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Abstract

This paper surveys estimates of the value of the GATT/WTO's contributions to global welfare through providing a forum for negotiating reductions in policy-induced distortions to trade flows, including through the process of accession by new members. After reviewing measures of the price-distorting effects of trade-related policies, it assesses estimates from global simulation models of the welfare effects of trade liberalizations prior to the WTO's Doha round, including the net benefits and transfers associated with implementing the Uruguay Round agreement on trade-related intellectual property rights, and then reviews estimates of the potential welfare effects of a Doha round agreement to cut tariffs and subsidies. Econometric estimates of past trade and related effects of the GATT/WTO are then examined, before turning to estimates of the benefits of WTO accession and of potential benefits from WTO-sponsored trade facilitation. The paper concludes that while it remains difficult to attribute reforms directly to the GATT/WTO, the overall body of evidence presented supports the economic profession's consensus that this institution has contributed substantially to global economic welfare.

Keywords: rules-based multilateral trading system, trade liberalization, global economywide modeling, Uruguay Round agreements

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Contributions of the GATT/WTO to Global Economic Welfare: Empirical Evidence

The World Trade Organization (WTO) and its predecessor, the General Agreement on Tariffs and Trade (GATT), have contributed to global economic welfare in many and varied ways. They range over the WTO's five areas of competence, which are to:

- establish international trade rules and disciplines,
- negotiate reductions in policy-induced distortions to the free flow of goods and services between members (including when non-members seek to accede),
- settle trade-related disputes between members,
- monitor, record notifications and disseminate information on trade and trade-related policies of members, and
- coordinate with other international organizations on trade-related issues, including aid for trade.

As Irwin (1995a,b) notes, there has also been the hope that the GATT/WTO would help avoid a repetition of the economic depression of the 1930s, and even of war (through promoting greater economic interdependence, which raises the opportunity cost of going to war).

Estimating empirically the worth of those contributions is a challenge that has barely begun to be addressed by economists. For present purposes the last two of the above-listed five roles of the WTO are ignored, partly because they did not apply to the GATT but also because we know of no quantitative assessments of those contributions.ⁱ

Nor are any assessments included of the value of the GATT/WTO core rules and disciplines. That area is covered qualitatively by Anderson and Hoekman (2005), but again we know of no attempt to estimate their value empirically.

The economic welfare contributions of the WTO's Dispute Settlement Body also are difficult to assess, not least because the very existence of that Body increases the extent to which members comply with WTO rules, disciplines and commitments.ⁱⁱ

Furthermore, more than half the disputes are resolved informally between the parties without the complainant having to request a Panel (Horn and Mavroidis 2011). Of the cases that do go through the Panel process, it is rare to see estimates of the economic consequences of the dispute (other than the value of trade involved). In any case such estimates necessarily would be speculative if done *ex ante*, because the exercise would involve comparing the WTO-inconsistent policy measure under dispute with not the absence of the measure but its replacement with an unknown WTO-consistent (but possibly no less protective) alternative policy measure (Anderson 2002).

Thus this survey focuses mostly on the value of the GATT/WTO's contribution in providing a forum for negotiating reductions in policy-induced distortions to trade flows, including through the process of accession by new members -- of which there have been 31 in the WTO's first 19 years, bringing the total membership to 159 customs territories by late 2013, with a further 25 governments still 'observing' while in various states of negotiating their accession protocol.

Even this narrowing of the field is insufficient, as the lowering of trade distortions generally (although not in every case) has contributed to global economic welfare through, for example, improved efficiency of resource use, lower consumer prices, often more employment, faster economic growth, more sustainable development, nearly always less global income inequality and poverty, and less conflict between and within nations. Readings on these issues are collected by Brown and Stern (2007) on trade and employment, by Sampson and Whalley (2005) on the environment, by Winters (2007) on income inequality and poverty, and by Busch and Mansfield (2007) on conflict.

This survey's focus is thereby confined mainly to the empirical literature aimed at estimating the *ex ante* or *ex post* national and global economic welfare impacts of producer and consumer responses in the marketplace to GATT/WTO-induced multilateral liberalization of price-distorting policies (past and also prospective). Smaller sections briefly focus on implementation of the Uruguay Round's TRIPS agreement on intellectual property rights, and on WTO accession and trade facilitation (more on which can be found in Maskus 2004, Primo Braga and Cattaneo 2010, and Maur and Wilson 2010, respectively). Welfare effects are estimated directly by some authors. Others have sought to estimate econometrically the impact of WTO on trade, presuming that trade growth resulting from a multilateral reform process will improve economic welfare (given the anti-trade bias in virtually

every country's trade policy regime, and the low risk of trade diversion in multilateral as distinct from preferential policy reform).

The theory of trade policy and economic welfare blossomed in the two decades following the seminal contribution by Meade (1955). A synthesis appears in Bhagwati (1971), and a fuller treatment in Corden (1974, revised in 1997). That theory makes clear why trade taxes and other border measures are almost never first-best policy instruments for overcoming externalities or achieving the non-economic objectives of a small open economy. Even for large economies able to influence their terms of trade, there is value in international cooperation to desist from exploiting that power via trade taxes when retaliation is likely – or as a way to move from a sub-optimal equilibrium resulting from unilateral application of trade measures (a Nash equilibrium) to a negotiated solution that allows higher income levels for all countries.

A rich theoretical literature around the economics of the multilateral trading system has been evolving over the past decade or so, with important contributions from Bagwell and Staiger (1999, 2002) and Horn and Mavroidis (2001). Saggi (2009) provides a recent enhancement involving a repeated game of tariff cooperation, in which multilateral free trade is shown to be easier to sustain under most-favoured-nation (MFN) rules than under discriminatory preferential ones. This conclusion holds even when tariff discrimination takes the form of bilateral trade agreements. Overall, his analysis shows that from the viewpoint of low-income countries, MFN and multilateral tariff cooperation are complementary in nature. A further important contribution shows how WTO tariff bindings are welfare improving even when bound tariffs are above applied rates, in a world of fluctuating prices (Francois and Martin 2004).

Despite the strong theoretical case in favor of free trade, most countries continue to impose trade-restrictive policies; and despite the compelling case for multilateral cooperation in reducing those barriers, national governments of the key large economies are often reluctant to champion the multilateral trade negotiation process. That reticence to reform – and the occasional trade subsidy – suggests there are political economy forces at work that favour trade-distorting policies (see the readings in Ethier and Hillman 2008). That in turn suggests counter-forces are needed within national polities to provide the majority gainers with more influence over the minority that might lose from reducing those distortions. One counteracting force has

emerged in recent years, as a result of past policy reforms plus technological advances that have fragmented production along the value chain. This rapidly developing phenomenon has increased incentives for countries to lower trade costs and has greatly reduced their incentives to protect domestic markets (Baldwin 2012). Another counteracting force that can alter the imbalance of intra-national political powers is more transparency on the extent and economic effects of price-distorting policies. This prospect has stimulated analysts to estimate the extent to which national policies have distorted prices and quantities traded, how markets would be altered under various actual or proposed partial multilateral trade agreements, and what the national and global trade and welfare consequences would be or have been of such reforms.

This survey is divided into seven parts: measuring the price-distorting effects of trade-related policies, estimating with global simulation models the welfare effects of reforms prior to the WTO's Doha round, estimating the net benefits and transfers associated with implementing the Uruguay Round agreement on trade-related intellectual property rights, estimating (again with global simulation models) the potential welfare effects of a Doha round agreement to cut tariffs and subsidies, estimating econometrically past trade and related effects of the GATT/WTO, estimating the benefits of WTO accession, and estimating potential benefits from WTO-sponsored trade facilitation. The paper ends with some concluding comments.

An important caveat needs to be made at the outset though. Not only is it impossible to place even an approximate value on the contribution of the rules-based multilateral trading system to the world economy, but it is also very difficult to attribute policy changes specifically to GATT/WTO negotiations *per se*. Some commitments made in GATT agreements are no more than belated recognition of past unilateral policy changes (just as national laws are often just belated codification of changes in societal norms – see Cooter 1997). The challenge still before the economics profession is to better identify *how* the GATT/WTO has contributed to trade-related policy reforms, and then to use that knowledge to more-precisely estimate *how much* that contribution is worth in terms of national and global economic welfare.

1. Measuring Price Distortions due to Trade-related Policies

The first step in any analysis of the market and welfare consequences of trade reform is quantification of the extent to which policies alter market prices. Such measures are essential inputs into sectoral or economywide models aimed at estimating economic welfare effects, but they are also useful as stand-alone indicators for monitoring national policy trends. They may also serve as an aid to trade negotiators and as a guide to compliance with WTO obligations.

Price distortions can be due to taxes or subsidies on imports or exports, or quantitative restrictions on trade volumes (including trade bans). Trade can be also distorted by interventions in foreign exchange markets. Myriad domestic policy interventions such as output, input and factor taxes and subsidies, even on nontradables, can affect trade as well. Conditions of competition also affect domestic prices, especially in the case of impediments to services trade and investment flows. In the case of a national economy too small to influence its international terms of trade, and without any externalities or market failures, such market interventions generally will reduce national economic welfare. And when many such small economies so intervene, international prices and hence other countries' terms of trade also are affected.

Over recent centuries the most common trade distortionary measure, and certainly the one most studied by international economists and most negotiated at the GATT and WTO, is the import tax known commonly as the tariff.ⁱⁱⁱ We discuss it first, then export taxes and subsidies, and then domestic subsidies – all of which are subject to varying extents to the rules and disciplines of the GATT and WTO. When the prices of some intermediate inputs are also distorted by policies, that affects the value added by an industry and hence its profitability depending on the importance of such intermediate inputs. To capture that effect the concept of effective protection was created to provide an indicator of how much policies may have reallocated resources within a sector. Allocation of resources between sectors is determined also by the assistance provided to producers in other tradable sectors, so a relative rate of assistance has been devised. These measures do not give policy makers and trade negotiators very reliable indicators of the overall sectoral or economywide trade and welfare effects of those distortionary policies, however. Hence another family of single indicators of the trade-distorting and welfare-reducing effects of price and trade policies has been developed, known as trade restrictiveness indexes. Finally in this

section we discuss measures to capture the impediments to services trade and foreign investment.

1.1 Import tariffs and tariff equivalents

To measure the extent of a country's aggregate tariff protection against import competition, attention focused initially on developing tariff level indexes. Early efforts include studies by Crawford (1934) and Carmody (1952) for Australia (infamous for having perhaps the highest manufacturing tariffs in the OECD in the twentieth century), plus Loveday (1929), Liepmann (1938) and the League of Nations (1927) more generally.

One of the problems with any aggregate measure, however, is that it cannot serve equally well all purposes simultaneously. Domestic uses for the index could be as an indication of the aggregate degree of resource re-allocation towards protected industries and/or of taxation of consumption of importables, or of foregone welfare gains from trade. International uses such as by trading partners could be as an indication of the degree of restriction on import market access. Aggregation across products requires deciding on what to use as weights (actual imports? production? consumption?) and, if some tariffs are expressed per unit of volume or weight they need to first be converted to an ad valorem basis (using what prices?). These and other measurement issues associated with aggregate tariff level indicators are discussed in Michaely (1977).

The second most important group of trade distortions are non-tariff restrictions on imports. The most common of those during the 20th century were import quotas and licenses. These non-tariff barriers (NTBs) to trade are even more difficult to deal with than tariffs, but the most practical way for modelers to estimate their effects on trade and welfare is to express them as ad valorem tariff equivalents at a point in time. If that is greater than the rate of tariff that is also in place for a particular product, then generally the former is the appropriate measure of protection.

The science – and art – of so deriving an accurate measure of the extent of price distortions due to tariffs and NTBs can be complicated and tedious empirical work (Laird 1997; Maskus and Wilson 2001). But once the percentage by which the domestic price is raised by a tariff or more-protective NTB has been estimated, it is then able to be compared with similar estimates for other products. This rate has

become known as the nominal rate of protection (NRP). If that product's domestic price is distorted only by those trade measures at the country border, and if prices along the value chain are transmitted proportionately, the NRP will also be the consumer tax equivalent (CTE), since both the producer and consumer prices are raised by an import restriction. And if the domestic industry producing that product produces no other products and receives no other help or hindrance from government policies, the NRP will be the same as the nominal rate of assistance (NRA) to that industry.^{iv}

Generally NTBs are outlawed in the WTO (GATT Article XI). Those still on farm products were tariffed after 2004, following the signing at the end of the GATT's Uruguay Round of the Agreement on Agriculture (URAA). Even so, many farm tariffs were expressed in specific rather than ad valorem form, and for some agricultural products one tariff rate is applied to a specified volume of (so-called in-quota) imports while any additional (out-of-quota) imports are subject to a higher tariff.

1.2 Export subsidies or taxes

The NRP/NRA can equally be used to indicate the ad valorem rate of government assistance to an export industry enjoying help via an export subsidy. In the case of an export tax being imposed, the NRA would be negative. Again, if the subsidy or tax is specific and it is to be aggregated or compared with rates for other products, it needs to be converted to an ad valorem rate (at, for example, the average price of the exported product in the relevant period). And, as with import restrictions, any quantitative barrier to exports can likewise be converted to an ad valorem equivalent rate.

In the WTO, export subsidies are generally outlawed. However, an exception is still made for agricultural products (see GATT Article XVI(b)), where they are now subject to specific or ad valorem bindings following the URAA. Export taxes are not explicitly disciplined under GATT, which is an asymmetry in the rules that has yet to be resolved. More than that, an exception in Article XI permits quantitative export restrictions for food

1.3 Domestic subsidies

Subsidies that affect trade are generally discouraged under GATT Article XVI, but again an exception has been made for agriculture under the URAA. They are, like export subsidies, subject to ceiling bindings though. The rules and commitments are extremely complex and not very transparent, not least because many members are slow to notify the WTO of changes each year. A comprehensive empirical analysis of them for a selection of major subsidizing countries can be found in Orden, Blandford and Josling (2011).

1.4 Effective protection and assistance

Useful and necessary though they are for economic modelers, NRPs/NRAs has a number of weaknesses as a stand-alone summary indicators of resource re-allocation, trade restriction and welfare reduction. That fact has encouraged the development of additional indicators, two of which are the effective protection concept and trade restrictiveness indexes.

The distinction between nominal and effective protection is that the NRP can measure the extent to which the tariff or subsidy raises the domestic price of a producer's output whereas the effective rate of protection (ERP) indicates the extent to which the producer's value added is enhanced, taking into account any distortions to the prices of importable intermediate inputs and the share of the industry's value added in the value of final output. The origin of this indicator was a paper on Canada's protection by Barber (1955), from which Corden (1963) developed and applied it to Australia.

The ERP concept gained immediate recognition as a practical way of indicating more appropriately the level of industry protection against import competition not only in aggregate for a country but also – and more importantly – between industries within a country. Its first official use was by the Australian Government with the publication of the Vernon Report (Vernon et al. 1965), and the first major academic journal publication with cross-country estimates came out at the same time (Balassa 1965). The next few years saw an avalanche of both theoretical and empirical ERP papers and reports. In his seminal book, Corden (1971) brings together most of the key theoretical ideas, while his survey of empirical studies covers the first decade of quantitative applications of the concept (Corden 1975). The early

empirical work includes numerous comparative studies of both industrial countries (Balassa et al. 1967) and developing countries (Little, Scitovsky and Scott 1970; Balassa et al. 1971), a testament to its widespread popularity. A striking feature of this literature is the genuine interaction between theory and empirical work, and between academic researchers and the policy community including the GATT. See, for example, the conference proceedings volume edited by Grubel and Johnson (1971). The state of the art at that time is summarized by Balassa (1971).

These studies reveal four points in particular that are worth mentioning here. First, the estimated EPRs far exceed the NRPs, suggesting that the resource pulls and hence costs of protection may be greater than the NRPs on their own might suggest. Second, the differences between NRPs and ERPs are not constant across countries, so that ERPs might be preferred to NRPs for cross-country comparisons of the extent of industry or sectoral protection. Third, while the NRP and ERP rankings of industries within countries are not greatly different when the degree of aggregation is fairly high, the rank correlation falls as the degree of disaggregation increases. This means ERPs are also better than NRPs for comparisons across industries within a country, since the resource-pull cost of protection tends to increase with the range of ERPs, particularly within sub-sectors where substitution in production is high (Lloyd 1974). And fourth, the ERP estimates exposed a non-trivial number of industries where value added has been negative at international prices even though those activities were privately profitable because of the height of protection on the final product.

Since its first adoption officially in Australia, the NRP and EPR concepts have been broadened to the nominal and effective rate of assistance (NRA and ERA) to industries, so as to capture in principle all forms of governmental assistance to producers.^v This broadening is helpful not only for those concerned with national resource allocation but also for trade negotiators, given the increasing tendency of negotiators to focus also on trade-related measures inside national borders, particularly when they are introduced or strengthened as border protection is lowered following trade negotiations.

1.5 Relative assistance to tradable sectors

The Symmetry Theorem due to Lerner (1936) demonstrates that producer incentives in a tradable sector are affected not only directly via distortions to their output and

input prices but also indirectly via government distortions to incentives in other tradable sectors of the national economy. The higher is the NRA to those other sectors, the more incentive producers there will have bid up the value of mobile resources that could otherwise have been employed in the sector of interest, other things equal.

For example, one of the most important negative effects on farmers in many (especially developing) countries has been protection from import competition for industrialists. To capture this indirect influence on farmer incentives as well as the standard direct effect, Anderson et al. (2008) define a Relative Rate of Assistance (RRA) that can be estimated annually with just the production-weighted average NRA for tradable agricultural industries and the comparable NRA for all non-agricultural tradable sectors.^{vi}

Simple though it is, this RRA measure has been proven to be useful as a single general equilibrium indicator for international comparisons over time of the extent to which a country's policy regime is biased in favor or against a particular sector. It is used by Anderson (2010) to illustrate how the policy bias towards farmers has changed since 1960 for developed versus developing countries, based on a sample of 75 countries that together account for all but one-tenth of global agriculture.

1.6 Trade restrictiveness indexes

Another single measure concept that has developed to improve on NRAs/CTEs with the aim of giving policy makers and trade negotiators a more reliable indication of the trade or welfare effects of price-distorting policies is the family of trade restrictiveness indexes (TRIs). Certainly partial and general equilibrium modeling can estimate such effects using NRAs and CTEs as inputs, as discussed in the next section. However, those models can require a great deal of other information and analytical effort that is often not readily available, particularly in low-income countries; and such models typically are calibrated only for a recent (or not-so-recent) year and so are incapable of providing estimates of trends over time. With that in mind, single indicators of the trade-distorting and welfare-reducing effects of price and trade policies were developed in the 1990s for the World Bank, by Anderson and Neary (1994). Their indicators require somewhat more computation than just the nominal rates, but they provide much better indications of price distortions as they

affect trade and welfare than NRA/CTE (or PSE/CSE) estimates. The literature surrounding them has developed considerably over recent years, in terms of both theoretical advances, summarized in Anderson and Neary (2005), and partial equilibrium applications following the simplifications by Feenstra (1995).

The key contribution of this literature is that it addresses the problem that overall NRAs and CTEs are weighted averages for one or more sectors and thus hide the fact that distortions vary across products within an economy or even within a sector. This is especially problematic in cases where some product NRAs are negative, as when trade taxes apply also to exports or when dual exchange rates operate. In those cases the sectoral mean NRA may be close to zero even though the trade- and welfare-reducing effects of the sector's interventions could be substantial. Further, the sectoral mean NRA may be the same in two countries and yet, if the variance of the NRA across industries within that sector is greater in one country, so too will be the welfare cost of its policies for that sector. This is because the welfare cost is proportional to the square of the tariff rate or NRA.

The growing literature on TRIs that has developed serves a key purpose: it overcomes aggregation problems (across different intervention measures and across industries) by using theoretically sound aggregation procedures to answer precise questions regarding the trade or welfare reductions imposed by each country's trade or other price-distorting policies. Specifically, it seeks to estimate the uniform trade tax rate which, if applied to all goods in the place of all actual border and behind-the-border price-distorting policies, would result in the same reduction in economic welfare (or in the volume of trade) as the actual mix of distortionary policies. Anderson and Neary call these the Trade Restrictiveness Index and the Mercantilist Trade Restrictiveness Index, respectively.

Notwithstanding these advances, few consistently estimated indexes have yet been generated across time, and even fewer across countries. A prominent exception is the work of Kee, Nicita and Olarreaga (2009), who follow the simplifying approach of Feenstra (1995) to estimate a series of Trade Restrictiveness Indexes for the import restrictions of many developing and developed countries. Those authors provide estimates for a snapshot in time, the mid-2000s. Another recent study provides a very long time series (103 years), but for just one country, the United States (Irwin 2010). Both of those empirical studies are based only on import barriers.

Another recent empirical study provides a 48-year time series of indexes for 75 countries (Lloyd, Croser and Anderson 2010). While the latter study is just for one sector, namely agriculture, it has two innovative features. One is to show that if one is willing to assume domestic price elasticities of supply are equal across farm commodities within a country, and likewise for elasticities of demand, the calculations simplify and the indexes can be generated with no more information than that needed to estimate the underlying NRAs and CTEs. With those assumptions the formula simplifies to a share-weighted function with shares of production and consumption as weights; and it can include all price-distorting policies, not just import restrictions. For agriculture the latter is very important because over the past half-century there have been also export restrictions (and occasionally import subsidies) applied by developing countries, export subsidies by high-income countries, and numerous domestic producer and consumer taxes and subsidies that have driven wedges between farmer and consumer prices. A summary of those estimates is provided by Anderson (2010). That application also exposes the relative importance of the ‘three pillars’ that were included in commitments undertaken as part of the WTO’s Uruguay Round Agreement on Agriculture: so-called market access (import tariffs once NTBs had been tariffied), domestic support (a limited set of domestic farm production subsidies) and export subsidies. Croser and Anderson (2010) show that export restrictions have been second only to import restrictions in their contribution to the TRI historically, and that import subsidies have been nearly as important as export subsidies.^{vii} The sudden increased use of export restrictions and import subsidies when international food prices spiked in 2008 underscored the asymmetry in WTO commitments, and in particular the limited role those commitments can play in making international food trade more stable and predictable.

A unifying feature of all these TRI studies is that they indicate a much higher degree of price distortions in markets for goods than do weighted average NRAs or CTEs. That has stimulated modelers to use the TRI logic to better estimate price distortions across products that have to be aggregated to make sectoral and especially economywide models tractable given the much higher level of aggregation at which domestic input-output data are available relative to trade and protection data (see Laborde, Martin and van der Mensbrugge 2011a).

1.7 Impediments to international trade and investment in services

Price comparisons of services across countries are generally inappropriate. This is not least because services involve a much greater use of local inputs that are nontradable, and the degree of product differentiation and heterogeneity is generally far greater than for commodities. As well, services trade barriers often take the form of government regulations, including limitations on the number of firms allowed to contest a market or on the nature of their operations, and even prohibitions on private provision.

Two different alternative approaches to quantifying services impediments have been taken in the recent literature (Francois and Hoekman 2010). The first involves collecting information on applied policies, converting these to coverage/frequency indicators and using the resulting indices as regressors to explain observed measures of prices or costs (with the price-cost margin often the focus of estimation). The second approach is to rely on indirect methods, such as calculating price-cost margins by sector across countries or gravity regressions to estimate what trade flows “should be” and back out an estimate of the tariff equivalent of policies from the difference between estimated and observed flows. A well-known problem with indirect approaches is that it is not possible to attribute price-cost margins or differences in trade volumes to specific policies. Most of the literature has therefore pursued the first approach.

Warren and Findlay (2000), drawing on Findlay and Warren (2000), provide a survey of much of the early quantitative literature investigating the effects of services policies. They discuss many of the efforts to directly measure the extent of policy barriers on a sectoral and cross-country basis and the use of such measures – usually a policy index of some kind – to estimate the price or quantity effects of policies. They suggest that despite limited information, barriers to trade appear to be very substantial.^{viii}

1.8 Have indicators of price distortions fallen under GATT/WTO?

The only comprehensive historical benchmark indicators for the pre-GATT period are trade-weighted average tariffs on imports of manufactures (or in some cases just import duty collections as a percent of the total value of imports) and some NRAs for agriculture in high-income countries.

Table 1 reveals the relatively low rates of protection in 1875 during the first wave of globalization, the generally higher rates during the first four decades of the twentieth century with the key exception of the United States, and then falling rates, particularly in Europe and other high-income countries, after the GATT came into force in 1948 and a series of trade negotiating rounds were concluded. In developing countries, however, rates of manufacturing protection were still very high in the 1960s, and well above their rates in the six decades prior to World War II (shown in Table 2). Evidently the GATT had not been able to prevent that rise, even though some developing countries had become contracting parties to the GATT.

By contrast, rates of assistance to agricultural sectors of high-income countries without a strong agricultural comparative advantage had been rising from the late nineteenth century to the late 1930s (Table 3). After the war the GATT did not manage to discipline that rise, and it continued through to the early 1990s for high-income countries (upper rows of Table 4). Meanwhile, in developing countries, agriculture was being heavily discouraged directly, as well as indirectly via the protection provided to manufacturers (lower rows of Table 4).

After the latter 1980s, the rates of distortion to both agricultural and manufacturing prices diminished in both high-income and developing countries. Assistance to non-agricultural tradable sectors continued to fall, especially in developing countries. At the same time the heavy taxation of agriculture in developing countries (mainly due to export taxes) was phased out, and the high domestic prices for farmers in high-income countries were brought more into line with international prices as trade measures were replaced by more-direct forms of farm income support. Thus the relative rate of assistance to farmers rose from -50 percent to zero in developing countries, and fell from almost 50 percent to less than 15 percent in high-income countries.

How much of those changes in trade distortions is attributable to the GATT and WTO is still being debated. Certainly the phasing out of export taxes is not, since they are not disciplined in the GATT. Most of the phasing down of tariffs on manufactures in developing countries also has not been primarily due to GATT or WTO, with the exception perhaps of some recent WTO accession protocols, particularly China's (see Bhattasali, Li and Martin 2004). But the reductions in agricultural tariffs, domestic supports and export subsidies in high-income countries have been at least partly attributed to the Uruguay Round Agreement on Agriculture

(see the survey in Anderson, Rausser and Swinnen 2013), as has the re-instrumentation of support away from trade-distorting measures toward more-direct forms of farm income support (Swinnen, Olper and Vandemoortele 2012).

1.9 Transferring price distortion estimates to economic models

Economic models of commodity markets or of whole economies represent the price distortions discussed above in various ways. Models focusing just on trade impacts typically use tariffs on imports, sometimes supplemented with tariff equivalents of quantitative restrictions on imports. Early versions of the GTAP protection database for use in the GTAP global economywide model inserted just the applied tariffs. It became clear after the signing of the GATT's Uruguay Round agreements that the new bound tariffs on farm products typically were well above applied rates. Since future trade agreements would be specified in terms of cuts to bound rates, that may or may not deliver a cut to applied rates, depending on the extent of 'binding overhang'. Thus it became necessary to include in the modelers' database both bound and applied tariffs, and to reduce applied rates in reform scenarios only to the extent that the proposed cut in bound rates was greater than the binding overhang. A further complication involved including the lower (preferential) tariff rates enjoyed by the many exporting countries that are members of preferential trading agreements. Boumellassa, Laborde and Mitaritonna (2009) describe these steps taken to build the 2004 tariff data into GTAP's Version 7 database. These needed to be supplemented, in the case of agriculture for developed countries, with domestic producer and export subsidies on farm products (drawing on the PSE and CSE estimates by the OECD). There is now a Version 8 GTAP database, for 2007, for which the updated tariff data have been assembled by Guimbard, Jean, Mimouni and Pichot (2012).

Since agricultural incentives in developing countries also have been distorted by numerous policy instruments in addition to tariffs, they too need to be incorporated in the GTAP database if one is interested in the full effects of distortionary policies on one or more of those economies. Valenzuela and Anderson (2008) have provided such a supplementary database for 2004 for GTAP modelers, drawing on the agricultural NRA and CTE estimates referred to in Anderson (2010). The inclusion of those additional distortions to farmer incentives makes a non-trivial difference to the

developing country welfare effects of price-distorting policies (Anderson, Martin and van der Mensbrugge 2013).

2. Welfare Effects of Reducing Distortions Pre-Doha

Modeling the markets affected by trade policy reform is a sub-field of economics that has become increasingly sophisticated as the power of computing has grown (Anderson 2003). The first global models were for single commodities and initially focused on the welfare cost of protection from import, thereby providing an estimate of what is at stake in negotiations aimed at reducing that protection. An early example is the analysis of sugar policies by Snape (1969). But the GATT negotiations prior to the Uruguay Round led to commitments to cut protection only in manufactures, so the first models of relevance to those rounds needed to be multi-product ones capable of measuring simultaneously the effects on different countries of inter-industry responses to trade reform by GATT contracting parties. Among the earliest to appear were for *ex post* analysis of the GATT's Tokyo Round, by Deardorff and Stern (1979, 1986) and Whalley (1985). The latter model was subsequently applied also to estimating the effects of trade barriers on trade between developed and developing countries. Shoven and Whalley (1992) summarize that model and those two applications. They reveal both the global and regional economic welfare gains to the world from partial liberalizations agreed to in the 1970's Tokyo Round, and the potential gains from full liberalization of North-South trade barriers. The results suggest that the Tokyo Round liberalizations, which were confined to tariff cuts on trade in manufactures between high-income countries, boosted the welfare of the rich liberalizing countries by a fraction of 1 percent. The gain was smallest for the United States, it being the main agricultural exporter among the rich countries, and biggest for Western Europe. In the process, however, that opening of manufactures trade turned the terms of trade against developing countries who, at the time, were exporters of primary products and did not participate in the liberalization. The global and high-income country welfare gains were therefore at the expense of welfare in developing countries as a group.

That outcome meant that, as talks in the first half of the 1980s began to focus on launching the next GATT round, agricultural-exporting countries demanded that

farm policies would have to be included because assistance to farmers had grown hugely in the previous two decades (Anderson and Josling 2005). That in turn led to a flurry of model building to provide *ex ante* estimates of the effects of reducing agricultural protectionism, one of the more widely cited being multi-commodity model of key world food markets by Tyers and Anderson (1986, 1992).

The GATT's Uruguay Round was launched in September 1986. As the negotiations progressed, considerable controversy arose over whether agricultural trade liberalization would help or harm developing countries, since by the early 1990s they *as a group* were net importers of temperate farm products. Anderson and Tyers (1993) explore this issue in some depth, and point to two aspects that are critical to the sign of the estimated welfare effect of reform on that group. One is the extent to which developing countries would switch, even with current technologies, from being net importers to net exporters of farm products if levels of agricultural protection in rich countries were to be lowered. The other is the extent to which agricultural productivity growth in developing countries would be stimulated by such a reform-driven improvement in their incentives to expand farm production. Their empirical results suggested that the developing country group would indeed gain if rich countries removed their agricultural protection. They also showed that if developing countries also removed their farm price-distorting policies, their welfare gains would be twice as large. In both cases, developing countries would gain almost one-third of the global welfare gains from that complete liberalization of farm product markets.

Since agricultural reform was being negotiated in the Uruguay Round alongside trade policy reforms in other sectors, economy-wide models were needed to capture the combined impacts on national and global welfare of the negotiated outcome. By the end of the Uruguay Round, a substantial number of such models were available for *ex post* analysis of that round, as is clear from the collection of essays in Martin and Winters (1996). One of those studies is by Francois, McDonald and Nordström (1996). All three authors were economists at the newly named World Trade Organization at the time. Their model drew on the 1992 GTAP database and incorporated imperfect competition and scale economies. It also allowed for either fixed or endogenous capital stocks and savings rates. With that degree of flexibility they show how much greater the estimated welfare gains from the Uruguay Round trade reforms are when capital stocks and savings rates are allowed to be endogenous (a near-trebling in the global gains) and when firms are differentiated to allow for

imperfect competition and scale economies (a further doubling in the global gains, to 0.94 percent of global welfare). Of that estimated welfare gain, almost three-fifths was expected to go to developing countries. That was not primarily because of the inclusion of agriculture in the Uruguay Round, however. Rather, because developing country exports by the latter 1990s had become much more focused on manufactures, and tariff cuts on manufactures – especially textiles and clothing – were to be larger than the reforms in agriculture, and economies of scale were assumed to prevail in manufacturing but not in agriculture, most of their projected gains were from industrial product reforms. Those gains were to be received only gradually however, as the Uruguay Round commitments were to be phased in over the ten years to 2004; and, in the case of textiles and clothing, half of the reform was to be back-loaded to the very end of that phase-in period. Meanwhile, China was industrializing rapidly and working towards WTO accession (which occurred in late 2001), so during the past decade China has been the major exporting beneficiary of the substantial opening of the world's textile and clothing markets.

As already mentioned, there were many autonomous trade policy reforms in the two decades to 2004 in addition to those resulting from the Uruguay Round. Valenzuela, van der Mensbrugge and Anderson (2009) used the GTAP model in back-casting mode to estimate how far the world had come towards free trade during that period. In doing so they included the estimated agricultural distortions in developing countries from Anderson and Valenzuela (2008) to capture the declines in distortions between 1980-84 and 2004, so as to include such changes as the phasing out of agricultural export taxes as well as import tariff reforms. They found that the combination of unilateral, preferential and multilateral trade reforms had brought the world almost three-fifths (58 percent) of the way toward freeing up all goods markets, in terms of global welfare. However, in terms of developing country welfare those reforms contributed only two-fifths of their potential. Thus developing countries have a bigger stake than high-income countries in further trade reform: nearly 70 percent of the potential global welfare gains from removing remaining distortions as of 2004 would go to developing countries, according to that study.

All of the above models, and those reviewed in the next section, assume there would be zero costs of adjustment to trade reform. While that may seem unreasonable to politicians focused on the next election, it should be kept in mind that all reforms agreed to under in GATT/WTO agreements are well known in advance of

implementation, and are phased in over an extended period of several (up to ten) years. This assumption is thus consistent with dynamic theories of adjustment costs for labour (Furusawa and Lai 1999) or capital (Chisik 2003), as well as with empirical studies which typically show that actual trade reforms added very little to unemployment (see, e.g., de Melo and Tarr 1990, Winters and Takacs 1991, and Porto and Hoekman 2010) .

The Uruguay Round agreements included much more than just cuts to merchandise import barriers and agricultural production and export subsidies of course. Commitments were made on services under the General Agreement on Trade in Services (GATS), but unfortunately they were insufficient to have much real impact on services trade and investment (Hoekman 1996).

Commitments were also made to reduce sanitary and phytosanitary (SPS) as well as other technical barriers to trade (TBTs). However, measuring the welfare effects of those commitments is very difficult (see Beghin and Bureau 2001 and other papers in Henson and Wilson 2005), so it is not surprising that there are no empirical analyses to date of the economic welfare contributions of either the SPS or TBT agreements that came out of the Uruguay Round.^{ix}

An agreement was also reached on safeguards. Finger (1996, 2002) points out that unfortunately it does not distinguish between government interventions that serve the national interest and those that do not. Even so, provisions such as safeguards and anti-dumping have provided WTO member government the scope to take a step back where that is politically necessary to preserve two earlier steps forward. Finger (2012) believes that in practice these provisions have served the trading system well, because any new restriction applied under this agreement is disciplined to ensure that it only minimally compromises the momentum of liberalization while simultaneously discouraging protection seekers. Empirical assessments of the welfare effects of the Uruguay Round's agreement on safeguards are inherently difficult, because the cost of a back-stepping safeguard measure in national and global welfare terms needs to be weighed against the benefit of being able to take those two earlier steps towards freer trade. Hence the absence of such welfare analyses in the collection of readings by Bown (2006). There is some evidence, though, that this GATT rule does help governments make greater commitments to free up trade (Staiger and Tabellini 1999).

More controversially, an agreement was reached on trade-related aspects of intellectual property rights (TRIPS). Its welfare effects, to which we now turn, are far less obvious than those from reducing price and trade distortions.

3. Welfare Effects of the WTO's Agreement on Intellectual Property Rights

The TRIPS agreement required developing countries to greatly reform their IPR regimes, to bring them more into harmony with those of advanced economies. As those reforms are gradually introduced, the monopoly rents enjoyed by IP owners in advanced economies would also accrue to them from those developing country markets in which their IP is being used. Meanwhile, those reforming developing countries hoped to see more inward technology transfer, more local innovation and cultural development, and perhaps even a closing of the technology gap between them and richer countries. As Maskus (2002) points out though, such expectations from a stronger IPR regime alone are likely to be frustrated if complementary policy reforms are not simultaneously implemented. The latter include strong commitments to boost education and skills development, to make capital and labour markets more flexible, to ensure product and input markets are open to trade and foreign investment, and to have a pro-R&D tax regime and a pro-competitive competition policy regime. Much has been written about how a stronger IPR regime with or without sound complementary policies can affect developing countries (Maskus 2004, 2012), but there are very few empirical analyses to date of the economic welfare contributions of implementation of the 1994 TRIPS agreement, with the following exceptions.

The first exception is by McCalman (2001), who explores the extent to which international patent harmonizing required by the TRIPS Agreement transfers rents to patent holders (who mostly reside in the United States) from the rest of the world. A dynamic model of international patenting behavior is estimated, where firms decide to apply for patents in different countries based on such factors as growth, market size, factor supplies, and the patent regime. The value of those patents are then compared before the TRIPS changes with what they would be after the new rules are implemented, according to a data set of 1988 patent applications. This comparative static set of estimates suggests the TRIPS Agreement generates significant net benefits for the most innovative countries, while raising the costs of access to technology for nations that import knowledge. They are compared with an independent set of estimates of the efficiency gains from goods trade liberalization in the Uruguay Round provided by Harrison, Rutherford and Tarr (1996). Those

estimated long-run gains for Canada are reduced by half when this patent aspect of the TRIPS agreement is taken into account, and the trade reform gains for developing countries are reduced by about one-fifth. The author points out that dynamic efficiency gains from increased innovation could go some way towards offsetting the negative impact of the TRIPS agreement on developing countries' welfare, however.

A second study by McCalman (2005a), also employing a multi-country dynamic model, provides estimates of the dynamic benefits from the greater incentive that stronger IPRs provide to innovate. In the short run all 27 countries in the sample experience an increase in the value of their global patent portfolios. However, owing to asymmetries in the reforms required, some countries gain disproportionately from policy changes undertaken in other countries. Therefore these net benefits of the TRIPS agreement in the short run are negative for the majority of countries, particularly developing countries. The long-run analysis, on the other hand, reveals that there is potential for all countries to benefit, although the distribution of these estimated benefits also is highly skewed towards high-income countries, and developing countries experience the smallest gains. This ranking and the possibility that some countries may not gain even in the long run suggest that developing countries are likely to continue to question the value of the TRIPS agreement.

Yet another study by McCalman (2005b) seeks to assess the relative influence of IPR on the international diffusion of new goods and services. By employing a product level data set relating to the behaviour of Hollywood movie studios, dates can be established as to when a movie is first made available and subsequently how long it takes to reach a particular country. The analysis reveals that the nuances suggested by theory are present in the data. In particular, where moderate standards of IPR encourage the spread of movies, either weaker or stronger property rights tend to decrease the speed with which American movies are released abroad: while some IPR recognition may encourage diffusion, very strong IPR may actually retard the speed of diffusion. These results argue against any simple prediction about the implications of IPR reform for the speed of diffusion, suggesting instead that the nature and magnitude of the impact of IPR reform depends on the initial standard of IPR, among other factors. Since the interplay of promotion, piracy and product lifecycles is common to many IPR dependent products (e.g. pharmaceuticals), Hollywood's response to stronger IPR provides at least some suggestion as to how other IP owners

may behave. While this paper does not go as far as to estimate economic welfare effects of the altered speed of diffusion of this group of products, it does illustrate the complexities that can be involved in one of the steps in such a calculus.

Chaudhuri, Goldberg and Jia (2006) focus on patents for pharmaceuticals. They estimate the welfare effects of the TRIPS agreement on developing countries using data for the fluoroquinolones sub-segment of the systemic anti-bacterials segment of the Indian pharmaceuticals market. Their results support the view that there may be adverse welfare effects of TRIPS for some developing countries. They estimate that the withdrawal of all domestic products in this sub-segment is associated with substantial welfare losses to the Indian economy, even in the presence of price regulation, with most of this coming from the loss of consumer welfare. This result underlines a point made by Qian (2007) that national patent protection alone does not stimulate domestic innovation. Rather, domestic pharmaceutical innovation will accelerate, when stronger IP regulations are implemented, in those developing countries that have higher levels of economic development, educational attainment, and economic freedom.

4. Potential Welfare Effects of a Doha Round Agreement

The WTO's so-called Doha Development Agenda was launched in 2001 and has been struggling more than any previous round of multilateral trade negotiations to come to a successful conclusion. The most recent Ministerial, in Bali in December 2013, was only able to conclude an Agreement on Trade Facilitation (WTO 2013a,b). On the major issue of cuts to tariffs and subsidies there has been very little movement since the Trade Ministerial in Hong Kong in December 2005. One silver lining to that cloud has been that analysts have had time to improve the theory and the empirical inputs that go into their simulation models of the world economy that are used for numerical trade policy analysis. This section reviews those analytical developments and then provides estimates of the possible market and welfare effects of a Doha Round agreement to lower import tariffs and subsidies, and compares them with the potential gains from full global trade liberalization so as to assess how far the WTO might take the world toward free trade after this round of negotiations.

There is a practical reason for beginning with measurement issues: the policy community understandably is unlikely to make use of estimates from various models that have very divergent results unless they understand the reasons behind those divergences. This is especially so if the divergent results come from the same analyst using the same model, as happened in the early 2000s in the World Bank. That led the analyst in question to write a paper on why the estimates change (van der Mensbrugghe 2006), in which he carefully explains why his 2005 estimate of the global gains that would come from full trade liberalization are so much lower than his estimates earlier in the decade. There are two main reasons. One is that the earlier exercise assumed no policy changes over the projection period to 2015, whereas the new exercise allowed for reforms already committed even if not yet fully implemented. The latter include the remaining commitments under the Uruguay Round, most notably the phase-out of quotas on textiles and clothing by the end of 2004; the policy changes associated with the expansion of the European Union to include 10 new members in 2004; and the commitments associated with China's accession (in late 2001) to the WTO. A second reason is that the baseline data changed from 1997 to 2001. That changed the structure of the world economy as represented in the model. It also meant that the protection database was updated by four years. More than that, for the first time that protection database took into account tariff preferences as they affect applied bilateral tariff rates, which lowered substantially the average import tariff of most countries.

There was another important improvement in the protection database early this century. Almost all global modelers have been using the GTAP database, and its protection estimates during the past decade have come from very careful data work at CEPII in Paris (Boumellassa, Laborde and Mitaritonna 2009). One of the crucial innovations for the GTAP Version 6 (2001) protection database was to include bound tariffs in addition to actual applied tariff rates. This meant that for partial trade policy reform scenarios, modelers could now reduce the bound tariff to the extent promised and see whether that would lead to a reduction in the 2001 applied tariff. Only if it did would the modeler reduce the applied rate, and only to the extent beyond the previous binding overhang.

Those are not the only areas where protection data used by modelers had to improve. Francois and Martin (2011) also point to the need for including more protection measures than have hitherto been covered, including non-tariff barriers and

restraints on some exports. They also point to the scope for improving on the way the tariffs on individual tariff line items are aggregated to obtain a product group average. Otherwise much of the gain from a trade reform that reduces differences between those line items' tariffs will not be captured by the modeler.

A further area for model improvement discussed by Francois and Martin (2011) is the need to make numerical models dynamic, so they can capture the impact of trade reform on boosting investment and speeding technical change. Related to that is the role that services trade and investment liberalization can play. Francois and Martin also stress the need for models to go beyond assuming homogeneous firms in each industry with constant returns to scale and perfect competition and unchanging factor productivity. Important departures from this approach in the subsequent literature have included changes in firm and industry-level efficiency. Competition from trade opening tends to drive out less-efficient firms and see product quality rise and products become more differentiated (Bernard et al. 2012). Yet there are pro-competitive gains from opening up where markets were imperfectly competitive, whereby the number of domestically produced varieties falls but the overall number of varieties increases thanks to import growth. It is now well established, based on econometric evidence, that pro-competitive effects, in their various guises, can have dramatic implications for the linkages between trade policy and economic performance. There is thus great scope to properly integrate recent advances, from the theoretical and econometric literature, into computational models.

Balistreri, Hillberry and Rutherford (2011) pick up this last-mentioned challenge to develop a global model with heterogeneous firms, for see numerically how much difference it can make to the results from running trade reform scenarios without and with that assumption. They find that, in the case of a 50 percent cut in tariffs on manufactured goods the global welfare gains are four times larger when firms are assumed to be heterogeneous rather than homogeneous.

With these measurement issues in mind, consider now the empirical evidence, beginning with two widely cited early papers estimating the effects of partial reform. Francois, van Meijl and van Tongeren (2005) make use of their global economywide model, which includes imperfect competition, scale economies and variety effects. It also offers the opportunity to explore services trade liberalization and trade facilitation. Since that study was undertaken before substantive Doha Round offers from WTO members were on the negotiating table, its liberalization scenarios involve

simply 50 percent cuts across the board in all protective measures (tariffs, export subsidies, domestic farm support and restrictions on services) plus some cut in trade costs. The authors find that the gains from going half way towards free markets would be a 0.5 percent boost to global welfare (slightly more in developing countries, slightly less in high-income countries). If just high-income countries took part in the reform, however, the global gain would be only half as much and developing countries would gain very little. In both cases the welfare gain is due slightly more to variety and scale effects than to traditional resources reallocation effects, which underscores the point that models that instead assume perfect competition and constant returns to scale will grossly underestimate the gains from trade reform. A further result that simpler models miss has to do with services opening and trade facilitation: together they contribute as much as goods trade liberalization to the global welfare gains.

The Doha analysis by Anderson, Martin and van der Mensbrugghe (2006) reverts to a relatively standard computable general equilibrium model (the World Bank's recursive dynamic CGE Linkage Model), and so gets somewhat smaller estimates of welfare gains from trade reform than Francois, van Meijl and van Tongeren (2005): a gain of 0.7 percent of GDP from full trade liberalization compared with the latter study's 0.5 percent from reducing distortions by just half. Three-fifths of that potential global gain, and of the gain to developing countries, is attributed to agricultural policies. Despite its underestimation of gains, this study is worthy of attention for several reasons. First, the model's baseline is projected from 2001 to 2015, to give a better sense of how the world economy would look by the time the expected (at that time) Doha agreement would be implemented. Second, its Doha reform simulations are based on what was on the table at the time of the Trade Ministerial meeting in Hong Kong in late 2005, which was expected to be close to what would eventually be agreed. Since there was almost nothing on the table and little expected in the way of new reform commitments in the services area, attention is focused only on merchandise trade reforms. And third, some of the very detailed proposals on agriculture looked likely to undermine the hope of major reform in that contentious area, so careful analysis of those proposals was called for.

The Doha simulations by Anderson, Martin and van der Mensbrugghe (2006) suggest that if a Doha agreement with the liberalizing elements that were proposed by end-2005 had been agreed to at that WTO Ministerial meeting in Hong Kong, with no

exemptions and with developing countries relinquishing their right to special and differential treatment, the world would have exploited two-fifths of its potential for welfare gains from freeing all merchandise trade. However, developing countries continued to demand that they be required to lower their trade barrier bindings by only two-thirds as much as high-income countries, and that least developed countries not be required to liberalize at all. Anderson, Martin and van der Mensbrugge (2006) show that such differential treatment diminishes the estimated welfare gain by 20 percent globally and by 30 percent for developing (including least developed) countries. Three-quarters of that diminished global gain would be due to agricultural reforms, provided WTO members did not demand lesser cuts in support for 'sensitive' and 'special' products. But in fact both rich and poor countries were demanding that exceptional treatment. When that demand is factored in even for just a small proportion of farm products, the estimate of the global gains from a Doha agreement is much reduced, and the gains to developing countries even more so. This analysis is thus a sobering reminder of the scope for small exceptions to undermine a trade agreement, especially when those exceptions are the most protected areas.

We now know that a Doha agreement did not emerge from the Hong Kong Ministerial, and that the talks broke down in August of 2008 and went into hibernation after those draft modalities were recorded in December that year (WTO 2008a,b). So did most ex ante analysis of the proposals. An important exception, however, was a team that produced a much-revised set of studies of the foregone value to the world economy of what appeared to be on offer at the time of that breakdown (Martin and Mattoo 2011). One of those chapters, by Laborde, Martin and van der Mensbrugge (2011b), again uses the World Bank's recursive dynamic Linkage Model, although with a database updated to 2004. Its point of departure is to revise the way in which the average tariff rates for each product group in the model's database are estimated from the very detailed tariff line data available in national tariff schedules. The traditional trade-weighted average approach wastes a great deal of information in those schedules about the diversity of tariffs and, being trade-weighted, gives insufficient weight to lines with high tariffs. By effectively hiding that dispersion and under-emphasizing highly protective rates, this approach necessarily leads to an underestimation of the prospective gains from tariff reductions. The alternative approach used by Laborde, Martin and van der Mensbrugge (2011b) draws on a new optimal tariff aggregator technique developed by James Anderson

(2009) to overcome this problem. The authors present results for full global liberalization and for partial Doha reform using both the traditionally aggregated tariffs and the newly aggregated ones. The differences in global welfare effects are non-trivial: the latter are higher by nearly one-half for full reforms and by more than one-quarter for Doha reform. The differences for developing country welfare are even greater, because of the greater diversity of tariff rates in those countries.

Given that the agricultural sector accounts for only 6 percent of world trade and 3 percent of global GDP, it is striking that, according to Anderson, Martin and van der Mensbrugghe (2006), agriculture accounts for three-fifths of the potential gains from freeing global trade, and three-quarters of the gains from the partial reforms that were on the Doha negotiating table at end-2005 (provided developing countries did not seek differential treatment and lesser cuts were not agreed to for 'sensitive' and 'special' farm products). Yet even this understates the significance of liberalizing farm products, for two reasons. One is that there are more instruments distorting the agricultural sector in developing countries than those captured in the GTAP distortions database (e.g., huge farm input subsidies in India). The other reason is that, absent further disciplines on farm support programs via an ambitious Doha agreement, it is quite likely that agricultural protection will grow in some rapidly emerging, densely populated economies. Indeed the nominal rate of assistance to farmers in both China and India roughly trebled, to around 20 percent, during the first decade of this century (Anderson and Nelgen 2012). Yet the analysis in Anderson, Martin and van der Mensbrugghe (2006) assumes in its baseline that 2001 policies remain unchanged through the projection period to 2015.

Anderson and Nelgen (2011) address both of the above points. They do so by making use of the standard GTAP model and Version 7 (2004) database except that they replace that database's distortions to agricultural prices in developing countries with those drawn from their own distortions database, which have been assembled for GTAP modelers by Valenzuela and Anderson (2008). They then project the world economy to 2030 by assuming all price-distorting policies remain unchanged, and then compare that baseline with an alternative one in which distortions to agricultural markets in each developing country are allowed to change as the country's per capita income and agricultural comparative advantage are projected to change over that period. The nature of that assumed change in distortions draws from cross-country political econometric regression equations estimated for each main farm product in

2004. For most farm products it predicts protection to increase with per capita income. Those projected increases are capped at the bound tariff rate for each country and product.^x Full global trade liberalization of those two alternative 2030 baselines reveals that, if in fact agricultural protection growth is the correct counterfactual in the absence of a Doha agreement, then assuming no policy change underestimates by one-quarter (one-ninth) the potential welfare gain from freeing agricultural (all merchandise) policies in developing countries.^{xi}

It appears unlikely that there will be substantial liberalization of services trade and investment restrictions under a Doha agreement, and even less likelihood that progress will be made in Mode 4 of the General Agreement on Trade in Services (GATS). Mode 4 has to do with the ‘movement of natural persons’, or temporary migration. The only commitments of this kind made in the Uruguay Round’s GATS have to do with skilled personnel, particularly within corporations involved in Mode 3 (direct foreign investment). This is unfortunate for developing countries, because their main economic interest is in the movement of less-skilled workers. It is therefore also unfortunate also for the Doha Development Agenda, because its absence on that agenda is seen as further evidence that high-income countries are not taking the development theme of this negotiating round very seriously.

To get a sense of just how important this issue is in terms of economic welfare, Winters et al. (2003) use the standard GTAP model and a new global database on bilateral flows of temporary workers and their remittances to estimate the effects of expanding the workforce in high-income countries by three percent. This simulation assumes those workers would come from developing countries in the same bilateral pattern as in the migration database they have assembled. Consistent with much earlier work by Hamilton and Whalley (1984), their results are striking. That relatively small out-migration from developing countries would expand global welfare by more than \$150 billion in 2001 US dollars, which is more than estimates around that time of when might flow from a Doha liberalization of merchandise trade. A similar exercise summarized in Anderson and Winters (2009), but using the World Bank’s Linkage model, found an even bigger benefit from such an opening up by high-income countries. The latter study points out that the welfare effects from merchandise trade liberalization and from a more liberal immigration scheme cannot simply be added up, because one could be, to some extent at least, a substitute for the other (Mundell 1957; but see also Markusen 1983). Nonetheless, this simulation work

underscores the potential contribution the WTO's GATS could play in boosting global welfare and reducing international income inequality.

Another controversial development aspect of the Doha Agenda has to do with the erosion of nonreciprocal preferential market access that will occur when any preference-providing country opens its markets on a most-favoured-nation (MFN) basis. Unilateral (nonreciprocal) preferences to developing countries have been allowed by the GATT, but they have created a tension between the preference-receiving developing countries—commonly former colonies of the preference-providing country—and other developing countries. Although erosion is a long-standing concern of many developing countries (see Hoekman and Özden 2006), the scope and coverage of unilateral preferential regimes have in the past few years increased significantly, especially for least-developed countries (LDCs) that now enjoy not just a tariff preference on some items but duty- and quota-free access for virtually all products to key markets of numerous high-income countries. The main sources are the European Union's Everything But Arms (EBA) and the United States' African Growth and Opportunity Act (AGOA) programs. Any reductions in MFN tariffs by those countries necessarily lower the preference margin of the beneficiary countries, hence the attention this issue has attracted in the Doha round of WTO multilateral negotiations.

A synthesis of estimates of the global and national effects of preferences on market access is provided by van der Mensbrugghe (2009). The GTAP Version 6 database used in this study suggests that the average margin of preference is rather small for most countries, amounting to 3.8 percent on imports into the EU and about 0.6 percent on average on imports into other rich countries. Those margins, which are highest in agriculture and food, are similar to the ones found by other analysts (see, for example, those surveyed in Hoekman, Martin and Braga 2009). This study addresses three questions: (i) what would low-income countries lose if their imports were taxed at MFN rates rather than at preferential rates, (ii) how much would their economic welfare change if all high-income countries completely liberalized their merchandise trade, and (iii) what is the upper bound of gains and losses to low-income countries from full global merchandise trade reform? The study finds, firstly, that for developing countries combined, preferences may add about US\$8 billion or 0.1 percent to their income each year on average, but about 0.3 percent for the lowest-income countries (whose export revenue is boosted by 2.3 percent). These estimates,

which are derived from a scenario in which preferential tariffs are replaced by MFN tariffs, provide an upper bound on the value of preferences to developing countries because they assume that the preferences are fully used and that the cost of regulatory requirements is zero (both of which do not hold in practice). Secondly, if high-income countries were to set all tariffs to zero (thus eliminating the preference margin), low-income countries would gain, because the overall benefits from greater market access would outweigh the loss in preferences. And thirdly, in terms of global merchandise trade reform (that is, in developing as well as high-income countries), ignoring preferences would lead to overestimating the annual income gains to developing countries from reform by about 50 percent, or by US\$16 billion of the total gain of US\$51 billion. Put differently, preferences reduce the gains from global trade reform for all developing countries from 1.0 percent of their initial income to 0.7 percent, and for the lowest-income countries from 0.8 percent to 0.4 percent (but again this reduction is an exaggeration because it ignores the current underutilization of preferences and the costs of complying with entry requirements such as rules of origin). But preferences make little difference to the expansion of export revenue for developing countries – by about one-quarter – that would result from full global trade liberalization. In short, preferences matter little except for a few low-income countries, and even for them the costs of complying with entry requirements are often so high as to lead to little or no utilization of their available preferences. Once quotas on textile and clothing trade were removed at the end of 2004, preferences became even less important.

5. Historical Econometric Analysis of Impacts of WTO on Trade

The widely held and long-standing views about the positive economic effects of WTO membership on national and global welfare have been called into question recently from within the economics profession. Assuming there is a natural political tendency for national governments to restrict trade (an anti-trade policy bias), then one useful index of trade reform that saves having to use an economywide model – or even measure changes in rates of protection by comparing domestic and border prices – could be an expansion in overall trade. To his surprise, using a sample of 175 countries over 50 years, Rose (2004a) found that those countries acceding to or being

a GATT/WTO member did not have a bilateral trade pattern that was statistically significant from those countries outside the club. Puzzled, he undertook another econometric exercise to examine 68 measures of trade policy and liberalization to see if being a GATT/WTO member is associated with more-liberal trade policy (Rose 2004b). Again he could not find a statistically significant correlation. A series of critiques of those papers followed, challenging the questions posed and the methods employed, and Rose himself refined his analysis in response to his critics.

Subramanian and Wei (2007), for example, use a different methodology, and find that the WTO had a strong positive impact on trade. They first point out that the effects of WTO could be diminished by a number of factors, such as: *what* the country did with its membership (industrial countries that participated more actively than developing countries in reciprocal trade negotiations witnessed a larger increase in trade); *with whom* it negotiated (bilateral trade was greater when both partners undertook liberalization than when only one partner did); and *which products* the negotiations covered (sectors that did not witness liberalization did not see an increase in trade). An example of the second point is provided by Pietras (1998), who notes that the protectionist practices of transition economies' trading partners adversely affected the train of reforms and the benefits of WTO membership to those economies: their sense that "other countries do it too" led to a slow but visible retreat from their initially quite liberal policies. Subramanian and Wei (2007) offer a different gravity model specification (suggested by Anderson and van Wincoop 2003) that is more consistent with the Bagwell and Staiger (1999, 2002) economic theory of the GATT, and find that high-income countries that participated in GATT more actively than developing countries in reciprocal trade negotiations did experience an increase in trade. They also find that bilateral trade was greater when both partners undertook liberalization than when only one partner did. Not surprisingly, they find no significant increase in trade for those sectors (agriculture, textiles and clothing) that were not included in the liberalization. And they find that members joining after 1995, who were required to liberalize more than those developing countries that joined in the pre-WTO era of GATT, traded more. They conclude from their econometric study that the GATT/WTO has more than doubled global imports, even though it has been uneven (consistent with the institution's asymmetries). They also note that while WTO membership had little impact on imports of developing

countries, it certainly helped their exports to high-income countries, notwithstanding the remaining restrictions on farm and textile products.

Tomz, Goldstein, and Rivers (2007) argue that Rose (and Subramanian and Wei) underestimate the effect of the GATT/WTO by mistakenly classifying a number of countries as non-participants when in fact they had rights and obligations under the GATT (e.g. colonies, de facto members, and provisional members). Over half of the observations that Rose classified as involving no GATT members actually involved nonmember participants. When Tomz, Goldstein, and Rivers correct for that, they find – even when using the same data and methods as Rose – that being part of the GATT/WTO either as a formal member or as a nonmember participant substantially increased trade across countries and over time.

Rose (2007) responds to the critique by Tomz, Goldstein, and Rivers, acknowledging their point but offering additional results and claiming that several pertinent questions remain unanswered. Rose (2010) further responds to their and others' critiques. On a key point made by Subramanian and Wei, he describes their conclusion, somewhat tongue-in-cheek, as: the GATT has worked well if you ignore the countries, sectors and times when it hasn't. More generally, Rose (2010) lists a number of remaining challenges for econometricians to address. One he stresses particularly strongly is: has the GATT/WTO created trade at the extensive margin, that is, between pairs of countries that otherwise would not have traded with each other? An initial attempt to address that question, by Liu (2009), gives an affirmative answer: GATT/WTO membership increases the partner-level extensive margin of trade. Dutt, Mihov and Van Zandt (2013) also get a positive answer, with GATT/WTO membership increasing the extensive margin of exports by 31 percent.

This extensive margin issue is also taken up in the study by Grant and Boys (2012), who also point out that the study by Subramanian and Wei (2007) has a fundamental problem in its selection rule to characterize agriculture. When correcting for those two problems, Grant and Boys find that the GATT/WTO has indeed promoted trade even in farm products. That is an important finding, as most analysts presume agriculture would be the most likely sector in which one would not find a positive GATT/WTO effect.

Most of the econometric studies of the impact of this institution on trade use parametric estimation of gravity-based trade models (another recent one being by Herz and Wagner 2011). An exception is Chang and Lee (2011), who suggests non-

parametric methods are more appropriate. In doing so they find large trade-promoting effects of GATT/WTO that are robust to numerous variations in their specifications.^{xii} This will not be the last word on this issue, but it adds to the positive conclusions of several of the other critiques of the original study by Rose and opens the way for further analyses as more countries accede to WTO, to which we now turn.

6. Benefits From WTO Accession

There were 23 countries (accounting for 61 percent of world trade in 1948) that had signed the General Agreement on Tariffs and Trade when it came into effect on 1 January 1948. Gradually that number increased over the years, reaching 50 in the early 1960s, 100 in the early 1970s, and in 1994 alone a further 12 signed up, so that when the GATT was converted to the WTO in 1 January 1995 there were 128 members (accounting for 91 percent of world trade in 1994). Since then 31 more countries have become members (accounting for 97 percent of world trade in 2012, the most important additions being China and Russia) and a further 25 (which account for almost all of the remaining 3 percent of world trade) are observer countries in various stages of accession.

Becoming a GATT contracting party prior to 1995 was far easier than joining the WTO. The majority of developing countries that joined the GATT did not actually accede, but rather succeeded to GATT status. In the post-World War II period, many countries that gained independence from colonial powers had the option of entering the GATT under the special terms of GATT Art. XXVI:5(c),^{xiii} and thereby acquired *de facto* GATT status, before converting this status into full GATT contracting party status by succession. That process was much less stringent than the ordinary accession process under GATT Art. XXXIII, and 64 countries took advantage of that fast track accession process.

For a country to become a WTO member, by contrast, many more policy reforms typically are required. The most visible sign is the opening up to trade in goods and services which encourages the country to specialize its production more in those activities in which it is most competitive internationally and to import other products at lower than pre-accession prices to the benefit of its consumers – including those producers using imported intermediate inputs. As the Introduction to Braga and

Cattaneo (2009) points out, there are many other benefits to accession though. They include:

- lower costs of trade negotiations,
- participation to international trade rule-making,
- access to an impartial and binding dispute settlement mechanism,
- an improved business climate for domestic producers and foreign investors, and
- an anchor for domestic regulatory and administrative reforms.

Thus estimates of the effects of WTO accession on joining the WTO could be viewed as providing a more-complete measure of the worth of the organization to a nation.

Drabek and Bacchetta (2004) point out that there is some evidence that WTO membership goes hand in hand with higher institutional quality and efficiency and reduced rent-seeking behavior and corruption. The better protection of intellectual property rights (Agreement on the trade-related aspects of intellectual property rights, TRIPS), better governance of so-called backbone services such as telecoms, banking, transports (General Agreement on Trade in Services, GATS), and better regulation of technical, sanitary and phytosanitary measures (Agreement on the application of sanitary and phytosanitary measures, SPS, and Agreement on technical barriers to trade, TBT), contribute to improving the national business environment, and to creating sizeable domestic payoffs. Not only importers and exporters benefit from these reforms, but all domestic firms, whether or not they are involved in trade. Ultimately, the country becomes more attractive to foreign investors, and foreign direct investment inflows (FDI) are expected to contribute to reducing the cost of capital.

WTO incumbent members accept new members into the club because they too expect to benefit from the expansion. True, there is the risk that the new entrants' exporters would become more efficient competitors and win market shares to the detriment of some of their own producers. Most observers expect that these potential losses will be far outweighed by the gains elsewhere in most economies, although the biggest question mark hangs over accession by the largest economies. Indeed Braga and Cattaneo (2009) note that 75 percent of the scholarly references on WTO accession are to do with China (and another 10 percent on Russia), with a large share of that literature focusing on the impact of accession on the rest of the world. That

also helps explain why the accession process was the longest for those two countries (more than 15 years).

Certainly China is the most important trading economy to accede to the WTO post-1995. It joined in December 2001, but it was steadily reforming its policies over the previous seven-plus years in anticipation of joining. Quantifying the effects of its accession therefore requires taking account of those earlier reforms as well as those undertaken during the post-accession phase-in period. That is what is done in the global economywide modeling exercise undertaken by Ianchovichina and Martin (2004). They find that three-fifths of the total global benefit from China's WTO accession had already been achieved by 2001. Their study has many other distinguishing features though. One is that they carefully take into account that China had import duty exemptions in place for export processors who were using imported intermediate inputs. Without that feature, the model would have overstated the increase in China's trade flows by 40 percent. Another key feature is the labor market mechanism (*hukou*) that restricted the flow of labor from rural to urban areas in China. A third critical feature is that China was excluded from the liberalizing elements of the Uruguay Round Agreement on Textiles and Clothing, and so did not enjoy the increases in quotas that restricted global trade in those products. Once China joined and was able to enjoy greater market access until those quotas were eventually phased out and replaced by tariffs in 2005, and then even greater access thereafter, it had a major positive impact on its – and the rest of the world's – textile and clothing markets. And fourth, this study examined not only the trade reforms but also important complementary domestic policies that could be put in place to ease the adjustments to those changes in border restrictions.

The Ianchovichina and Martin (2004) study, based on their modifications of the GTAP model of the global economy, demonstrates that the extreme views held in China at the time about various adverse effects of WTO accession were not justified. For example, while some agricultural industries would see an increase in imports (most notably feedgrains for the livestock sector), other farm groups would be able to export more, hence the overall trade balance on farm products would change very little. Likewise in manufacturing: some highly protected industries would have to shrink, but others (most notably apparel) would boom and raise their demand for labor and thus wages for non-farm workers. The net result is that China is estimated to have benefitted by US\$31 billion a year from trade reforms in preparation of WTO

accession and an addition \$10 billion a year from agreed reforms implemented in the five years following accession. And it would benefit at least a further \$1 billion a year from two domestic reforms considered in the study to ease adjustments, namely, reducing the restrictions on rural out-migration and upgrading the skills of its workforce.

China is not the only country to benefit from its accession to WTO, however. Being a large trading economy, the rest of the world also benefits from its greater opening up. Ianchovichina and Martin (2004) estimate that those additional gains in global welfare amount to \$34 billion a year. Some of that gain to the rest of the world is due to allowing China the same access as other WTO members to markets for textiles and clothing, but most of it is due to China's tariff reductions. The key beneficiaries are China's East Asian neighbors plus Western Europe and North America. There are some developing countries that are estimated in this study to have lost from China's accession.

It should be kept in mind, though, that the simulation model used in this simulation exercise has several features that lead to it underestimate the benefits of trade reform. One is that it assumes constant returns to scale and perfect competition. Another is that it does not include liberalization of trade and investment in services. Also, it is comparative static and therefore does not measure the additional dynamic consequences of trade reform. Those can result in various ways, including from more-productive firms taking over less-productive ones in response to reforms (Bernard et al. 2012). As well, industries are highly aggregated and so the model does not capture the gains from trade relating to greater fragmentation of production processes as trade costs are lowered; and nor does it take into account that China's commitment to greater openness may alter the political economy of protection in both China and its trading partners, providing stronger opposition to restrictions from new exporters and thus leading to more opening up of economies (Baldwin 2012).

The issue of more-productive firms taking over less-productive ones in response to reforms is explored by Brandt et al. (2012). Since China's import tariffs differed tremendously across industries but converged to an almost uniform low level after WTO entry, Brandt et al. are able to exploit that sectoral variation in the extent of tariff reduction to identify the impact of increased import competition on firm performance and its contribution to productivity growth over the 1995–2007 period. They find evidence of strong downward pressure on prices and mark-ups, but limited

evidence that imports took away market share from domestic firms. They also find that much of the sectoral productivity effect come from changes at the extensive margin: sectors that liberalized most tended to attract especially productive private firms. This provides strong empirical support for that theoretical notion championed by Melitz (2003).

The first three of those caveats mentioned in the previous paragraph are gradually being overcome by subsequent modelers. An important example is in the ex ante modeling by Rutherford and Tarr (2008) of the likely effects of Russia's accession to the WTO. Russia did not join until 2012, but most of the elements of what was likely to be included were evident when the Rutherford and Tarr study was being undertaken for the Russian Government.^{xiv} An important component of what was agreed to by Russia was reform to and opening up of its services sector to foreign trade and investment. That was expected to stimulate productivity growth in both goods and services sectors, both of which are characterized by imperfect competition and scale economies and product variety differences. A further important innovation in the Rutherford and Tarr (2008) study is the inclusion of a large number of household types (more than 55,000). By incorporating their factor income shares, product expenditure shares, and transfers between them and the government, it is possible to estimate the personal income distributional and poverty consequences of shocks such as the policy reforms associated with WTO accession.

A limitation of the Rutherford and Tarr study is that it uses a single-country model and so is unable to estimate the gains to the rest of the world of Russia's WTO accession. But its estimated gains to Russia are enormous, amounting to 7.3 percent of aggregate consumption in that economy. To show why the gain is so great, the authors decompose it into three elements. By far the biggest (5.3 percent or just over two-thirds of the total) is due to reducing barriers to foreign direct investment. Tariff lowering adds another 1.3 percent and other market access improvements the remaining 0.7 percent. Had constant returns to scale been assumed, the gains would have amounted to only 1.2 percent, which is of a similar order of magnitude to more-conventional economywide models. Even more importantly, the authors show that this more-enhanced model implies almost no households in Russia would lose from WTO accession whereas, if the simpler constant-returns-to-scale version is used, about 7 percent of households lose.

A particularly attractive feature of legal bindings associated with WTO accession is that they make it less likely that the acceding country's economic reforms and market opening will be subsequently reversed. Staiger and Tabellini (1999) show that developing countries did indeed gain policy commitment by embedding policy reforms as part of their commitments made in the 1970s' Tokyo Round of GATT negotiations. That greater policy certainty encourages more investment, and thus can be expected to lead to faster economic growth.^{xv} Li and Wu (2004) examine the average effects of GATT/WTO accessions on growth between 1960 and 1998, but they do not take into account the major change in the nature of the accession process once WTO came into being. Tang and Wei (2009) seek to test the growth proposition more rigorously, by examining the GATT/WTO accession between 1990 and 2001. They compare the change in the GDP growth rate of acceding countries before and after accession with the change in growth rate of non-acceding developing countries. They find that, relative to other developing countries, countries that became WTO members grew faster than before, and the increments in their ratios of investment to GDP were greater too. They show that this is because acceding countries have engaged in a wider range of reforms and improved their general investment climate beyond narrowly defined trade areas. They acknowledge that this higher growth may not last forever, but it does for the period for which data were available at the time of their study.

Bagwell and Staiger (2011) look at WTO accession through the lens of their theory of the GATT/WTO (Bagwell and Staiger (1999, 2002)). Specifically, their theory predicts that a bound tariff of an acceding country will be further below its unbound tariff prior to accession the greater the pre-accession volume of imports of that good. That is indeed what they find for a sample of 16 countries that joined WTO during 1995 and 2005. It is thus consistent with the finding by Broda, Limão and Weinstein (2008) that WTO members set import tariffs higher on inelastically supplied imports relative to those supplied elastically. These results are a reminder that joining WTO does not remove all influence of interest groups on tariff setting.

Having said that, it should be kept in mind that GATT/WTO accession and multilateral trade rounds generally led to the setting and lowering of bound tariffs so as to reduce 'water' (the gap between bound and applied tariffs) in the import tariff structure. That contribution of the WTO was particularly noticeable during the recent downturn in advanced economies: there was no repeat in 2008-09 of the rampant

protectionism that followed the Great Crash of the early 1930s, thanks in part to the WTO disciplines that raise the cost of using trade policies at such times (Gawande, Hoekman and Cui 2014).

7. Benefits from WTO-sponsored Trade Facilitation

Trade costs are non-trivial impediments to international trade (Anderson and van Wincoop 2004). They can be so large for small, remote and/or poor countries especially as to be non-trivial determinants of a country's comparative advantage (Venables 2004). Imperfect competition in the supply of services that contribute to trade costs can further reduce trade, as with shipping (Hummels, Lugovskyy and Skiba 2009)^{xvi} but even more so in the provision of domestic nontradable services. Following methodological developments by such analysts as Wilson, Mann and Otsuki (2003), a wide range of comparable indicators of cost impediments to trade have become available. They show that trade costs vary considerably across countries, even those with similar per capita incomes, but in general they are higher the poorer a country. The Logistics Performance Index in 2012, for example, was 2.3 for low-income countries, 2.7 for middle-income countries, and 3.6 for high-income countries, on a scale of 1 to 5 (Arvis et al. 2012). The average number of days to import ranged in 2012 from 10 in high-income countries to around 20 in East Asia and Latin America and to more than 30 in South Asia and Sub-Saharan Africa (World Bank 2012).^{xvii}

Hoekman and Nicita (2011) provide estimates to suggest that a 10 percent reduction in the cost of importing or exporting would increase a country's international trade by 5 percent. Their results highlight the fact that policies that reduce behind-the-border domestic costs of trade could have a greater payoff for developing countries than further reductions in border trade restrictions such as import tariffs. This is consistent with the economic welfare estimates by Francois, van Meijl and van Tongeren (2005), which includes model simulation results for cuts in trade costs for comparison with their results or traditional border tax reductions. Moreover, as noted at the end of Hoekman and Nicita (2011), the role that WTO could play in the trade facilitation space is something that can be done even 'while Doha sleeps', to use the phrase coined by Ikenson (2008).

As the readings in Maur and Wilson (2010) make clear, governments can influence trade costs in numerous ways, such as via reforming regulatory regimes including competition policies, and boosting infrastructure investments.

The issue of relevance to this survey is: what role can or should WTO play in fostering trade facilitation, particularly in developing countries? This question is addressed explicitly by Finger (2008). He notes at the outset that when a country lowers its trade costs, it benefits but so too do those countries trading with it, hence the interest of all WTO members in this issue. Proposals for improved performance that have been tabled include the use of harmonized international nomenclature and processes for transparent and objective management of appeals of valuation findings. Finger suggests positive results are most likely in the application of international nomenclature, the publication of regulations, and consultation mechanisms for stakeholders. The experience of the WTO in managing technical standards covered by the WTO's SPS and TBT agreements is a relevant example. In December 2013, Trade Ministers finally established a WTO Agreement on Trade Facilitation after more than a decade of negotiating (WTO 2013a, Neufeld 2014). It is too early to estimate its potential impact on trade and economic welfare as the agreement offers great scope for discretion, but *ex ante* studies suggest that trade facilitation programs could generate welfare gains well above those estimated for tariff reductions.

8. Concluding Comments

The papers cited in this survey reflect the fact that there continues to be a general consensus in the economics profession that the GATT/WTO rules-based multilateral trading system has contributed to global economic welfare – even though it is never going to be possible to put a precise value on it. There is also a consensus that GATT trade negotiations have contributed to the economic welfare gains that have resulted from trade policy reforms since the late 1940s, and could contribute further if the Doha round of negotiations can be brought to a successful trade-liberalizing conclusion. The gains from multilateral negotiations come predominantly from commitments to bind tariffs and subsidies, which with the WTO's Dispute Settlement Body reduce uncertainty and bring greater predictability and stability to world trade, and lower the risk of trade policy back-sliding. That can boost investment and hence

economic growth, providing gains possibly several times greater than those estimated in the comparative static modeling studies included in this survey.^{xviii} The profession's consensus includes a recognition that not everyone gains from each trade reform. Examples presented here include the cases of tariff preference erosion and a strengthening of intellectual property rights. There can also be costs of adjustment in the short run to policy reforms, although such losses are minimized by pre-announcements of liberalizations and a long phase-in of the changes, and especially if sound policies and institutions are in place domestically and if trade reforms are accompanied by complementary behind-the-border domestic reforms.

Not included in this survey are estimates of the net economic benefits of the effects of trade reforms on the natural environment. Environmental effects can certainly be a by-product of trade reform but – with one exception – their economic welfare effects will be more than outweighed by the standard economic gains from trade reform provided optimal domestic environmental policies are in place and adjust appropriately to any shock, including from trade reform (Anderson 1992, Copeland and Taylor 2003). The key exception is when the environmental effects spill over national borders or are global, as with chlorofluorocarbons and greenhouse gas emissions, because then pollution disutility and environmental policies in other countries also matter.

Finally, it is worth reiterating the caveat stressed at the outset, which is the challenge of attribution. Just how much of the benefits from rules, the Dispute Settlement Body, or any trade reform can be attributed specifically to GATT/WTO negotiations per se is impossible to estimate with precision. The challenge is thus still before the economics profession to better identify how the GATT/WTO has contributed to trade-related policy reforms and to use that knowledge to more-precisely estimate how much that contribution is worth in terms of national and global economic welfare.

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Table 1: Import tariffs on manufactures, key trading countries, 1875 to 1970
(percent)

	1875	1902	1913	1925	1937	1950	1955	1962	1970
Europe									
Austria	9-10		16	27		18			
Belgium		13	9	15	11	11	7	11	6
Czechoslovakia			18	27					
Denmark	15-20	19	14	10		3			
France	12-15	34	20	21	17	18	19 ^b	11	6
Germany	4-6	25	13	20	14	26	16 ^b	11	6
Greece						39			
Hungary			18	27					
Italy	8-10	27	18	22		25	24 ^b	11	6
Netherlands	3-5	3	4	6				11	6
Norway	2-4	12			14	11	10		11
Poland				32					
Portugal	20-25					18			
Russia		131							
Spain	15-20	76	41	41					
Sweden	3-5	23	20	16	13	9	6	7	7
Switzerland	4-6	7	9	14	13		8		3
United Kingdom	0			17 ^a		23	17 ^b		
Yugoslavia				23					
Other high-income countries									
Australia		32 ^c	31	31	45	25	22	22	24
New Zealand							21	22	23
Japan		1	20	13	11		14 ^b	16	12
United States		54	30	24	28	12	11	12	9
Canada		17	26	23	16		12 ^b	12	14
Developing countries									
Argentina		28	28	29			141 ^d		
Brazil ⁱ					70		29	99 ^e	
Chile					34		39		
India		3	4	16	29		30		
Mexico							22 ^e		
Pakistan							93 ^f		
Philippines							46 ^g		
Taiwan							30 ^h		

^a 1931 ^b 1952 ^c 1903-04 ^d 1958 ^e 1966 ^f 1960 ^g 1963/64 ^g 1961 ^h 1966 ⁱ Import duties as a % of the value of imports were (often well) above 30 percent in 1913 also for Paraguay, Peru, Uruguay and Venezuela, according to Bulmer-Thomas (1994, pp. 141-42).

Sources: Compiled by Anderson (2013), drawing from League of Nations (1927), Little, Scitovsky and Scott (1970), Woytinsky and Woytinsky (1955), Maizels (1963), Bairoch (1989), Irwin (2010, Table A1) for the United States, Lloyd (2008, Table 5) for Australia and, for other 1970 estimates, GATT (1972).

Table 2: Import tariffs on manufactures, major developing countries, 1870 to 1938

(import duties as a percent of total imports)

	1870-99	1900-13	1913-38
Asia			
China	3	3	11
India	3	5	17
Indonesia	5	5	10
Mynmar	4	11	23
Philippines	10	21	8
Sri Lanka	6	7	13
Thailand	4	7	15
<i>Average, Asia^a</i>	4	5	13
Latin America			
Argentina	26	23	18
Brazil	35	40	23
Chile	19	18	22
Colombia	34	47	29
Cuba	23	26	26
Mexico	17	22	21
Peru	32	23	16
Uruguay	30	33	20
<i>Average, LA^a</i>	25	28	21
Egypt	11	14	26
Turkey	7	10	31
<i>Average, all 17^a</i>	7	8	15

^a Averages are weighted using 1900 GDP as weights, from Maddison (2008).

Source: Clemens and Williamson (2010, Table 8).

Table 3: Nominal Rates of Assistance to agriculture, high-income countries, 1890 to 1938

(percent)

	1890-99	1900-09	1910-19	1920-29	1930-38
Belgium	-2	-3	-1	8	35
Finland					87
France		16	24	32	98
Germany	16	22		39	115
Japan		9	24	13	47
Netherlands			13	34	61
United Kingdom		6	1	6	45

Source: Swinnen (2010) and, for Japan, Anderson and Hayami (1986).

Table 4: Nominal rates of assistance to agricultural and nonagricultural tradables and relative rate of assistance, high-income and developing countries, 1955 to 2010

(percent)

	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-04	2005-10
High-income countries^a											
NRA agriculture tradables	22	29	33	24	31	38	53	42	33	30	15
NRA non-agric. tradables	8	9	9	6	5	4	4	2	2	2	1
RRA	13	19	22	16	26	32	47	39	30	28	14
Developing countries^b											
NRA agriculture tradables	na	-25	-25	-28	-26	-21	-10	-2	7	9	5
NRA non-agric. tradables	na	43	45	31	27	19	14	13	9	6	5
RRA	na	-48	-48	-45	-42	-33	-21	-13	-2	3	0

^a Includes Turkey and, from 1992, Europe's transition economies. Does not include assistance to farmers that is considered decoupled from production.

^b Estimates for China pre-1981 and India pre-1965 are based on the assumption that the agricultural NRAs in those years were the same as the average NRA estimates for those countries for 1981-84 and 1965-69, respectively, and that the value of production in those missing years is that which gives the same average share of value of production in total world production in 1981-84 and 1965-69, respectively. The final column has data for developing countries to 2009.

Source: Anderson and Valenzuela (2008) and Anderson and Nelgen (2012), based on a sample of more than 40 developing countries and more than a dozen of Europe's transition economies in addition to all OECD member countries.

Notes

ⁱ See, however, the qualitative assessment of the potential worth of policy surveillance by Blackhurst (1991), and early reviews of implementation of the WTO's Trade Policy Review Mechanism by Keesing (1998), Laird (1999) and Francois (2001), who point out that this mechanism to improve transparency can help lower risk perceptions by reducing uncertainty. Indeed a country's WTO membership itself, with associated commitments on trade policies that are subject to binding dispute settlement, can also have this effect. The attribution problem makes it difficult to estimate the possible effects of aid for trade initiatives, but one attempt to examine trade effects is available in Hühne, Meyer and Nunnenkamp (2013).

ⁱⁱ For qualitative assessments of the WTO's dispute settlement process though, see Bown (2004) plus the readings in Mavroidis and Sykes (2005) and, in particular, Büttler and Hauser (2000). On the scope for improving the efficiency of WTO dispute settlement, see Anderson (2002) and Bagwell, Mavroidis and Staiger (2007).

ⁱⁱⁱ In earlier centuries a common international trade barrier was state-condoned piracy on the high seas. See, for example, the popular history of the spice trade from 1553 to 1667 by Milton (1999), which gives a vivid account of the early days of intercontinental maritime commerce between Europe and Southeast Asia.

^{iv} In the case of farm products, an annual time series since the 1950s of NRAs and CTEs has been compiled recently for about 80 countries (Anderson and Valenzuela 2008, Anderson and Nelgen 2012), the methodology for which is outlined in Anderson et al. (2008). The OECD Secretariat also has compiled since 1986 an annual series of similar measures for agricultural support in high-income countries, called producer and consumer support estimates (PSEs and CSEs, see OECD 2013). The OECD expresses the value of its measures as a percentage of production or consumption including assistance, rather than as a percentage of the undistorted (border) price.

^v ERAs have been published for all Australian manufacturing industries each year since 1968-69, for all rural industries since 1970-71, and occasionally also for mining industries. Details can be freely downloaded from the website of Australia's Productivity Commission (formerly the Tariff Board, the Industries Assistance Commission, and the Industry Commission), at www.pc.gov.au. That Commission also estimates and publishes the consumer tax equivalent (CTE) of industry assistance policy measures including the tariff.

^{vi} Expressing the estimates of $NRAag^t$ and $NRAnonag^t$ in proportional terms, the Relative Rate of Assistance is defined as:

$$RRA = \left[\frac{1 + NRAag^t}{1 + NRAnonag^t} - 1 \right]$$

^{vii} The methodology has also been used to provide a better exposure of the differences across farm products in the extent of price distortions globally (Croser, Lloyd and Anderson 2010).

^{viii} A new cross-country effort to quantify barriers to trade in services has been compiled recently by Borchert, Gootiiz and Mattoo (2012). For more on quantifying impediments to trade and investment in services, see Dee, Hanslow and Pham (2003), Francois and Hoekman (2010) and Hoekman (2012).

^{ix} Nonetheless, there is no doubt that the SPS agreement has encouraged some WTO members to be less extreme in their quarantine restrictions on imports, and encouraged other members to challenge such extreme barriers via the WTO's dispute settlement mechanism. Even though the SPS agreement does not require countries to consider the adverse economic welfare effect on consumers of such barriers, exposing the extent of that welfare loss has helped bring extreme cases to the attention of domestic consumers

and foreign suppliers. A case in point is Australia's ban on banana imports (see James and Anderson 1998), which the Philippines has successfully challenged under WTO law.

^x In a similar study, Bouët and Laborde (2010) examine the higher cost of a failed Doha round by simply assuming for each farm product that the counterfactual is each country's bound tariff.

^{xi} One further omission in Doha analyses is recognition of the fact that the longer it takes to reach a multilateral agreement and the less comprehensive is that agreement, the more preferential trade agreements (PTAs) will be signed. Some of those PTAs may be stepping stones to freer global trade, while others will be sufficiently trade-diverting as to lower global welfare and thus add to the cost of not concluding the Doha round.

^{xii} See also the econometric study, using cross-sectional nonparametric matching techniques by Baier and Bergstrand (2009), of the trade-expanding effects of free trade agreements in Western Europe and Central America. They find in both locations that those agreements expanded very substantially the long-run bilateral trade among members, consistent with their earlier study using panel data (Baier and Bergstrand 2007).

^{xiii} Article XXVI:5(c) of GATT 1947 reads as follows: "If any of the customs territories, in respect of which a contracting party has accepted this Agreement, possesses or acquires full autonomy in the conduct of its external commercial relations and of the other matters provided for in this Agreement, such territory shall, upon sponsorship through a declaration by the responsible contracting party establishing the above-mentioned fact, be deemed to be a contracting party."

^{xiv} For an account of what eventually was agreed, see Shepotylo and Tarr (2012).

^{xv} Using a dynamic, heterogeneous firms model, Handley and Limão (2012) show why investment and entry into export markets is reduced when trade policy is uncertain and why trade agreements can therefore be valuable to exporters even if applied trade barriers are currently low or zero. Handley and Limão (2013) further show that the impact of U.S. trade policy uncertainty toward China reduced investment in export entry and technology upgrading, which in turn reduced trade flows and real incomes for consumers.

^{xvi} Indeed cartelization in ocean shipping can mean that as much as half the welfare gains from policy reforms affecting North-South trade can be captured by shipping firms rather than the domestic economies of the trade-liberalizing countries (Francois and Wooton 2001).

^{xvii} For more on the importance of time as a trade cost, see Djankov, Freund and Pham (2010) and Hummels and Schaur (2013).

^{xviii} For an example of a model generating such gains, see Rutherford and Tarr (2002). A review of the literature on the dynamic gains from trade reform can be found in, e.g., Anderson (2013).

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