Policy Research Working Paper 8932

Taking Another Look at Policy Research on China's Accession to the World Trade Organization

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WORLD BANK GROUP
Latin America and the Caribbean Region
Office of the Chief Economist
July 2019

Policy Research Working Paper 8932

Abstract

Recent work on China's accession to the World Trade Organizations pays little attention to the wave of reforms in China in the 1980s and 1990s. These reforms created the preconditions for accession and strongly influenced its outcomes. The preeminence of processing trade at the time of accession sharply reduced the impact of accession-related tariff reductions on exports and set the stage for China's increases in domestic value added and reduction in China's involvement in global production sharing since that time. The assessment in this paper, based on export data and simulation results on the ex ante accession-related effects on export volumes in the literature, finds that the accession must have increased China's real export growth by at most 6 percentage points between 1997 and 2005. This effect is substantial, but not as large as suggested by the difference between the pre- and post-accession export growth rates in the four years before and after accession. This is because the influence of cyclical fluctuations related to the Asian financial crisis and the U.S. dot-com crash dampened export growth in the period before accession in 2001 and accelerated it afterward.

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Taking Another Look at Policy Research on China's Accession to the World Trade Organization

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JEL Codes: F02, F13, F63

Key Words: China, WTO accession, export growth, export processing, duty exemptions, trade

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We would like to thank Caroline Freund for useful comments on an earlier draft. The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the views of the International Bank for Reconstruction and Development/World Bank and its affiliated organizations, or those of the Executive Directors or the governments they represent.

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1. Introduction

A large body of research has recently emerged on the implications of China's accession to the World Trade Organization (WTO) in 2001. This is well-justified, given China's rapid emergence since that time as the workshop of the world and its largest trading nation, with major implications for other economies. However, we are concerned that much of this research has focused too much on this one, momentous, policy change, ignoring the enormous changes made in the lead up to this event, and the interactions of these changes with the reforms directly required by WTO accession. There is also no consensus on the magnitude of the effect of accession-related reforms on China's export growth. In this paper, we take another look at this body of work to highlight the policies that set the stage for China's astounding rise as an exporter of merchandise goods, paying special attention to the question to what extent accession-related policies *per se* generated this export growth. We also clarify some apparent puzzles, such as the reduction in China's involvement in global production sharing since accession to the WTO. The share of processing exports in total exports declined only slightly from 57% in 2000 to about 52% in 2010 (Yu and Tian, 2012), but the share of processing imports in total imports declined from 53% in 2000 (General Administration of Customs of the People's Republic of China, 2000) to 30% in 2010 (Yu and Tian, 2012).

We show that accurate representation of the trade policy conditions in China is crucial for the accuracy of *ex-ante* predictions, while *ex post* assessments cannot ignore cyclical fluctuations in

economic activity, especially those that stem from large shocks such as the 1997 Asian financial crisis and the 2000 US dot-com crash. Since many factors shape exports at any point in time, annual averages of growth rates vary substantially across periods of different lengths, making it difficult to infer the magnitude of the accession-related effects on exports from the data. We illustrate this point with two comparisons. We compare China's pre- and post-accession export growth in the 4 years before and after accession and find that China's real export growth increased by 12 percentage points per year during this period.[1] A significant portion of this phenomenal growth acceleration can be attributed to the bounce back in export growth during the recovery from the Asian financial crisis and the US dot-com crash from rates that were depressed by these events in the period 1997-2001. A second comparison of China's average annual export growth during the longer 8-year accession period (1997-2005) with growth during the previous 8 years (1990-1997) indicates an increase in real export growth of just 2.4 percentage points per year. In this case the comparison is made against the higher export growth rates in the period 1990-1997 and the acceleration is dampened by the effects of the two crises. In sum, in the first case, the accession-related effect is overestimated, while in the second one it is underestimated.

The literature that quantifies the ex-ante effects of WTO accession can serve as an alternative source of information on the magnitude of accession-related effects. A review of this literature points to a range of projected increases in real export growth, varying from 1.4 percentage points per year to 6.2 percentage points per year, depending on model specification, sectoral aggregation, the extent of trade reforms and their potential efficiency gains. However, it is reassuring that most results are clustered between 3.5 and 6 percentage points. On one hand, all studies, except Ianchovichina and Martin (2004), overestimate the effects of the tariff reform on exports because

[1] The difference in growth rates is calculated as $(1+g_1/100)/(1+g_2/100)-1)*100$.

they do not model explicitly the effect of duty exemptions on imported inputs used in the production of exports and/or implement larger tariff cuts. As indicated in Ianchovichina (2004), the projected export growth in Ianchovichina and Martin (2004) would have been 40% higher and closer to 5 percentage points in the absence of export processing arrangements such as duty exemptions. On the other, all studies underestimate the gains from reducing the tariff variation within product aggregates. They also do not include the beneficial effects of the abolition of state-owned Foreign Trade Corporations, which made it harder for small companies to start exporting and created barriers between producers and the customers. Most of these studies also underestimate the efficiency gains from the removal of non-tariff barriers in manufacturing (other than autos) and services (other than in cross-border services trade). On balance, it is likely that the accession-related export boost is closer to the upper range of results or 6 percentage points per year. The data allow us to cross-check this. One would expect that in the absence of accession-related reforms, China's export growth would have bounced back from its lows in the period 1997-2001 to no more than 13 percent – its average annual growth rate in the period 1987-1997 before it started implementing accession-related reforms. Yet, with accession-related reforms, China's export growth accelerated to the much higher rate of 20% per year in the period 2001-05. The difference between the two growth rates is about 6 percentage points, which could be considered a plausible estimate of the accession-related impact on export growth.

The remainder of the paper is organized as follows. Section 2 discusses China's policy changes during the three decades leading to WTO accession in 2001. Section 3 presents the accession-related policy changes that were key to China's trade growth in the post-2001 period. Section 4 reviews the literature that assesses the quantitative effects of WTO accession with a focus on studies that report results on export growth. It then compares the magnitude of simulated

accession-related export gains with those calculated from the historical data. Section 5 offers concluding remarks.

2. Policy changes prior to WTO accession

Prior to 1978, when China started liberalizing, its trade was centrally managed and opportunities for direct interaction between Chinese firms and firms importing Chinese exports were minimal as all foreign trade was channeled through centralized Foreign Trade Corporations (Martin, 1993). By the late 1980s, according to a comprehensive World Bank (1988) study, the shares of exports and imports under the centrally planned system had substantially declined but were still high at an estimated 50 and 40 percent of exports and imports, respectively. Most research conducted during this period focused on issues pertinent to further trade decentralization. Naughton (1985) and Wong (1985) studied the process of shifting economic decision making from central authorities toward enterprises and provincial governments, others focused on reforming the two-tier (or multi-tier) pricing (Sicular, 1988; Byrd, 1987, 1989; Wu and Zhao, 1987) and foreign exchange systems (Desai and Bhagwati, 1979).

2.1 Reforming the exchange rate system

As China started liberalizing, there was a need to reform the foreign exchange system. In addition to the official rate, which was devalued multiple times between the early 1980s and the early 1990s, authorities introduced a second-tier rate applied to trade-related transactions and legal secondary markets for foreign exchange retained by enterprises (Martin, 1993). Even with these modifications, prior to 1994, China's foreign exchange system imposed large and unpredictable taxes on trade (see, for example, Huang *et al.* 2009). By the early 1990s, devaluations of the official

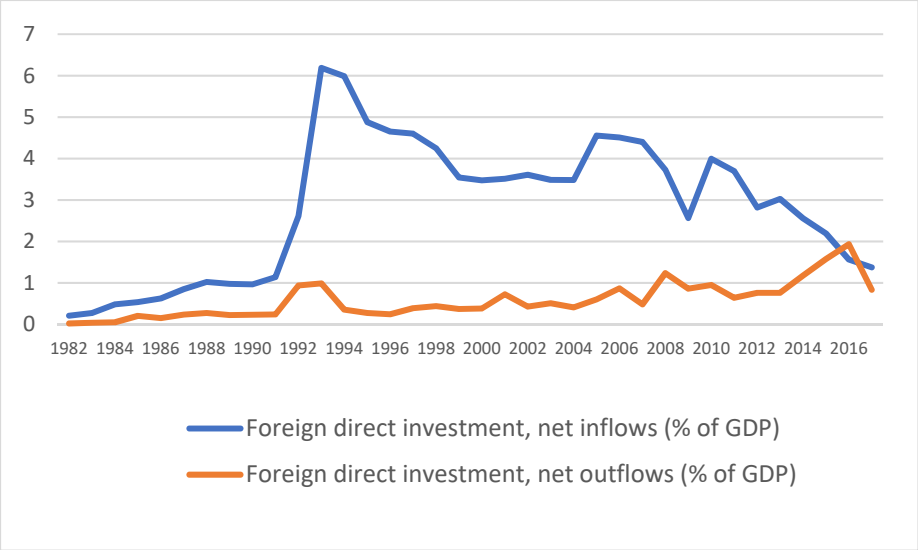
exchange rate brought the rates in the two-tier system much closer together, and in 1994, the exchange rate was unified, removing this disincentive for trade.

2.2 Liberalizing processing trade

Importantly, in 1979, China introduced zero tariffs and exempted from non-tariff barriers all imported intermediate inputs and capital goods used in the production of exports. These exemptions, described in detail in Ianchovichina (2007) and Hong Kong Trade Development Committee (2018), were part of China's export processing system. They provided incentives for both the processing of imported raw materials and the assembly of imported parts and components into *finished* export products. Provisions for processing with supplied materials also allowed firms to deal with the capital market failures that were a serious constraint on export growth in the early reform era.

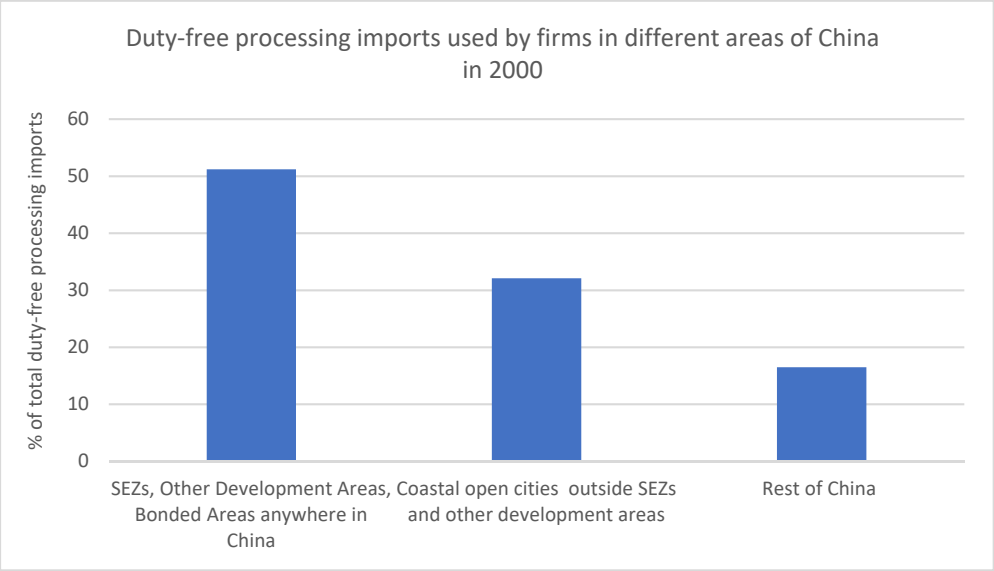
The effect of duty exemptions was sizable. Right after their introduction in 1979 in four coastal cities designated as special economic zones (SEZs) (Yu and Tian 2012), processing trade comprised only 5% of Chinese trade flows (General Administration of Customs of the People's Republic of China, 2000), but after 1984, the authorities expanded the scope of the duty exemption system beyond the four SEZs to 14 'open' cities and a range of other zones (Yu and Tian 2012). This gave a significant boost to trade growth, well ahead of accession, with duty-free imports used for export processing quadrupling as a share of total imports between 1981 and 1988 (Ianchovichina 2007 based on data from General Administration of Customs of the People's Republic of China, 2000). By 1992 this open-door policy was extended from eastern to central and western China and foreign direct investment inflows surged from 1% of GDP in 1991 to more than 6% of GDP in 1992 (Figure 1), speeding up the integration of China into global production networks.

Figure 1. Foreign direct investment flows



Source: World Development Indicators.

Figure 2. Use of duty-free imports for export processing by location in China



Source: Authors' calculations using data from General Administration of Customs of the People's Republic of China (2000). The coastal open cities include Tianjin, Qinhuangdao, Dalian, Shanghai, Nantong, Lianyungang, Ningbo, Wenzhou, Fuzhou, Qingdao, Yantai, Guangzhou, Zhanjiang, Beihai.

Less than a decade later, in 2000, duty-free processing imports represented 53% of the value of China's total imports (General Administration of Customs of the People's Republic of China, 2000). About half of these processing imports were used by firms located in SEZs, around 32% of

them were used by firms located outside SEZs and other development areas in 'open' cities, and the remaining 17% were used by firms located anywhere in the rest of China (Figure 2). In sum, on the eve of WTO accession, duty exemptions benefited virtually all firms engaged in export processing in China, not just those located in SEZs and other development areas. This ability for enterprises outside the zones to engage in processing trade was critical for ensuring that this trade grew rapidly, rather than just benefitting a limited number of firms and workers in export processing enclaves.

Table 1. Average tariff rates in China (percent)

	All products		Primary products		Manufacturing products	
	Simple	Weighted	Simple	Weighted	Simple	Weighted
1992	42.9	40.6	36.2	22.3	44.9	46.5
1997	17.6	18.2	17.9	20.0	17.5	17.8
2001	16.6	12.0	21.6	17.7	16.2	13.0
After accession	9.8	6.8	13.2	3.6	9.5	6.9

Source: Ianchovichina and Martin (2001). Authors' calculations for tariff lines with imports in 1999 from COMTRADE; CDS Consulting for protection data for 1999-2001; and after accession data from China's WTO final offer.

2.3 Reducing tariff and non-tariff barriers

In addition to liberalizing processing trade, China made substantial progress in reducing both its own non-tariff and tariff barriers. The number of products subject to quotas and licenses fell from 1,247 tariff lines in 1992 to 261 in 1999 (Ianchovichina and Martin, 2001) and China's average tariffs declined from above 40 percent in the early 1990s to substantially below 20 percent by 2001 (Table 1). Much of the liberalization during the 1990s was influenced by China's desire to prepare for the trade regime required for WTO accession and to demonstrate its commitment to an open economy. The large protection cuts during this period are unlikely to have occurred without the prospect of accession to the WTO.

These trade policies led to a significant reduction in the dispersion of tariff rates – with the standard deviation of tariff rates falling from 32.1 percent in 1992 to 13.1 percent in 1998. The post-accession tariff cuts aimed to again halve average tariff rates, but in absolute terms these cuts were smaller because they were applied to the much lower 2001 tariff levels than those prevailing in the early 1990s. Unfortunately, much of the new wave of empirical work, such as Handley and Limão (2017), has focused only on the small tariff cuts after 2000.

3. Accession-related policy changes

The review of the policy reform literature presented so far suggests that most of China's major trade reforms were undertaken before accession. In 2001, China's economy was already open and ready to take advantage of two major changes that came with accession and boosted its economic and export growth.

The first change was the removal of quotas on textiles and apparel in the US, the EU and several other industrial economies. Unlike most other developing economies, China did not benefit from liberalization under the Uruguay Round Agreement on Textiles and Clothing. With slow growth rates for its quotas and with none being abolished by integration of textile and clothing products under General Agreement on Tariffs and Trade (GATT) rules, the prices of these quotas in China rose more rapidly than they otherwise would, raising the cost of exports just as an equivalent export tax would have done. Under the terms of accession, all quotas imposed on Chinese exports of textiles and apparel were to be phased out by 2005.

Another major change came from greater exploitation of economies of scale triggered by the restructuring of China's automobile and other manufacturing industries, which prior to accession were sheltered by higher than average tariffs and focused on producing low volumes of models, many of which had been superseded in the rest of the world. Francois and Spinanger (2004) argue

that removing the resulting inefficiencies was an important source of growth and projected a productivity gain of 20 percent associated with the restructuring of China's automobile sector during the accession period 2001-07. Productivity gains were also expected from the removal of non-tariff barriers on cross-border trade in services (Francois and Spinanger, 2004) and from technological transfer in manufacturing through FDI flows from developed countries to China (Wang, 2003). Another feature of China's WTO accession that appeared relatively unimportant at the time but may have played a major role in the outcome was the abolition of the requirement that firms trade through state-owned Foreign Trade Corporations unless specifically exempted. Being able to trade without using an intermediary may well have helped improve market information and reduce costs and would certainly have contributed to the growth of exports from new firms highlighted by Handley and Limão (2017).

China is also believed to have benefited substantially from reduction in uncertainty following WTO accession because of the US granting permanent normal trade relations (PNTR) to China and thus, reducing its risk of facing high tariffs on its exports to the U.S. (see Handley and Limão, 2017 and Amiti et al. 2018). Yet, this reduction in uncertainty was offset because the accession agreement enabled China's trading partners to take additional safeguard measures against China for 12 years after accession (Messerlin 2004) and continue to allow use of non-market economy provisions that facilitate antidumping action. This makes Handley and Limão's (2017) finding of substantial risk-reduction gains from accession even more striking. When considering China's overall export performance, it is important to remember that this risk reduction was much less relevant for most other major export markets, which had granted China permanent MFN treatment prior to accession.

4. How big were the accession-related gains?

China's accession to the WTO generated large interest and extensive research was undertaken on different aspects of this topic, including its economic, legal and political implications (Halverson 2004), its effect on the performance of Chinese firms (Brandt et al. 2017; Lu and Yu, 2015), the location decisions of manufacturing FDI in China (Ng and Tuan, 2003), China's agricultural policies (Martin, 2003) and rural-urban inequality (Anderson et al. 2004), among others. A strand of this literature focuses on quantifying ex-ante the effects of China's WTO accession using either static or dynamic CGE models. In this paper we focus on this literature and specifically on studies by Yang (1996), Wang (1997, 2003), McKibbin and Tang (2000), Walmsley and Hertel (2001), and Ianchovichina and Martin (2004)[2] who report results on the effects of accession on China's exports. Other studies of this event either focus on countries other than China (e.g. Wang, 2003; Ianchovichina and Walmsley 2004; McKibbin and Woo, 2006) or on other aspects of accession (Walmsley et al, 2006). The idea is to use the results from this literature as an alternative source of information on the projected magnitude of accession-related effects on China's export growth.

There is a consensus that WTO accession provided a substantial boost to China's exports, but no agreement on the magnitude of the boost. As expected, results from studies in the literature differ depending on model specification, database version, sectoral aggregation and assumptions about types of tariff and non-tariff trade reforms, model parameters, and potential efficiency gains. Table 2 summarizes the results from different scenarios in 5 studies published in academic journals and the details of the modeling exercises that produced them. The results indicate that accession was projected to boost China's exports to a significant degree within a period of about 8 years between

[2] Anderson et al. (2000) assess the effects of China's WTO accession as part of an assessment of the potential gains from trade reform in the new millennium. However, their paper does not report separate results on China or the effects of accession alone.

1996/1997 and 2005. Only McKibbin and Tang (2000) conclude that trade liberalization in China would lead to a decline in exports due to a projected strengthening of the yuan. Since this scenario significantly departs from the developments in China during the period from 1997 to 2005, when the yuan remained pegged to the dollar and even strengthened relative to the currencies of countries affected by the Asian crisis (Yang and Tyers, 2001), their results are not discussed further and are omitted from Table 2.

Table 2 Simulated Effects of WTO Accession on China's Exports

Study	Results	Model closure	Model Specification	Data & policy shocks
Wang (1997)	51 cumulative percentage point increase relative to baseline (1996-2005)	Static capital market closure with fixed capital stock and trade balance in a multi-country extension of the model of de Melo and Tarr (1992)	Perfect competition, endogenous savings, CES function allows for substitutability between value added and aggregate inputs; international shipping sector a la GTAP;	Version 3 GTAP Database aggregated into 12 regions and 14 sectors; 35% reduction in average tariffs due to accession between 1996 and 2005, removal of quotas on textiles and apparel in US and EU
Wang (1997)	57 cumulative percentage point increase relative to baseline (1996-2005)	Steady state capital market closure with endogenous capital stock in a multi-country extension of the model of de Melo and Tarr (1992)	Perfect competition, endogenous savings, CES function allows for substitutability between value added and aggregate inputs; international shipping sector a la GTAP	Version 3 GTAP Database aggregated into 12 regions and 14 sectors; 35% reduction in average tariffs due to accession, removal of quotas on textiles and apparel in US and EU
Wang (2003)	54 cumulative percentage point increase relative to baseline (2000-2010)	Recursive dynamic extension of the model in Wang (1997) with import embodied technology transfer	Perfect competition, endogenous savings, CES function allows for substitutability between value added and aggregate inputs; international shipping sector a la GTAP	Version 5 GTAP Database aggregated into 17 regions and 25 sectors; approximately 50% reduction in average tariffs due to accession, removal of quotas on textiles and apparel in US and EU, efficiency gains from sector-specific technology transfers
Ianchovichina and Martin (2004)	40 cumulative percentage point increase relative to baseline (1997-2007)	Static capital market closure with fixed capital stock and trade balance fixed as a share of GDP, trade taxes replaced by a consumption tax in GTAP-DD (Ianchovichina	Perfect competition, fixed propensity to save, CET function between value added and aggregate inputs, fixed full employment, perfect mobility of skilled and unskilled labor between manufacturing sectors	Version 5 GTAP Database aggregated into 20 regions and 25 sectors; 14% reduction in average tariffs between 1997 and 2005, duty exemptions on imported inputs used in the production of exports, removal of quotas on

		2004), an extension of the GTAP model (Hertel, 1997)	and of unskilled workers within agriculture; GTAP elasticities of substitution between imports and domestic products	textiles and apparel in US and EU and agricultural subsidies in China, efficiency gains in automobile sector and cross-border trade in services
Walmsley and Hertel (2001)	35% cumulative percentage point increase relative to baseline (2000-2005)	Recursive dynamics with adaptive expectations and endogenous capital stock in GDyn documented in Ianchovichina and Walmsley (2012)	Perfect competition, fixed propensity to save, CET function between value added and aggregate inputs, fixed full employment, perfect mobility of skilled and unskilled labor across sectors but not across regions, international capital mobility and ownership	Version 4 GTAP Database aggregated into 19 regions and 22 sectors; 11.2% reduction in average tariffs between 2000 and 2005, removal of quotas on textiles and apparel in US and EU and agricultural subsidies in China
Yang (1996)	30% cumulative percentage point increase relative to baseline (1992-2005)	Static capital market closure with fixed capital stock in GTAP, documented in Hertel (1997)	Perfect competition, fixed propensity to save, CET function between value added and aggregate inputs, fixed full employment, perfect mobility of skilled and unskilled labor across sectors, but not across regions	Version 2 GTAP Database aggregated to 6 regions and 32 commodities; 26% cut in tariffs (including equivalent quantitative restriction); 24% reduction in export subsidies; 15% reduction in domestic support between 1992-2005; removal of quotas on textiles and apparel in US and EU
Yang (1996)	35% cumulative percentage point increase relative to baseline (1992-2005)	Static capital market closure with fixed capital stock in GTAP, documented in Hertel (1997)	Perfect competition, fixed propensity to save, CET function between value added and aggregate inputs, fixed full employment, perfect mobility of skilled and unskilled labor across sectors, but not across regions	Version 2 GTAP Database aggregated to 6 regions and 32 commodities; 36% cut in tariffs (including equivalent quantitative restriction); 36% reduction in export subsidies; 20% reduction in domestic support; removal of quotas on textiles and apparel in US and EU
Yang (1996)	81% cumulative percentage point increase relative to baseline (1992-2005)	Static capital market closure with fixed capital stock in GTAP, documented in Hertel (1997)	Perfect competition, fixed propensity to save, CET function between value added and aggregate inputs, fixed full employment, perfect mobility of skilled and unskilled labor across sectors, but not across regions	Version 2 GTAP Database aggregated to 6 regions and 32 commodities; cuts in tariffs to a maximum of 10% resulting in bigger cuts and reduction tariff variation; 24% reduction in export subsidies; 15% reduction in domestic support; removal of quotas on textiles and apparel in US and EU

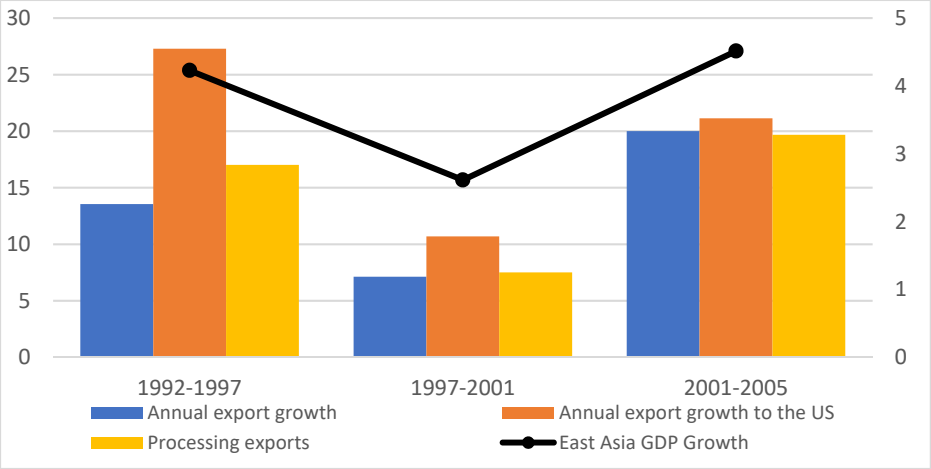
The authors of these studies employed different model specifications, data, and assumptions. Therefore, variations in results across studies reflect differences in macroeconomic closures, the extent of tariff and non-tariff reforms and associated efficiency gains as well as different initial conditions due to different versions of the GTAP Database used in these analyses. Tariff cuts are largest in Yang (1996) and Wang (2007), while in Ianchovichina and Martin (2004) tariff reform is most limited because they reduce only the tariffs on imports used domestically and in the production of ordinary exports, which were *not* produced under processing arrangements and accounted for roughly two-fifths of exports. Ianchovichina (2004) shows that failure to account for duty exemptions on imported inputs used in the production of exports leads to an overstatement of the increase in China's exports flows by 40% and the exports of selected sectors by as much as 90%. The magnitude of this bias depends on the level of pre-accession tariffs and the size of accession-related tariff cuts; the larger the initial tariffs, the larger the bias when duty exemptions are not factored into the analysis.

The decline in tariffs and the elimination of most quantitative restrictions—both in the leadup to accession and as its direct consequence—reduced the need to use processing trade arrangements and encouraged the expansion of ordinary exports that did not involve the compliance costs associated with export processing arrangements, contributing to the increase in domestic value-added found by Kee and Heiwai (2016). According to the estimates by Ianchovichina and Martin (2004), China's export growth associated with accession-related reforms implemented after 2001 was projected to be one-half of the size of export growth associated with reforms implemented prior to accession between 1997 and 2001. The accession-related gains were attributed mostly to the removal of quotas on textiles and apparel in the US and the EU markets and the realization of

economies of scale associated with the liberalization and restructuring of China's automobile sector.

How do these simulated gains compare to the real effects of WTO accession? The difference between the average annual export growth rates before and after this historical event implies a phenomenally large WTO accession impact. It appears, as shown on Figure 3, that between the two 4-year periods before and after 2001 China tripled its annual real export growth rate. But, how much of this increase can be purely attributed to China's WTO accession? It is difficult to answer this question because China's export growth was influenced by many other factors unrelated to accession reforms. In addition, average growth rates vary substantially across different periods and across periods of different lengths, making it difficult to infer the magnitude of accession-related gains from historical export data. Figure 3 shows that export growth in the period immediately preceding WTO accession was half of what it was during the years leading to the Asian financial crisis. It averaged 13.1% in the period 1987-93 (Yang, 1996) and slightly more than that (13.5%) in the period 1993-1997 but then it dropped down to just 7.1% in the period 1998-2001.

Figure 3 China's export growth and East Asian GDP growth (%)



Source: Exports growth rates, shown on the left-hand side, are computed based on export values obtained from China Customs Statistics and deflated using 1992 US Consumer Price Index, as discussed in Amiti and Freud (2007). Data on GDP growth, shown on the right-hand side, come from the World Development Indicators, World Bank.

A major reason for the steep decline in China's average export growth between 1992-1997 and 1997-2001 was the Asian financial crisis, which lasted from July 1997 to 1999. During this period economic growth in the region slowed down considerably, dropping from slightly above 4% per year before the crisis to about 2.5% after the crisis (Figure 3). At the same time, the currencies of Asian-crisis countries depreciated relative to China's own currency (Yang and Tyers, 2001), which remained pegged to the US dollar, and as shown in Figure 1, FDI slowed in response to rising risk premia (Fernald and Babson, 1999). The growth of China's processing exports and its exports to the US declined too during the same period (Figure 3), reflecting the growth deceleration in the US during the dot-com crash, which started in March 2000 and lasted until October 2002. As the ripple effects of the Asian crisis subsided, economic growth in East Asia returned to its pre-crisis level (Figure 3). China's export growth accelerated too, averaging 20% per year for several years after 2000.

The shocks during the period 1997-2001 obscure the effects of China's WTO accession on export growth. Two examples illustrate the difficulty of gauging the accession-related magnitudes from the data. If we compare China's pre- and post-accession export growth in the 4 years before and after accession, we find that China's real export growth increased by 12 percentage points per year (Table 3). A significant portion of this phenomenal growth acceleration can be attributed to the bounce back in exports during the recovery from the Asian financial crisis and the US dot-com crash and to the depressed export growth in the previous 4 years. It is therefore unclear to what extent accession increased China's export growth. If we compare China's average annual export growth during the longer 8-year accession period (1997-2005) with growth during the previous 8 years (1990-1997), we find an increase in real export growth of just 2.4 percentage points per year (Table 3). In this case, the acceleration is dampened by the effects of the Asian financial crises and

the burst of the dot-com bubble in the US and the comparison is made against the higher export growth rates in the period 1990-97. In the first example, the accession-related effect is overestimated, while in the second it is underestimated. The effect of accession is neither as large as implied by the difference between pre- and post-accession growth rates in the 4 years before and after accession, nor it is as small as implied by the difference between average export growth rates in the 8-year accession period between 1997 and 2005 and the previous 8 years.

The literature that quantifies the ex-ante effects of WTO accession can serve as an alternative source of information on the magnitude of accession-related effects. We therefore turn to a comparison of simulated and actual export growth rates. We annualize the cumulative growth effects reported in Table 2 and present the comparisons in Table 3 along with average annual growth rates calculated using the data for the respective periods. Prior to 1997 (1990-97), China's exports grew at 13.3% per year and this growth accelerated to 16% in the subsequent 8 years (1997-2005). One could argue that this acceleration would not have been possible without the beneficial effects of WTO accession reforms. After all an annual export growth rate of 13% is already high, given that even the newly industrializing economies in East Asia, which liberalized successfully during the period 1965-93, achieved an annual export growth of just 12.1% during this period (Yang, 1996). Assuming that without accession-related reforms China's exports would have continued to grow at its pre-1997 rate of 13.3%, the implied accession boost in export growth is just 2.4 percentage points per year. This is a lower bound estimate of the accession-related effect on export growth reflecting the dampening effect of the Asian financial crises and the burst of the dot-com bubble in the US.

However, if we simply look at the 4 years before and after the crisis when China's exports grew at an annual rate of 7% and 20%, respectively, the implied accession boost in export growth is

much bigger (around 12 percentage points per year) because it includes the bounce back in trade after the crises from the depressed growth rate during the crises period 1997-2001. In any case an export growth rate of 20% per year is unusually high both in terms of China's own record, which registered real export growth of 16.3% per annum in the period 1978-1993, and in terms of the record of the newly industrializing countries in Asia, which achieved average annual growth rates of just 12.1% over the course of their development from 1965 to 1993 (Yang, 1996).

Table 3 Comparison of actual and simulate real export growth rates

	Average annual real export growth rate
1990-1997	13.3
1997-2005	16.0
Implied WTO accession effect including effect of crises	2.4
1997-2001	7.1
2001-2005	20.0
Implied WTO accession effect including crisis recovery	12.0
Simulation effects	
Wang (1997, 2003)	4.4-5.1
Ianchovichina and Martin (2004)	3.4
Walmsley and Hertel (2001)	6.2
Yang (1996)	1.4-4.7

Source: Data on exports come from Amiti and Freund (2007) based on China Customs Statistics and export values deflated using 1992 US Consumer Price Index. Note: The accession-related effect is computed as the difference in growth rates calculated as $(1+g_1/100)/(1+g_2/100)-1)*100$. The annualized rates are obtained from the cumulative effects reported in some studies the formula $((1+g_c/100)^{(1/n)}-1)*100$, where n is the number of years associated with reform.

We next turn to the annualized simulation results from the studies presented in Table 2. They serve as an alternative source of information on the magnitude of the accession-related export effect and can help us narrow the range of possible export outcomes. Several points come out clearly and are worth emphasizing. First, the range of the simulated effects is smaller than the range obtained from

the scenario analysis with the data. The effect of accession on export growth varies between 1.4 percentage points and 6.2 percentage points per year and is clustered between 3.5 and 6 percentage points. The results differ depending on the assumptions made, but all of them show that China benefits from the removal of non-tariff restrictions on manufactures, especially the removal of quotas on textiles and apparel in the industrial economies, and to different extents from the removal of tariffs because tariff cuts by sector and on average vary greatly across studies and authors make different assumptions about the efficiency gains from the removal of tariff and non-tariff restrictions (Table 2).

Second, the results in all the studies considered, except Ianchovichina and Martin (2004), overstate the beneficial effect of WTO accession on the cost of intermediate inputs. The cost of intermediate inputs declined only for firms producing ordinary, not processed, exports. Processed exports were already produced using duty-free intermediates and capital goods. Ianchovichina (2004) shows that the accession effect on export growth would be 40% larger if duty exemptions are not modeled. In other words, the projected export growth in Ianchovichina and Martin (2004) would then be closer to 5 percentage points. Third, all the studies underestimate the gains from reducing the tariff variation within product aggregates because the sectoral aggregations hide much of the variation in tariffs (Bach and Martin, 2001; Bach and others, 1996). They also do not include the beneficial effects of the abolition of state-owned Foreign Trade Corporations, which served as trade monopolies and made it harder for small companies to start exporting. Most of these studies also underestimate the efficiency gains from the removal of non-tariff barriers in manufacturing (other than autos) and services (other than in cross-border services trade). On balance, it is likely that the magnitude of the accession-related export boost is closer to the upper range of the results or 6 percentage points per year.

The data allow us to cross-check this. One would expect that in the absence of accession-related reforms, China's export growth would have bounced back from its lows in the period 1997-2001 to no more than 13 percent – its average annual growth rate in the period 1987-1997 before it started implementing accession-related reforms. Yet, with the accession-related reforms, China's export growth accelerated to the much higher rate of 20% per year in the period 2001-05. The difference between the two growth rates is about 6 percentage points, which could be considered a plausible estimate of the accession-related impact on export growth, which falls in the middle of the range between the two extremes discussed earlier of 2.4 and 12 percentage point increases per year.

5. Conclusions

We are delighted at the outpouring of outstanding work on the implications of China's accession to the WTO. This work has generated both specific insights into the impact of this event on the world, and new conceptual measures such as the Trade Policy Uncertainty measure of Handley and Limão (2017). However, we are concerned that much of this outstanding work has not given sufficient attention to the sequence and scope of reforms in the lead-up to accession, including the reforms that liberalized processing trade and stimulated China's stellar trade growth prior to accession; the reforms to the exchange rate regime; the end of the requirement to use Foreign Trade Corporations and the reductions in tariffs prior to accession. We think that paying greater attention to these critically-important reforms is vitally important in understanding the evolution in China's trade since accession.

In this paper, we take another look at this body of work to highlight the policies that set the stage for China's astounding rise as an exporter of merchandise goods and that clarify some apparent

puzzles, such as the reduction in China's involvement in global production sharing since accession to the WTO. We pay special attention to the question to what extent accession-related policies *per se* generated this export growth. Our assessment based on export data and simulation results on the ex-ante accession-related effect on export volumes in the literature finds that accession must have increased China's real export growth by at most 6 percentage points between 1997 and 2005. This effect is substantial, but not as large as suggested by the difference between the pre- and post-accession export growth rates in the 4 years before and after accession because of the influence of cyclical fluctuations related to the Asian financial crisis and the US dot-com crash which dampened export growth in the period before accession in 2001 and accelerated it afterwards. It is re-assuring that the ex-ante projections of the accession-related effects on export growth in simulation studies are clustered in the range between 3.5 and 6 percentage points. For various reasons, these projections underestimate the actual increase in export growth, which historical data imply is close to the upper end of this range.

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