether the accession of CEECs to the EU would induce substantial trade diversion in some products, however, it is necessary to examine the results on trade flows by product category.

[Insert Table 4 around here]

Table 5 provides trade flow adjustments for eight selected products under scenario 3 in 2015. The results are reported for three aggregate regions (enlarged EU, East Asia, and other regions) as well as for the world. In four of the eight products (i.e., processed food, textiles, apparel and transport equipment), East Asia's exports to the enlarged EU

R&D, and imitating best practice. In the case of the latter, productivity—once achieved—is less likely to decline.

region decline substantially.[14] The most notable sector is apparel, where its exports to the EU-29 (the EU-15, CEEC-10 and BRCT) would decline by 25.3 percent. Among East Asian countries, China would be particularly hit hard by a drastic fall in apparel exports because of its relatively large export share of this product (Table 2).

[Insert Table 5 around here]

In many products, East Asia's exports to the EU-29 are affected very little. For example, its exports of metals and products and electronic equipment to enlarged EU would decline by only 0.2 and 1.0 percent, respectively. Other products with small reductions in East Asia's exports to the EU-29 include chemical products and machinery. In natural resources and other manufactures, its exports to an enlarged EU are predicted to increase by 2.3 and 0.7 percent, respectively.[15] Although not shown in Table 5, East Asia's exports to the EU-29 are predicted to increase somewhat in three other product groups: crops, energy and services. Thus, the impact of EU enlargement on East Asia's trade adjustments is quite small for a large number of products.

4.3 Effects on Sectoral Output

While the aggregate welfare and trade results are of interest in themselves, the most useful results are at the industry level, where structural adjustments and resource reallocations occur in response to policy changes. Because sectoral interests can exert significant influence on policy negotiations, the sectoral results would be most important for political economy considerations. In this section we examine the effects of EU enlargement on sectoral output.

Table 6 summarizes output adjustments for the 15 sectors under scenario 3 in 2015. Before examining the results, it should be noted that the effects on textiles and apparel might be overstated because we did not incorporate the Uruguay Round's Agreement on Textiles and Clothing in the baseline scenario. Overall, sectoral output adjustments are very large for the CEEC-10 and BRCT mainly because these regions depend very heavily upon trade with the EU-15, which increases drastically as they accede to the Union. By contrast, sectoral adjustments are substantially smaller for the EU-15 because its trade with the CEEC-10 and BRCT constitutes only 5-6 percent of its total trade.

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[14] Although not included in Table 5, EU enlargement would also lead to significant trade diversion in "other agriculture."

[15] As shown in Table 2, the export shares of natural resources are extremely small in all EU and East Asian regions. Thus, a 2.3 percent increase in East Asia's exports to the EU-29 is negligible.

[Insert Table 6 around here]

The magnitude and direction of changes in sectoral output depend upon a number of factors, including pre-accession tariff rates and *ad valorem* equivalents of nontariff barriers, the export-output ratios, the import-demand ratios, and the elasticities of substitution between domestic and imported products. The trade barriers in 1997 were relatively high in crops, other agriculture, processed food, textiles and apparel. In the CEEC-10, the export-output ratios in the same year were relatively high in electronic equipment (57%), apparel (53%), machinery (52%), textiles (43%) and transport equipment (43%), whereas the import-demand ratios for the same year were relatively high in electronic equipment (64%), machinery (63%), textiles (55%), transport equipment (50%) and chemical products (48%). In BRCT, the export-output ratios were highest in apparel (56%), followed by textiles (36%), machinery (24%) and metals and products (21%), whereas the import-demand ratios were highest in machinery (57%), followed by electronic equipment (36%), transport equipment (36%) and textiles (29%).

In both the CEEC-10 and BRCT, the apparel sector would expand substantially largely because the EU-15, CEEC-10 and BRCT all had relatively high pre-accession protection rates and both regions have comparative advantage in this sector vis-à-vis the EU-15. Output of textiles in BRCT would increase significantly for the same reasons, but that in the CEEC-10 would also increase despite the fact that it does not appear to have comparative advantage in textiles. A relatively large increase in output of textiles in the CEEC-10 may be explained by a relatively large reduction in the price of imported textile materials (intermediate inputs) resulting from the removal of trade barriers on imports from the EU-15 and BRCT, leading to substantial domestic cost reductions and increased competitiveness.

The sectors that would experience contractions in output usually result from large import penetrations within the enlarged EU. For example, output of transport equipment in BRCT would decrease substantially mainly because its imports, which are more than four times its exports, are predicted to increase drastically following the accession. Another important factor is that an increase in demand for capital and labor in the expanding sectors would bid up factor prices. The services sector in the CEEC-10 and BRCT would contract primarily because of increases in factor prices.

Turning to sectoral output adjustments in the four East Asian regions, we find that percentage changes in output exceed 1 percent only in the textiles and apparel sectors in China, Asian NIEs and ASEAN. In all other sectors, output adjustments are less than 1

percent. Because the effects of EU enlargement on sectoral output in East Asian countries are extremely small, industry lobbies from these countries are likely to sit quietly.

5. Concluding Remarks

In this chapter, we have used a dynamic CGE model to examine the consequences of EU enlargement on economic welfare, trade flows and sectoral output of the EU-15, the new member states, the acceding and candidate countries, and East Asian countries. A standard result in this class of analysis is that the poorer and smaller region in the formation of a free trade area or customs union tends to gain significantly more in overall welfare than the larger and richer region. The impact on the existing EU-15 yields at best an increase of 0.3 percent of real income, whereas the impact on the CEEC-10 varies from 2.2 to 7.9 percent gains, and on the BRCT countries from 0.6 to 3.0 percent gains. Our policy scenarios exclude the impact of increased capital mobility, which—as in the case of Mexico's joining NAFTA, or Spain and Portugal joining the EU—may have much greater effects than the removal of tariffs. However, it will be difficult to identify this impact precisely because much of the capital movement into Eastern Europe can also be attributed to the region's transition to a market economy. The welfare effects on non-member economies are small, though ASEAN and possibly China—perhaps the greatest direct competitors with East European producers—will be harmed the most.

The results also show that the reduction in frictional trade barriers could be more important at the macro-level than tariffs themselves. For the CEEC-10 and BRCT, the welfare gains increase by a factor of 3.7 and 4.3 respectively when a 5 percent reduction in frictional trade costs are incorporated in the policy-reform scenario, and even greater impacts occur with a more significant reduction in these costs. The incorporation of a linkage between productivity and openness has a more modest impact and is an area that would require more detailed sectoral and firm-level analysis.

The results clearly indicate that East Asia will lose export revenues—particularly in the enlarged EU-29, but also globally. The sectors facing the greatest threat are those where Central and Eastern Europe is likely to be very competitive with East Asian producers—processed food, textiles, apparel and transport equipment. This will mostly affect the low- and lower middle-income countries of ASEAN and China. East Asian exporters will hold up well in metals and metal products and electronic equipment—the latter, of course, is the high-growth sector globally, with linkages to high productivity growth.

[Insert Appendix Table here]

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Table 1. Regional and Sectoral Aggregation

A. Regional Aggregation

Countries/Regions	Corresponding economies/regions in the GTAP database
EU-15	Austria, Belgium, Denmark, Finland, France, Germany, Great Britain, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden
CEEC-10 (new members)	Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia
Acceding and candidate countries (BRCT)[a)]	Bulgaria, Romania, Croatia and Turkey
Japan	Japan
China	China and Hong Kong
Asian NIEs	Korea, Taiwan and Singapore
ASEAN[b)]	Indonesia, Malaysia, Philippines, Thailand and Vietnam
United States	United States
Other developed countries	Australia, Canada, Iceland, Liechtenstein, New Zealand, Norway and Switzerland
Rest of world	All the other economies/regions

B. Sectoral Aggregation

Sectors	Corresponding commodities/sectors in the GTAP database
Crops	Paddy rice, wheat, cereal grains n.e.s., vegetables and fruits, oil seeds, sugar cane and sugar beet, plant-based fibers, crops n.e.s.
Other agriculture	Bovine cattle, sheep and goats, animal products n.e.s., raw milk, wool, silk-worm cocoons, fishing
Natural resources	Forestry, minerals
Energy	Coal, oil, gas, petroleum and coal products, electricity, gas manufacture and distribution
Processed food	Food products, beverages and tobacco products
Textiles	Textiles
Apparel	Wearing apparel, leather products
Chemical products	Chemical, rubber and plastic products
Metals and products	Iron and steel, nonferrous metals, metal products
Machinery	Machinery
Electronic equip.	Electronic equipment
Transport equip.	Motor vehicles and parts, other transport equipment
Other manufactures	Wood products, paper products, publishing, non-metallic mineral products, other manufactures
Construction	Construction, water distribution
Services	Trade, transport, communication, financial services, other services

[a)] Excludes Macedonia because it is aggregated into the rest of the world in the GTAP database.

[b)] Excludes Brunei, Cambodia, Laos and Myanmar because they are aggregated into the rest of the world. Singapore is also excluded because it is included in Asian NIEs.

Source: GTAP database, Version 5.4.

Table 2. Export Shares by Product Category, 1997 (percent)

Sector	Region									
	EU-15	CEEC-10	BRCT	Japan	China	Asian NIEs	ASEAN	United States	Other developed	ROW
Crops	1.5	1.1	4.5	0.0	1.3	0.2	1.6	3.5	2.6	5.5
Other agriculture	0.5	0.7	0.5	0.0	0.8	0.2	0.5	0.4	1.6	0.5
Natural resources	0.3	0.7	0.8	0.0	0.3	0.1	1.2	0.4	1.9	2.5
Energy	2.4	5.9	2.1	0.3	1.9	2.9	6.9	1.4	12.2	29.5
Processed food	6.1	5.6	4.4	0.6	2.9	1.4	7.0	3.6	5.9	5.8
Textiles	2.9	3.2	9.2	1.5	8.2	6.4	3.3	1.3	1.3	3.2
Apparel	2.7	6.0	13.3	0.3	18.0	2.5	6.4	1.1	0.7	4.7
Chemical products	12.6	8.7	5.7	8.4	6.1	8.5	6.4	9.9	9.3	5.1
Metals and products	6.9	10.2	9.5	5.9	5.0	6.5	2.6	4.0	9.9	8.7
Machinery	17.7	13.1	5.7	25.8	12.3	12.8	7.0	18.8	13.5	5.9
Electronic equipment	7.5	5.2	1.2	21.7	12.8	34.6	29.6	12.8	3.8	3.0
Transport equipment	12.0	8.4	2.5	18.8	1.6	5.9	1.0	12.0	11.2	4.1
Other manufactures	8.9	11.4	6.2	3.6	12.5	4.5	8.7	6.2	11.6	6.2
Construction	0.8	1.1	3.4	1.4	0.3	0.1	0.1	0.5	0.1	0.2
Services	17.3	18.5	30.9	11.7	16.0	13.2	17.7	24.1	14.4	15.2
All sectors	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: GTAP database, version 5.4.

Table 3. Effects on Welfare (Deviations in equivalent variations from the baseline in 2015)

Region	Scenario 1	Scenario 2	Scenario 3
A. Absolute deviations (US$ billion in 1997 prices)			
EU-15	4.50	19.86	26.47
CEEC-10	9.75	35.97	31.30
Acceding and candidate countries (BRCT)	2.35	10.19	11.87
Japan	-0.48	-1.15	1.12
China	-2.04	-3.19	0.35
Asian NIEs	-0.32	-1.20	-0.24
ASEAN	-0.87	-1.26	-1.13
United States	-0.45	-1.56	7.46
Other developed countries	-0.20	-0.83	-0.08
Rest of world	-1.33	-3.19	-1.51
Enlarged EU	16.61	66.02	69.64
East Asia	-3.72	-6.80	0.10
Other regions	-1.98	-5.59	5.88
World	10.91	53.63	75.61
B. Percent deviations			
EU-15	0.04	0.19	0.25
CEEC-10	2.15	7.93	6.90
Acceding and candidate countries (BRCT)	0.59	2.54	2.95
Japan	-0.01	-0.02	0.02
China	-0.07	-0.11	0.01
Asian NIEs	-0.02	-0.07	-0.01
ASEAN	-0.09	-0.12	-0.11
United States	0.00	-0.01	0.06
Other developed countries	-0.01	-0.04	0.00
Rest of world	-0.02	-0.05	-0.02
Enlarged EU	0.14	0.57	0.60
East Asia	-0.03	-0.06	0.00
Other regions	-0.01	-0.03	0.03
World	0.02	0.12	0.17

Definitions of scenarios:

Scenario 1: the removal of bilateral tariffs between the EU-15 and the CEEC-10 and the adoption of the EU's CET by CEEC-10 over the 1998-2005 period. This is followed by the elimination of bilateral tariffs between the EU-25 and the acceding and candidate countries (BRCT) and the adoption of CET by BRCT over the 2005-2015 period. The sector-specific productivity factors related to openness ($\chi_{i,t}$) are fixed at the baseline levels.

Scenario 2: Scenario 1 plus a 5 percent reduction in non-monetary trade costs between the EU-15 and the CEEC-10 over the 1998-2005 period, followed by the same reduction in these costs between the EU-25 and BRCT over the 2005-2015 period. $\chi_{i,t}$ are fixed at the baseline levels.

Scenario 3: Same as scenario 2 except that $\chi_{i,t}$ are endogenous and determined by equation (2).

Table 4. World Trade Flow Adjustments under Scenario 3 (Percent deviations from the baseline for the year 2015)

	Importing region										
Exporting region	EU-15	CEEC-10	BRCT	Japan	China	Asian NIEs	ASEAN	United States	Other developed	ROW	World
EU-15	-3.2	52.4	42.3	-0.3	-0.8	-0.7	-0.6	-0.4	-0.4	-0.6	1.2
CEEC-10	74.8	23.9	19.2	-24.3	-22.1	-20.5	-22.6	-19.6	-15.6	-7.6	39.0
Acceding and candidate countries (BRCT)	53.9	54.7	49.3	-10.1	-8.7	-10.0	-10.2	-4.4	-8.6	-2.5	24.9
Japan	-1.4	2.8	-18.7		-0.1	-0.1	-0.1	0.1	0.3	0.0	-0.3
China	-4.6	6.5	-3.8	0.4	-0.1	0.3	0.4	0.6	0.6	0.7	-0.5
Asian NIEs	-1.4	-1.0	-10.3	0.0	-0.3	-0.1	-0.2	0.0	0.2	0.0	-0.4
ASEAN	-2.2	6.3	-11.4	0.1	-0.2	0.0	0.0	0.1	0.4	0.0	-0.4
United States	-1.1	7.4	-2.2	0.1	-0.2	-0.1	0.0		0.0	0.0	-0.3
Other developed countries	-0.8	7.0	-2.9	0.0	-0.5	-0.2	-0.2	-0.2	0.1	-0.1	-0.3
Rest of world	-1.8	0.6	-1.2	0.3	-0.2	0.1	0.1	0.1	0.4	0.1	-0.4
Enlarged EU	3.4	48.0	40.8	-1.9	-1.5	-1.8	-1.8	-1.4	-1.1	-1.2	4.2
East Asia	-2.6	3.2	-10.2	0.2	-0.2	0.0	0.0	0.3	0.4	0.3	-0.4
Other regions	-1.3	3.3	-1.7	0.1	-0.3	-0.1	0.0	0.0	0.1	0.0	-0.3
World	1.2	33.8	21.1	-0.3	-0.4	-0.3	-0.4	-0.2	-0.2	-0.3	1.3

Table 5. Trade Flow Adjustments for Selected Products under Scenario 3
(Percent deviations from the baseline for the year 2015)

	Importing region and sector							
	Natural resources				Processed Food			
Exporting region	Enlarged EU	East Asia	Other regions	World	Enlarged EU	East Asia	Other regions	World
Enlarged EU	1.9	-3.8	-5.5	-0.1	15.2	-0.7	2.5	10.3
East Asia	2.3	0.1	0.6	0.5	-9.0	0.0	-0.5	-1.1
Other regions	2.7	-0.2	0.3	0.9	-5.5	-0.3	-1.0	-1.8
World	2.4	-0.2	-0.3	0.7	9.2	-0.3	0.3	3.6

	Importing region and sector							
	Textiles				Apparel			
Exporting region	Enlarged EU	East Asia	Other regions	World	Enlarged EU	East Asia	Other regions	World
Enlarged EU	14.9	-0.6	0.6	10.7	54.1	3.3	4.6	39.6
East Asia	-8.6	-1.5	-1.0	-2.1	-25.3	-0.3	0.1	-5.8
Other regions	-8.8	-1.7	-1.3	-3.3	-30.5	-2.1	-1.6	-11.1
World	7.8	-1.5	-0.7	1.9	13.8	-0.1	0.2	5.3

	Importing region and sector							
	Metals and products				Electronic equipment			
Exporting region	Enlarged EU	East Asia	Other regions	World	Enlarged EU	East Asia	Other regions	World
Enlarged EU	6.4	-3.1	-2.3	3.5	4.7	-1.2	-1.2	2.6
East Asia	-0.2	0.2	0.4	0.2	-1.0	0.0	0.0	-0.2
Other regions	-1.1	0.0	0.2	-0.2	-1.4	-0.1	0.0	-0.3
World	4.2	-0.3	-0.4	1.3	1.8	-0.2	-0.1	0.4

	Importing region and sector							
	Transport equipment				Other manufactures			
Exporting region	Enlarged EU	East Asia	Other regions	World	Enlarged EU	East Asia	Other regions	World
Enlarged EU	15.1	0.0	1.0	10.8	5.2	-1.5	-1.7	2.5
East Asia	-11.7	-0.2	-0.3	-2.6	0.7	0.1	0.6	0.4
Other regions	-13.7	-0.8	-0.5	-2.6	0.0	-0.2	0.2	0.1
World	8.2	-0.4	-0.1	3.2	3.5	-0.2	-0.3	1.2

Table 6. Sectoral Output Adjustments under Scenario 3 (Percent deviations from the baseline for the year 2015)

	Region									
Sector	EU-15	CEEC-10	BRCT	Japan	China	Asian NIEs	ASEAN	United States	Other developed	ROW
Crops	0.0	0.2	2.7	0.0	0.0	0.0	-0.1	-0.1	-0.6	-0.2
Other agriculture	-0.6	7.4	1.2	0.0	0.0	-0.2	-0.1	0.0	-0.8	-0.3
Natural resources	0.4	-8.3	-2.0	0.0	0.3	0.0	0.1	0.0	0.0	0.3
Energy	0.5	-6.1	-0.7	0.0	0.1	0.0	0.1	0.0	0.2	0.4
Processed food	-0.7	15.1	0.2	0.0	0.0	0.0	-0.3	0.0	-0.7	-0.4
Textiles	1.3	18.0	33.8	-0.9	-1.1	-1.8	-3.0	-0.8	-1.6	-1.3
Apparel	-7.2	61.9	74.4	-0.5	-2.7	-1.9	-5.2	-1.0	-2.7	-2.7
Chemical products	0.5	-3.5	-0.4	0.0	0.1	-0.2	-0.1	0.0	0.0	-0.1
Metals and products	0.4	-0.9	-3.1	0.0	0.3	0.0	0.1	-0.1	-0.2	0.0
Machinery	0.5	12.5	-2.8	-0.1	0.2	-0.2	-0.1	-0.1	-0.3	0.1
Electronic equipment	0.0	16.9	5.2	0.0	0.2	-0.1	-0.1	-0.1	-0.3	0.0
Transport equipment	-1.9	98.3	-11.0	-0.8	-0.2	-1.3	-0.6	-0.9	-0.7	-0.7
Other manufactures	0.5	-7.1	-1.0	0.0	0.3	0.0	0.1	0.1	0.0	0.1
Construction	0.3	3.3	2.4	0.0	0.0	0.0	-0.1	0.0	0.0	0.0
Services	0.1	-2.8	-0.6	0.1	0.3	0.2	0.3	0.1	0.1	0.1

Appendix Table. Sensitivity of Changes in the Trade Efficiency Parameter to the Welfare Results for Scenario 3 (Percent deviations from the baseline in 2015)

	Trade cost reduction		
Region	2.5%	5%	10%
EU-15	0.16	0.25	0.44
CEEC-10	4.33	6.90	12.36
Acceding and candidate countries (BRCT)	1.91	2.95	5.16
Japan	0.02	0.02	0.03
China	0.01	0.01	0.02
Asian NIEs	0.00	-0.01	-0.03
ASEAN	-0.10	-0.11	-0.14
United States	0.05	0.06	0.08
Other developed countries	0.00	0.00	-0.01
Rest of world	-0.01	-0.02	-0.04
Enlarged EU	0.38	0.60	1.07
East Asia	0.00	0.00	0.00
Other regions	0.02	0.03	0.03
World	0.11	0.17	0.29