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The Heterogeneous Effects of China's Accession to the World Trade Organization*

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Abstract

China's accession to the World Trade Organization (WTO) in 2001 was a massive boost for the multilateral trading system. We present descriptive evidence on the trade effects of China's WTO accession. Moreover, we combine the most recent approaches from the gravity literature of international trade to provide a causal analysis of the effects of China's WTO accession on bilateral trade with other WTO members. We find that the trade effect is positive on average. Moreover, we document substantial heterogeneity in the trade effects across China's trading partners. These findings seem to be consistent with China's position in global value chains.

JEL-Classification: F13, F14

Keywords: GATT/WTO, China, international trade, structual gravity

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1 Introduction

Almost 20 years ago, in December 2001, China joined the World Trade Organization (WTO), the international institution in charge of administering and extending the rules-based international trading system. Mike Moore, at that time WTO-Director General, characterized this event as a "defining moment in the history of the multilateral trading system".[1] China had applied to the predecessor of the WTO, the General Agreement on Tariffs and Trade (GATT), already in 1986. After almost 15 years of negotiations, China committed to open and liberalize its regime in order to better integrate into the world economy and to offer a more predictable environment for trade and foreign investment in accordance with WTO rules. Its WTO accession increased the share of world trade governed by WTO regulation from 80 percent to more than 95 percent. In this paper, we portray how China's WTO accession shaped its exports to and imports from other WTO member countries.[2]

GATT/WTO membership can affect international trade through different channels (Felbermayr et al. 2019, Larch et al. 2019). When a country enters the WTO, tariffs are typically reduced. However, most WTO members apply their most-favored-nation (MFN) tariffs to all countries, including non-WTO members. At first sight, one would therefore not expect too much of an effect of new WTO-membership on China's exports. Indeed, the US granted China MFN status already in the 1980s. However, this status was subject to annual renewal by the US Congress, imposing a pervasive threat of revoking the MFN status. If the MFN status had been revoked, China's exports to the US would have been subject to much higher rates. Hence, WTO membership resolves trade policy uncertainty. The literature argues that this channel was particularly important in the case of China.[3]

On top of tariff reductions, WTO membership is associated with reductions of non-tariff barriers. These barriers include measures imposed (i) on imports, e.g. import quotas, im-

[1] See `https://www.wto.org/english/news_e/pres01_e/pr243_e.htm`.

[2] We also briefly explore how China's WTO accession shaped its trade with *all* trading partners, regardless of whether these are WTO member countries or not.

[3] Handley and Limão (2017) find that reduced trade policy uncertainty in the years after China's WTO accession increased US consumers' income by the equivalent of a 13-percentage-point permanent tariff decrease.

port prohibitions, import licensing, and customs procedures and administration fees, (ii) on exports, e.g. export taxes, export subsidies, export quotas, export prohibitions, and voluntary export restraints, and (iii) on the domestic economy, e.g. domestic legislation covering health, technical, product, labor, or environmental standards, internal taxes or charges, and domestic subsidies. In fact, China committed to abolish price controls, export subsidies on agricultural products, and to allow all firms to import and export all goods and trade them throughout China's territory with limited exceptions.[4] Moreover, it implemented the TRIPS (Trade-related Aspects of Intellectual Property Rights) Agreement to protect intellectual property rights.

Although the evolution of international trade is interesting in and of itself, we are ultimately interested in consequences for real per capita incomes. Frankel and Romer (1999) have shown that openness to trade has a quantitatively large and robust positive effect on income. The recent quantitative trade literature demonstrates how to map trade changes into real income changes (Arkolakis et al. 2012). Importantly, a reduction in the domestic expenditure share, which implies an increase in the share of spending on imports, is associated with a real income gain. The intuition is that deeper trade integration allows for reaping gains from specialization. Hence, China's integration into the multilateral trading system has not only real income consequences for China itself, but also for its trading partners and even for third countries.[5]

The empirical literature on trade effects of GATT/WTO membership was initiated by Rose (2004). He finds no significant trade effect of GATT/WTO membership. Tomz et al. (2007) argue that this "interesting mystery" (Rose 2004, p. 112) can be explained by the fact that a bunch of countries are only *de jure* GATT/WTO member countries, but *de facto* do not participate in trade liberalization rounds. Subramanian and Wei (2007) find strong GATT/WTO effects, but only for industrialized countries. Rose (2005) finds positive WTO trade effects when accounting for the diverse trade effects produced by regional trade agreements (RTAs). Henn

[4]For further details, see `https://www.wto.org/english/news_e/pres01_e/pr243_e.htm`.

[5]Quantifying real income consequences of China's WTO accession is beyond the scope of the paper.

and Eicher (2011) control for observed and unobserved bilateral heterogeneity and disentangle overlapping WTO and RTA membership effects. Felbermayr and Kohler (2006, 2010) argue that joint GATT/WTO membership has a positive effect on the probability that positive trade flows between two countries exist at all. The recent gravity literature stresses the importance of controlling for internal trade flows. Larch et al. (2019) find that joining the GATT/WTO increases international trade of member countries with any other country relative to domestic sales on average by 72 percent and international trade with other WTO members relative to domestic sales by 171 percent. Felbermayr et al. (2019) document substantial variation in country-specific GATT/WTO membership effects. China's international trade, relative to domestic sales, has increased by approx. 60 percent after joining the WTO. On average, the trade effect amounts to 25 percent.

Following the best estimation practices and recommendations proposed by Yotov et al. (2016) and using their dataset, we estimate a gravity equation which includes international and intra-national trade flows (domestic sales) and controls for multilateral resistance terms as well as globalization effects on international trade. Larch et al. (2019) have used this approach to estimate unilateral and bilateral trade effects of GATT/WTO membership. Their main focus is on the trade effect of the "average" new GATT/WTO member country, but they also show that trade effects depend on the status of economic development of the trading partners. We explore the extent to which China differs from other GATT/WTO member countries. Felbermayr et al. (2019) present country-specific trade effects of WTO membership, including an estimate for the average trade effect of China. We adopt the approach proposed by Baier et al. (2019) for the case of regional trade agreements to further zoom into the effect of China's WTO accession on trade with its different trading partners. We estimate pair-specific and "directional" effects of China's WTO accession. This allows us to characterize how trade effects differ across (i) China's trading partners and (ii) across China's exports to and imports from these trading partners.[6]

We document a substantial heterogeneity in effects on China's international trade with

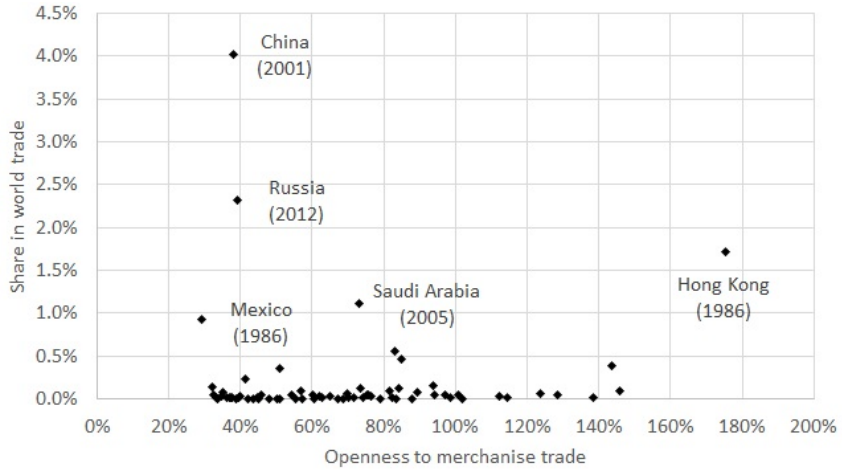
[6]With our GATT/WTO dummy variable approach we capture both, changes in tariff and non-tariff barriers.

other WTO members. For example, China's WTO accession increased its trade with Costa Rica and Malta by, respectively, more than 1000 percent and 651 percent and lowered trade with Hong Kong, Macao, and Sri Lanka by, respectively, 39 percent, 43 percent, and 54 percent. China's trade with Germany increased on average by 69 percent. At first sight, this heterogeneity might be surprising as non-discrimination is a prominent feature of the WTO and all countries in the sample but one (Iran) are WTO members as well. Thus, neither can China discriminate against certain WTO members nor can WTO members discriminate against China. The heterogeneity might be explained by ex ante differences in bilateral trade barriers.[7]

We also uncover different effects on Chinese exports to and imports from a given trading partner. Chinese imports from most of the countries increase stronger than Chinese exports to these countries. This holds particularly true for most of the European countries – including Germany – as well as for Japan and the US, as we not find a significant effect on Chinese exports to these countries. For Argentina, Brazil, Uruguay, and Turkey, the reverse holds true. Chinese imports from these countries are not significantly affected, while Chinese exports to these countries are. Chinese exports to the special administrative regions Hong Kong and Macao as well as to Sri Lanka fall in response to China's WTO accession. Also Chinese imports from Macao and Sri Lanka fall. Moreover, we find a stronger than average unilateral effect of China's WTO accession of its trade with non-members and members.

The structure of the paper is as follows. Section 2 highlights the special role of China in its accession to the WTO. Section 3 introduces the data and provides descriptive evidence on the evolution of Chinese trade before and after its accession. Section 4 presents the gravity-based causal analysis of the trade effects of China's accession and explores the heterogeneity of these effects. The final section contains some concluding remarks.

Figure 1: Trade-related country characteristics of new GATT/WTO members in the year of the accession



Notes: For the 70 countries which have accessed the GATT/WTO since 1986, the figure shows the country's share in merchandise world trade and its openness to merchandise trade (merchandise trade in percent of GDP) in the year of accession. It also shows the year of accession of five outstanding countries. *Source*: World Development Indicators. Own illustration.

2 China and its accession to the WTO

The share of world trade that is covered by WTO regulations has risen from about 80 percent in 1996 to almost 100 percent in 2016 (Felbermayr et al. 2019, Figure 9). 70 countries have accessed the GATT/WTO since 1986. The youngest WTO member country is Afghanistan which joined in 2016. Figure 1 plots the contributions of the 70 new GATT/WTO members to world trade – measured as the share of merchandise trade in world trade (y-axis) – against their trade openness – measured as merchandise trade in percent of the gross domestic product (x-axis) – in the year of their accession. The following observations stand out. First, there is substantial variation in the countries' trade openness in their year of GATT/WTO accession, but their contributions to world trade – measured as the share of merchandise trade in world trade – has typically been negligible.[8] Trade openness ranges from 29 percent (Mexico) to

[7]Baier et al. (2019) show that – among other things – ex ante differences in bilateral trade barriers explain heterogeneity in the trade effects within free trade agreements. In this paper, we do not engage in explaining differences in trade effects.

[8]This is why we suppress country labels for most of the countries. Table A1 in Appendix A lists all countries that joined the GATT/WTO since 1986 and displays their trade openness and trade shares.

175 percent (Hong Kong), with an unweighted average of 69 percent. Second, with Mexico and Hong Kong, two large international players in terms of their world trade share joined the GATT in 1986. Mexico has strong trade relationships with the US. Hong Kong – at the time of its GATT accession a British dependent territory – serves as a conduit for Chinese exports. Over the period 1988 to 1998, 53 percent of Chinese exports were shipped through Hong Kong (Feenstra and Hanson 2004). Third, with Saudi Arabia and Russia, large oil and gas exporting countries joined the WTO only very recently (in 2005 and 2012, respectively).

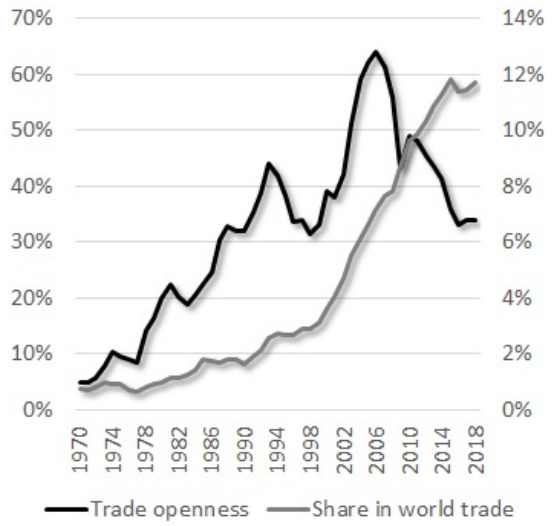
Finally, with a trade openness of 38 percent, China shows up at the lower end of the openness distribution, in company of other large countries like Russia and Mexico. Its trade share, however, amounted to as much as 4 percent in 2001. As a substantial share of trade is still channeled through Hong Kong, this number is likely to underestimate China's true contribution to world trade. Putting this number into perspective, the world trade shares of Germany and the US in 2001 amount to 8.3 percent and 15 percent, respectively. Given the already high integration into the world economy, it is interesting to explore whether China's WTO accession further boosted its international trade.[9]

China's trade openness in the year of its accession to the WTO amounted to 38 percent, only slightly above half of the (unweighted) average of the countries that have accessed the GATT/WTO since 1986.[10] China's trade openness, however, has evolved very dynamically; see Figure 2. From 1970 to 1993, it increased from 5 percent to 44 percent, which implies an average annual growth rate of more than 9 percent. It went down to 33 percent in 1999 (annual average decline of 4.7 percent). Between 1999 and 2006, it rose to 64 percent (annual average growth of 10.7 percent), before it went down to 34 percent in 2018 (annual average decline of 5.1 percent). Thus, China's recent fast increase in its trade openness started already prior to its WTO accession, which might be explained by an anticipation effect. The reversal occurred

[9] China also integrated "regionally" into the world economy; see Appendix C.

[10] Using data from Borchert et al. (2020), we have also experimented with an alternative measure of trade openness where total production rather than GDP is in the denominator. The advantage of this alternative measure is it avoids mixing gross terms (trade) and value added terms (GDP). Information about total production, however, is not easily available; see the discussion on internal trade flows below.

Figure 2: Evolution of China's trade openness and share in world trade



Notes: The figure shows China's openness to merchandise trade (merchandise trade in percent of GDP) on the left axis and its share in merchandise world trade (right axis) for the period 1970 to 2018. *Source*: World Development Indicators. Own illustration.

already prior to the financial crisis.[11] The strong rise in China's contribution to world trade also starts in 1998, but lasts – unaffected by the financial crisis – until 2015 with an average annual growth rate of 8.6 percent.

3 Evolution of trade across China's trading partners

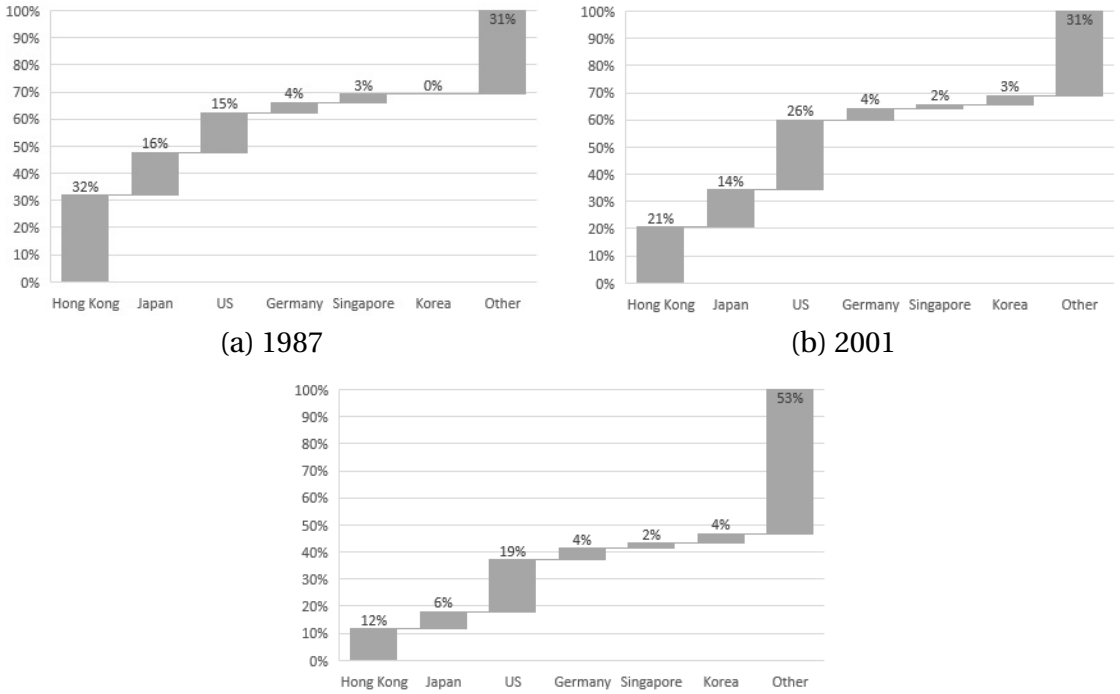
3.1 "International" transactions

We now take a closer look at Chinese exports. We first focus on "international" transactions. We put "international" in quotation marks, as international transactions include trade with Hong Kong, Macao, and Taiwan. Although Hong Kong has been returned to China in 1997, it is a "special administrative region" and therefore still appears as a separate entity in trade statistics. Similarly, Macao shows up separately in international trade statistics. The political

[11] It is important to note, however, that the picture is blurred by China's enormous GDP growth rates. In 2007, for example, China's GDP grew by 14 percent. Thus, a drop in trade openness does not imply that Chinese trade falls.

status of Taiwan is unclear. Some international trade statistics also contain separate numbers for Taiwan, others do not. Given their special roles, we represent separate numbers for these countries whenever possible.

Figure 3: Importance of Chinese export destinations



(a) 1987

(b) 2001

(c) 2016

Notes: The diagrams show the importance of the top five export destinations in a given year.
Source: Feenstra's World Trade Flows (WTF) Bilateral Data. Own illustration.

Data on international trade flows for almost all countries or territories in the world up to the year 2016 are provided by Robert Feenstra (World Trade Flows (WTF) Bilateral Data); see Appendix B. Our dataset starts in 1987, the first year for which information about Chinese trade with Taiwan is available.

The list of the top five export destinations is remarkably stable over the observed period. In 1987, Hong Kong, Japan, the US, Germany, and Singapore are the top five export destinations (in descending order of the share of Chinese manufacturing exports). In 2016, Singapore is overturned by Korea, while the other top destinations remain the same. Interestingly, the positions have changed. Moreover, the share of Chinese manufacturing exports the top five

countries receive has fallen from 69 percent to 47 percent, which emphasizes the growing importance of further destination countries. Figure 3 illustrates the importance of the top five export destinations over time. From 1987 to 2001, the share of exports going to the US increased by 11 percentage points, while at the same time the share of exports going to Hong Kong fell by 10 percentage points. From 2001 to 2016, the share of exports going to Hong Kong fell by further 9 percentage points, but the share of exports going to the US also fell by 7 percentage points. The share of Chinese exports that Germany received remained quite the same. Singapore lost some importance, Korea gained some importance. While the rest category receives 31 percent of Chinese exports in 1987 and 2001, this share increases to more than 50 percent in 2016.[12]

In the given period, all the top export destinations are GATT/WTO members.[13] Figure 4 shows the evolution of Chinese exports to these countries. Chinese exports to a given distination country are normalized to their 2001 value, the year of China's WTO accession. Thus, we cannot compare the values of exports across destinations, but explore the evolution of Chinese exports to a given destination over time.

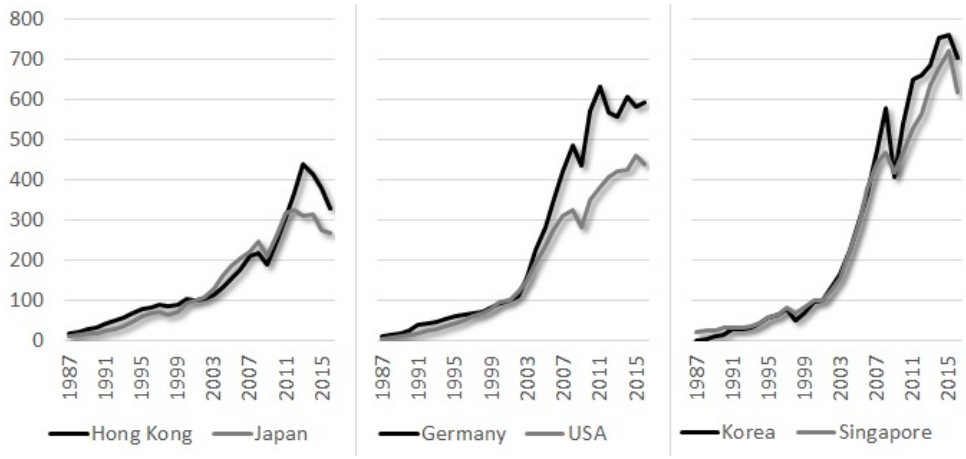
Chinese exports to all these countries have increased already prior to the year 2001. Note that exports to Hong Kong are smaller in 2001 than in 2000. Over the period 2001 to 2016, however, exports to all destinations dramatically increase, with a drop in 2009 due to the financial crisis and at the end of the observed period. Based on export dynamics, we can identify three different groups of destinations. First, exports to Hong Kong and Japan increased by factors 3 to 4 until 2014. There is a negative trend after 2014 that turns out to be particularly strong for Hong Kong. While for a long time, Hong Kong was only member of a regional trade agreement with mainland China (date of entry into force: 2003), it has become more active in terms of regional trade policy since 2011. Japan has integrated regionally since 2002.

Second, Chinese exports to Germany and the US increased by factor 4.4 to 6, with a sharp

[12]We double-checked export shares in the years 2001 and 2016 using data from Borchert et al. (2020).

[13]Entering new regional trade agreements may entail trade diversion away from China. These effects are ignored in our descriptive analysis, but accounted for in the regression analysis, see below. Appendix C contains information on regional trade agreements that entered into force in the relevant period.

Figure 4: Evolution of Chinese exports to its top destination countries (2001 = 100)

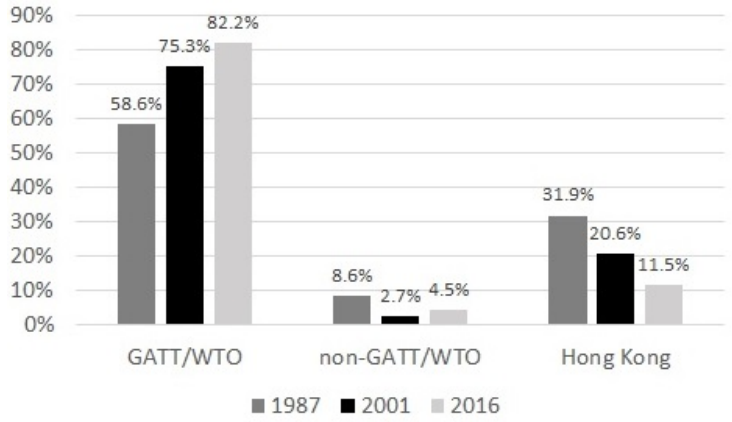


Notes: The graphs show the evolution of Chinese manufacturing exports to a given destination. Exports to a given destination in 2001 are normalized to 100.
Source: Feenstra's World Trade Flows (WTF) Bilateral Data. Own illustration.

rise in exports to Germany until 2011 and a sidewards trend since then. During the period, Germany encountered a lot of "regional" trade integration, both through the enlargement of the EU and through trade deals of the EU with countries around the globe. The strong increase in exports to Germany might reflect the link between the two hubs of the "Factory Asia" and "Factory Europe" in global value chains (World Bank Group et al. 2017, Figure 6). Finally, Chinese exports to the other Asian countries Korea and Singapore increased by factor 7 until 2015 and dropped thereafter.

We now differentiate export destinations by GATT/WTO membership in the year of the observation. The group of non-GATT/WTO members is shrinking, while the group of GATT/WTO members is becoming larger over time; see Table A1 in Appendix A. For the sake of a clear picture, Hong Kong is shown as an extra group, while Macao and Taiwan are excluded from the analysis. Figure 5 shows the shares of Chinese exports to the different groups of countries for the three exemplary years 1987, 2001, and 2016. The share of exports that go to GATT/WTO members grows from 59 percent in 1987 to 75 percent in 2001 and 82 percent in 2016. At the same time, however, the share of exports to Hong Kong – which contain to a large extent exports to other countries – declines. The sum of the export shares that go to GATT/WTO

Figure 5: Chinese exports as a share of total exports



Notes: Chinese export destinations are grouped by GATT/WTO membership in the year of observation. Hong Kong is shown separately. Macao and Taiwan are excluded from the analysis. They receive 0.02 percent, 1.17 percent, and 1.6 percent of Chinese exports in, respectively, 1987, 2001, and 2016. *Source*: Feenstra's World Trade Flows (WTF) Bilateral Data. Own illustration.

members and Hong Kong marginally increase from 90.5 percent to 93.8 percent over the entire period. The share of exports to the shrinking group of non-WTO members rises from 2.6 percent in 2001 to 5 percent in 2010. Its drop in 2012 might be explained by Russia's WTO accession in that year.[14]

3.2 Intra- and international trade flows

Following the practice in the recent international trade literature, we now take intra-national trade flows into account. Arguably, the largest share of sales is accomplished on the domestic market. Including them allows for identifying trade diversion from domestic sales.

Although one might think that the value of domestic transactions can easily be observed, they have to be computed from production and trade data. Combining different data sources with different product classifications is a complicated issue. We therefore rely on data pro-

[14]Alternatively, we classify destination countries by the status of their WTO membership in 2001 such that the groups of countries do not vary over time. The share of exports to WTO members as of 2001 increases from 1991 to 2003. The drop in the share of exports to Hong Kong, however, shows up more pronounced, so we see a slight reduction in the sum of the shares of exports that go to GATT/WTO members and Hong Kong from 91.5 percent to 88 percent over the entire period. While the share of exports to non-GATT/WTO members steadily declines from 7.5 percent to 2.7 percent from 1987 to 2001, it increases again thereafter.

vided by Yotov et al. (2016). The dataset contains 65 countries and covers the years 1986 to 2006 in 4-year intervals.[15] Focusing on a shorter time span has two advantages. First, the financial crisis in the years 2008 and 2009 does not blur the picture. Second, international fragmentation of production has substantially increased in the last decade, and China is heavily involved in global value chains. In our analysis, we look at trade flows in gross terms, which are only a good proxy for international transactions if there is not much trade in intermediate inputs. With a lot of trade in intermediate inputs, value added trade would be a better proxy. Value added and gross trade flows can differ substantially (Johnson and Noguera 2012). The problem is less severe in the considered time period, but this leaves out ten years of China's post WTO accession time.[16]

Figure 6 displays manufacturing exports to GATT/WTO members and Hong Kong relative to Chinese internal trade.[17] Relative exports to GATT/WTO member countries increase from 4.6 percent in 1986 to 24.5 percent in 1998. In 2002, the share amounts to 27.3 percent and remains stable thereafter. Exports to Hong Kong relative to Chinese domestic trade amounts to 3.4 percent in 1986 and about 9 percent in 1998. They fall slightly to 6.8 percent in 2002 and 5.2 percent in 2006, respectively.

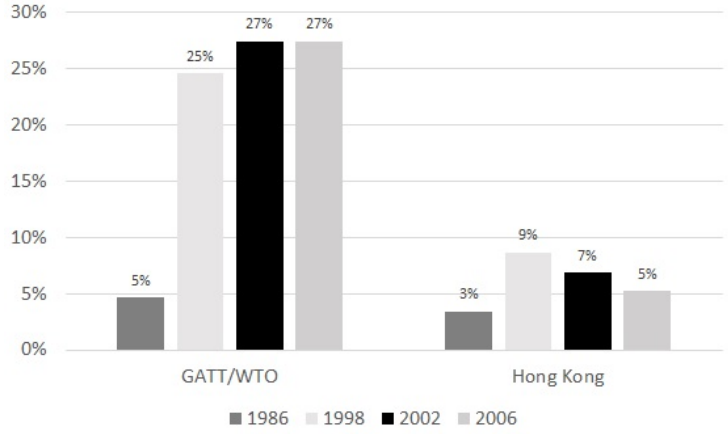
Summing up, our descriptive analysis does not show a clear picture. China's WTO accession seems to have increased its exports to other WTO members. If we take exports channeled through Hong Kong into account, however, the evidence is less clear. Moreover, Chinese exports to non-WTO members have also risen after China's WTO accession. In order to obtain a clear(er) picture, we turn to a causal analysis.

[15]The latter implies that we do not observe 2001, the year of China's WTO accession. The countries included in the dataset are those listed in Table A2 plus China and Iran.

[16]The disadvantage is, of course, that we only cover two periods after China's WTO accession.

[17]In the dataset, the number of non-GATT/WTO countries is small. Exports to these countries, relative to Chinese international trade flows, are negligibly small.

Figure 6: Chinese exports relative to internal trade



Notes: Chinese export destinations are grouped by GATT/WTO membership in the year of observation. Hong Kong is shown separately. Macao and Taiwan are excluded from the analysis. Exports to non-GATT/WTO countries, relative to Chinese internal trade, are negligibly small and not shown. *Source*: Data from Advanced Guide on Trade Policy Analysis (Yotov et al. 2016). Own illustration.

4 A causal analysis of the heterogeneous trade effects of China's WTO accession

The gravity model of international trade has become the workhorse for the estimation of causal trade effects of various trade policies. In this paper, we utilize this framework to estimate the causal effect of China's WTO accession. In its simplest form, the gravity equation explains bilateral trade flows by the sizes of the two countries – typically measured by their GDPs – and by proxies for bilateral trade costs. We expect joint GATT/WTO membership to reduce trade costs and therefore to enhance international trade.

Given the prevalence of regional trade agreements such as the European Union (EU) or the North American Free Trade Agreement (NAFTA) between the US, Canada, and Mexico, it is important to control for them in trade policy analysis. Physical trade barriers such as geographical distance are time-invariant.[18] To a large extent, this also holds true for informal barriers such as differences in languages or in cultural roots. In order to control for time-

[18]The trade barrier effect of distance may vary over time. The approach is well suited to control for time-varying distance effects; see Bergstrand et al. (2015) and Yotov (2012).

invariant determinants of trade costs, we include country-pair fixed effects in the regression analysis. The presence of pair-fixed effects also alleviates the problem of endogenous selection into regional trade agreements (Baier and Bergstrand 2007).

Anderson and van Wincoop (2003) argue that a theory-consistent specification of the gravity equation requires to control for the average barriers to trade of the two trading parties with all their partners. As these so-called "multilateral resistance terms" are essentially unobservable, country fixed effects are used. As we work in a panel data context, we include exporter-and-time and importer-and-time effects that incorporate outward and inward multilateral resistance terms and other time-varying country-specific characteristics such as country size.

In line with the latest insights of the gravity literature, we include intra-national trade flows into the analysis. Specifications with intra-national trade flows allow for capturing trade diversion from domestic sales. Given that domestic sales are typically very large, taking account of trade diversion from domestic sales has turned out to be important (Yotov 2012, Dai et al. 2014). They also allow for controlling for global trends in international trade by means of time-varying border effects (Bergstrand et al. 2015).

We estimate by Poisson Pseudo Maximum Likelihood (PPML). PPML handles heteroscedasticity in the errors terms (Santos Silva and Tenreyro 2006). It is therefore the preferred estimation technique in recent trade applications.[19]

4.1 Effects of common GATT/WTO membership

Adopting the approach from Larch et al. (2018, 2019), we specify the estimation equation as follows:

[19]PPML also allows to deal with zeros in international trade, but zeros are not a problem in our dataset. Weidner and Zyklin (2020) argue that (i) estimates from so-called three-way fixed effects PPML models are biased due to an "unique type" of an incidental parameter problem and (ii) standard errors are biased when the number of periods is small. We have experimented with their approach to numerically quantify the biases of the point estimates and the standard errors. The overall conclusions remain unaffected. Results are available upon request from the author.

$$X_{ij,t} = \exp\left[\alpha_0 + \alpha_1 WTO_{ij,t} + \alpha_2 \left(WTO_{ij,t} \cdot CHN_{i,j}\right) + \alpha_3 RTA_{ij,t}\right] \times \exp\left[\bar{\mu}_{ij} + \pi_{i,t} + \chi_{j,t} + \sum_t \gamma_t BRDR_{ij,t}\right] + \varepsilon_{ij,t}. \quad (1)$$

The variable $X_{ij,t}$ accommodates exports from country i to country j if $i \neq j$ as well as internal trade flows if $i = j$. $WTO_{ij,t}$ is a dummy variable that takes one if the exporter and the importer are both GATT/WTO member countries and the transaction is international.[20] $CHN_{i,j}$ is a dummy variable that takes one if one of the trading partners is China. The estimated coefficient $\hat{\alpha}_2$ captures by how much the effect for China differs from the average effect. We have no expectations about the sign of α_2. If $\hat{\alpha}_1 > 0$ and $\hat{\alpha}_2 > 0$, China's WTO accession had a stronger than average pro-trade effect. The $RTA_{ij,t}$ is a dummy variable that takes one if both countries are members of the same regional trade agreement. We include time-varying border dummies $BRDR_{ij,t}$ which take one for international transactions in a given year. $\pi_{i,t}$ and $\chi_{j,t}$ represent the set of exporter-and-time and importer-and-time effects. $\bar{\mu}_{ij}$ represents the set of symmetric country-pair fixed effects. The variable $\varepsilon_{ij,t}$ is the error term.

Table 1 presents the results. Columns (1) and (2) are based on a dataset which includes only international trade flows, but covers the period from 1987 to 2016. In columns (3) and (4), we turn to the shorter dataset. Again, we include only international trade flows. In columns (5) and (6), we also include intranational trade. In columns (1), (3), and (5), we set $\alpha_2 = 0$ and estimate only the average effect, while in the remaining columns we also identify the differential effect for China.

Columns (1) and (2) imply that common WTO membership reduces trade. The trade effect of China's WTO accession is not statistically different from the average; see column (2). In the shorter and smaller sample, the GATT/WTO effects are insignificant; see columns (3) and (4). In all these specifications, in contrast to our intuition, regional trade agreements do

[20] Due to the presence of pair fixed effects (see below), α_1 is identified from country pairs where at least one trading partner accesses the WTO during the observed period. Table A1 in Appendix A shows that in our sample, eleven countries plus China access the GATT/WTO between 1987 and 2016.

Table 1: Trade effects of joint GATT/WTO membership

	(1)	(2)	(3)	(4)	(5)	(6)
	Only international trade flows				With intra-national trade	
	Large dataset		Small dataset		Small dataset	
WTO	-0.205	-0.207	-0.038	0.043	0.477	0.214
	(0.087)**	(0.089)**	(0.182)	(0.255)	(0.077)***	(0.081)***
WTO^{CHN}		0.012		-0.203		0.282
		(0.055)		(0.252)		(0.115)**
RTA	-0.031	-0.031	-0.052	-0.052	0.199	0.200
	(0.044)	(0.044)	(0.057)	(0.057)	(0.069)***	(0.070)***

Notes: Results from estimating equation (1) on different samples. *Large dataset*: Feenstra's World Trade Flows (WTF) Bilateral Data. *Small dataset*: Advanced Guide on Trade Policy Analysis (Yotov et al. 2016). *Estimation method*: PPML. All regressions include a comprehensive set of exporter-and-time, importer-and-time, and (symmetric) pair-specific fixed effects (all not shown). Regressions with internal trade additionally include time-varying globalization effects (also not shown). Standard errors in parenthesis are clustered at the level of symmetric country pairs. *** and ** indicate significance at the 1 percent and 5 percent level, respectively.

not turn out to have significant (positive) trade effects.

As argued above, in the absence of internal trade flows, we cannot identify trade diversion from domestic transactions. In the sample with internal trade flows, we indeed find that common GATT/WTO membership increases international trade by $\exp(0.47) - 1 = 60$ percent; see column (5). On average, the effect is only $\exp(0.21) - 1 = 23$ percent. For country pairs that involve China, the effect is significantly larger, namely $\exp(0.21 + 0.28) - 1 = 63$ percent; see column (6). The estimated RTA coefficient implies that in the preferred specifications, regional trade agreements increase bilateral trade among members by $\exp(0.2) - 1 = 22$ percent.[21]

On top of the trade effects, we can compute the tariff equivalents of the trade cost shock induced by common GATT/WTO membership as $\exp(-\hat{\alpha}/\hat{\beta}_{tariff}) - 1$. In order to do so, we

[21] Using a larger sample and the same estimation technique, Felbermayr et al. (2019) and Larch et al. (2019) find smaller RTA effects. Without controlling for domestic sales (and time-varying globalization effects) and not taking heteroscedasticity into account, Baier and Bergstrand (2007) find larger RTA effects, while Santos Silva and Tenreyro (2006) report RTA effects of similar magnitude.

need an estimate of the elasticity of international trade flows in tariffs. A typical estimate is $-\hat{\beta}_{tariff} = 5$ (Anderson and van Wincoop 2003). Under this assumption, the average joint GATT/WTO membership effect is equivalent to the abolishment of a $\exp(0.47/5) - 1 = 9.2$ percent ad valorem tariff. While the average tariff equivalent is $\exp(0.21/5) - 1 = 4.3$ percent, for pairs that involve China it amounts to $\exp((0.21 + 0.28)/5) - 1 = 10.2$ percent.

4.2 Pair-specific and direction-specific estimates

We now explore the heterogeneity of China's WTO accession effect across WTO member countries as of 2001. We present pair-specific and direction-specific estimates.

In order to obtain country pair-specific average effects, we estimate the following specification:

$$\begin{aligned} X_{ij,t} = \quad & \exp \left[\alpha_0 + \alpha_1 WTO_{ij,t}^{NoCHN} + \sum_{\omega} \alpha_{2,p} \left(WTO_{ij,t} \cdot \omega_{i,j} \cdot CHN_{i,j} \right) + \alpha_3 RTA_{ij,t} \right] \\ \times \quad & \exp \left[\bar{\mu}_{ij} + \pi_{i,t} + \chi_{j,t} + \sum_{t} \gamma_t BRDR_{ij,t} \right] + \varepsilon_{ij,t} \end{aligned} \tag{2}$$

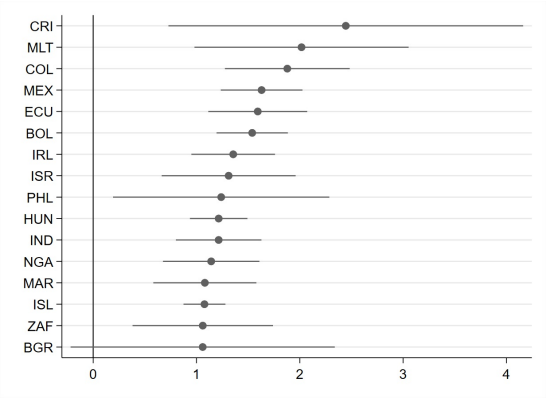
In this equation, the dummy variable $WTO_{ij,t}^{NoCHN}$ is one if both trading partners are GATT/WTO members, but neither of the countries is China. ω is a country which is GATT/WTO member at some point in our sample, except China.[22] As above, the dummy variable $WTO_{ij,t}$ takes one if both countries member at time t and $CHN_{i,j}$ is dummy variable that takes one if either the exporter or the importer is China. $\omega_{i,j}$ is a set dummy variables that take one if either the exporter or the importer is country ω. The estimated coefficients $\hat{\alpha}_{(2,p)}$ represent pair-specific average effects of joint WTO membership when one of the trading partners is China. For the pair-specific average effects the direction of trade is not important. Consider China and Germany. The pair Germany-China appears twice in every year: we have exports from China to Germany and exports from Germany to China. In the years 2001 and later, the interaction term for the pair Germany-China takes on one.

[22] All countries in our sample but Iran are GATT/WTO members.

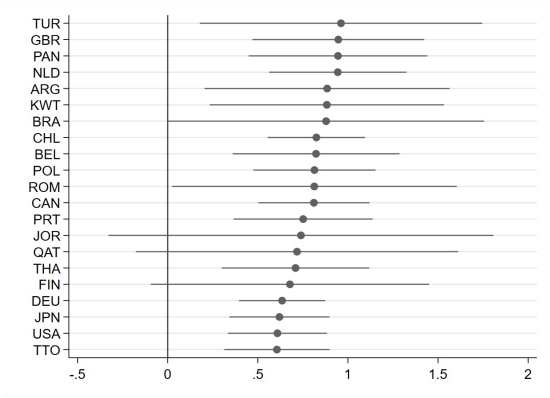
Figure 7 displays the estimated coefficients $\hat{\alpha}_{(2,p)}$ and the 95 percent confidence intervals.[23] For the sake of illustration, we present the results in four panels. Panel (a) shows estimated undirected effects above 1, panel (b) those between 0.6 and 1, panel (c) those between 0 and 0.6, and panel (d) those below 0. While most of the average effects are significantly different from zero at the 10 percent level, this is not true for Bulgaria (see panel (a)), Jordan and Qatar (panel (b)), Tunesia, Uruguay, Indonesia, Mauritius, and Sweden (panel (c)), as well for Nepal (panel (d)). The largest effects show up for Costa Rica and Malta. Using the point estimate, China's WTO accession has increased trade with Costa Rica on average by factor $\exp(2.445) = 11.5$ (1.050 percent) and with Malta on average by factor 7.5 (650 percent). Arguably, Chinese trade with countries like Costa Rica and Malta is small. Negative average trade effects arise for Sri Lanka (-59 percent), Macao (-43 percent), and Hong Kong (-39 percent). These results are not surprising. The ties between China and Sri Lanka have been relatively strong even before China's accession. Given this strong initial position, Chinese trade with Sri Lanka falls relative to domestic transactions and transactions with non-WTO members. The incentive to channel trade through Macao and Hong Kong, both special administrative regions of China, has been reduced since mainland China accessed the WTO in 2001, which may explain the corresponding negative estimates. The coefficient for Nepal is negative as well, but not statistically different from zero. Chinese trade with Japan, the US, and Germany – countries among the group of top 5 Chinese export destinations – has increased on average by, respectively, 86 percent, 84 percent, and 88 percent; see panel (b). Korea and Singapore – further important export destinations – show up in panel (c) with average trade effects of, respectively, 68 percent and 41 percent.

[23] For a correspondence of country ISO codes to country names, see table A2 in Appendix A. Standard errors are "three-way" clustered by exporter, importer, and year. Clustering standard errors by symmetric country pairs yields very similar confidence intervals. All countries in our sample but Iran are GATT/WTO members in some year covered by the dataset.

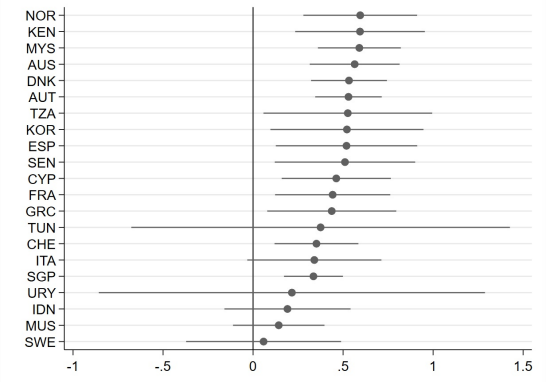
Figure 7: Pair-specific trade effects of joint WTO membership with China



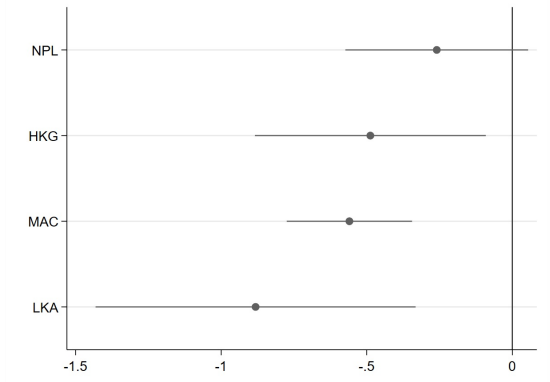
(a) Coefficients larger 1



(b) Coefficients between 0.6 and 1



(c) Coefficients between 0 and 0.6



(d) Negative coefficients

Note: The figure shows the pair-specific (undirectional) trade effects $\hat{\alpha}_{2,p}$ of joint WTO membership with China, which are obtained from the estimation of equation (2) using data from Advanced Guide on Trade Policy Analysis (Yotov et al. 2016). Standard errors are "three-way" clustered by exporter, importer, and year.

In order to obtain direction-specific estimates, we estimate the following model:

$$X_{ij,t} = \exp\left[\alpha_0 + \alpha_1 WTO_{ij,t}^{NoCHN} + \sum_{\omega}\left[\alpha_{2,x}\left(WTO_{ij,t}\cdot\omega_i\cdot CHN_j\right) + \alpha_{2,m}\left(WTO_{ij,t}\cdot\omega_j\cdot CHN_i\right)\right]\right] \times \exp\left[\alpha_3 RTA_{ij,t} + \mu_{ij} + \pi_{i,t} + \chi_{j,t} + \sum_{t}\gamma_t BRDR_{ij,t}\right] + \varepsilon_{ij,t}. \quad (3)$$

In this specification, ω_i is a set of dummy variables for exporting and ω_j a set of dummy variables for importing GATT/WTO member countries. CHN_i and CHN_j take one if, respectively, the exporting country or the importing country is a China. $\alpha_{2,x}$ is the exporter-specific

effect of joint WTO membership with China, while $\alpha_{2,m}$ is the importer-specific effect of joint WTO membership with China. Hence, we take the direction of trade into account. Consider again China and Germany. In this case, the pair China-Germany and the pair Germany-China are treated as two different pairs. The pair fixed effects are allowed to be asymmetric, $\mu_{ij} \neq \mu_{ij}$, which means that they vary by direction as well.

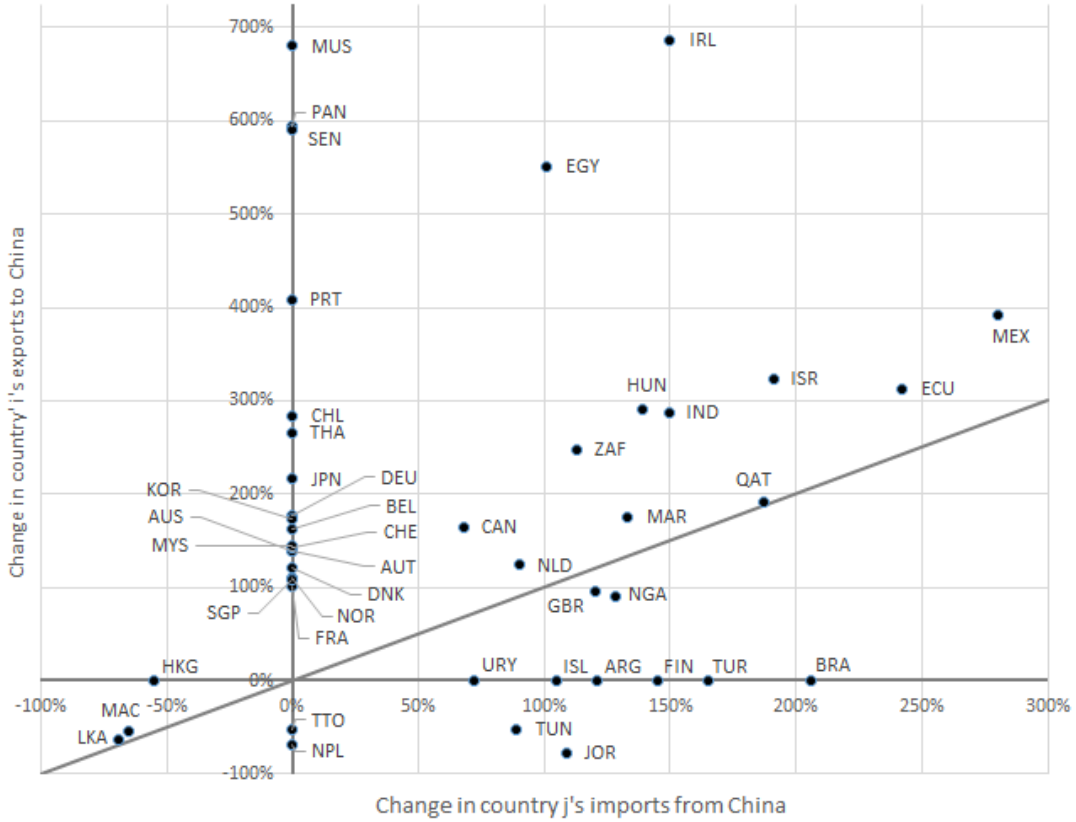
Table A2 in Appendix A displays the estimated coefficients and standard errors for the undirected country pairs; see columns (1) and (2). The remaining columns show the estimated coefficients and standard errors for directed country pairs. Columns (3) and (4) show the effects on Chinese exports, while columns (5) and (6) show the effects on Chinese imports. In all specifications, standard errors are "three way" clustered at the exporter, importer, and year.

Figure 8 illustrates the heterogeneity of the WTO effect on Chinese exports to and imports from a particular trading partner that is GATT/WTO member. The effect on a country's imports from Chine (Chinese exports to this country) appears on the x-axis, while the effect on a country's exports to China (Chinese imports from this country) shows up on the y-axis. Trade effects are set to zero for directional estimates that turn out to be insignificant at the 10 percent level. For the sake of illustration, effects on Chinese imports that are larger than 700% are not shown.[24]

The following observations stand out. First, Chinese exports to Hong Kong significantly decline, while Chinese imports from Hong Kong are not significantly affected. This suggests that China's WTO accession reduces the incentive for channeling Chinese exports through Hong Kong. Second, China's exports to Macao, a special administrative region, and Sri Lanka, fall, relative to domestic transactions and transaction with non-WTO members. Third, Argentina, Brazil, and Uruguay (South America) as well as Island, Finland, and Turkey (Europe) significantly import more from China, while Chinese imports from these countries do not change significantly (see the positive part of the x-axis). Hence, China seems to have improved market access to these countries, while vice versa, the same is not true. Forth, China

[24]Trade effects are larger than 700% for Bolivia, Columbia, Costa Rica, Malta, and the Philippines.

Figure 8: Heterogeneity in direction-specific trade effects of joint WTO membership with China



Note: The figure plots the effects of China's WTO accession on GATT/WTO member countries' exports to China (y-axis) against the effects on these countries' imports from China (x-axis) (directional trade effects). These effects are computed from the coefficients $\hat{\alpha}_{2,x}$ and $\hat{\alpha}_{2,m}$, which are obtained from the estimation of equation (3) according to $\exp(\hat{\alpha}_{2,\cdot}) - 1$ using data from Advanced Guide on Trade Policy Analysis (Yotov et al. 2016).

imports significantly more from a number of European countries (including Germany), Japan, Korea, Singapore, Malaysia, and Thailand (Asia), as well as the US, while Chinese export to these countries do not significantly change (see the positive part of the y-axis). These countries seem to have improved access to Chinese markets for final and/or intermediate goods. Interestingly, the US shows up in this list of countries. While this finding does not seem to be in line with the literature on the "China shock" (see the survey in the NBER Reporter 2016 Number 1), it might be explained by the fact that China received the MFN status in the US even prior the official WTO accession. Finally, both Chinese exports to and imports from

a number of countries significantly increases. While for the UK and Nigeria, the change in imports from China is larger than the change in exports to China, for the bulk of countries the change in exports to China dominates the change in imports from China. These countries include India (South Asia), Netherlands, Hungary, Ireland, and Malta (Europe), Canada and Mexico (North America), Costa Rica (Central America), Bolivia, Colombia, and Ecuador (South America), South Africa (Southern Africa), Morocco and Egypt (North Africa), as well as Israel and Qatar (Near Eastern Countries). For Qatar, the effects on exports and imports are quite balanced in percentage terms (see 45-degree line).

The pattern that arises in Figure 8 seems to be consistent with common perceptions about China's position in global value chains (World Bank Group et al. 2017, Figure 6). China is the hub of the "Factory Asia", mainly sourcing from the other Asian countries in the first quadrant of the figure and from Australia. Japan is also integrated in the "Factory Asia" and appears as both a supplier of intermediate goods and a consumer of final goods. China also appears as large destination market for products from the "Factory Europe" and the "Factory America" whose hubs are, respectively, Germany and the US.

4.3 Unilateral GATT/WTO accession effects

GATT/WTO membership may enhance the environment for all international transactions, including those with non-member countries. GATT/WTO members are forced to make their trade rules as transparent as possible, which also facilitates trade with non-member countries. In the standard gravity framework without internal trade flows, the presence of time-varying country fixed effects precludes the validation of this hypothesis.

In the presence of internal trade flows, we can explore unilateral effects of GATT/WTO accession. The estimation equation is the following:

$$\begin{aligned} X_{ij,t} = \quad & \exp \quad [\alpha_0 + \alpha_1 oneWTO_{ij,t} + \alpha_2 (oneWTO_{ij,t} \times CHN_i)] \\ & \times \quad [\alpha_3 WTO_{ij,t} + \alpha_4 (WTO_{ij,t} \times CHN_{i,j})] \\ & \times \quad \exp \left[\alpha_5 RTA_{ij,t} + \mu_{ij} + \pi_{i,t} + \chi_{j,t} + \sum_t \gamma_t BRDR_{ij,t} \right] + \varepsilon_{ij,t}. \end{aligned} \tag{4}$$

In this specification, the variable $oneWTO_{ij,t}$ is a dummy variable that takes one if the exporting country i is a GATT/WTO member at time t, while the importing country j is not, and the transaction is international. Only in the presence of intra-national trade can α_1 be identified. The estimated coefficient $\hat{\alpha}_1$ captures by much how bilateral trade is larger if *exactly one* trading partner is a GATT/WTO member. CHN_i is a dummy variable that takes one if the exporting country is China. Thus, $\hat{\alpha}_2$ captures by how much the unilateral GATT/WTO effect differs if the WTO member is China. As above, $WTO_{ij,t}$ is a dummy variable that takes one if both members are GATT/WTO member countries and the transaction is international. By construction, the estimated coefficient $\hat{\alpha}_3$ captures the effect that emerges *in addition* to $\hat{\alpha}_1$ if the partner country is also a GATT/WTO member.[25] $CHN_{i,j}$ is dummy variable that is one if the international transaction involves China.

Table 2: Unilateral trade effects of GATT/WTO membership

	(1)	(2)
oneWTO	0.990***	0.584
	(0.384)	(0.485)
oneWTO^{CHN}		0.479*
		(0.252)
WTO	0.958***	0.513*
	(0.202)	(0.267)
WTO^{CHN}		0.260**
		(0.117)
RTA	0.206***	0.206***
	(0.070)	(0.070)

Notes: Results from estimating equation (4) using data from the Advanced Guide on Trade Policy Analysis (Yotov et al. 2016). *Estimation method*: PPML. All regressions include a comprehensive set of exporter-and-time, importer-and-time, (symmetric) pair-specific, and time-varying globalization fixed effects (all not shown). Standard errors in parenthesis and clustered at the level of symmetric country pairs. *** and * indicate significance at the 1 percent and 10 percent level, respectively.

Table 2 presents the results. In column (1), we set $\alpha_2 = \alpha_4 = 0$. On average, GATT/WTO

[25]Note that the interpretation of of α_3 in specification 4 differs from the interpretation of α_1 in specification 1. In specification 1, the control group is spanned by country pairs where both countries or one country is not not GATT/WTO member plus domestic transactions, wheras in specification 4, the control group only comprises domestic transactions.

membership increases trade with non-members by $\exp(0.99) - 1 = 169$ percent. In a larger dataset covering more countries and years, Larch et al. (2019) find a smaller unilateral GATT/WTO effect, suggesting that also unilateral GATT/WTO trade effects are heterogeneous across countries. The additional effect on bilateral trade with other GATT/WTO members is substantial. In total, bilateral trade of GATT/WTO members with other countries (non-members and members) increases by $\exp(0.99 + 0.95) - 1 = 600$ percent, relative to domestic trade. This effect is identified from the eleven countries plus China that have accessed the GATT/WTO since 1987; see Table A1 in Appendix A. Column (2) shows that our large effects are mainly driven by China. The average unilateral trade effect of GATT/WTO membership is not statistically different from zero. For China, the effect is positive. Moreover, the additional effect that arises if the partner country is also GATT/WTO member is larger if China is involved.

5 Concluding remarks

Instead of providing a summary, we make some concluding remarks. First, although we argued that it might be advantageous not to have the recent decade in the dataset that contains internal trade flows, it is a clear limitation of our analysis that the period considered after China's WTO accession is (i) very short and (ii) one with a high growth in Chinese openness to trade. Moreover, the number of countries included in the sample is small. Larch et al. (2019) and Felbermayr et al. (2019) work with an extended dataset that covers more countries and years. It might be worthwhile to replicate the regression analysis of section 4 with an updated dataset.[26] Second, we may underestimate the true effect of China's WTO accession because in our regression analysis, we ignore both anticipation effects, which we see in our descriptive analysis and which have been rationalized in the literature, and phasing-in effects. Third, although we include directed pair fixed effects in the estimation of directed trade effects in order to control for directed pair-specific unobserved heterogeneity, we only include a single RTA dummy. We could control for observable pair-specific heterogeneity by including a

[26] The dataset provided by Borchert et al. (2020) is very detailed, but mainly covers the years after China's WTO accession.

battery of RTA-specific dummies (Henn and Eicher 2011). Fourth, we work with aggregate bilateral data, ignoring the sectoral dimension as well as input-output linkages. It would be interesting to allow for a richer structure in the analysis. Fifth, from our regression analysis we only obtain so-called partial equilibrium trade effects. By partial equilibrium we mean that all other determinants of bilateral trade flows such as country sizes and multilateral resistance terms are held constant. Clearly, changes in bilateral trade costs have an impact on the entire trade cost matrix and therefore all countries' multilateral resistance terms, as well as all their GDPs. Thus, China's WTO accession also affects trade among non-WTO members. Yotov et al. (2016) demonstrate how partial equilibrium trade effects can be translated into general equilibrium effects. Finally, we do not explain why the trade effects of China's WTO accession differ across China's trading partners and across China's exports to and imports from a given trading partner. We leave all these extensions for further research. Despite the limitations, the paper shows what has been put at risk recently. The year 2018 has witnessed US tariff increases and retaliatory tariffs. This rise in tariffs not only has direct trade and real income consequences, but also undermines the multilateral trading system. Moreover, the recent policy responses to the Covid-19 pandemic have not only important implications for domestic production and sales, but also for international trade in intermediate and final goods.

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A Additional tables

Table A1: Integration of new GATT/WTO members into the world economy by the year of accession

Year	Country	Open-ness	Trade share	Year	Country	Open-ness	Trade share
1986	*Hong Kong*	*175%*	*1.7%*	**1996**	**Bulgaria**	**82%**	**0.1%**
1986	*Mexico*	*29%*	*0.9%*	**1996**	**Ecuador**	**35%**	**0.1%**
1987	Antigua & Barb.	79%	0.0%	1997	Mongolia	88%	0.0%
1987	Botswana	128%	0.1%	**1997**	**Panama**	**35%**	**0.0%**
1987	**Morocco**	**32%**	**0.1%**	1998	Kyrgyzstan	82%	0.0%
1988	Lesotho	138%	0.0%	1999	Estonia	124%	0.1%
1990	**Bolivia**	**33%**	**0.0%**	1999	Latvia	62%	0.0%
1990	**Costa Rica**	**60%**	**0.0%**	2000	Albania	39%	0.0%
1990	**Tunisia**	**74%**	**0.1%**	2000	Croatia	57%	0.1%
1990	Venezuela	51%	0.4%	2000	Georgia	34%	0.0%
1991	**Macao**	**94%**	**0.0%**	**2000**	**Jordan**	**76%**	**0.0%**
1991	El Salvador	40%	0.0%	2000	Oman	84%	0.1%
1991	Guatemala	32%	0.0%	**2001**	**China**	**38%**	**4.0%**
1992	Mozambique	38%	0.0%	2001	Lithuania	89%	0.1%
1992	Namibia	77%	0.0%	2001	Moldova	99%	0.0%
1993	Bahrain	146%	0.1%	2002	Taiwan	NA	NA
1993	Brunei Darus.	97%	0.1%	2003	Armenia	70%	0.0%
1993	Dominica	57%	0.0%	2003	Macedonia	74%	0.0%
1993	Fiji	72%	0.0%	2004	Cambodia	112%	0.0%
1993	Mali	39%	0.0%	**2004**	**Nepal**	**37%**	**0.0%**
1993	Saint Lucia	69%	0.0%	2005	Saudi Arabia	73%	1.1%
1993	St. Vinc. & the Gr.	67%	0.0%	2007	Tonga	50%	0.0%
1993	Swaziland	114%	0.0%	2007	Viet Nam	144%	0.4%
1994	Angola	101%	0.1%	2008	Cabo Verde	48%	0.0%
1994	Djibouti	42%	0.0%	2008	Ukraine	85%	0.5%
1994	Grenada	44%	0.0%	2012	Russia	39%	2.3%
1994	Guinea	36%	0.0%	2012	Samoa	55%	0.0%
1994	Guinea-Bissau	84%	0.0%	2012	Vanuatu	45%	0.0%
1994	Honduras	65%	0.0%	2013	Laos	45%	0.0%
1994	Pap. New Guinea	75%	0.0%	2013	Tajikistan	63%	0.0%
1994	Paraguay	54%	0.0%	2014	Yemen	46%	0.1%
1994	**Qatar**	**70%**	**0.1%**	2015	Kazakhstan	42%	0.2%
1994	Saint Kitts & Nev.	51%	0.0%	2015	Seychelles	102%	0.0%
1994	Slovenia	94%	0.2%	2016	Afghanistan	37%	0.0%
1994	Solomon Isds	60%	0.0%				
1994	UAR	83%	0.6%				

Notes: GATT/WTO membership: CEPII's Gravity Dataset. Openness (merchandise trade in percent of GDP) and trade share (merchandise trade in percent of world trade): World Bank Open Data. Own calculations. Countries in **bold** are included in the dataset and change their membership status during the observed period. Countries in *italics* are also included in the dataset, but are GATT/WTO over the entire observed period.

Table A2: Pair- and direction-specific trade effects of joint WTO membership with China

		(1)	(2)	(3)	(4)	(5)	(6)
		Av. Chinese trade with...		Chinese exports to...		Chinese imports from...	
ISO	Country	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
ARG	Argentina	0.88+	0.35	0.79+	0.47	0.78	0.56
AUS	Australia	0.56+	0.13	0.22	0.32	0.87+	0.36
AUT	Austria	0.53+	0.09	0.21	0.36	0.87+	0.36
BEL	Belgium	0.82+	0.24	0.56	0.39	0.97+	0.43
BGR	Bulgaria	1.06	0.65	1.54+	0.64	-0.51	0.67
BOL	Bolivia	1.54+	0.18	1.05+	0.43	4.54+	0.75
BRA	Brazil	0.88+	0.45	1.12+	0.41	0.52	0.43
CAN	Canada	0.81+	0.16	0.52+	0.31	0.97+	0.39
CHE	Switzerland	0.35+	0.12	-0.13	0.29	0.89+	0.37
CHL	Chile	0.82+	0.14	0.28	0.27	1.34+	0.40
COL	Colombia	1.88+	0.31	1.37+	0.32	3.85+	0.58
CRI	Costa Rica	2.45+	0.88	0.90+	0.42	5.02+	0.72
CYP	Cyprus	0.46+	0.15	0.15	0.36	0.08	0.39
DEU	Germany	0.63+	0.12	0.26	0.32	1.02+	0.40
DNK	Denmark	0.53+	0.11	0.19	0.39	0.79+	0.36
ECU	Ecuador	1.59+	0.24	1.23+	0.34	1.42+	0.60
EGY	Egypt	1.04+	0.16	0.70+	0.31	1.87+	0.48
ESP	Spain	0.52+	0.20	0.30	0.31	0.31	0.38
FIN	Finland	0.68+	0.39	0.90+	0.36	0.64	0.48
FRA	France	0.44+	0.16	0.16	0.31	0.70+	0.41
GBR	United Kingdom	0.95+	0.24	0.79+	0.29	0.67+	0.35
GRC	Greece	0.44+	0.18	0.14	0.30	-0.18	0.36
HKG	Hong Kong	-0.49+	0.20	-0.80+	0.44	-0.64	0.40
HUN	Hungary	1.21+	0.14	0.87+	0.41	1.36+	0.57
IDN	Indonesia	0.19	0.18	0.01	0.37	0.38	0.32
IND	India	1.21+	0.21	0.92+	0.41	1.35+	0.52
IRL	Ireland	1.36+	0.21	0.92+	0.34	2.06+	0.44
ISL	Iceland	1.08+	0.10	0.72+	0.31	0.01	0.41
ISR	Israel	1.31+	0.33	1.07+	0.39	1.44+	0.49
ITA	Italy	0.34+	0.19	0.17	0.34	0.46	0.35
JOR	Jordan	0.74	0.54	0.74+	0.40	-1.46+	0.55
JPN	Japan	0.62+	0.14	0.06	0.30	1.15+	0.41
KEN	Kenya	0.59+	0.18	0.22	0.37	0.71	0.68
KOR	Koreaa	0.52+	0.22	0.07	0.30	1.00+	0.45
KWT	Kuwait	0.88+	0.33	0.71	0.54	0.63	0.41
LKA	Sri Lanka	-0.88+	0.28	-1.16+	0.56	-1.02+	0.51
MAC	Macao	-0.56+	0.11	-1.04+	0.50	-0.77+	0.44
MAR	Morocco	1.08+	0.25	0.85+	0.31	1.01+	0.50
MEX	Mexico	1.63+	0.20	1.34+	0.37	1.59+	0.35
MLT	Malta	2.02+	0.53	1.08+	0.31	4.63+	0.65
MUS	Mauritius	0.14	0.13	-0.26	0.35	2.05+	0.46
MYS	Malaysia	0.59+	0.12	0.28	0.35	0.89+	0.36
NGA	Nigeria	1.14+	0.24	0.82+	0.36	0.64+	0.31
NLD	Netherlands	0.94+	0.19	0.64+	0.33	0.81+	0.42
NOR	Norway	0.60+	0.16	0.32	0.32	0.74+	0.36
NPL	Nepal	-0.26	0.16	-0.39	0.52	-1.17+	0.47
PAN	Panama	0.94+	0.25	0.51	0.38	1.94+	0.69
PHL	Philippines	1.24+	0.53	-0.05	0.38	2.62+	0.41
POL	Poland	0.81+	0.17	0.53	0.43	0.63	0.58
PRT	Portugal	0.75+	0.20	0.26	0.31	1.63+	0.38
QAT	Qatar	0.72	0.46	1.05+	0.40	1.07+	0.42
ROM	Romania	0.81+	0.40	0.80	0.71	0.30	0.70
SEN	Senegal	0.51+	0.20	0.03	0.51	1.93+	0.55
SGP	Singapore	0.34+	0.08	-0.09	0.38	0.73+	0.36
SWE	Sweden	0.06	0.22	-0.08	0.49	0.34	0.45
THA	Thailand	0.71+	0.21	0.13	0.36	1.30+	0.47
TTO	Trinidad and Tobago	0.61+	0.15	0.38	0.32	-0.74+	0.43
TUN	Tunisia	0.38	0.54	0.64+	0.33	-0.73+	0.34
TUR	Turkey	0.96+	0.40	0.97+	0.36	-0.48	0.46
TZA	Tanzania	0.53+	0.24	0.22	0.44	-0.03	0.61
URY	Uruguay	0.22	0.55	0.54+	0.31	-0.19	0.37
USA	USA	0.61+	0.14	0.24	0.29	0.86+	0.40
ZAF	South Africa	1.06+	0.35	0.76+	0.37	1.25+	0.63

Notes: Results from estimating equation (2) with symmetric pair fixed effects (columns (1) and (2)) and (3) with asymmetric pair fixed effects (columns (3) to (6)) using data from the Advanced Guide on Trade Policy Analysis (Yotov et al. 2016). *Estimation method*: PPML. All regressions include a dummy for common membership in a RTA, a bilateral GATT/WTO membership dummy for pairs that do not involve China, a comprehensive set of exporter-and-time, importer-and-time, pair-specific, and time-varying globalization fixed effects (all not shown). Standard errors are "three-way" clustered by exporter, importer, and year. + indicates significance at the 10 percent level.

B Data sources

B.1 World Bank Data

World Bank Data can be downloaded from https://databank.worldbank.org/home.aspx. We make use of the following series: (i) Merchandise trade (% of GDP): TG.VAL.TOTL.GD.ZS, (ii) Merchandise imports (current USD): TM.VAL.MRCH.CD.WT, (iii) Merchandise exports (current USD): TX.VAL.MRCH.CD.WT.

B.2 World Trade Flows (WTF) Bilateral Data

The WTF Bilateral Data can be downloaded from Robert Feenstra's website: https://cid.econ.ucdavis.edu/Html/WTF_bilateral.html. They contain aggregate international bilateral trade in manufacturing, mining (including oil), and agricultural goods on an annual basis for (more than) 200 countries and territories from 1987 to 2016. Values of bilateral trade in these files are in USD 1,000 (nominal, not adjusted for inflation).

B.3 An Advanced Guide to Trade Policy Analysis: The Structural Gravity Model

The corresponding datasets can be downloaded from the UNCTAD/WTO website: https://vi.unctad.org/tpa/web/zips/vol2/ch1.zip. They contain information on bilateral intra- and international trade in goods for 69 countries from 1986 to 2006 in 4-year intervals. The data is described in Yotov et al. (2016).

B.4 CEPII's Gravity Dataset

CEPII's Gravity Dataset can be downloaded from Thierry Mayer's Gravity Cookbook website at https://sites.google.com/site/hiegravity/data-sources. We use the information on GATT/WTO membership and joint membership in regional trade agreements.

C Regional trade integration of China and its trading partners

This appendix lists China's regional trade agreements (RTAs)that entered into force after its WTO accession in 2001. Moreover, it shows the RTAs of its top trading partners. RTAs may entail trade diversion effects which are accounted for in the descriptive analysis in section 3. In the estimation analysis in section 4, we control for RTAs among all countries in the sample. For a complete list of RTAs, see the WTO RTA Database (http://rtais.wto.org) and the most recent version of Mario Larch's Regional Trade Agreements Database from Egger and Larch (2008).

China. Since its WTO accession, China joined the Asia Pacific Trade Agreement (entry into force: 2002) as well as the Association of Southeast Asian Nations (ASEAN, 2005), signed RTAs with the special administrative regions Hong Kong (2003) and Macao (2003), and signed RTAs

with a number of other countries (Chile, 2006; Pakistan, 2007; New Zealand, 2008; Singapore, 2009; Peru, 2010; Costa Rica, 2011; Iceland, 2014; Switzerland, 2014; Australia, 2015; Korea, 2015; and Georgia, 2018).

Germany (EU). On top the enlargement of its single market and agreements with EU accession countries, the EU signed RTAs with Turkey (date of entry into force: 1996), Tunesia (1998), South Africa (2000), Morocco (2000), Israel (2000), Mexico (2000), Jordan (2002), Chile (2003), Lebanon (2003), Egypt (2004), Algeria (2005), the CARIFORUM States (2008), Pupua New Guinea/Fiji (2009), Korea (2011), Eastern and Southern African States (2012), Columbia and Peru (2013), Central America (2013), Ukraine (2014), Cameroon (2014), Georgia (2014), Cote d'Ivoire (2016), and Ghana (2016).

Hong Kong. Hong Kong signed RTAs with New Zealand (entry into force: 2011), Iceland, Liechtenstein, Norway, and Switzerland (members of the European Free Trade Association, EFTA, 2012), and Chile (2014).

Japan. Japan signed regional trade agreements with Singapore (2002), Mexico (2005), Malaysia (2006), Chile (2007), Thailand (2007), Indonesia (2008), Brunei Darussalam (2008), the Southeast Asian Countries (ASEAN, 2008), Philippines (2008), Switzerland (2009), Viet Nam (2009), India (2011), Peru (2012), Australia (2015), and Mongolia (2016).

Korea. Since 2002, Korea has signed regional trade agreements with China via the Asia Pacific Trade Agreement (entry into force: 2002), Chile (2004), Singapore (2006), EFTA (2006), ASEAN (2010), India (2010), EU (2011), Peru (2011), US (2012), Turkey (2013), Australia (2014), Canada (2015), China (2015). New Zealand (2015), Viet Nam (2015), and Colombia (2016).

Singapore. Singapore entered regional trade agreements with Southeast Asian countries (ASEAN, 1993), New Zealand (2001), Japan (2002), ETFA (2003), Australia (2003), US (2004), China via ASEAN (2005), India (2005), Jordan (2005), Korea (2006), New Zealand, Brunei Darussalam, and Chile (2006), Panama (2006), Japan via ASEAN (2008), China (2009), Peru (2009), Korea, Australia, New Zealand, and via ASEAN (all 2010), Costa Rica (2013), Gulf Cooperation Council (2013), and Chinese Taipei (2014).

US. The US signed regional trade agreements with Canada (entry into force: 1988) which was superseded by the agreement with Canada and Mexico (1994), Jordan (2001), Singapore (2004), Chile (2004), Australia (2005), Morocco, Central America (2006), Bahrain (2006), Oman (2009), Peru (2009), Korea, Colombia, and Panama (all 2012).

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