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Trade Liberalization and Developing Countries under the Doha Round

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Keywords: WTO; Doha Round; trade liberalization; services trade, trade facilitation, CGE modeling

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1. Introduction

After the failed attempts in Seattle in late 1999, the Ministerial Meeting of the World Trade Organization (WTO) in Doha, in November 2001 launched the agenda for a new comprehensive round of multilateral trade negotiations. At the behest of the EU, the ministerial declaration emphasized that the Doha Round should provide a major opportunity for developing countries. Consequently the agenda for new WTO round has been coined the 'Doha Development Agenda'. In this paper we explore the likely economic effects of the new WTO "Doha Development Round" for major developed and developing regions. While the methodology employed is comparable to that used in recent studies of these issues, we extend this literature by including market structure and investment effects in the modeling exercise, and by stressing a policy benchmark including China's accession to the WTO, the Agenda 2000 reforms to the CAP, enlargement of the EU. We cover the areas of agricultural liberalization, liberalization in industrial tariffs, liberalization in services trade, and trade facilitation measures. Our services scenarios build on gravity-equation based estimates of services barriers.

The core of our analysis is structured around a set of scenarios. These scenarios are based on alternative liberalization approaches for agriculture, manufactured goods, and services trade. They are meant to illustrate the implications of alternative approaches to market access liberalization. They are stylized rather than exact representations. In part, this is because we are working with an aggregate model (i.e. we do not model trade at the 6-digit HS level), and as such detailed treatment of all product-specific proposals is simply impossible. In addition, the actual

market access modalities remain to be worked out. In agriculture, domestic support may or may not be affected, developing countries may or may not have to liberalize, and certain politically sensitive sectors may yet again escape from meaningful liberalization. Our scenarios are themselves decomposed into different components, related to specific sets of countries and specific sectors and instruments. This offers the advantage of allowing us (or the reader) to construct rough representations of hybrid liberalization experiments later, since individual components can be taken from different scenarios and combined.[1]

The paper is organized as follows: Section 2 develops the liberalization scenarios for the subsequent quantitative analysis. Section 3 describes briefly the modeling framework used. Section 4 discusses the results of our liberalization scenarios. It starts with a section on global results, proceeding with the results for the EU.

2. The Policy Landscape and Scenarios

Tariff negotiations in the GATT/WTO have generally been based on tariff bindings, or schedules of concessions tabled under GATT rules that define a maximum or ceiling rate for trade restrictions. The coverage and level of these bindings is an important element of the initial conditions for the negotiations. Table 2.1 provides information on the share of industrial-product tariffs (on a trade-weighted basis) that remains either unbound or bound above applied rates. While tariffs in the OECD (and Latin America) are generally bound, many Asian and African economy tariffs remain unbound despite more than a four-fold increase in the coverage of developing-country tariff bindings in the Uruguay Round (Abreu 1996). For almost all developing countries, existing bindings are, on average, well above applied rates, reflecting a combination of relatively high initial bindings, and the subsequent wave of reductions in applied rates. (See Blackhurst *et al* 1996, Francois 2001).

In addition to general Uruguay Round commitments, there have also been efforts for sector-based commitments to implement zero tariffs (called "zero-for-zero"). This is reflected in the next-to-last column of Table 2-1. As a result of zero-for-zero efforts, OECD economies have between roughly 10% and 30% of tariff lines bound at zero percent. Most developing countries have opted out of this process. Zero-for-zero increased developed country duty-free imports to 43% of total imports (Laird 1998). The process itself ground to a halt after the initial

[1] Technically, decomposition of general equilibrium-related effects of policy scenarios exhibits path dependence, meaning that the decomposition can be sensitive to the ordering of the elements of the experiment set. The impact of a particular instrument is also sensitive to the other members of the set. We employ a linear decomposition method in this paper that addresses the path dependence problem (Harrison et al 2000). As such, individual experiment elements are roughly additive.

Information Technology Agreement (ITA). This seems to have been for two reasons: (i) the sectors in which OECD economies could easily reach agreement had already been included, and (ii) those sectors remaining involve North-South issues not susceptible to this approach. In other words, the cherries have been picked, leaving us with the hard nuts.

[Table 2.1 about here]

With the implementation of Uruguay Round commitments, average *ad valorem* tariffs in the industrial countries generally are around 3 percent. This is reflected in the first columns of Table 2.2.[2] However, there are important exceptions. One of these is textiles and clothing, where the average rate is roughly three times this overall average. This is reflected in the standard deviation and maximum tariff columns. With full implementation of current commitments, the estimated simple average industrial tariff in the United States is 3.2 percent, with a standard deviation of 4.3, and a maximum tariff of 37.5 percent. The European Union has a higher average, but less dispersion. (The EU has an average of 3.7 percent, a standard deviation of 3.6 percent, and a maximum tariff of 17 percent.) For the developing countries in Table 2.1, average industrial tariffs range from a low of 3 to 4 percent to a high of more than 20 percent. Table 2.2 presents detailed data for three developing countries: Brazil, India, and Thailand. These countries span the spectrum of developing country bindings as reflected in Table 2.1. Brazil's tariffs are all bound, though the average rate for industrial products is 14.9 percentage points above the current applied rate. This gap is called a "*binding overhang*." (See Francois and Martin 2003.) India and Thailand's tariffs are partially covered by bindings, again with significant binding overhang. In general, for developing countries, binding overhang is large enough that reductions in the range of 50% are necessary to force any reductions in average applied rates for countries like Brazil. For many countries, even this will have little or no effect, as tariffs are largely unbound. Of course, this limits severely the negotiating leverage of developing countries in the WTO. This is also why the debate over using bound, applied, or "historic" rates in the WTO as a starting point for negotiations is important.

[Table 2.2 about here]

[2] For agriculture, Table 2.2 only covers notified *ad valorem* tariffs, and hence omits specific tariffs and quantity based measures that abound in agricultural trade.

As in the case of industrial tariffs, the stage for any future agriculture negotiations was also set by the Uruguay Round outcome -- this time by the Uruguay Round Agreement on Agriculture (URAA). One key difference from industrial products is that essentially all agricultural tariffs are bound. However, in both industrial and developing countries, there is a large degree of binding overhang resulting from "dirty tariffication" or the use of "ceiling bindings" (Hathaway and Ingco 1996). The next round of agricultural negotiations was scheduled in the URAA, while the negotiating parameters (tariffs, tariff-rate-quota levels, subsidy commitments, etc.) must also be viewed in the context of the schedules of URAA commitments. The system that has emerged is complex and similar to arrangements in the textile and clothing sectors, featuring a mix of bilaterally allocated tariff-rate-quotas (with associated quota rents) and tariffs. Viewed in conjunction with industrial protection, the basic pattern is that the industrial countries protect agriculture and processed food, while protection in developing countries is more balanced (though also higher overall) in its focus on food and non-food manufactured goods.

The URAA had a stated goal of no backsliding and modest liberalization. However, negotiating parties (generally the relevant agriculture ministries) gave considerable leeway to themselves with regard to selection of the appropriate reference period from which to measure export subsidy reductions. In addition, the move to a price-based system for protection has, in many cases, been subsumed into an effective adoption of explicit quotas. The disciplines on domestic subsidies have also been weakened by a relatively soft definition of the aggregate measure of support (AMS) vis-à-vis individual subsidies and the scope for reallocation of expenditures within the AMS. (See Tangermann 1998 for discussion.) Commitments not to erode current market access were meant to limit the scope for increased protection through dirty tariffication. As the name implies, dirty tariffication involved violations of the spirit, if not the letter, of the URAA text. It involved setting tariff bindings at rates far above then current effective protection rates. The practice of setting high bindings complicated the problem of measuring the impact of further commitments to reduce bindings. Basically, in agriculture, we are in a world that allows scope for great policy discretion and uncertainty as a result of the loose nature of the commitments made. In addition, the setting of high bound rates made possible the conversion of NTBs into even more restrictive import tariffs. This in turn made quantity disciplines necessary to avoid backsliding. As a result, despite the stated goals of subsidy reductions and a shift toward price-based border measures, one of the more striking features of the regime that has actually emerged from the URAA is the prominent role that quantity measures have taken in the new architecture. Basically, the agricultural trading system is complicated and still evolving. Policy measurement in this area has converged on

the use of price-based measurements that emphasize the tax/subsidy equivalent of policy. (As this approach reflects available data, this is the approach we employ in this paper as well.)

For services, "market access" is a problematic concept. From the outset, service negotiations have been "qualitative." They have not targeted numeric measures, but rather commitments in the cross-border movement of consumers and providers and the establishment of foreign providers. In fact, for academics, the GATS seems to confuse FDI and migration with international trade. As a result, efforts to quantify market access in service sectors (a basic requirement if we want to then quantify liberalization) have been problematic at best. The standard approach (an example is Hoekman 1995) has been to produce inventory measures. As an alternative approach, we have produced estimates of "tariff equivalents" for services trade. These are based on a simple gravity model, estimated from detailed global trade data for services trade in 1997. The basic approach is described in an annex to this paper (available upon request). The resulting estimates are summarized in Table 2.3. The estimates are admittedly crude. The pattern that emerges is consistent with that for industrial tariffs. It appears that barriers to services trade are higher (often much higher) in developing countries than in the OECD. Hence, as in the case of industrial tariffs, the effects of further GATS negotiations will hinge critically on developing country participation or non-participation, and the extent to which they commit to actual liberalization rather than stand-stills (the qualitative equivalent of ceiling bindings).

[Table 2.3 about here]

With the reduction in traditional trade barriers, attention in the regional and multilateral trade arenas has not only shifted to quantity restrictions, but also to trade facilitation measures. These are meant to target less transparent trade barriers, such as customs procedures, product standards and conformance certifications, licensing requirements, and related administrative sources of trading costs. Studies of regional integration initiatives (Baldwin and Francois 1999, Smith and Venables 1988) have emphasized the potential for liberalization initiatives to substantially reduce such barriers. Conceptually, these costs are different from the price and quantity measures used for manufactures and agriculture. They are a pure global deadweight loss.

The estimates of trading costs are very rough (at best). Nonetheless, they provide some sense of the magnitudes involved. An overview of estimates is provided in Table 2.4. In the context of the EC single market program, elimination of internal customs procedures and related

administrative streamlining were projected to reduce trading costs by up to 2 percent of the value of trade (EC 1988). Globally, UNCTAD (1994) has noted that trading costs represent 7 to 10 percent of the cost of delivered goods. Like the EC, UNCTAD also estimates that simple trade facilitation measures could reduce these costs by 2 percent of the value of trade. The Australian Industry Commission (1995) has estimated potentially higher savings in the context of APEC, ranging from 5 to 10 percent of the value of trade. Under more modest facilitation initiatives, the Japanese Economic Planning Agency (1997) has estimated savings at 2 percent in an APEC context, while Francois (2001) has employed a similar range of estimates.

[Table 2.4 about here]

To bring these elements together, we define three sets of scenarios (See Table 2.5). The first two are partial liberalization scenarios. In the "Linear 50%" all trade instruments are reduced by 50%. This involves a 50% reduction in agricultural and industrial tariffs and export subsidies, a 50% reduction in OECD domestic support for agriculture, a 50% reduction in the tariff-equivalent of services barriers, and a partial reduction in trading costs, related to trade facilitation measures. Services liberalization involves a 50% or a full reduction in the barriers shown in Table 2.3. The second partial liberalization experiment is called the "Swiss formula" experiment. In this experiment the reduction in import tariffs in agriculture and manufacture is based on a straight Swiss formula with a coefficient of 0.25, meaning the maximum tariff is reduced to 25%. (See Francois and Martin 2003). The third scenario simply involves full elimination of all trade barriers. Trade facilitation, based on the range of available estimates, is assumed to range between 1.5 percent of the value of trade (partial liberalization) and 3 percent (full liberalization).
[Table 2.5 about here]

Each experiment is decomposed, both in terms of sectors and instruments, and also in terms of country grouping. We use the decomposition algorithm for non-linear policy experiments outlined in Harison et al (2000). An example of the basic results structure is given in Table 2.6, where the welfare effects (equivalent variation) are decomposed across sectoral instruments and regions. Because of the decomposition method used, the reader can roughly pick and choose, combining the results of hybrid experiments involving elements from different experiments, for a rough sense of possible effects. For example, if in the next WTO round, the outcome will be only 50% liberalization in manufactures in all regions and trade facilitation only

in OECD countries, the estimated world welfare effect is approximately $83 billion ($37 billion due to liberalization in manufacturing and $46 billion due to trade facilitation in the OECD).

Finally, for each of the experiments we employ alternative model features (these model features are discussed in more detail in section 3.2). First, we include short-run versus long-run effects. In the short-run capital stocks are fixed and in the long-run capital stocks adjust (See Francois et al 1997). Second, we alternatively employ perfect competition and imperfect competition in the manufacturing and services sectors. With perfect competition we assume constant returns to scale and with imperfect competition we assume monopolistic competition with increasing returns to scale, firm-level product differentiation, and average cost pricing. The model therefore includes the basic features of "economic geography" models, including intermediate linkages, monopolistic competition, and returns from specialization. (See Francois and Nelson 2002). For the agricultural sectors (except for the food processing industry) we maintain constant returns to scale in all cases. We use the constant returns to scale scenario mainly as a benchmark scenario to assess the impact of the increasing returns to scale features and it facilitates comparison with other studies that mainly use constant returns to scale in all sectors. A similar approach was followed in the ex-ante literature on the Uruguay Round. (See Harrison, Rutherford, and Tarr 1997).

3. The Model and Data

We turn to a brief overview of the global computable general equilibrium (CGE) model used here. The full set of model code, datasets, and background documentation is available for download. [http://www.intereconomics.com/francois]. The model is characterized by an input-output structure (based on regional and national input-output tables) that explicitly links industries in a value added chain from primary goods, over continuously higher stages of intermediate processing, to the final assembling of goods and services for consumption. Inter-sectoral linkages are direct, like the input of steel in the production of transport equipment, and indirect, via intermediate use in other sectors. The model captures these linkages by modelling firms' use of factors and intermediate inputs. The most important aspects of the model can be summarized as follows: (i) it covers all world trade and production; (ii) it allows for scale economies and imperfect competition; (iii) it includes intermediate linkages between sectors; (iv) and it allows for trade to affect capital stocks through investment effects. The last point means we model medium to long-run investment effects. The inclusion of scale economies and

imperfect competition implies agglomeration effects like those emphasized in the recent economic geography literature.

3.1 Model Data and the Benchmark

Our data come from a number of sources. Data on production and trade are based on national social accounting data linked through trade flows (see Reinert and Roland-Holst 1997). These social accounting data are drawn directly from the Global Trade Analysis Project (GTAP) dataset, version 5.2. (Dimaranan and McDougall, 2002). The GTAP version 5 dataset is benchmarked to 1997, and includes detailed national input-output, trade, and final demand structures. The basic social accounting and trade data are supplemented with trade policy data, including additional data on tariffs and non-tariff barriers.

The data on tariffs are taken from the WTO's integrated database, with supplemental information from the World Bank's recent assessment of detailed pre- and post-Uruguay Round tariff schedules and from the UNCTAD/World Bank WITS dataset. All of this tariff information has been concorded to GTAP model sectors. Services trade barriers are based on the gravity model estimates described in the annex to this paper (available upon request). We also work with the schedule of China accession commitments. While the basic GTAP dataset is benchmarked to 1997, and reflects applied tariffs actually in place in 1997, we of course want to work with a representation of a post-Uruguay Round world. We also want to include the accession of China, the enlargement of the EU, and Agenda 2000 reforms as part of the baseline. To accomplish this, before conducting any policy experiments we first run a "pre-experiment" in which we do the following:

- implement the rest of the Uruguay Round tariff commitments,
- implement the ATC (agreement on textiles and clothing), phasing-out quotas,
- implement China's accession to the WTO,
- implement Agenda 2000,
- and Implement the EU enlargement.

As such, the dataset we work with for actual experiments is a representation of a notional world economy (with values in 1997 dollars) wherein we have realized many of the trade policy reforms already programmed for the next few years.

The social accounting data have been aggregated to 17 sectors and 16 regions. The sectors and regions for the 17x16 aggregation of the data are given in Table 3.1 (a more detailed mapping between the aggregated sectors and regions and the original GTAP regions and sectors is given in a technical annex available with the downloadable model files).

3.2 Theoretical structure

We turn next to the basic theoretical features of the model. In all regions there is a single representative, composite household in each region, with expenditures allocated over personal consumption and savings (future consumption) and over government expenditures. The composite household owns endowments of the factors of production and receives income by selling them to firms. It also receives income from tariff revenue and rents accruing from import/export quota licenses (when applicable). Part of the income is distributed as subsidy payments to some sectors, primarily in agriculture.

On the production side, in all sectors, firms employ domestic production factors (capital, labor and land) and intermediate inputs from domestic and foreign sources to produce outputs in the most cost-efficient way that technology allows. Perfect competition is assumed in the agricultural sectors as indicated in Table 3.1 (notice that the processed food products sector is characterized by increasing returns to scale). In these sectors, products from different regions are assumed to be imperfect substitutes in accordance with the so-called "Armington" assumption. Production under imperfect competition is discussed below.

[Table 3.1 about here]

Prices on goods and factors adjust until all markets are simultaneously in (general) equilibrium. This means that we solve for equilibria in which all markets clear. While we model changes in gross trade flows, we do not model changes in net international capital flows. Rather our capital market closure involves fixed net capital inflows and outflows. This does not preclude changes in gross capital flows. (See the Hertel el al 1997 discussion on macroeconomic closure. The present approach facilitates welfare analysis.) To summarize, factor markets are competitive, and labor and capital are mobile between sectors but <u>not</u> between regions. All primary factors, labor, land and capital are fully employed within each region.

We model manufacturing and services as involving imperfect competition. The approach followed involves monopolistic competition. Monopolistic competition involves scale economies that are *internal* to each firm, depending on its own production level. In particular, based on estimates of price-cost markups, we model the sector as being characterized by Chamberlinian large-group monopolistic competition. An important property of the monopolistic competition model is that increased specialization at intermediate stages of production yields returns due to specialization, where the sector as a whole becomes more

productive the broader the range of specialized inputs. These gains spill over through two-way trade in specialized intermediate goods. With these spillovers, trade liberalization can lead to global scale effects related to specialization. With international scale economies, regional welfare effects depend on a mix of efficiency effects, global scale effects, and terms-of-trade effects. Similar gains follow from consumer good specialization.

Another important feature involves a dynamic link, whereby the static or direct income effects of trade liberalization induce shifts in the regional pattern of savings and investment. These effects have been explored extensively in the trade literature, and relate to classical models of capital accumulation and growth, rather than to endogenous growth mechanisms. Theory on this approach includes Smith (1976, 1977) and Srinivasan and Bhagwati (1980). Several studies of the Uruguay Round (see for example Francois, McDonald and Nordstrom 1993 and Harrison, Rutherford and Tarr 1997) also incorporated variations on this mechanism, along with variations in market structure. Such effects compound initial output welfare effects over the medium-run, and can magnify income gains or losses. How much these "accumulation effects" will supplement static effects depends on a number of factors, including the marginal product of capital and underlying savings behaviour. It also hinges on interactions with market structure. In the present application, we work with a classical savings-investment mechanism. This means we model long-run linkages between changes in income, savings, and investment. The results reported here therefore include changes in the capital stock, and the medium- to long-run implications of such changes.

4. Results

We now turn to the results of the experiments outlined in chapter two. Tables 4-1 to 4-4 present a summary of results at the global level. The tables present a breakdown of the national income effects (technically measured as equivalent variation) resulting from the various policy experiments along the lines of major sector components. Table 4-1 is focused on agriculture, Table 4-2 is focused on manufactures, Tables 4-3 is focused on services liberalization, and Table 4-4 focuses on trade facilitation. The tables also give a breakdown of the effects of scale economies, through a comparison of a perfect competition version of the model to the one with scale economies and imperfect competition. We consider the increasing returns case to be the most relevant, and unless indicated otherwise, the discussion of results pertains to this version of the model.

[Tables 4-1,2,3,4 about here]

Overall, while agriculture has been a consistent sticking point in negotiations, with agriculture exporters in particular pressing for agricultural liberalization, the overall effects are not as clear-cut. From the set of income effect tables, we can see that agricultural liberalization offers an uneven set of results. Liberalization of domestic support in the OECD, on the one hand, is generally positive for the OECD, though with negative consequences for the food-importing sub-Saharan Africa. We find that significant, though limited, liberalization yields positive results globally, and regionally for Europe, Africa, and most of Asia. On the other hand, on net agricultural liberalization is a mixed-bag, with gains in most areas from elimination of domestic support, but with more mixed results from the elimination of border measures. Static results are consistently positive if constant returns to scale (CRS) are assumed, but induced changes in investment (not shown in all tables), combined with the imperfect competition and agglomeration features of the model, both point to negative effects over the longer-run. Specifically, we note the following. First, Australia and New Zealand, both net agricultural exporters who generally favor agricultural liberalization, are not clear winners from agriculture liberalization. In addition, the Mediterranean countries who are close to the EU and are usually expected to gain as well from liberalization in the heavily protected EU agricultural markets are not clear winners. In addition, other non-OECD countries (India, China, South Africa, SSA) who do not liberalize themselves loose anyway under agricultural liberalization even as their access to OECD markets is improved. Finally, the gains for South America are very limited relative to expectations.

In order to understand why results and rhetoric do not necessarily match in agriculture, it is helps to distinguish the standard perfect competition aspect of the analysis, which is held in common with most ex-ante Doha studies use, from the additional effects related to product differentiation and agglomeration (IRS). With IRS, expanding agricultural sectors draw resources from industrial sectors. As a consequence, the industrial sectors have to contract, which has negative implications for welfare because of a loss of agglomeration and variety effects. This illustrates a point lurking in the recent literature on new economic geography and trade. If liberalization leads to specialization and expansion of constant or decreasing returns sectors, this may be inferior compared to the status quo or to a policy-induced expansion in IRS sectors alongside trade liberalization. In the latter case, the traditional gains from liberalization are magnified by agglomeration and variety effects. The pattern of results therefore highlights the importance of taking a long-term structural view. CAIRNS group countries should perhaps be cautious about expecting long-term economy-wide gains if, as a result of liberalization, the

agricultural sector draws more resources away from other productive uses. Developing countries also need to think carefully about the risks of reinforcing an emphasis on primary exports.

The pattern for manufacturing liberalization is more consistent and generally positive, both in the initial static results and over the long-term. From Table 4.2 the most important area for manufacturing tariff liberalization for developing countries is the developing countries themselves. Recall from the discussion in Section 2 that OECD tariffs are, on average, below 3 percent for manufacturing. As a result, the impact of a Swiss-formula (which targets high tariffs) yields only limited effects on the OECD, while directly proportional cuts have a more dramatic effect. The one region consistently, and significantly, hurt by significant manufacturing liberalization is China. Once the WTO accession is fully implemented (as assumed in our baseline), China will have realized most of the effects of its own trade policy reforms. Hence, the Doha round cannot be expected to yield much additional gain in this respect. The negative results for China follow from an erosion of its terms of trade, driven by its growth in textile exports, combined with increased competition from other low wage countries. Natural competitors, such as India, currently limit their participation on world markets through a mix of import and export barriers. Rationalization in this area by developing countries leads to heightened competition against China in a number of sectors, with the result being income losses for China driven almost entirely by manufacturing and agricultural liberalization in the developing world.

Another important source of overall effects is services, which yields static income gains on a par with remaining manufacturing tariffs, and ranging potentially to over $50 billion globally. One obvious winner from services liberalization is the United States, which is projected to pick up a substantial share of total gains. Another big winner in services, however, is somewhat less obvious. India, which has moved in recent years to become a major exporter in services (including software and back office services) is projected to be a bigger potential winner from services liberalization than North America. In fact, as a share of GDP, services is a more important source of gains for India than agriculture and manufacturing liberalization combined. The other important source of gains for India (and for much of the world) is trade facilitation. In the Asia-Pacific region, where exports alone are often 50 percent of GDP, trade facilitation yields a dramatic short-run effects as well as a long-run impact driven by investment effects (Table 4.4). For the Asia-Pacific developing countries, the single most important issue is trade facilitation, particularly by other developing countries.

In terms of labor market effects, both unskilled and skilled workers gain from the partial and full liberalization scenarios in most regions, except for some cases in the CEEC economies

and China. In China, the results are linked to the trade and income effects following from competition with other low-wag exporters, as discussed above. The general pattern of wage effects is summarized in Figure 4.1, which shows percent changes in wages for unskilled workers in all regions, under all three scenarios. The basic pattern is clear – positive wage effects everywhere, under all scenarios, except for China in all cases and the CEECs in some cases.

The general pattern of export effects (reported in detail in the annex tables available as part of the model files package) is summarized in Figure 4.2. Like Figure 4.1, the emphasis here is not on individual values, but the general pattern of results. Export growth, under all scenarios, is greatest in the developing countries, especially in Asia and the Pacific (including India and China), but also in the Mediterranean, African, and Latin American economies. The CEECs suffer from trade-erosion with respect to market access to the EU15 economies. A decomposition of bilateral trade effects shows that much of the potential gains for developing countries depend on the realization of South-South trade opportunities. While improved access to OECD markets is certainly important, it is equally pressing to engage in meaningful liberalization of trade amongst developing countries. As middle-income countries are shifting their export packages towards more processed products, the sourcing of raw materials and intermediate inputs can increasingly take place in low-income countries.

The European Union provides a natural experiment with respect to the erosion of trade diversion incentives in the face of multilateral liberalization. The EU is a customs union, with a common external tariff against supplies from third countries, and practically zero tariffs within the union. Lower external trade barriers affect producers and consumers in member states in two related ways. First there is the direct boost to competition on home markets through improved market access for suppliers from outside the European Union. Second, the relative position of suppliers within the EU might change. The formation of the EU customs union leads, by definition, to trade preferences amongst the members of the free trade area. As a consequence the share of trade that is within the EU (intra-EU trade) is typically biased upward, and trade within the EU is larger than might be expected on the basis of geographic proximity and other trade promoting factors alone. With the recent eastward enlargement the preferences are extended from the current 15 EU members to the new member states.[3] Recall that the enlargement process has been incorporated in our baseline scenario.

[3] Our simulations include all 12 accession candidates newcomers, i.e. we also include Bulgaria and Romania, although these two countries will not enter the EU with the first wave of new member countries.

The lowering of external trade barriers by the EU will inevitably lead to the erosion of the intra-EU trade preferences. Suppliers with lower cost will be able to enter the EU markets once the tariff barriers have come down that currently shield domestic producers from foreign competition. Consequently, we can expect the current bias towards intra-EU trade to be reduced. Table 4.5 illustrates this effect by breaking down the simulated change in EU27 import values for one of the more modest liberalisation scenarios.

[Table 4.5 about here]

The 2% growth in EU27 exports is small compared to the 12% growth in world trade. A first driver of this result is that EU countries mostly trade amongst themselves. The benefits from removing the intra-EU barriers have already been realised in the past and there are no additional gains for intra-EU trade in a new WTO round. A second driver of this result is the increased competition from non-EU countries on EU markets. Simulated intra-EU27 trade shrinks by -6% as other suppliers enter the EU markets. The most impressive growth in markets share is realized by suppliers from developing countries, who are simulated to expand their exports to the EU by 30%, compared to the 12% increase of imports from other developed countries.

Because there is no positive growth to be expected from intra-EU trade, European exports can only by increased by expansion in non-EU markets. Exports to developing countries grow with 21% and exports to the other regions grow with 13%. Although these growth figures are high, this is insufficient to significantly boost total exports as their weight in total EU27 exports is limited.

Developing countries obtain the highest growth in exports (30%). They expand exports to all destinations, though the largest trade surge is observed for intra-developing country trade. Global trade creation in this experiment amounts to 12% in the short run and 15% in the long run. While the trade increase materialises already in the short run for the EU and other developed economies, developing countries see even larger growth in their exports in the longer term. Dynamic capital accumulation enables them to specialise more in exportable goods.

Trade (both exports and imports) between the EU and developing countries expands relatively faster in our experiments than trade with developed countries. Already low trade barriers amongst OECD countries explains this. An interesting case is Textiles and Clothing. Recall that our experiment assumes that current quota regime, called the Agreement on Textiles and Clothing or ATC and having grown out of the multifibre arrangement or MFA, is already

phased out (this is part of the baseline simulation), and the trade liberalisation experiment subsequently lowers the import tariffs on textiles and clothing. This greatly boosts exports from developing countries into the EU, and it crowds out the imports from developed economies and from CEECs.

5. Conclusions

In this paper we explore the possible economic effects of the new WTO Doha Round of trade negotiations for major developed and developing regions. Our modelling exercise includes market structure and investment effects, and it stresses a policy benchmark including China's accession to the WTO, the Agenda 2000 reforms to the CAP, enlargement of the EU. The analysis focuses on market access and agricultural support. We cover the areas of agricultural liberalization, liberalization in industrial tariffs, liberalization in services trade, and trade facilitation measures.

We argue that the modalities for tariff reduction are at least as important as size of cuts. For example, in agriculture cuts in bound rates greater than 50% are required to effectively reduce applied rates in a country like Brazil. In view of the potential impact, trade facilitation and liberalisation in services may also need a higher valuation vis-à-vis agriculture in the current round of negotiations. For agricultural liberalisation on the other hand, we find quite mixed results. Given the current protection landscape, OECD countries are expected to achieve allocative efficiency gains if they engage in own agricultural liberalisation. Reduction of domestic support in OECD countries is certainly not unequivocally beneficial for all developing countries. On the contrary, those developing countries that are depending on food imports, and which do not have the resource base to develop their food sectors, will not benefit from the higher prices brought about by liberalisation in industrial countries. In addition, for some primary exporters, the addition of agglomeration effects in non-primary sectors highlights possible negative effects related to primary specialization following improved market access conditions. This last point also highlights the importance of a long-term structural view on the effects of trade liberalisation. Even for countries with a strong natural resource base, such as the CAIRNS group, it is not necessarily the case that expansion of primary exports is beneficial in the long run.

Finally, a key finding is the importance of effective participation by developing countries in the negotiations, especially in manufacturing and trade facilitation. South-South trade liberalization is key to the "development" part of the Doha Development Agenda. However, this is downplayed in the current negotiations by all WTO-partners, with an emphasis instead on exemptions for developing countries (called Special and Differential treatment).

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Table 2-1

Industrial tariff rates and bindings -- post UR and ITA						
	Percent of MFN imports that are subject to:				Tariff lines	
	bound tariffs	unbound tariffs	tariffs bound above applied rates	tariffs unbound or bound above applied rates	Share of bound duty free tariff lines to total tar. lines	Total tariff lines
Argentina	100.0	0.0	99.9	99.9	0.0	10530
Australia	96.9	3.1	31.7	34.8	17.7	5520
Brazil	100.0	0.0	91.0	91.0	0.5	10860
Canada	99.8	0.2	45.7	45.9	34.5	6261
Chile	100.0	0.0	99.7	99.7	0.0	5055
Colombia	100.0	0.0	97.7	97.7	0.0	6145
El Salvador	97.1	2.9	96.0	98.9	0.0	4922
European Union	100.0	0.0	17.7	17.7	26.9	7635
Hungary	93.6	6.4	3.3	9.7	10.4	5896
India	69.3	30.7	14.8	45.5	0.0	4354
Indonesia	92.3	7.7	86.6	94.3	0.0	7735
Japan	95.9	4.1	0.1	4.2	47.4	7339
Korea	89.8	10.2	3.4	13.6	11.6	8882
Malaysia	79.3	20.7	31.0	51.7	1.6	10832
México	100.0	0.0	98.4	98.4	0.0	11255
New Zealand	100.0	0.0	46.5	46.5	39.5	5894
Norway	100.0	0.0	36.5	36.5	46.6	5326
Peru	100.0	0.0	98.5	98.5	0.0	4545
Phillipines	67.4	32.6	15.5	48.1	0.0	5387
Poland	92.8	7.2	44.6	51.8	2.2	4354
Singapore	36.5	63.5	11.7	75.2	15.2	4963
Sri Lanka	9.2	90.8	1.4	92.2	0.1	5933
Thailand	67.4	32.6	8.9	41.5	0.0	5244
Tunisia	67.9	32.1	41.5	73.6	0.0	5087
Turkey	49.3	50.7	0.0	50.7	1.4	15479
United States	100.0	0.0	14.0	14.0	39.4	7872
Uruguay	100.0	0.0	96.3	96.3	0.0	10530
Venezuela	100.0	0.0	90.3	90.3	0.0	5974
Zimbabwe	13.6	86.4	3.9	90.3	3.0	1929

source: Francois (2001), based on WTO and World Bank data on Uruguay Round and post-Information Technology Agreement schedules.

Table 2.2

Summary of Effects of Basic Swiss Formula Reductions: Applied tariffs before and after a 50% cut in average tariff bindings

Agriculture

	post-UR and ITA tariffs				effect of basic Swiss-formula application on tariffs				
	simple average	standard deviation	maximum tariff	binding overhang	simple average	standard deviation	maximum tariff	binding overhang	Percent reduction in average
European Union	5.9	7.5	74.9	0.3	3.0	2.9	10.9	0.1	-48.6
Japan	6.2	8.1	43.3	1.2	3.5	3.7	13.9	0.2	-43.0
United States	3.5	7.4	90.0	0.5	1.9	2.4	11.5	0.1	-46.6
Brazil	12.9	5.1	27.0	22.6	12.4	4.6	22.3	5.3	-3.7
India	31.0	20.8	150.0	90.7	29.5	14.9	70.8	31.3	-4.8
Thailand	26.5	14.4	65.0	7.1	15.1	6.3	30.1	1.7	-43.0

Non-agriculture

	post-UR and ITA tariffs				effect of basic Swiss-formula application on tariffs				
	simple average	standard deviation	maximum tariff	binding overhang	simple average	standard deviation	maximum tariff	binding overhang	Percent reduction in average
European Union	3.7	3.6	17.0	0.4	1.9	1.4	5.0	0.1	-47.7
Japan	2.3	3.4	30.9	0.1	1.2	1.4	5.6	0.0	-48.5
United States	3.2	4.3	37.5	0.2	1.7	1.6	6.1	0.0	-48.3
Brazil	15.9	6.0	35.0	14.9	13.5	4.2	16.7	1.9	-15.4
India	19.2	16.5	40.0	3.9	11.3	9.2	30.5	0.3	-41.3
Thailand	10.5	10.8	80.0	7.8	7.2	6.1	20.7	2.0	-31.6

Source: Francois and Martin (2003).

Table 2.3

Estimated Services Trade Barriers (percent trade cost equivalents)

Label	Region	Trade	Transport and logistics	Business services	Other services
NLD	Netherlands	0.0	0.0	0.0	0.0
FRA	France	12.3	12.1	18.3	19.2
DEU	Germany	0.0	13.7	9.5	0.0
REU15	Rest of EU	12.3	0.0	0.0	0.0
CEEC	CEECs	1.6	0.0	0.0	0.0
MED	Mediterannean and Middle East	2.3	0.0	0.0	0.0
NAM	North America	0.0	22.6	1.2	16.0
SAM	South America	13.8	10.4	8.6	5.9
CHINA	China	0.0	14.5	37.4	3.7
INDIA	India	61.3	63.9	32.1	62.2
HINCAS	High income Asia	0.0	0.0	6.3	0.0
OASPAC	Other Asia-Pacific	0.0	0.0	0.0	0.0
AUSNZ	Australia and New Zealand	0.0	2.3	9.5	15.2
SAF	South Africa	28.3	17.5	32.8	22.6
SSA	Sub-Saharan Africa	0.0	0.0	0.0	0.0
ROW	Rest of World	7.2	0.0	0.0	0.0

Based on gravity equation estimates.

Table 2.4

ESTIMATED COST SAVINGS FROM TRADE FACILITATION

European Commission (1992)	In the context of the Single Market program, savings may amount to 1.6 % to 1.7% of the value of trade due to savings on administrative costs of transactions represent 7 to 10% of the value of trade.
UNCTAD (1994)	Trade facilitation could reduce this to 5% to 8%.
Australian Industry Commission (1995)	Trade facilitation may save 5% to 10% of the total value of trade, through reduced transaction costs, in the APEC context.
Japan EPA (1997)	A "modest" APEC initiative may lead to 2% savings (as a share of the value of trade) due to reduced transaction costs.

Table 2.5

Instruments	Scenario definitions		
	Linear 50%	Swiss formula	Full liberalisation
Import tariffs in agriculture and manufacturing	50% reduction	Swiss formula reduction (with a max 25% tariff)	100% reduction
Estimated border measures in services	50% reduction	50% reduction	100% reduction
Export subsidies	50% reduction	50% reduction	100% reduction
Domestic agricultural support in OECD countries	50% reduction	50% reduction	100% reduction
Trade facilitation	1.5% of value of trade	1.5% of value of trade	3% of value of trade

Table 2.6

Total Equivalent Variation from a
linear 50% experiment decomposed by sectoral instruments and regions,
millions of US dollars

	OECD	Developing countries	Other countries	Total
Agricultural liberalization (border measures)	24482	32446	4630	61558
Agricultural liberalization (domestic support)	8744	-	711	9455
Manufactures (border measures)	12057	22230	2789	37076
Services liberalization	17225	6907	1963	26095
Trade facilitation	46159	26152	5881	78192
Total	108667	87735	15974	212376

Source model simulations

Table 3-1

Sectors and regions

NLD	Netherlands	CERE*	Cerals
FRA	France	HORT*	Horticulture & other crops
DEU	Germany	SUGA*	Sugar, plants and processed
REU15	Rest of EU	INTLIV*	Intensive livestock &products
CEEC	CEECs	CATLE*	Cattle & beef products
MED	Mediterannean and Middle East	DAIRY*	Milk & dairy
NAM	North America	OAGR*	Other agriculture
SAM	South America	PROCF	Processed food products
CHINA	China	TEXT	Textiles, leather & clothing
INDIA	India	EXTR	Extraction industries
HINCAS	High income asia	CHEM	Petro & chemicals
OASPAC	Other Asia-Pacific	MELE	Metal and electotechnical ind
AUSNZ	Australia and New Zealand	OIND	Other industries
SAF	South Africs	TRAD	Trade services
SSA	Sub-Saharan Africa	TRAN	Transport services
ROW	Rest of World	BSVC	Business, financial & communnications services
		OSVC	Other private and public services

* denotes a competitive sector in all applications.

Table 4.1

Agricultural Liberalization

Static National Income Effects, millions of dollars (based on equivalent variation)

	Constant returns to scale			Increasing returns to scale							
	50% liberalisation of border measures			50% liberalization of border measures			Full liberalization or border measures			OECD Domestic Support	
	Total	OECD	Non-OECD	Total	OECD	Non-OECD	Total	OECD	Non-OECD	Partial	Full
Netherlands	139	-227	366	768	319	449	1,436	112	1,324	-16	119
France	657	193	464	1,661	1,524	136	3,312	2,543	769	2,746	4,320
Germany	809	441	368	2,307	2,122	184	4,855	4,181	674	1,110	1,534
Rest of EU 15	2815	1723	1092	5,042	4,914	128	8,651	7,647	1,004	4,576	7,069
CEECs	263	575	-312	1,702	1,143	559	4,348	2,023	2,325	-2	-202
Mediterranean	4293	269	4024	15,008	-794	15,802	22,232	-2,112	24,344	-600	-1,369
North America	3098	1358	1740	2,678	1,501	1,177	4,356	1,128	3,228	2,173	3,881
South America	2848	2052	796	2,054	162	1,892	4,366	392	3,973	-152	-289
China	1439	755	684	2,993	-374	3,367	3,549	555	2,993	-252	-577
India	165	69	96	756	-76	832	1,196	-205	1,401	-6	-35
High Income Asia	7737	7125	612	16,127	14,163	1,964	26,998	21,930	5,068	-504	-977
Other Asia-Pacific	1035	768	267	3,673	1,007	2,667	6,550	2,526	4,024	-85	-173
Australia-NZ	1261	969	292	-350	-419	70	-499	-721	222	70	185
South Africa	418	90	328	1,257	-84	1,341	2,057	-207	2,264	-38	-115
Sub-Saharan Africa	649	457	192	1,394	-194	1,588	3,162	-455	3,617	-92	-248
Rest of World	275	201	74	-141	-432	291	174	-527	700	-184	-755
Total	27901	16818	11083	56,928	24,482	32,446	96,743	38,811	57,932	8,744	12,368

Table 4.2

Manufacturing Tariff Reductions

Static National Income Effects, millions of dollars (based on equivalent variation)

	Constant returns to scale			Increasing returns to scale					
	50% liberalisation of border measures			50% liberalization of border measures			Full liberalization or border measures		
	Total	OECD	Non-OECD	Total	OECD	Non-OECD	Total	OECD	Non-OECD
Netherlands	303	-178	481	947	-18	965	1,586	-315	1,901
France	981	-134	1115	2,189	386	1,803	4,649	431	4,218
Germany	1910	-125	2035	3,397	322	3,075	6,002	-719	6,721
Rest of EU 15	2689	-964	3653	7,367	534	6,833	12,018	-2,016	14,033
CEECs	-3418	-2159	-1259	4,102	2,118	1,984	12,755	6,715	6,040
Mediterranean	189	1362	-1173	-1,133	1,310	-2,443	-3,206	2,186	-5,392
North America	543	-3917	4460	13,226	2,590	10,636	22,104	548	21,556
South America	203	1088	-885	-2,450	839	-3,289	-7,286	1,765	-9,051
China	1477	4175	-2698	-23,717	-9,444	-14,273	-37,826	-10,398	-27,428
India	357	548	-191	-499	427	-926	-3,991	778	-4,769
High Income Asia	9642	2088	7554	22,859	8,473	14,386	37,669	11,327	26,343
Other Asia-Pacific	1601	3140	-1539	3,244	2,320	924	1,701	3,932	-2,231
Australia-NZ	-169	-198	29	787	130	657	704	-471	1,174
South Africa	240	94	146	621	248	373	1,013	446	567
Sub-Saharan Africa	-128	75	-203	-156	242	-398	-574	452	-1,026
Rest of World	1214	727	487	3,503	1,579	1,924	6,928	2,705	4,222
Total	17634	5622	12012	34,287	12,057	22,230	54,247	17,367	36,880

Table 4.3

Services Liberalization

Static National Income Effects, millions of dollars (based on equivalent variation)

	Constant returns to scale			Increasing returns to scale					
	50% liberalisation of border measures			50% liberalization of border measures			Full liberalization or border measures		
	Total	OECD	Non-OECD	Total	OECD	Non-OECD	Total	OECD	Non-OECD
Netherlands	98	67	31	507	399	108	1,130	892	238
France	2,281	2,212	69	1,275	1,014	262	2,802	2,262	540
Germany	2,296	2,220	76	2,068	1,916	152	4,412	4,092	320
Rest of EU 15	798	587	211	2,031	1,579	453	4,342	3,390	953
CEECs	172	193	-21	504	372	133	970	623	347
Mediterranean	636	558	78	1,176	1,002	174	2,525	2,146	379
North America	8,742	8,461	281	7,015	6,334	681	16,260	14,805	1,456
South America	2,026	315	1,711	1,907	647	1,260	4,109	1,258	2,852
China	793	279	514	742	-280	1,022	1,524	-93	1,617
India	1,957	44	1,913	2,016	55	1,961	4,657	132	4,525
High Income Asia	1,722	1,577	145	2,031	1,967	64	4,257	3,960	297
Other Asia-Pacific	325	329	-4	751	630	121	1,522	1,252	270
Australia-NZ	670	654	16	736	715	21	1,569	1,523	46
South Africa	555	36	519	461	93	368	1,086	196	890
Sub-Saharan Africa	102	73	29	184	153	31	394	332	62
Rest of World	354	313	41	728	630	98	1,493	1,277	216
Total	23,527	17,918	5,609	24,132	17,225	6,907	53,053	38,046	15,007

Table 4.4

Trade facilitation

Static National Income Effects, millions of dollars (based on equivalent variation)

	Constant returns to scale			Increasing returns to scale					
	50% liberalisation of border measures			50% liberalization of border measures			Full liberalization or border measures		
	Total	OECD	Non-OECD	Total	OECD	Non-OECD	Total	OECD	Non-OECD
Netherlands	1058	944	114	1,436	1,123	313	2,910	2,314	596
France	1858	1670	188	2,183	1,858	325	4,615	3,922	693
Germany	2607	2366	241	3,475	2,709	766	7,161	5,683	1,478
Rest of EU 15	6654	6050	604	8,188	6,431	1,757	16,462	13,201	3,261
CEECs	-13	84	-97	1,804	1,253	551	4,576	3,108	1,469
Mediterranean	3974	205	3769	4,305	681	3,624	8,621	1,248	7,373
North America	10952	9938	1014	14,150	10,857	3,293	27,519	21,626	5,893
South America	4863	946	3917	4,440	884	3,556	9,365	1,800	7,565
China	6046	1399	4647	-1,675	-775	-900	3,097	682	2,415
India	1197	288	909	1,189	320	869	2,424	649	1,775
High Income Asia	14556	13622	934	19,755	15,419	4,336	37,790	30,686	7,104
Other Asia-Pacific	5451	1146	4305	7,545	2,246	5,299	15,320	4,516	10,804
Australia-NZ	1343	1271	72	1,348	1,077	271	2,589	2,134	455
South Africa	638	135	503	799	198	601	1,625	401	1,223
Sub-Saharan Africa	868	90	778	1,052	178	874	2,342	395	1,947
Rest of World	1105	1050	55	2,315	1,698	617	4,454	3,324	1,130
Total	63157	41204	21953	72,311	46,159	26,152	150,870	95,690	55,179

Table 4.5
Percent change in value of bilateral exports (f.o.b.), linear 50% cuts (*)

↓ from → to	EU27	Non-OECD	Other	Total exports
EU27	-6	21	13	2 (4)
Non-OECD	30	39	25	30 (38)
Other	12	26	8	14 (15)
Total imports	3 (5)	28 (35)	14 (15)	12 (15)

Source: Model simulations.

Note: (*) Short run results with scale economies. Long run results in brackets.

Figure 4.1

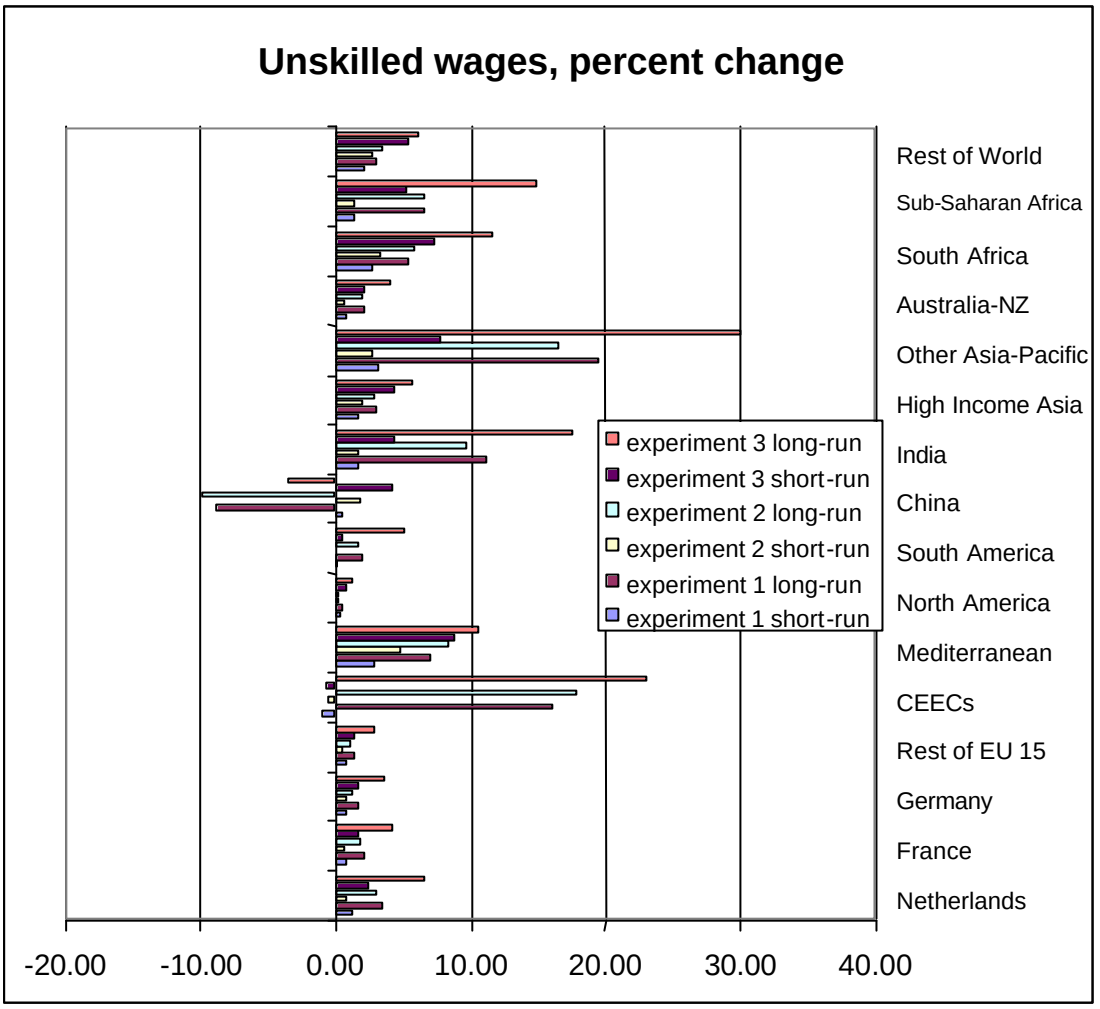
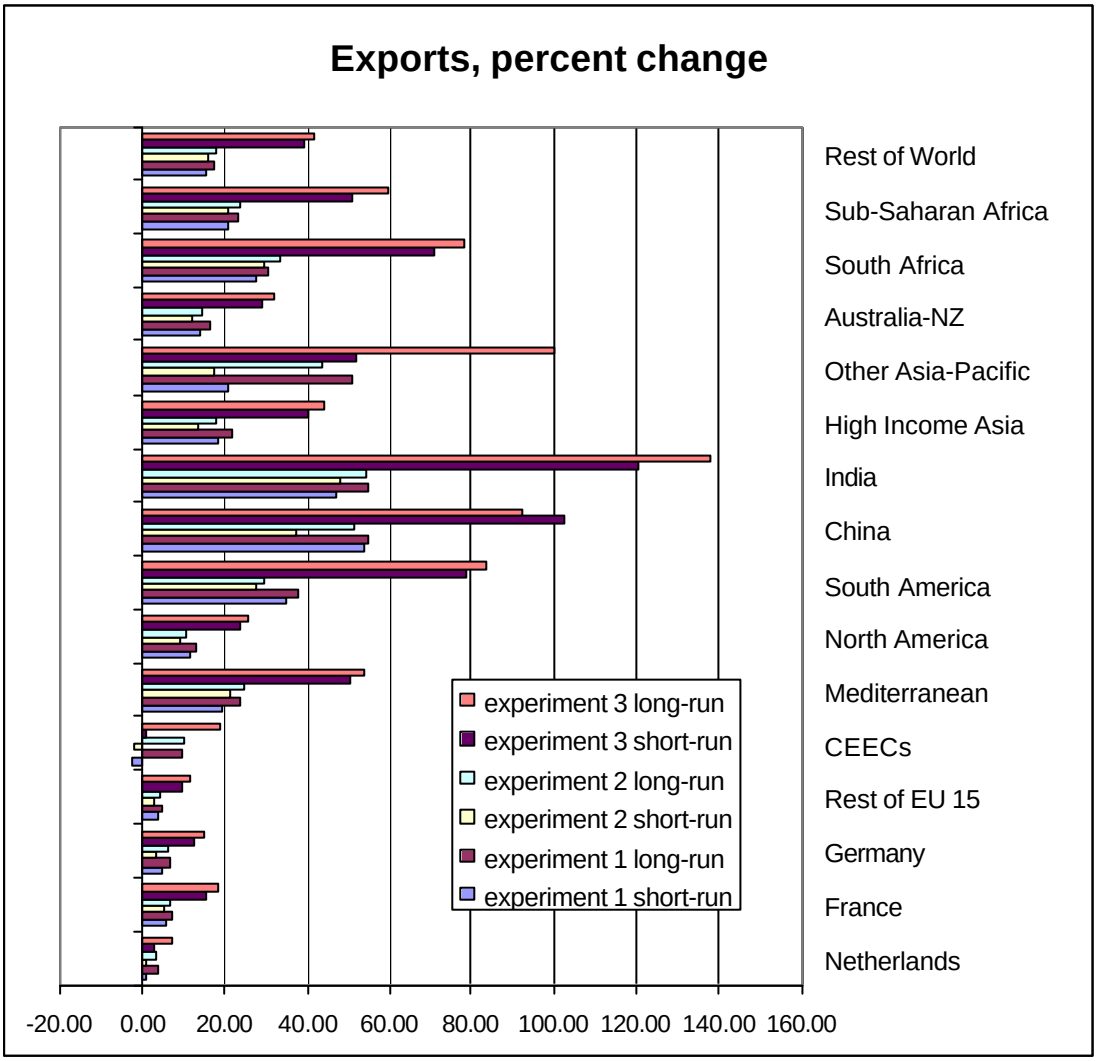

Unskilled wages, percent change
Rest of World
Sub-Saharan Africa
South Africa
Australia-NZ
Other Asia-Pacific
High Income Asia
India
China
South America
North America
Mediterranean
CEECs
Rest of EU 15
Germany
France
Netherlands
experiment 3 long-run
experiment 3 short-run
experiment 2 long-run
experiment 2 short-run
experiment 1 long-run
experiment 1 short-run
-20.00
-10.00
0.00
10.00
20.00
30.00
40.00

Figure 4.2


Exports, percent change
Rest of World
Sub-Saharan Africa
South Africa
Australia-NZ
Other Asia-Pacific
High Income Asia
India
China
South America
North America
Mediterranean
CEECs
Rest of EU 15
Germany
France
Netherlands
experiment 3 long-run
experiment 3 short-run
experiment 2 long-run
experiment 2 short-run
experiment 1 long-run
experiment 1 short-run
-20.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
160.00

Technical Annex

A.1 Introduction

This annex provides an overview of the basic structure of the global CGE model employed for our assessment of Doha Round-based multilateral trade liberalization. The model is implemented in GEMPACK -- a software package designed for solving large applied general equilibrium models. The model is solved as an explicit non-linear system of equations, through techniques described by Harrison and Pearson (1994). More information can be obtained at the following URL -- http://www.monash.edu.au/policy/gempack.htm. The reader is referred to Hertel (1996: http://www.agecon.purdue.edu/gtap/model/Chap2.pdf) for a detailed discussion of the basic algebraic model structure represented by the GEMPACK code. While this appendix provides a broad overview of the model, detailed discussion of mathematical structure is limited to added features, beyond the standard GTAP structure.

The model is a standard multi-region computable general equilibrium (CGE) model, with important features related to the structure of competition (as described by Francois and Roland-Holst 1997). The capital accumulation mechanisms are described in Francois et al (1996b: http://www.agecon.purdue.edu/gtap/techpapr/tp-7.htm), while imperfect competition features are described in detail in Francois (1998: http://www.agecon.purdue.edu/gtap/techpapr/tp-14.htm). Social accounting data are based on Version 5 of the GTAP dataset (McDougal 2001), with an update to reflect post-Uruguay Round protection, Agenda 2000, China's accession to the WTO, and EU enlargement, as discussed in the body of the report.

A.2 Overview of General Structure

The general conceptual structure of a regional economy in the model is represented in Annex Figure A.1. Within each region, firms produce output, employing land, labour, capital, and natural resources and combining these with intermediate inputs. Firm output is purchased by consumers, government, the investment sector, and by other firms. Firm output can also be sold for export. Land is only employed in the agricultural sectors, while capital and labour (both skilled and unskilled) are mobile between all production sectors. Capital is fully mobile within regions. All demand sources combine imports with domestic goods to produce a composite good, as indicated in the figure. In constant returns sectors, these are Armington composites. In increasing returns sectors, these are composites of firm-differentiated goods. Relevant substitution and trade elasticities are presented in Annex Table A.1.

A.3 Taxes and policy variables

Taxes are included in the theory of the model at several levels. Production taxes are placed on intermediate or primary inputs, or on output. Some trade taxes are modeled at the border. Additional internal taxes can be placed on domestic or imported intermediate inputs, and may be applied at differential rates that discriminate against imports. Where relevant, taxes are also placed on exports, and on primary factor income. Finally, where relevant (as indicated by social accounting data) taxes are placed on final consumption, and can be applied differentially to consumption of domestic and imported goods.

Trade policy instruments are represented as import or export taxes/subsidies. This includes applied most-favored nation (mfn) tariffs, antidumping duties, countervailing duties, price undertakings, export quotas, and other trade restrictions. The two exceptions are service-sector trading costs, which are discussed in the next section, and agricultural quotas, discussed in the

subsequent section. The full set of post-Uruguay Round tariff vectors is based on Francois and Strutt (1999) and Finger et al (1998). This background paper includes a description of the methodology used to estimate post-Uruguay Round tariff rates. Post-Uruguay Round protection in agriculture is taken from GTAP estimates. The set of services trade barrier estimates is described below. Tariff rates for China's accession to the WTO are taken from Francois and Spinanger (2001).

A.4 Trade and transportation costs and services barriers

International trade is modeled as a process that explicitly involves trading costs, which include both trade and transportation services. These trading costs reflect the transaction costs involved in international trade, as well as the physical activity of transportation itself. Those trading costs related to international movement of goods and related logistic services are met by composite services purchased from a global trade services sector, where the composite "international trade services" activity is produced as a Cobb-Douglas composite of regional exports of trade and transport service exports. Trade-cost margins are based on reconciled f.o.b. and c.i.f. trade data, as reported in version 5.2 of the GTAP dataset.

A second form of trade costs is known in the literature as frictional trading costs. These are implemented in the service sector. They represent real resource costs associated with producing a service for sale in an export market instead of the domestic market. Conceptually, we have implemented a linear transformation technology between domestic and export services. This technology is represented in Annex Figure A.2. The straight line AB indicates, given the resources necessary to produce a unit of services for the domestic market, the feasible amount that can instead be produced for export using those same resources. If there are not frictional barriers to trade in services, this line has slope -1. This free-trade case is represented by the line AC. As we reduce trading costs, the linear transformation line converges on the free trade line, as indicated in the figure.

The basic methodology for estimation of services barriers involves the estimation of sector-specific gravity equations, based on aggregate GTAP data (which reports detailed trading patterns in services) for total imports outside of intra-NAFTA and intra-EU trade. These equations have been estimated at the level of aggregation corresponding to the sectors of our CGE model.

The gravity equations are estimated using ordinary least squares with the following specification:

(1) $$M_{i,j} = a_1 + a_2 PCY_j + a_3 POP_j + a_4 EU_j + e_j$$

where $M_{i,j}$ represents imports in sector i by country j, PCY_i represents per-capita income in the importing country, POP_j is population, EU_j is a dummy for EU countries, and ε is an error term. Deviations from predicted imports are taken as an indication of barriers to trade. These tariff equivalent rates are then backed out from a constant elasticity import demand function as follows:

(2) $$\frac{T_1}{T_0} = \left[\frac{M_1}{M_0}\right]^{\frac{1}{e}}$$

Here, T_1 is the power of the tariff equivalent $(1+t_1)$ such that in free trade $T_0 = 1$, and $[M_1/M_0]$ is the ratio of actual to predicted imports. This is a reduced form, where actual prices and constant terms drop out because we take ratios. The term e is the demand elasticity (taken to be the substitution elasticity from Annex Table 1). Regression results from this approach are reported

in Annex Table A.2, while the relevant estimates of tariff equivalents for the model sectors and regions are reported in Annex Table A.3.

5. Agricultural quotas

An output quota places a restriction on the volume of production. If such a supply restriction is binding, it implies that consumers will pay a higher price than they would pay in case of an unrestricted interplay of demand and supply. A wedge is created between the prices that consumers pay, *PM* and the marginal cost for the producer, *PS*. Annex Figure A.3 below illustrates this point. The vertical distance between PM and PS at quota levels is known as the tax equivalent of the quota rent. Instead of applying a quota, an equivalent level of output taxation could be administered which has the same output reducing and price increasing effect. This is illustrated by the dashed line in the figure. The shaded area indicates the value of the quota rent: the wedge between consumer and producer prices times the level of output. It is an empirical matter to determine who is actually earning the quota rent. It represents income to someone in the economy, usually the holder of the quota right, though the rent distribution depends on the institutional set-up of quota allocation and tradability.

In our model both the EU milk quota and the sugar quota are implemented at the national level. Technically, this is achieved by formulating the quota as a complementarity problem. This formulation allows for endogenous regime switches from a state when the output quota is binding to a state when the quota becomes non-binding. In addition, changes in the value of the quota rent are endogenously determined. If τ denotes the tax equivalent of the quota rent, and $Y = (\bar{q} - q)$ denotes the difference between the output quota $\bar{q}$ and output q, then the complementary problem can be written as:

(3) $$t \geq 0 \perp Y$$

where either

	$\tau > 0$ and $Y = 0$	the quota is binding
or	$\tau = 0$ and $Y \geq 0$	the quota is not binding

Ignoring other tax and subsidy instruments that might be in place, the market price *pm* for commodities that are subject to a quota rent is

(4) $$pm = ps \cdot (1 + t)$$

where *ps* denotes the producer price, which equals marginal cost in the model. The value of the quota rent $\tau \cdot ps \cdot q$ is allocated as income to the regional household. The modelling of this class of non-continuous policy instruments has been greatly facilitated by the latest release of GEMPACK.

The effects of the quota, or the effect of a possible extension of quota rights, depend crucially on the size of the quota rent. For intra-EU distributional analysis it is also important to have estimates of the size of the quota rent at member state level. Such estimates are hard to obtain. Our quota rent estimates are obtained form recent studies on the EU dairy sector and sugar sector. The rent estimates for dairy are obtained from Berkhout et al. (2002), Bouamra-Mechemache et al. (2002) and Kleinhanss et al. (2002). The estimates for sugar have been obtained from Frandsen and Jensen (2002). For the Netherlands, the percentage increase of the market price above marginal productions cost, i.e. the tax equivalent of the quota rent, is estimated at 30% for milk. This is the highest figure within the EU and shows that Dutch dairy producers are very quota constrained. For sugar, France and Germany are most quota constrained, with rent estimates as high as 140%.

We have also applied milk and sugar quota in the accession candidate countries (CEECs). At the time of writing the allocation of production quota to CEEC producers is still subject to negotiations.

We have followed the suggestions of the European Commission (2002) to allocate production quota to CEECs. For milk, the EC proposes allocations based on average deliveries for direct sales during the reference period 1997-99. For sugar, this amounts to allocation based on average production in the historic reference period 1995-1999. This quota allocation allows CEECS to expand their output slightly beyond current levels, i.e. the quota is currently not binding. But it would constrain them to attain the high output levels of the pre-reform period.

A.6 The composite household and final demand structure

Final demand is determined by an upper-tier Cobb-Douglas preference function, which allocates income in fixed shares to current consumption, investment, and government services. This yields a fixed savings rate. Government services are produced by a Leontief technology, with household/government transfers being endogenous. The lower-tier nest for current consumption is also specified as a Cobb-Douglas. The regional capital markets adjust so that changes in savings match changes in regional investment expenditures. (Note that the Cobb-Douglas demand function is a special case of the CDE demand function employed in the standard GTAP model code. It is implemented through GEMPACK parameter files.)

A.7 Market Structure

A.7.1 Demand for imports: Armington sectors

The basic structure of demand in constant returns sectors is Armington preferences. In Armington sectors, goods are differentiated by country of origin, and the similarity of goods from different regions is measured by the elasticity of substitution. Formally, within a particular region, we assume that demand goods from different regions are aggregated into a composite import according to the following CES function:

$$q^{M}_{j,r} = \left[\sum_{i=1}^{R} a_{j,i,r} M^{r_j}_{j,i,r} \right]^{1/r_j} \tag{5}$$

In equation (5), $M_{j,i,r}$ is the quantity of M_j from region i consumed in region r. The elasticity of substitution between varieties from different regions is then equal to σ^{M}_{j}, where $\sigma^{M}_{j}=1/(1-\rho_j)$. Composite imports are combined with the domestic good q^D in a second CES nest, yielding the Armington composite q.

(6)
$$q_{j,r} = \left[\Omega_{j.M.r}\left(q^{M}_{j,r}\right)^{b_j} + \Omega_{j,D,r}\left(q^{D}_{j,r}\right)^{b_j}\right]^{1/b_j}$$

The elasticity of substitution between the domestic good and composite imports is then equal to σ^{D}_{j}, where $\sigma^{D}_{j}=1/(1-\beta_j)$. At the same time, from the first order conditions, the demand for import $M_{j,i,r}$ can then be shown to equal

(7)
$$\begin{aligned} M_{j,i,r} &= \left[\frac{a_{j,i,r}}{P_{j,i,r}}\right]^{s_i^{\backslash m}} \left[\sum_{i=1}^{R} a^{s^{M}_{j}}_{j,i,r} P^{1-s^{M}_{j}}_{j,i,r}\right]^{-1} E^{M}_{j,r} \\ &= \left[\frac{a_{j,i,r}}{P_{j,i,r}}\right]^{s^{M}_{j}} \left(P^{M}_{j,r}\right)^{s^{M}_{j}-1} E^{M}_{j,r} \end{aligned}$$

where $E^{M}_{j,r}$ represents expenditures on imports in region r on the sector j Armington composite. In practice, the two nests can be collapsed, so that imports compete directly with each other and with the corresponding domestic product. This implies that the substitution elasticities in equations (1) and (2) are equal. (These elasticities are reported in Annex Table 1).

A.7.2 Imperfect competition

As indicated in Annex Table A.1, we model manufacturing sectors and service sectors as being imperfectly competitive. The approach we follow has been used in the Michigan and the WTO assessment of the Uruguay Round. Recent model testing work indicates that this approach works "best" vis-à-vis Armington models, when tracked against actual trade patterns. (See Fox 1999, who uses the U.S.-Canada FTA as a natural experiment for model testing).

Formally, within a region r, we assume that demand for differentiated intermediate products belonging to sector j can be derived from the following CES function, which is now indexed over firms or varieties instead of over regions. We have

(8)
$$q_{j,r} = \left[\sum_{i=1}^{n} g_{j,i,r} X^{\Gamma_j}_{j,i,r}\right]^{1/\Gamma_j}$$

where $\gamma_{j,i,r}$ is the demand share preference parameter, $X_{j,i,r}$ is demand for variety i of product j in region r, and $\sigma_j = 1/(1-\Gamma_j)$ is the elasticity of substitution between any two varieties of the good. Note that we can interpret q as the output of a constant returns assembly process, where the resulting composite product enters consumption and/or production. Equation (8) could therefore be interpreted as representing an assembly function embedded in the production technology of firms that use intermediates in production of final goods, and alternatively as representing a CES aggregator implicit in consumer utility functions. In the literature, and in our model, both cases are specified with the same functional form. While we have technically dropped the Armington assumption by allowing firms to differentiate products, the vector of γ parameters still provides a partial geographic anchor for production. (Francois and Roland-Holst 1997, Francois 1998).

Globally, firms in dfferent regions compete directly. These firms are assumed to exhibit monopolistically competitive behaviour. This means that individual firms produce unique varieties of good or service *j*, and hence are monopolists within their chosen market niche. Given the demand for variety, reflected in equation (8), the demand for each variety is less than perfectly elastic. However, while firms are thus able to price as monopolists, free entry (at least in the long-run) drives their economic profits to zero, so that pricing is at average cost. The joint assumptions of average cost pricing and monopoly pricing, under Bertrand behaviour, imply the following conditions for each firm f_i in region i:

(9) $$z_{j,f_i} = \sum_{r=1}^{R} \frac{X_{j,f_i,r}}{X_{j,f_i}} \left(\sum_{k=1}^{n} \left(\frac{a_{j,k,r}}{a_{j,f_i,r}} \right)^{s_j} \left(\frac{P_{j,k,r}}{P_{j,f,r}} \right)^{1-s_j} \right)^{-1}$$

(10) $$P_{f,i} = AC_{f,i}$$

The elasticity of demand for each firm f_i will be defined by the following conditions.

(11) $$e_{j,f,i} = s_j + (1 - s_j) z_{j,f,i}$$

(12) $$\frac{P_{f,i} MC_{f,i}}{P_{f,i}} = \frac{1}{e_{f,i}}$$

In a fully symmetric equilibrium, we would have $\zeta = n^{-1}$. However, the calibrated model includes CES weights g, in each regional CES aggregation function, that will vary for firms from different regions. Under these conditions, ζ is a quantity weighted measure of market share. To close the system for regional production, we index total resource costs for sector *j* in region *i* by the resource index *Z*. Full employment of resources hired by firms in the sector *j* in region *i* then implies the following condition.

(13) $$Z_{j,i} = \sum_{f=1}^{n_i} TC_{j,i,f}$$

Cost functions for individual firms are defined as follows:

(14) $$C(x_{j,i}) = (a_{j,i} + b_{j,i}\, x_{j,i})\, P_{Z_{j,i}}$$

This specification of monopolistic competition is implemented under the “large group” assumption, which means that firms treat the variable n as "large", so that the perceived elasticity of demand equals the elasticity of substitution. The relevant set of equations then collapses to the following:

$$q_{j,r} = \left[\sum_{i=1}^{R} \bar{g}_{j,i,r} \, \bar{x}_{j,i,r}^{\Gamma_j} \right]^{\frac{1}{\Gamma_j}}$$

(15)

$$\bar{g}_{j,i,r} = a_{j,i,r} \, n_{j,i\,0}^{1-\Gamma_j}$$

$$\bar{x}_{j,i,r} = \left(\frac{n_{j,i}}{n_{j,i\,0}} \right)^{(1-\Gamma_j)/\Gamma_j} X_{j,i,r}$$

(16)

$$x_{j,i,r} = \left(\frac{Z_{j,i\,1}}{Z_{j,i\,0}} \right)^{(1-\Gamma_j)/\Gamma_j} X_{j,i,r}$$

In equation (15), n_0 denotes the number of firms in the benchmark. Through calibration, the initial CES weights in equation (15) include the valuation of variety. As a result, the reduced form exhibits external scale effects, determined by changes in variety based on firm entry and exit, and determined by the substitution and scale elasticities (equation 16).

A.7.3 Markups

Our average markup estimates are reported in Annex Table A.1. The starting point for these is recent estimated price-cost markups from the OECD (Martins, Scarpetta, and Pilat 1996). These provide estimates of markups, based on methods pioneered by Hall (1988) and Roeger (1995). The Martins et al paper provides an overview of the recent empirical literature.

Both Hall and Roeger focused their work on the United States. In contrast, Martins et al provide estimates for most OECD Members. However, because of data limitations, they did not provide estimates for the full matrix of countries and sectors. (In other words there are empty cells in the matrix.) To produce a complete matrix, Francois (2001) runs a cross-country regression, with dummy variables allowing for variations in markups by country (a general index of the degree of competition within a country) and by sector. The resulting coefficients were then used to fill in missing values within the table. The values reported in Annex Table are used either to calibrate the cost-disadvantage ratios and substitution elasticities under monopolistic competition. They are taken from Francois (2001) and Martins et al (1996). Their application, in terms of parameterizing the model, is explained in Francois and Roland-Holst (1997)

A.8. Aggregation scheme

The basic aggregation scheme for the model is presented in Annex Tables A.4 and A.5. Annex Table A.4 provides a basic overview of the sectors and regions in the model, while Annex Table A.5 provides a mapping to underlying GTAP5.2 sectors and regions. This provides a sense of what products are in the sector aggregates, and what countries are in the regional aggregates.

Industrial sectors have been aggregated into three groups: Chemicals, Metal and electrotechnical, and Other manufactures. This sectoring scheme is motivated by the forcus of this study on the Netherlands. The grouping has used the detailed Dutch Input-Output table (CBS, 1999) with 106 industries to cluster sectors on four indicators: share in industrial output, share in industrial value added, labour share in value added and trade openness. See Annex Figure 4 for key characteristics of these clusters. The sectoring scheme is then translated into GTAP sectors through Table A.5.

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Annex Table A.1

		A	B	C	D = (B-1)/B	E = 1/D	F = D/(1-D)
		trade substitution elasticities (regional differentiation)	average markup levels	elasticity of substitution in value added	implied CDRs	trade substitution elasticity (firm differentiation)	Variety-scaled output scale elasticity (firm differentiation)
CERE	Cerals	2.20	1.00	0.25	0.00	2.20	0.00
HORT	Horticulture & other crops	2.20	1.00	0.25	0.00	2.20	0.00
SUGA	Sugar, plants and processed	2.20	1.00	0.64	0.00	2.20	0.00
INTLIV	Intensive livestock &products	2.50	1.00	0.55	0.00	2.50	0.00
CATLE	Cattle & beef products	2.45	1.00	0.57	0.00	2.45	0.00
DAIRY	Milk & dairy	2.20	1.00	0.65	0.00	2.20	0.00
OAGR	Other agriculture	2.75	1.00	0.20	0.00	2.75	0.00
PROCF	Processed food products	2.47	1.13	1.12	0.11	8.98	0.13
TEXT	Textiles, leather & clothing	3.32	1.13	1.26	0.11	8.91	0.13
EXTR	Extraction industries	2.80	1.18	0.20	0.15	6.64	0.18
CHEM	Petro & chemicals	2.05	1.20	1.26	0.17	6.01	0.20
MELE	Metal and electotechnical industry	3.39	1.21	1.26	0.17	5.72	0.21
OIND	Other industries	2.30	1.20	1.26	0.17	5.95	0.20
TRAD	Trade services	1.90	1.27	1.68	0.21	4.67	0.27
TRAN	Transport services	1.90	1.27	1.68	0.21	4.67	0.27
BSVC	Business, financial & communnications services	1.90	1.27	1.26	0.21	4.67	0.27
OSVC	Other private and public services	1.97	1.27	1.29	0.21	4.67	0.27

sources: columns A, C are from the GTAP database. Columns B, D, E, and F are from estimates discussed in this annex.

Annex Table A.2
Services regression results

TRADE: trade services

Regression Statistics	
Multiple R	0.80
R Square	0.64
Adjusted R Square	0.55
Standard Error	0.65
Observations	16

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	8.955	2.985	7.097	0.0053
Residual	12	5.047	0.421		
Total	15	14.002			

	Coefficients	*Standard Error*	*t Stat*
Intercept	0.317	1.995	0.159
pop	0.728	0.173	4.202
PCI	0.500	0.158	3.170
EU	0.684	0.466	1.467

TRAN: transport and logistics services

Regression Statistics	
Multiple R	0.98
R Square	0.96
Adjusted R Square	0.94
Standard Error	0.27
Observations	16

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	18.313	6.104	86.036	0.000
Residual	12	0.851	0.071		
Total	15	19.165			

	Coefficients	*Standard Error*	*t Stat*
Intercept	-2.645	0.819	-3.229
pop	0.803	0.071	11.288
PCI	0.919	0.065	14.183
EU	0.307	0.192	1.605

Annex Table A.2 – continued

BSRV: business services

Regression Statistics	
Multiple R	0.88
R Square	0.78
Adjusted R Square	0.72
Standard Error	0.59
Observations	16

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	14.490	4.830	14.083	0.0003
Residual	12	4.116	0.343		
Total	15	18.606			

	Coefficients	*Standard Error*	*t Stat*
Intercept	-1.179	1.801	-0.654
pop	0.789	0.156	5.045
PCI	0.766	0.143	5.377
EU	0.535	0.421	1.271

OSVC: other services

Regression Statistics	
Multiple R	0.88
R Square	0.77
Adjusted R Square	0.71
Standard Error	0.68
Observations	16

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	18.611	6.204	13.279	0.0004
Residual	12	5.606	0.467		
Total	15	24.217			

	Coefficients	*Standard Error*	*t Stat*
Intercept	-3.287	2.102	-1.564
pop	0.844	0.183	4.623
PCI	0.909	0.166	5.466
EU	0.409	0.492	0.832

Annex Table A.3

Estimated services barriers (extra-EU trade)

Estimated Services Trade Barriers (percent trade cost equivalents)

Label	Region	trade	transport and logistics	business services	other services
NLD	Netherlands	0.0	0.0	0.0	0.0
FRA	France	12.3	12.1	18.3	19.2
DEU	Germany	0.0	13.7	9.5	0.0
REU15	Rest of EU	12.3	0.0	0.0	0.0
CEEC	CEECs	1.6	0.0	0.0	0.0
MED	Mediterranean and Middle East	2.3	0.0	0.0	0.0
NAM	North America	0.0	22.6	1.2	16.0
SAM	South America	13.8	10.4	8.6	5.9
CHINA	China	0.0	14.5	37.4	3.7
INDIA	India	61.3	63.9	32.1	62.2
HINCAS	High income Asia	0.0	0.0	6.3	0.0
OASPAC	Other Asia-Pacific	0.0	0.0	0.0	0.0
AUSNZ	Australia and New Zealand	0.0	2.3	9.5	15.2
SAF	South Africa	28.3	17.5	32.8	22.6
SSA	Sub-Saharan Africa	0.0	0.0	0.0	0.0
ROW	Rest of World	7.2	0.0	0.0	0.0

Based on gravity equation estimates.

Annex Table A.4

Model Aggregation Scheme

Model Sectors and Regions

Label	Region		Label	Sector
NLD	Netherlands		CERE	Cerals
FRA	France		HORT	Horticulture & other crops
DEU	Germany		SUGA	Sugar, plants and processed
REU15	Rest of EU		INTLIV	Intensive livestock &products
CEEC	CEECs		CATLE	Cattle & beef products
MED	Mediterannean and Middle East		DAIRY	Milk & dairy
NAM	North America		OAGR	Other agriculture
SAM	South America		PROCF	Processed food products
CHINA	China		TEXT	Textiles, leather & clothing
INDIA	India		EXTR	Extraction industries
HINCAS	High income asia		CHEM	Petro & chemicals
OASPAC	Other Asia-Pacific		MELE	Metal and electotechnical ind
AUSNZ	Australia and New Zealand		OIND	Other industries
SAF	South Africs		TRAD	Trade services
SSA	Sub-Saharan Africa		TRAN	Transport services
ROW	Rest of World		BSVC	Business, financial & communnications services
			OSVC	Other private and public services

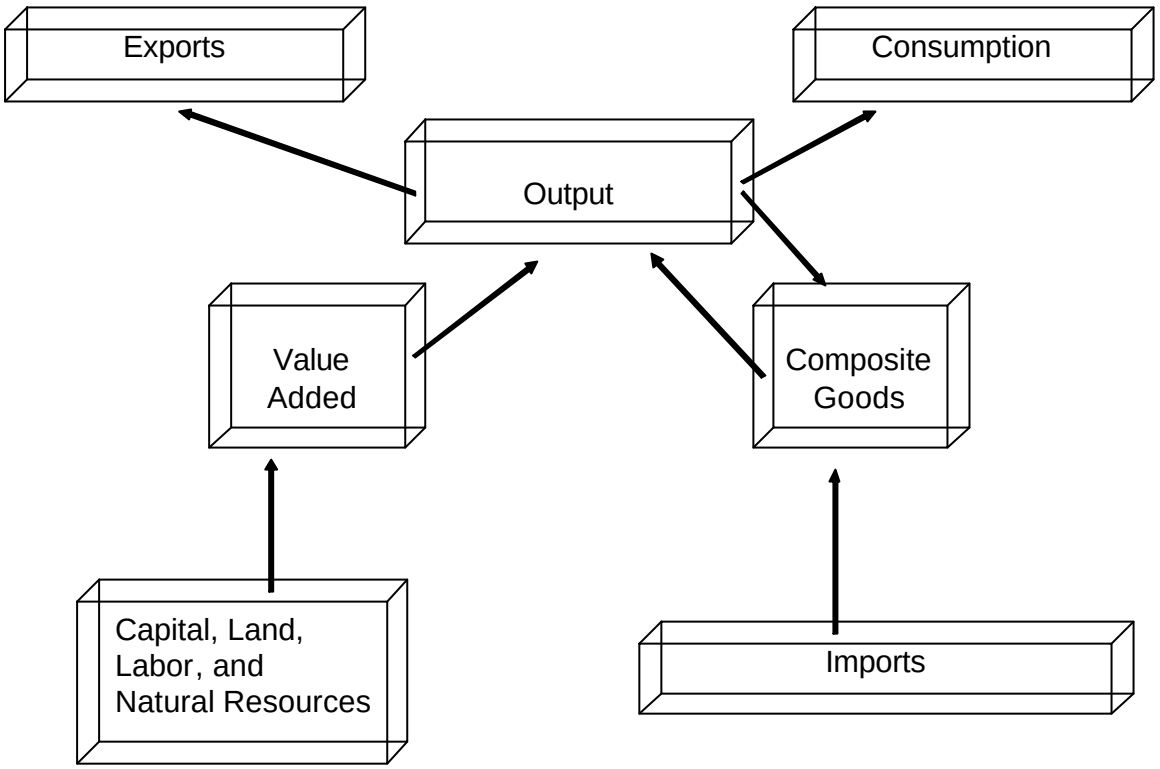
Annex Table A.5

Mapping to GTAP Sectors and Regions

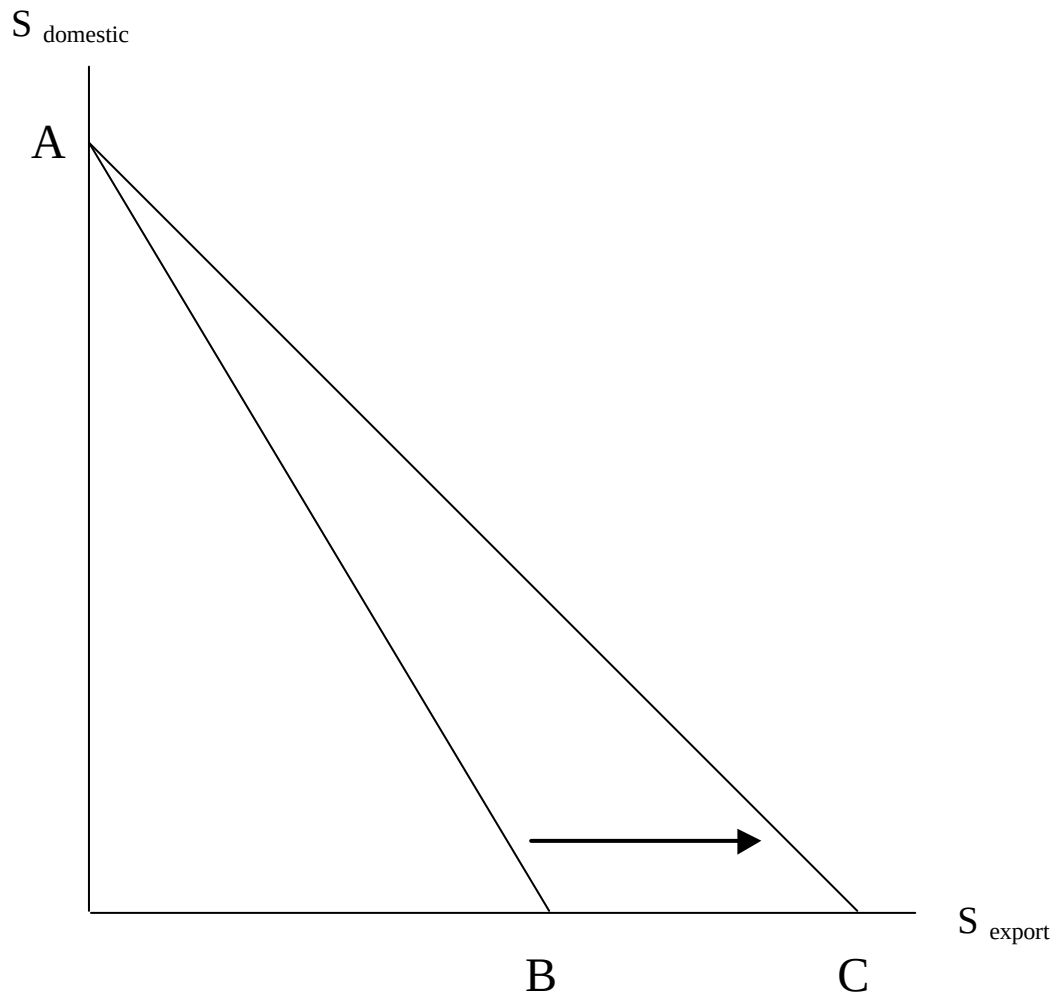
Model Sector	GTAP Sector
CERE	pdr, Paddy rice
CERE	wht, Wheat
CERE	gro, Cereal grains nec
HORT	v_f, Vegetables, fruit, nuts
HORT	osd, Oil seeds
SUGA	c_b, Sugar cane, sugar beet
HORT	pfb, Plant-based fibers
HORT	ocr, Crops nec
CATLE	ctl, Cattle,sheep,goats,horses
INTLIV	oap, Animal products nec
DAIRY	rmk, Raw milk
OAGR	wol, Wool, silk -worm cocoons
OAGR	for, Forestry
OAGR	fsh, Fishing
EXTR	col, Coal
EXTR	oil, Oil
EXTR	gas, Gas
EXTR	omn, Minerals nec
CATLE	cmt, Meat: cattle,sheep,goats,horse
INTLIV	omt. Meat products nec
PROCF	vol, Vegetable oils and fats
DAIRY	mil, Dairy products
PROCF	pcr, Processed rice
SUGA	sgr, Sugar
PROCF	ofd, Food products nec
PROCF	b_t, Beverages and tobacco products
TEXT	tex, Textiles
TEXT	wap, Wearing apparel
TEXT	lea, Leather products
OIND	lum, Wood products
OIND	ppp, Paper products, publishing
CHEM	p_c, Petroleum, coal products
CHEM	crp, Chemical,rubber,plastic prods
CHEM	nmm, Mineral products nec
MELE	i_s, Ferrous metals
MELE	nfm, Metals nec
MELE	fmp, Metal products
MELE	mvh, Motor vehicles and parts
MELE	otn, Transport equipment nec
MELE	ele, Electronic equipment
MELE	ome, Machinery and equipment nec
OIND	omf, Manufactures nec
OSVC	ely, Electricity
OSVC	gdt, Gas manufacture, distribution
OSVC	wtr, Water
OSVC	cns, Construction
TRAD	trd, Trade
TRAN	otp, Transport nec
TRAN	wtp, Sea transport
TRAN	atp, Air transport
BSVC	cmn, Communication
BSVC	ofi, Financial services nec
BSVC	isr, Insurance
BSVC	obs, Business services nec
OSVC	ros, Recreation and other services
OSVC	osg, PubAdmin/Defence/Health/Educat
OSVC	dwe, Dwellings

Model Region	GTAP Region
AUSNZ	aus, Australia
AUSNZ	nzl, New Zealand
CHINA	chn, China
CHINA	hkg, Hong Kong
HINCAS	jpn, Japan
HINCAS	kor, Korea
HINCAS	twn, Taiwan
OASPAC	idn, Indonesia
OASPAC	mys, Malaysia
OASPAC	phl, Philippines
HINCAS	sgp, Singapore
OASPAC	tha, Thailand
OASPAC	vnm, Vietnam
OASPAC	bgd, Bangladesh
INDIA	ind, India
OASPAC	lka, Sri Lanka
HINCAS	xsa, Rest of South Asia
NAM	can, Canada
NAM	usa, United States
SAM	mex, Mexico
SAM	xcm, Central America, Caribbean
SAM	col, Colombia
SAM	per, Peru
SAM	ven, Venezuela
SAM	xap, Rest of Andean Pact
SAM	arg, Argentina
SAM	bra, Brazil
SAM	chl, Chile
SAM	ury, Uruguay
SAM	xsm, Rest of South America
REU15	aut, Austria
REU15	bel, Belgium
REU15	dnk, Denmark
REU15	fin, Finland
FRA	fra, France
DEU	deu, Germany
REU15	gbr, United Kingdom
DEU	grc, Greece
REU15	irl, Ireland
REU15	ita, Italy
REU15	lux, Luxembourg
NLD	nld, Netherlands
REU15	prt, Portugal
REU15	esp, Spain
REU15	swe, Sweden
ROW	che, Switzerland
ROW	xef, Rest of EFTA
CEEC	bgr, Bulgaria
CEEC	hrv, Croatia
CEEC	cze, Czech Republic
CEEC	hun, Hungary
CEEC	mlt, Malta
CEEC	pol, Poland
CEEC	rom, Romania
CEEC	svk, Slovakia
CEEC	svn, Slovenia
CEEC	est, Estonia
CEEC	lva, Latvia
CEEC	ltu, Lithuania
ROW	xsu, Rest of Former Soviet Union
MED	cyp, Cyprus
MED	tur, Turkey
MED	xme, Rest of Middle East
MED	mar, Morocco
MED	xnf, Rest of North Africa
SSA	bwa, Botswana
SAF	xsc, Rest of SACU
SSA	mwi, Malawi
SSA	moz, Mozambique
SSA	tza, Tanzania
SSA	zmb, Zambia
SSA	zwe, Zimbabwe
SSA	xsf, Other Southern Africa
SSA	uga, Uganda
SSA	xss, Rest of Sub-Saharan Africa
ROW	xrw, Rest of World

Annex Figure A.1
The Flow of Production



Annex Figure A.2
Trading Costs in the Service Sector



Annex Figure A.3
Agricultural quotas