

EU enlargement and its impacts on East Asia

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Abstract

Ten countries—most completing their transition from socialist-based economies to market economies—are slated to join the European Union (EU) in 2004 and four additional countries are expected to become members at some future dates. Despite the relatively small economic size of the accession 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 paper, 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. The paper also assesses the relative importance of linking trade openness to productivity and lowering trade costs between the accession countries and the EU-15.
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1. Introduction

In December 2002, the European Union (EU) and 10 countries—Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, and Slovenia—jointly approved the largest enlargement in the history of the EU. Treaties of Accession were signed in April 2003, and with their ratification enlargement would take place in May

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2004. Bulgaria and Romania are expected to follow suit in 2007, whereas Croatia and Turkey are expected to become members at some future dates.

The current round of EU enlargement is 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 & 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 2000, the 10 acceding countries only represented some 4% of the combined \$8.2 trillion economy consisting of the 15 present members and 14 expected new members, though 17% of the combined population of 456 million. Thus, there is a 5 to 1 ratio in per capita incomes between the current EU-15 and the acceding countries. The four prospective future EU members are somewhat smaller in economic importance, but contain a population of over 100 million, compared with under 80 million for the 10 acceding countries. Despite the relatively small economic size of the accession 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.

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 & Thierfelder, 1999). The positive effect on economic welfare resulting from the EU’s Single Market program is supported by Baldwin, Forslid, and Haaland (1995) and Harrison, Rutherford, and Tarr (1996). Lejour, de Mooij, and Nahuys (2001) 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 Central and East European countries (CEECs) is predicted to increase by more than 8% in the long-run. By contrast, GDP per capita of the present EU members is predicted to increase by only about 0.1%. 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.

Based on empirical evidence, Deardorff and Stern (2002) 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. In this paper, we evaluate the effects of EU enlargement on economic welfare, trade flows and sectoral output of the present EU members, the acceding countries and the prospective future EU members using a dynamic global computable general equilibrium (CGE) model, paying particularly close attention to the implications for East Asian countries.

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 non-member 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.¹ 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 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

¹ 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 paper. 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.

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

$$WPM_{r,r',i} = \frac{(1 + \zeta_{r,r',i})WPE_{r,r',i}}{\lambda_{r,r',i}} \quad (1)$$

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 $\lambda_{r,r',i}$.² In our model, an increase in $\lambda_{r,r',i}$ represents a reduction in administrative barriers to trade (e.g., customs procedures) and/or a lower technical barrier (e.g., mutual recognition of technical standards in production, packaging and marketing).

Most of the data used in the model come from the GTAP database, version 5.2, which provides 1997 data on input–output, value added, final demand, bilateral trade, tax and subsidy data for 76 regions and 57 sectors.³ For the purpose of the present study, the database is aggregated into 10 regions and 15 sectors as shown in Table 1. The countries

² 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).

³ Dimaranan and McDougall (2002) give detailed descriptions of the GTAP database, version 5.0. The number of regions is increased from 66 to 76 in version 5.2, which disaggregates the Central and Eastern European regions into single countries.

Table 1
Regional and sectoral aggregation

Countries/regions	Corresponding economies/regions in the GTAP database
(A) Regional aggregation	
EU-15	Austria, Belgium, Denmark, Finland, France, Germany, Great Britain, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden
Acceding-10	Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia
Prospective future EU members	Bulgaria, Croatia, Romania and Turkey (BCRT)
Japan	Japan
China	China and Hong Kong
Asian NIEs	Korea, Taiwan and Singapore
ASEAN ^a	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
Sectors	Corresponding commodities/sectors in the GTAP database
(B) Sectoral aggregation	
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, non-ferrous metals, metal products
Machinery	Machinery
Electronic equipments	Electronic equipment
Transport equipments	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

Source: GTAP database, version 5.2.

^a Excludes Singapore. In the GTAP database, Brunei, Cambodia, Laos, and Myanmar are aggregated into the rest of the world.

that have applied for membership in the EU are divided into a region consisting of the 10 acceding countries and a region consisting of countries that do not fully meet the *acquis communautaire* criteria—Bulgaria, Romania, and Turkey—plus Croatia, which just applied for a membership in February 2003.⁴

⁴ See European Commission (2002) and Batory (2003) for discussions of the *acquis communautaire*, or the ability to adopt existing legal and institutional frameworks of the EU.

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 (see [Appendix A](#)).

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

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

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, 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 (1986–1988) for tariffication of non-tariff measures corresponds to peak farm protection in the EU, it makes effective agricultural liberalization minimal for the Union ([Messerlin, 2001](#)). Third, post-Uruguay Round average tariff rates are only slightly lower than the average

⁵ Three main channels have been identified linking openness with productivity: imports of technology-laden intermediate inputs (e.g., 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 The EU maintains significant tariff peaks in some so-called sensitive sectors, but their impacts are hard to assess at the level of aggregation of our model.

tariff rates in 1995 for CEECs (Francois & 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 world trade flow matrix for the year 1997. From this table, export shares by trading partner are computed. We find that 56.1% of the EU-15's exports in 1997 was to the other EU-15 countries, 3.9% of its exports was to the Acceding-10 countries, 1.7% to the four prospective future EU members (Bulgaria, Croatia, Romania and Turkey: BCRT), and 10.9% to the four East Asian regions (Japan, China, Asian NIEs and ASEAN). It is also found that 55.6% of the Acceding-10's exports and 50.0% of the BCRT's exports in 1997 were destined to the EU-15 market. In the same year, 19.2% of East Asia's exports were shipped to the EU-15 while its exports to the Acceding-10 and BCRT were only 0.8 and 0.5%, respectively of its total exports. Hence, changes in East Asia's exports to the acceding countries and the prospective future EU members 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 Acceding-10 will remove bilateral tariffs and the latter will adopt the EU's common external tariffs (CET) with respect to third countries over the 2005–2010 period. This is followed by the elimination of bilateral tariffs between the enlarged EU (EU-25) and the four prospective future EU members (BCRT) and the adoption of CET by the BCRT over the 2010–2015 period.⁸ 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 Acceding-10 by 2.5% over the 2005–2010 period, followed by the same rate of reduction in these costs between the EU-25 and BCRT over the 2010–2015 period. 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 Eq. (2). We set $\eta_i = 0.75$ in agricultural sectors and $\eta_i = 1.0$ in all other sectors. Scenario 4 is the same as scenario 3 except that we reduce iceberg trade costs by 5% instead of 2.5%.⁹

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

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 bilateral tariffs on most manufacturing products between the current EU members and the acceding countries have largely been removed. In addition, the acceding countries have already been changing their tariff structures to conform with the EU's CET. To the extent that the process had already been initiated, the estimated effects of EU enlargement reported in this paper are likely to be overestimated.

⁹ Smith and Venables (1988) use a 2.5% reduction in intra-EU trade costs in their study of the Single Market program's possible pro-competitive effects, whereas Keuschnigg and Kohler (2000) and Madsen and Sorensen (2002) use a 5% reduction in real costs of trade between the EU and CEECs. Thus, we use these two different rates in this study.

Table 2
World trade flows in 1997 (millions of US dollars)

Exporting region	Importing region										
	EU-15	Acceding-10	BCRT	Japan	China	Asian NIEs	ASEAN	United States	Other developed	ROW	Total
EU-15	1,325,218	87,940	41,370	85,367	51,792	67,524	54,070	221,851	144,586	284,396	2,364,114
Acceding-10	65,361	13,153	2,756	3,558	1,002	2,168	1,504	7,713	3,362	17,054	117,631
Prospective future EU members (BCRT)	31,467	2,075	1,561	2,638	921	1,529	1,568	5,483	2,209	13,489	62,939
Japan	92,239	2,914	2,566	–	54,071	76,216	50,410	125,222	25,815	52,977	482,430
China	56,953	2,551	1,469	42,694	20,162	25,000	13,527	73,398	12,841	40,353	288,948
Asian NIEs	72,598	4,287	2,761	36,455	69,464	25,932	53,066	82,960	17,477	46,445	411,445
ASEAN	57,448	1,862	1,108	38,678	16,345	46,631	17,469	55,957	12,468	23,755	271,719
United States	233,087	7,648	6,762	86,276	35,227	73,123	38,041	–	164,229	208,461	852,854
Other developed countries	131,323	4,534	3,129	32,778	14,184	23,076	14,055	193,398	16,397	40,656	473,531
Rest of world	232,122	18,570	14,853	67,911	24,804	46,499	24,193	216,530	31,619	176,129	853,229
World total	2,297,817	145,535	78,334	396,355	287,972	387,699	267,900	982,511	431,002	903,716	6,178,840

Source: GTAP database, version 5.2.

that the Acceding-10 and subsequently the BCRT 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 acceding countries will be 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 paper. It should be 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 most 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 paper to model the movement of labor between the EU-15 and CEECs, which is incorporated in the study by Lejour et al. (2001). They find that GDP per capita increases in CEECs by 0.6–1.1% and decreases slightly in the EU-15, whereas GDP decreases in CEECs (because of the labor outflow) and increases in the EU-15.

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 (Howe, 1975; Lluch, 1973). 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 EVs from the baseline in 2015. In scenario 1, EVs of the Acceding-10 and BCRT increase by \$9.1 billion (2.01%) and \$2.0 billion (0.50%), respectively, whereas EV of the EU-15 increases only very slightly 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 Acceding-10 and BCRT'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

Table 3

Effects on welfare (deviations in equivalent variations from the baseline in 2015)

Region	Scenario 1	Scenario 2	Scenario 3	Scenario 4
(A) Absolute deviations (\$1997 billion)				
EU-15	4.18	11.06	14.56	22.89
Acceding-10	9.12	21.18	18.76	29.93
Prospective future EU members	1.99	5.42	6.31	10.00
Japan	−0.46	−0.78	0.59	0.67
China	−1.94	−2.48	−0.46	−0.54
Asian NIEs	−0.31	−0.73	−0.23	−0.48
ASEAN	−0.81	−0.99	−0.89	−1.05
United States	−0.48	−1.03	4.39	5.24
Other developed countries	−0.19	−0.50	−0.03	−0.19
Rest of world	−1.25	−2.17	−1.12	−1.85
EU-29	15.29	37.66	39.63	62.81
East Asia	−3.52	−4.98	−0.99	−1.39
Other regions	−1.92	−3.70	3.24	3.20
World	9.85	28.98	41.87	64.62
(B) Percent deviations				
EU-15	0.04	0.10	0.14	0.21
Acceding-10	2.01	4.67	4.14	6.60
Prospective future EU members	0.50	1.35	1.57	2.49
Japan	−0.01	−0.01	0.01	0.01
China	−0.07	−0.08	−0.02	−0.02
Asian NIEs	−0.02	−0.04	−0.01	−0.03
ASEAN	−0.08	−0.10	−0.09	−0.10
United States	0.00	−0.01	0.03	0.04
Other developed countries	−0.01	−0.02	0.00	−0.01
Rest of world	−0.02	−0.03	−0.02	−0.03
EU-29	0.13	0.33	0.34	0.54
East Asia	−0.03	−0.04	−0.01	−0.01
Other regions	−0.01	−0.02	0.01	0.01
World	0.02	0.06	0.09	0.14

Scenario 1: the removal of bilateral tariffs between the EU-15 and the Acceding-10 and the adoption of the EU's CET by Acceding-10 over the 2005–2010 period. This is followed by the elimination of bilateral tariffs between the enlarged EU (EU-25) and Bulgaria, Croatia, Romania, and Turkey (BCRT) and the adoption of CET by the BCRT over the 2010–2015 period. The sector-specific productivity factors related to openness ($\chi_{i,t}$) are fixed at the baseline levels. Scenario 2: Scenario 1 plus a 2.5% reduction in non-monetary trade costs between the EU-15 and the Acceding-10 over the 2005–2010 period, followed by the same reduction in these costs between the EU-25 and BCRT over the 2010–2015 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 Eq. (2). Scenario 4: same as scenario 3 except that the reduction in non-monetary trade costs is 5% instead of 2.5%.

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% of its exports were shipped to the EU in 1997.

When a 2.5% reduction in trade costs between the EU-15 and CEECs is added (scenario 2), the magnitudes of welfare gains for the EU-15, Acceding-10 and BCRT increase by a factor of 2.5, 2.3 and 2.7, respectively. A greater access of the internal market resulting

from 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 threefold in scenario 2 compared with scenario 1 (0.06% versus 0.02%). Thus, trade creation resulting from a reduction in trade costs between the present and future EU members is likely to be far greater than trade diversion.¹⁰

In the next two scenarios, 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 BCRT, but not for the Acceding-10. It should be noted that the Acceding-10's welfare and real GDP gains are larger under scenario 3 in earlier years (e.g., 2005–2010). Its export growth in some of the products becomes smaller after the latecomers (BCRT) accede to the EU and their exports to the Union increase significantly. In 2015, the Acceding-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.

For the East Asian regions as a whole, the welfare loss shrinks from \$5.0 billion under scenario 2 to \$1.0 billion under scenario 3 because the export–output ratios increase slightly in some of the key sectors. 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 (0.09% versus 0.06%).

In scenario 4, non-monetary trade costs are reduced by 5% instead of 2.5% to examine the sensitivity of a change in the trade efficiency parameter $\lambda_{r,r',i}$ on economic welfare. An increase in trade efficiency among the present and future EU regions has a large impact on their welfare gains. In particular, the Acceding-10's welfare gains increase from 4.1% under scenario 3 to 6.6% under scenario 4. 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 bilateral and world trade flows

Table 4 summarizes bilateral trade flow adjustments resulting from EU accession in scenario 3, which combines an enlargement of the customs union and a 2.5% reduction in trade costs among the EU-15, Acceding-10 and BCRT 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 Acceding-10 and BCRT would be 40.9 and 33.4% higher, whereas the Acceding-10 and BCRT's exports to the EU-15 would be 58.2 and 42.0% 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

¹⁰ It should be noted that while trade creation always raises welfare, trade diversion may or may not reduce welfare.

Table 4
Bilateral trade flow adjustments under Scenario 3 (percent deviations from the baseline for the year 2015)

Exporting region	Importing region										
	EU-15	Acceding-10	BCRT	Japan	China	Asian NIEs	ASEAN	United States	Other developed	ROW	World
EU-15	−2.5	40.9	33.4	−0.2	−0.6	−0.5	−0.5	−0.3	−0.3	−0.5	0.9
Acceding-10	58.2	18.0	15.2	−18.8	−17.1	−15.8	−17.5	−14.7	−11.5	−4.5	30.6
Prospective future EU members (BCRT)	42.0	44.2	40.5	−7.1	−6.0	−7.2	−7.4	−1.8	−5.9	−0.6	20.1
Japan	−0.9	2.5	−14.9	–	−0.1	0.0	−0.1	0.0	0.2	0.0	−0.2
China	−3.8	8.2	−0.4	0.3	−0.1	0.3	0.3	0.4	0.5	0.4	−0.4
Asian NIEs	−1.0	2.9	−5.4	0.0	−0.3	−0.1	−0.2	0.0	0.1	−0.1	−0.3
ASEAN	−1.8	5.4	−10.7	0.1	−0.2	0.0	0.0	0.1	0.3	−0.1	−0.3
United States	−0.8	6.1	−0.9	0.0	−0.2	−0.1	0.0	–	0.0	−0.1	−0.2
Other developed countries	−0.6	7.4	−0.6	−0.1	−0.4	−0.2	−0.2	−0.2	0.0	−0.2	−0.2
Rest of world	−1.4	−0.7	−1.1	0.2	−0.1	0.1	0.1	0.1	0.4	0.0	−0.3
Enlarged EU	2.7	37.4	32.3	−1.4	−1.2	−1.3	−1.4	−1.0	−0.8	−0.8	3.4
East Asia	−2.1	5.0	−6.6	0.2	−0.2	0.0	−0.1	0.2	0.3	0.1	−0.3
Aggregate rest of world	−1.0	2.2	−1.0	0.1	−0.2	0.0	0.0	0.0	0.1	−0.1	−0.2
World	0.9	26.5	17.0	−0.2	−0.4	−0.2	−0.3	−0.2	−0.2	−0.3	1.0

Table 5

Trade flow adjustments for selected products under Scenario 3 (percent deviations from the baseline for the year 2015)

Exporting region	Importing region and sector							
	Enlarged EU	East Asia	Other regions	World	Enlarged EU	East Asia	Other regions	World
	Processed Food				Textiles			
Enlarged EU	13.9	−0.5	2.9	9.5	13.1	−0.4	0.8	9.5
East Asia	−8.6	−0.1	−0.6	−1.1	−7.0	−1.3	−0.9	−1.8
Other regions	−4.9	−0.3	−1.0	−1.7	−7.3	−1.4	−1.1	−2.8
World	8.4	−0.2	0.3	3.3	7.0	−1.2	−0.6	1.8
	Apparel				Metals and products			
Enlarged EU	45.8	2.6	4.5	33.7	4.8	−2.4	−1.8	2.6
East Asia	−20.8	−0.3	−0.2	−4.9	0.3	0.2	0.3	0.2
Other regions	−25.9	−1.5	−1.3	−9.4	−0.4	0.0	0.2	0.0
World	11.8	−0.1	0.1	4.5	3.3	−0.2	−0.3	1.0
	Electronic equipment				Transport equipment			
Enlarged EU	3.6	−0.9	−0.9	2.0	11.5	−0.1	0.7	8.2
East Asia	−0.7	0.0	0.0	−0.1	−7.6	−0.1	−0.2	−1.7
Other regions	−1.1	−0.1	0.0	−0.2	−10.3	−0.5	−0.4	−2.0
World	1.4	−0.1	−0.1	0.3	6.4	−0.3	−0.1	2.5

substantial trade diversion in some products, however, it is necessary to examine the results on trade flows by product category.

Table 5 provides trade flow adjustments for six 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.¹¹ In four of the six products (i.e., processed food, textiles, apparel and transport equipment), East Asia's exports to the enlarged EU region decline substantially.¹² The most notable sector is apparel, where its exports to the EU-29 (the EU-15, Acceding-10 and BCRT) would decline by 20.8%. 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.

In many products, East Asia's exports to the EU-29 are affected very little. For example, its exports of electronic equipment to enlarged EU would decline by only 0.7%. Other products with small reductions in East Asia's exports to the EU-29 include chemical products and machinery. In metals and products, its exports to an enlarged EU are predicted to increase by 0.3%. Although not shown in Table 5, East Asia's exports to the EU-29 are predicted to increase somewhat in five other product groups: crops, natural resources, energy, other manufactures and services. Thus, the impact of EU enlargement on East Asia's trade adjustments is quite small for a large number of products.

¹¹ See Lee and van der Mensbrugghe (2003) for trade adjustment results for 10 regions and 14 sectors (all the sectors except construction).

¹² Although not included in Table 5, EU enlargement would also lead to significant trade diversion in "other agriculture."

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 sectoral output effects might be overstated because we include the removal of bilateral tariffs between the EU-15 and CEECs that has already taken place since 1997. Overall, sectoral output adjustments are very large for the Acceding-10 and BCRT mainly because these regions depend very heavily upon trade with the EU-15, which increases drastically as they accede to the Union.

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 non-tariff barriers, the export–output ratios, the import–demand ratios, and the elasticities of substitution between domestic and imported products. The pre-accession trade barriers were relatively high in crops, other agriculture, processed food, textiles and apparel. In the Acceding-10, the export–output ratios for 1997 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 the BCRT, 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 Acceding-10 and the BCRT, the apparel sector would expand substantially largely because the EU-15, Acceding-10 and BCRT all had relatively high pre-accession protection rates and both acceding regions have comparative advantage in this sector vis-à-vis the EU-15. Output of textiles in BCRT would increase significantly for the same reasons, but that in the Acceding-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 Acceding-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 BCRT, 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 the BCRT 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 Acceding-10 and BCRT would contract primarily because of increases in factor prices.

Table 6
Sectoral output adjustments under Scenario 3 (percent deviations from the baseline for the year 2015)

Sector	Region									
	EU-15	Acceding-10	BCRT	Japan	China	Asian NIEs	ASEAN	United States	Other developed	ROW
Crops	−0.1	1.2	2.4	0.0	0.0	0.0	−0.1	−0.1	−0.6	−0.2
Other agriculture	−0.6	7.1	0.8	0.0	0.0	−0.2	−0.1	0.0	−0.7	−0.2
Natural resources	0.4	−7.7	−2.2	0.0	0.2	0.0	0.1	0.0	0.0	0.3
Energy	0.3	−6.4	−1.2	0.0	0.1	−0.1	0.1	0.0	0.1	0.4
Processed food	−0.7	14.3	−0.1	0.0	0.0	−0.1	−0.3	0.0	−0.7	−0.4
Textiles	1.2	17.4	30.0	−0.7	−0.9	−1.6	−2.6	−0.7	−1.3	−1.1
Apparel	−6.5	57.2	60.7	−0.4	−2.2	−1.6	−4.5	−0.9	−2.2	−2.2
Chemical products	0.4	−2.9	−0.6	0.0	0.1	−0.2	−0.1	0.0	0.0	−0.1
Metals and products	0.4	−2.0	−3.2	0.0	0.3	0.0	0.1	−0.1	−0.1	0.1
Machinery	0.4	8.1	−2.8	−0.1	0.2	−0.1	0.0	−0.1	−0.2	0.1
Electronic equip	0.0	13.2	3.9	0.0	0.2	−0.1	0.0	−0.1	−0.2	0.0
Transport equip	−1.2	69.7	−12.2	−0.6	−0.1	−0.7	−0.4	−0.7	−0.6	−0.5
Other manufactures	0.4	−6.5	−1.4	0.0	0.2	0.0	0.1	0.0	0.0	0.1
Construction	0.2	1.7	1.2	0.0	0.0	0.0	−0.1	0.0	0.0	0.0
Services	0.1	−2.7	−0.9	0.1	0.2	0.1	0.2	0.1	0.1	0.1

Turning to sectoral output adjustments in the four East Asian regions, we find that percentage changes in output exceed 1% only in the textiles and apparel sectors in China, Asian NIEs and ASEAN. In all other sectors, output adjustments are less than 1%. 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 paper, 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 acceding countries, the prospective future EU members 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 0.2% of real income, whereas the impact on the Acceding-10 varies from 2.0 to 6.6 percentage points, and on the BCRT countries from 0.5 to 2.5 percentage points. 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 Acceding-10 and BCRT, the welfare gains increase by a factor of 2.3 and 2.7, respectively, when a mild 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 East 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.

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Appendix A. Baseline scenario summary

Summary of growth rates in the baseline scenario (average annual percent changes).

	GDP		Population		Labor supply	
	1997/2005	2005/2015	1997/2005	2005/2015	1997/2005	2005/2015
EU-15	2.1	2.3	0.1	−0.2	0.0	−0.3
Acceding-10	3.3	4.5	−0.1	−0.1	0.4	−0.2
Prospective future EU members	1.9	4.4	0.8	0.6	1.1	0.8
Japan	0.7	1.7	0.1	−0.2	−0.4	−0.9
China	7.5	6.7	0.8	0.6	1.2	0.8
Asian NIEs	4.6	4.4	0.8	0.5	0.8	0.6
ASEAN	2.4	5.0	1.5	1.2	2.1	1.7
United States	3.0	3.3	0.8	0.7	1.1	0.5
Other developed countries	3.0	2.7	0.8	0.4	1.0	0.3
Rest of world	2.8	3.8	1.7	1.4	2.3	1.8

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