The Persistence of Trade Policy in China After WTO Accession

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Abstract

Import tariffs have fallen steeply worldwide over the last several decades, but has trade policy persisted through a rise in the use of other instruments? I study this question in the context of China's 2001 accession to the World Trade Organization, using panel data on Chinese export policies. I find that after its entry into WTO, the distribution of China's export restrictions across industries increasingly resembles the inverse of its pre-WTO import tariff schedule. The evidence suggests that increases in export restrictions are likely to have partly restored China's pre-WTO trade policy.

JEL codes: F13, F14, O13, O24.

Keywords: China; WTO; trade policy; tariffs; export restrictions; export taxes.

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1 Introduction

A striking stylized fact about the international economy of the last several decades is the dramatic worldwide decline in the most widely observed instrument of trade policy: the import tariff. Much of this decline has been credited to the GATT/WTO process of multilateral trade negotiations, in which governments have committed to the implementation of ever smaller tariffs. But does the demise of the import tariff signal a retreat from trade policy among governments, or has trade policy simply persisted in other forms instead?

In this paper, I consider whether participation in WTO has served as an effective constraint on trade policy in China. I first note that China has completed the reductions in import tariffs required as a condition of its 2001 WTO accession. However, my contribution is to consider another class of instruments for which comprehensive and readily quantifiable data on Chinese policies is available: export restrictions. Using this data, I find evidence that steep increases in the use of export restrictions after 2001 are likely to have partly restored China's pre-WTO trade policy.

Specifically, I gather panel data on several instruments for which, like import tariffs, product-level policy schedules are published frequently in China. Figure 1 plots the standard deviation across products of import tariffs and the export tax equivalents of two of these instruments over time. As shown in the figure, I find that compression in China's tariff schedule due to its WTO accession commitments (which set product-level maximum 'bound' rates for Chinese tariffs) has been followed by a rise in variation in export taxes across products. Moreover, I document in the empirical analysis below that these post-accession changes in China's export taxes are systematically related to its pre-WTO schedule of import tariffs.

I first show that industries with higher import tariffs before WTO accession subsequently experienced smaller increases in export taxes. This relationship is strong: the correlation between the two variables at the level of the four-digit industry is -0.5. This is a form of 'policy substitution' that is relevant in the presence of intra-industry trade; that is, for industries in which China is both an importer and an exporter.

I then document two additional relationships operating across industries, via input-output linkages. First, while the sectors with the largest pre-WTO tariffs were producers of goods relatively downstream in the value chain (a case of 'tariff escalation'), China's subsequent export tax rises have been concentrated in raw materials industries. Second, I find that downstream sectors benefiting from relatively lower input tariffs before WTO accession were then subject to larger increases in export taxes on inputs from the same industries. These findings have inter-industry implications because export taxes on raw materials can generate an input cost advantage for local downstream firms by creating a wedge between the domestic and world prices of those materials.

I summarize these findings by estimating a significant positive relationship across industries between the effective rates of protection (ERPs) implied by China's 1999 tariff schedule and the changes in these ERPs due to its post-WTO increases in export taxes. This implies that industries that were afforded a higher effective rate of protection before China's WTO accession (through higher output tariffs and/or lower input tariffs) subsequently saw a larger

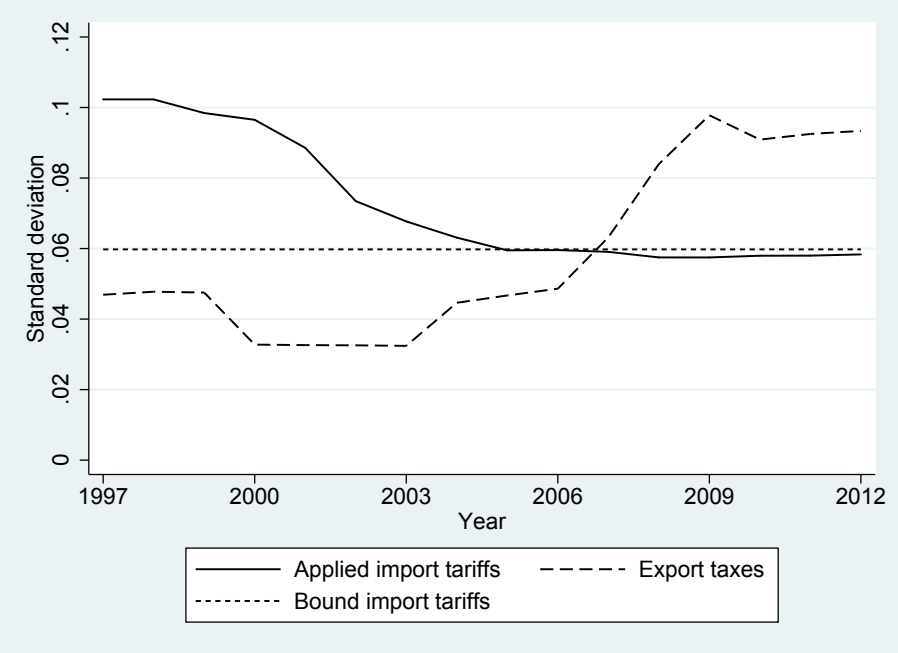

Figure 1: Standard deviation of China's applied and bound import tariffs and export tax equivalents of export VAT rebate policies and export duties across nonagricultural products, 1997 to 2012

rise in their ERPs via changes in export-side policies afterwards.

I next examine whether the recent amendments to China's export restrictions have been associated with changes in Chinese export patterns. As expected, I observe a negative relationship between export taxes and exports, along with a positive relationship between upstream export taxes and exports of downstream products. Finally, I discuss the implications of my empirical findings for the wider trade policy literature.

While this study is concerned with a single country and event, the potential for substitution between instruments of trade policy is relevant well beyond China's WTO accession. As early as 1984, Baldwin suggested in the first Handbook of International Economics that non-tariff barriers "have been used more extensively by governments to attain the protectionist goals formerly achieved with tariffs." Since then, a handful of other empirical studies have found evidence of substitution from import tariffs to other policies in developing countries including India (Bown and Tovar 2011) and Turkey (Limão and Tovar 2011), as well as in the US (Ray and Marvel 1984) and across countries (Bown and Crowley 2014).[1] However, these studies all consider substitution between import tariffs and other import-side measures (such as anti-dumping duties); the study of substitution between import-side and export-side policies in the same country is an innovation of this study.[2]

[1]See Feinberg and Reynolds (2007), Vandenbussche and Zanardi (2010) and Moore and Zanardi (2011) for other cross-country analyses. Anderson and Schmitt (2003) present a theoretical study of substitution between import-side policies.

[2]Some observers have drawn parallels between cuts in import tariffs in one country and the negotiation

In fact, although there is a long theoretical literature on symmetries between import tariffs and export taxes, beginning with Lerner's classic contribution in 1936,[3] very few papers have actually observed an empirical relationship between tariffs and export taxes.[4] This dearth of empirical papers on a long-studied theoretical topic is partly due to the fact that global data on export taxes is sparse. The assembly of detailed panel data on export restrictions in China, allowing for comparisons with trends in import tariffs, is thus a contribution to this literature.[5,6]

The remainder of the paper is laid out as follows. Section 2 provides background information on China's WTO accession, including its commitments regarding import tariffs. Section 3 introduces the export restrictions data and discusses the evolution of Chinese export restrictions over time. Section 4 analyzes the relationship between China's export restrictions and its import tariffs, while Section 5 examines whether export restrictions have actually been associated with changes in China's export patterns. I discuss the implications of my findings in Section 6, and present a brief conclusion in Section 7.

2 Background: China and WTO

After finalizing WTO accession agreements with the United States in 1999 and the European Union in 2000, China entered WTO in December 2001. China already held most-favoured-nation (MFN) status in each of its main trading partners at the time of its entry into WTO, so the schedule of import tariffs that it faced in these countries did not change after its WTO membership. However, China gained market access abroad through a decline in trade policy uncertainty: perhaps most importantly, China's MFN status in the US was subject to annual renewal before 2001, but was made permanent upon China's accession to WTO.[7]

As a WTO member, China became bound both by WTO rules and by additional specific commitments made as conditions of its accession. Like other countries joining WTO, one

of agreements requiring its *trading partners* to place quotas on exports ('voluntary export restraints', or VERs). See Yu (2000) for a theoretical discussion.

[3]For example, McKinnon (1966) provides an theoretical extension of Lerner symmetry to an economy with intermediate goods.

[4]Golub and Finger (1979) observe a cross-country relationship of this kind, noting parallels between import tariffs on downstream goods in developed countries and export taxes on raw materials in their less developed trading partners. See also Latina et al. (2011).

[5]This data is available to other researchers on my web site.

[6]In work contemporaneous to this study, Gourdon et al. (2016a) and Eisenbarth (2017) use data on some of the export restrictions studied here to investigate the motivation for these policies, but neither of these papers explores their implications for the effects of import tariffs. The dataset in this paper is also distinctive in that it includes a wider range of policy instruments and years. Chandra and Long (2013) calculate the elasticity of Chinese exports to VAT rebate rates using firm-level data on VAT payments, and Gourdon et al. (2016b) also estimate the effects on exports of China's VAT rebate policy, though neither of these papers examines the indirect effects of upstream policies on downstream exports. Solleder (2013) compiles data on export taxes from twenty countries, including two years of data on export duties in China.

[7]Pierce and Schott (2016) and Handley and Limão (2017) find that uncertainty related to the difference between US MFN tariffs and the non-MFN tariffs that would otherwise have prevailed for China has explanatory power for the evolution of US manufacturing employment after 2001.

of China's key commitments was to permanently set its import tariffs at or below levels agreed in international negotiations. For almost all products, this bound tariff rate was equal to or smaller than China's applied tariff in 1999, the year in which agreement on tariffs on industrial products was reached, and so tariff cuts were required in order to meet this condition.[8] The schedule for implementation of China's bound tariffs extended to 2010, with most tariffs to be reduced to their bound rates by 2005.

In practice, China's nonagricultural applied tariffs were indeed reduced to their bound levels after its WTO accession. As a consequence, China's mean applied tariff across nonagricultural products decreased from 16% in 1999 to 9% in 2012, as shown in Table 1 Panel A. Because negotiated tariff cuts were highly correlated to initial tariff levels (with a correlation coefficient of approximately 0.8 across nonagricultural products), these cuts led to a compression of China's tariff schedule. Panel A of Table 1 accordingly shows that the standard deviation of China's applied tariffs across products declined along with the mean.

Since its accession to WTO, a number of China's policies have been the subject of disputes addressed through the WTO's dispute settlement mechanism. During the period studied in this paper (up to 2012), China was the respondent in 19 separate cases brought by other WTO members. Two of these disputes involved its restrictions on exports: *China - Measures related to the exportation of various raw materials* (brought to the dispute settlement mechanism by the US, EU and Mexico in 2009) and *China - Measures related to the exportation of rare earths, tungsten and molybdenum* (brought by the US, EU and Japan in 2012).

In these two cases, China argued that its policies were covered by Article XX of the General Agreement on Tariffs and Trade, which allows for exceptions from GATT/WTO rules for measures "relating to the conservation of exhaustible natural resources" or "necessary to protect human, animal or plant life or health". However, both WTO panels ruled that the policies identified by the complainants were inconsistent with China's WTO accession commitments. In response to the rulings, China altered some of its export policies specific to the narrow range of products identified in the cases, starting in 2013. However, most of China's export restrictions were not targeted by these disputes and therefore remained in place.[9]

[8]Throughout the paper, I restrict the analysis to nonagricultural products (or industries), and also omit important agricultural inputs (fertilizers and pesticides); see the online appendix for details. This is because liberalization of trade in agricultural products, where nontariff barriers tend to be particularly important, often involved the replacement of nontariff barriers with tariffs during this period rather than tariff cuts (Branstetter and Lardy 2008). The inclusion of agricultural products into the analysis therefore complicates the interpretation of the relationship between export policies and import tariffs in Section 4. Including agricultural products somewhat weakens but does not otherwise change the results in the paper.

[9]The disputes targeted export duties, export licenses and export quotas on raw materials for which China's share of world production was large, so the export restrictions removed by China were likely of disproportionate importance to its trade policy regime.

Table 1: Summary statistics of Chinese trade policies

Panel A. Import tariffs			
	1999 (applied)	2012 (applied)	Bound
Import tariffs	.161	.089	.093
	(.098)	(.058)	(.060)
Panel B. Export VAT rebate policies and export duties			
	2002	2007	2012
Export tax equivalent of	.019	.057	.063
export VAT rebate policies	(.020)	(.040)	(.063)
Export duties	.002	.004	.007
	(.023)	(.026)	(.036)
Joint export tax equivalent	.021	.063	.073
	(.033)	(.063)	(.093)
Panel C. Export processing prohibitions			
	2005	2007	2012
Export processing prohibitions	.0003	.062	.158
Panel D. Other export restrictions			
	2002	2007	2012
Export licenses	.020	.039	.042
Export quotas	.019	.014	.017
State or designated trading	.008	.007	.007
Any of the above	.022	.041	.043

These summary statistics include the mean and standard deviation (in brackets) across nonagricultural products of the policies in Panels A and B and the proportion of nonagricultural products covered by the policies in Panels C and D. See the online appendix for information on data sources for all policy variables.

3 Export restrictions in China

In this section, I document the proliferation of export restrictions in China after its accession to WTO. Specifically, I consider each of the instruments identified by the WTO Trade Policy Reviews of China (WTO 2006, 2008, 2010, 2012) as 'policies affecting exports' for which product-level schedules are available.[10] The analysis below covers the period up to 2012, since after this time, China altered some of these policies in response to rulings by WTO

[10]One such instrument is export prohibitions (see the online appendix); however, there are only a small number of products whose export was entirely prohibited by China at any time during the period studied, and I simply exclude these products from the empirical analysis. Also, some policies that are classified as 'policies affecting exports' in the WTO reviews but that do not vary primarily at the product level, such as tax concessions to foreign-invested enterprises, are not considered here.

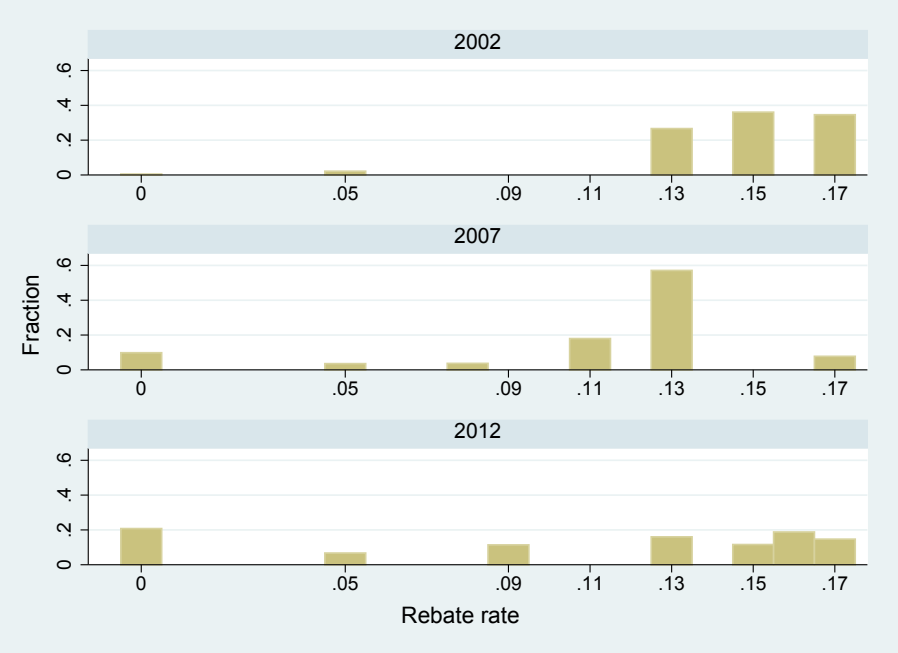

Figure 2: Distribution of China's export VAT rebates across nonagricultural products, 2002, 2007 and 2012

panels, as discussed above.[11] The key findings of this section are that variation in export restrictions across nonagricultural products rose steadily after China's WTO accession, and that changes in Chinese export policies appear to have been coordinated across more than one instrument.

I begin by discussing China's value-added tax (VAT) rebates for exporters. As noted by Feldstein and Krugman (1990), in an international system where countries charge VAT on imports (as do China and other countries with value-added taxes), the nondistortionary policy is for countries to also fully rebate VAT on exports, so that the effective VAT rates charged on domestically produced and imported goods are equalized within each country. This means that incomplete rebates of VAT constitute a tax on exports. However, in China, the official VAT rebate rates for Chinese exporters, which are set at the product level, are often lower than the rate of VAT charged (which is 17% for most nonagricultural goods).

I have therefore gathered product-level panel data on Chinese VAT rates and export VAT rebate rates. The data is taken from policy updates that are periodically disseminated to firms in electronic format from official sources and used to calculate and apply for tax rebates. The set of these updates starting from 2004 is available from the web site www.taxrefund.com.cn, and data for 2003 were found at www.cnnsr.com. To this I add product-level data for 2002 from the *2001-2002 Export Commodity Code and Tax Rebate Rate Quick Reference Handbook* (State Administration of Taxation 2002).

[11] However, because these changes left most of China's export restrictions untouched, the empirical results below change very little when the sample period is extended.

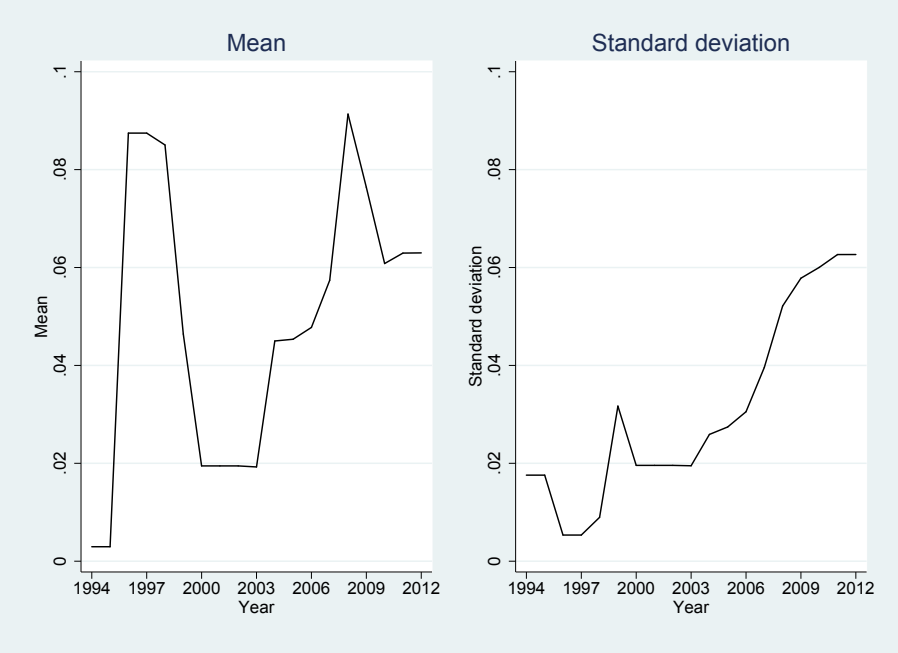

Figure 3: Mean and standard deviation of export tax equivalents of China's export VAT rebate policies across nonagricultural products, 1994 to 2012

Figure 2 plots the distribution of export VAT rebate rates for nonagricultural products in 2002, 2007 and 2012.[12] It is apparent from the figure that the dispersion of VAT rebate rates across products increased greatly over this period. Moreover, while in 2002, exporters of most products received full or near-full rebates, approximately 20% of products were subject to a zero-rebate policy by 2012.

These policy changes did not simply serve to restore a pattern of export restrictions dating from before 2002. Although I do not have product-level data on export VAT rebate policies before 2002, more aggregate summaries of pre-2002 policy changes are available from the *China Master Tax Guide* published by Deloitte Touche Tomatsu (2005). Using this information, I extrapolate the 2002 product-level data back to 1994, the year in which VAT was first placed at the center of China's taxation system. I then use the data to calculate export tax equivalents of China's export VAT rebate policies for each product and year between 1994 and 2012 (see the online appendix for details), and summarize the evolution of these export taxes in Figure 3.

As shown in the figure, there were many changes to China's export rebate policies over this period. At the time of China's taxation reform in 1994, a policy of full export VAT rebates for most nonagricultural goods was maintained. However, the widespread practice

[12]These policies are generally set at either the eight-digit or the ten-digit product level, and the Chinese product classification changes from year to year. I therefore weight each observation according to the level of aggregation at which the rebate is defined, such that each six-digit product is weighted equally according to a six-digit product classification that is consistent over time.

of claiming rebates for goods that were not actually exported resulted in excessive fiscal obligations for the central government, and official rebate rates were significantly reduced soon afterwards (Branstetter and Lardy 2008). This led to a steep rise in the average export tax equivalent of rebate policies, but because this cut in rebates applied across the board, variation in export taxes across products did not rise accordingly. Rebate rates were raised again in the late 1990s – at the time of the negative export demand shock associated with the Asian financial crisis – and China's export VAT rebate policy was then relatively stable until 2003.

However, an official notice in October 2003, less than two years after China's WTO accession, announced a significant reform of rebate rates to be effective in January 2004.[13] This was the first in a series of notices frequently amending China's export rebate rates over the following several years. Figure 3 shows that these policy changes usually increased the average export tax equivalent of VAT rebate policies, but at the time of the late-2000s global recession, instead served to support exports through decreases in mean export taxes. However, unlike the pre-2002 policy changes, the 2003 notice and subsequent reforms consistently increased the variation in export taxes across products. Table 1 Panel B shows that the standard deviation of these export taxes rose from 2.0% in 2002 to 4.0% in 2007 and 6.3% in 2012.

Because VAT rebates for exporters are bounded below at zero, the export tax equivalent of this policy instrument is bounded above at the rate of VAT (see the online appendix for details). But in addition to charging export taxes via incomplete rebates of VAT to exporters, China also directly imposes duties on some exported products. While neither export duties nor incomplete VAT rebates for exporters are prohibited under WTO rules, China's WTO accession agreement allows for export duties only on a small group of products, ruling out such duties on other goods "except under exceptional circumstances" (WTO 2001). Until 2004, China's schedule of export duties only included a subset of the goods identified in its accession agreement. However, starting in 2005, China began imposing 'temporary' export duties on some other products, and the number of products covered by these duties continued to rise thereafter.

The lists of goods subject to export duties and the corresponding rates are published by China annually together with its schedule of import tariffs in the *Customs Import and Export Tariff of the People's Republic of China*, and I have collected product-level data on export duties from this publication for the years 1997 to 2012. According to this data, export duties have affected only a narrow range of goods: the share of six-digit products with a nonzero export duty was just 0.7% as of 2002, rising to 3.3% in 2007 and 5.1% by 2012.[14] However, these duties have become increasingly coordinated with China's export VAT rebate policies over time. Before 2005, export duties were mostly imposed on goods whose exporters were eligible for nonzero rebates of VAT. But by 2012, export duties were imposed exclusively on products whose export VAT rebate rates were zero; i.e. products whose export taxes via

[13] *Caizheng bu, guojia shuiwu zongju caishui* (2003) no. 222.

[14] More precisely, this is the share of six-digit products within which at least one eight-digit product had a nonzero export duty in these years.

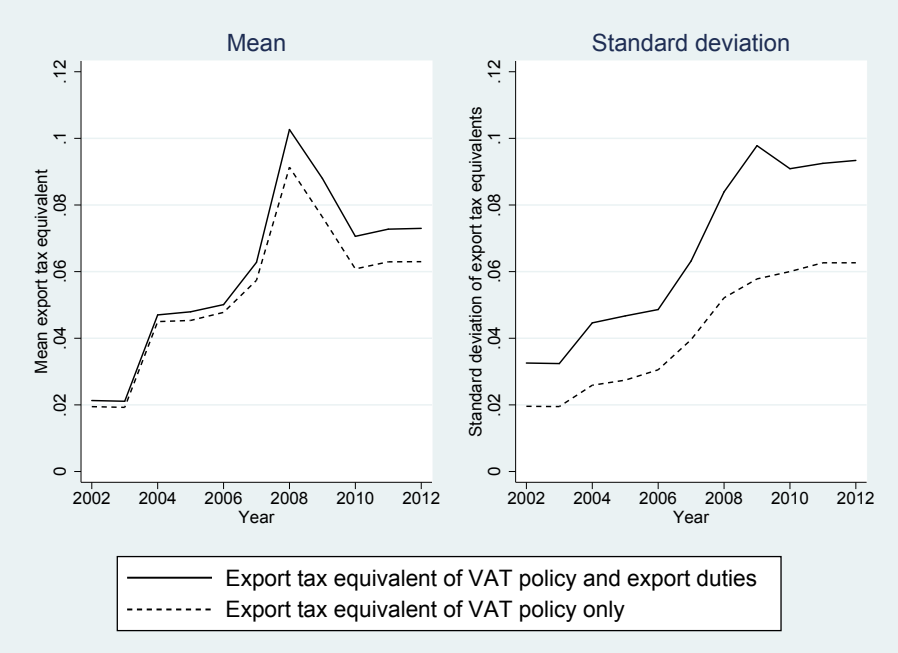

Figure 4: Mean and standard deviation of export tax equivalents of China's export VAT rebate policies and export duties across nonagricultural products, 2002 to 2012

VAT rebate policy were at their maximum possible level.

Thus, although they have been quite sparingly applied, Figure 4 shows that rising export duties have made an important additional contribution to the increasing variation in export taxes across products since China's WTO accession. The figure compares export taxes resulting from export VAT rebate policies to the joint export tax equivalent of both export duties and export VAT rebate policies (see the online appendix for details), for the years 2002 to 2012. Inclusive of both instruments, the standard deviation across nonagricultural goods of China's export taxes rose from 3.3% to 9.3% between these two years, as shown in Table 1 Panel B. The major role played by export duties in this rise occurred despite the fact that these duties had a much smaller effect on mean export taxes across products during this period.

These two policy instruments cover only products exported from China under the system of 'ordinary trade'. However, during the period studied, approximately half of Chinese exports by value left the country via 'processing trade', a system by which inputs from abroad may be imported duty-free, processed and then re-exported, again duty-free. I have thus also collected information on product-level changes in China's processing trade policy regime. Specifically, I observe a series of ad hoc official notices updating the list of products prohibited from export via processing trade, beginning with a notice in 2004.[15] As can be seen in Panel C of Table 1, the share of nonagricultural products affected by processing trade

[15] *Shangwu bu, haiguan zongshu, guojia huanjing baohu zongju gonggao* (2004) no. 55.

Table 2: Industries with highest and lowest average export taxes in 2012

Panel A. Industries with highest average export taxes	
Industry (four-digit)	2012 export tax
Rare earth metal smelting	.511
Steelmaking	.429
Mining and dressing of lead and zinc ore	.420
Mining and dressing of other ferrous metal ores	.381
Mining and dressing of nickel and cobalt ore	.381
Panel B. Industries with zero average export taxes	
Industry (two-digit)	Share of four-digit industries
Universal equipment manufacturing	10 of 28
Manufacture of special equipment	8 of 42
Manufacture of transportation equipment	6 of 24
Manufacture of electrical machinery and equipment	19 of 27
Manufacture of telecommunications equipment, computers and other electrical equipment	17 of 17
Manufacture of instruments and appliances, culture-related and office machinery	4 of 23

Panel A shows the five four-digit industries with the highest average export tax (defined as the export tax equivalent of VAT rebate policies and export duties) as of 2012. Panel B identifies the 64 four-digit industries in which no product faced a positive export tax in 2012, by two-digit industry. 'Share of four-digit industries' represents the number of four-digit industries in which all products faced zero export taxes, as a share of the total number of four-digit industries within that two-digit industry.

prohibitions rose from less than 0.1% in 2005 to 6.2% in 2007 and 15.8% in 2012.[16]

Finally, I source data on the set of products requiring export licenses or subject to export quotas, and goods which may only be exported by designated (usually state-owned) firms, from the annual official notices relating to these measures for 2002 to 2012.[17] These policies were to be phased out for some products as conditions of WTO accession, and indeed, the share of six-digit products subject to at least one of these restrictions fell slightly from 2.2% in 2002 to 2.1% in 2005. However, this share then increased to 4.1% by 2007 and remained at approximately this level thereafter. As shown in Panel D of Table 1, this was mostly due to a rise in the share of products requiring export licenses.

For the remainder of the paper, my primary measure of China's export restrictions will be the export tax equivalent of its VAT rebate policies and export duties, since this is both easily quantifiable and straightforward to interpret. I will also estimate several specifications including the other policies introduced above, but the results of these will be displayed in the

[16]Specifically, this is the proportion of six-digit products within which at least one ten-digit product was prohibited from export via processing trade in these years.

[17]I gather data only for unilateral policy measures; export quotas related to the multilateral Multifiber Arrangement are thus not included here. See the online appendix for details.

online appendix and reported in footnotes. In practice, changes in these various instruments appear to have been coordinated; as shown in Figure A1 in the online appendix, products in the top 25% of post-accession export tax rises are also much more likely to be newly covered by an export processing prohibition or another export restriction during the sample period.[18]

Table 2 provides information on the sectoral distribution of China's export taxes as of the end of the sample period. The table suggests that the five four-digit industries with the highest average export taxes in 2012 were all producers of industrial raw materials. Meanwhile, there were 64 four-digit industries in which no product faced a positive export tax in 2012, and these were all sectors producing downstream goods such as machinery, equipment and electronics. I will investigate this apparent relationship between Chinese export policy and the value chain in more depth below.

4 Export restrictions and pre-WTO tariffs

In this section, I consider the extent to which the changes in China's export policies documented above can be interpreted as a continuation of its pre-WTO trade policy. To do so, I examine whether increases in China's export taxes after WTO accession are related to its pre-WTO pattern of import restrictions across industries, as defined by its schedule of import tariffs in 1999. I use China's 1999 tariffs because this was the final tariff schedule released by China before agreement was reached on the nonagricultural tariff cuts required for its WTO accession. I conduct the analysis mainly at the level of the four-digit industry according to the Chinese industrial classification, clustering standard errors by two-digit industry. I find that China's post-accession export policy changes are strongly related to its pre-WTO tariffs, and that much of this relationship is due to how the two instruments vary by stage of production.[19]

First, I summarize how the relationship between China's export taxes and 1999 tariffs has evolved over time in Figure 5, by plotting the estimated coefficients $\hat{\beta}^t$ from a series of simple regression specifications:

$$exporttax_i^t = \alpha^t + \beta^t tariff_i^{1999} + \epsilon_i^t \tag{1}$$

I run the regression in equation (1) for each year t between 1997 and 2012. The figure shows that as the variation across industries in export taxes gradually rose after China's WTO accession (see Figure 4), it also increasingly reflected the across-industry variation in China's pre-accession import tariffs.

[18]Specifically, Figure A1 displays the result of the following exercise: I calculate the increase in the export tax between 2002 and 2012 for each six-digit product, separate products into groups according to the size of this export tax increase (the top 5%, the next 20% and the bottom 75%), and then chart the evolution of the share of each group of products that are covered by an export processing prohibition or another export restriction (license requirement, quota or state trading) over time.

[19]The findings presented below are robust to using other base years for Chinese tariffs. They are also robust to considering the difference between China's bound tariffs and its 1999 applied tariffs rather than 1999 tariff levels. In other words, there is also a strong relationship between post-accession changes in export taxes and the tariff cuts required by China's accession agreement. These results are available upon request.

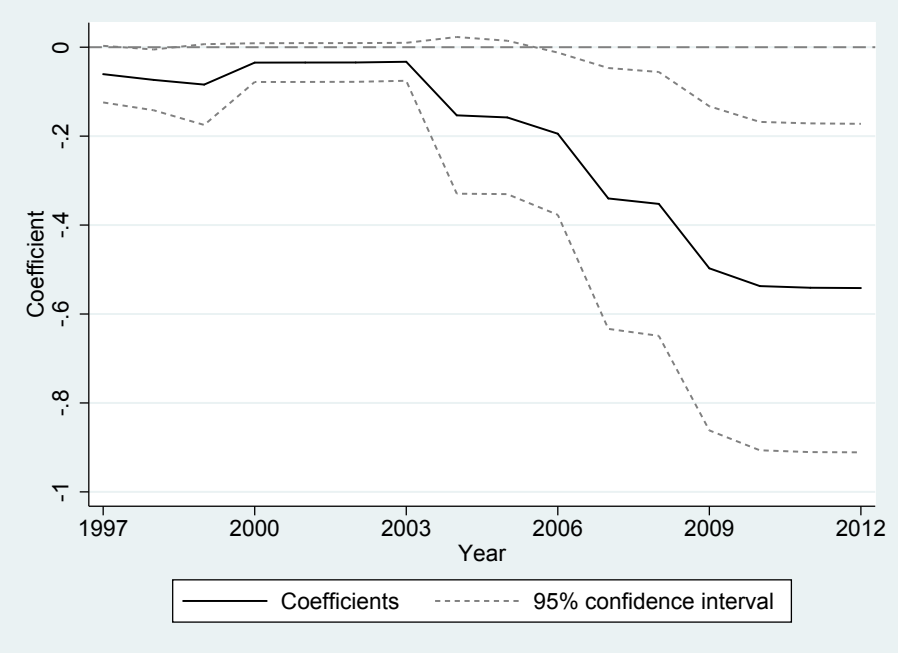

Figure 5: Coefficients of annual industry-level regressions of export tax equivalents of China's export VAT rebate policies and export duties on 1999 applied tariffs, 1997 to 2012

Column (1) of Table 3 displays the results of a simple regression of $\Delta exporttax_i \equiv exporttax_i^{2012} - exporttax_i^{2002}$ on $tariff_i^{1999}$. This shows that across four-digit industries, a one percentage point larger 1999 tariff is associated with a one-half percentage point smaller rise in export taxes from 2002 to 2012. In other words, industries for which imports were more restricted in 1999 (as measured by 1999 tariffs) were, on average, subject to smaller increases in taxes on exports after WTO accession. This estimate is statistically significant at the 1% level, using p-values derived from wild bootstraps as in Cameron et al. (2008) due to the small number of clusters. The correlation between the two variables is -0.5.[20]

It is important to note that these initial findings are relevant in practice only if import tariffs and export taxes both have implications for the actual trade patterns of a given industry. This would be the case in the presence of intra-industry trade; i.e. if China both imports and exports products within a given industry. If China instead exclusively imports goods in some industries and exports in others, then a relatively high import tariff and a relatively low export tax cannot directly affect the same industry. Before moving on to consider indirect effects via input-output relationships between industries, I estimate three

[20]In Table A1 in the online appendix, I report the results of separate regressions of each of the export policy instruments discussed in the previous section on 1999 tariffs. I find that increases in the export tax equivalent of China's VAT rebate policies, its export duties and the share of products covered by export processing prohibitions are all negatively related to China's pre-WTO import tariffs. However, there is no statistically significant relationship at the industry level between post-accession changes in other export restrictions (licenses, quotas and state trading) and 1999 tariffs.

Table 3: Changes in export taxes and pre-WTO import tariffs

Dependent variable:	Δ Export tax				
	(1)	(2)	(3)	(4)	(5)
Unit of observation:	4-digit industry	2-digit industry	4-digit industry	6-digit product	4-digit industry
Tariff 1999	-.51	-1.04	-.44	-.33	-.48
	(.17)	(.17)	(.16)	(.08)	(.17)
	[.004]	[.002]	[.014]	[.000]	[.01]
Import NTB					-.04
					(.02)
					[.11]
Observations	402	35	211	1,118	402
Clusters	35	35	29	70	35
R^2	.25	.65	.18	.18	.26

Columns (1) to (4) display the results of regressions of changes in the joint export tax equivalent of China's export VAT rebate policies and its export duties between 2002 and 2012 on China's 1999 applied tariffs. Column (5) adds the share of products for which China's WTO accession agreement specifies that non-tariff barriers to imports were to be removed as an independent variable. See the text for details of changes in the construction of the variables and the sample in columns (3) and (4). The unit of observation is a four-digit industry in columns (1), (3) and (5), a two-digit industry in column (2) and a six-digit product in column (4). All regressions are estimated using ordinary least squares. Robust standard errors (in round brackets) are clustered at the two-digit industry level in columns (1), (2), (3) and (5), and at the two-digit product level in column (4). p-values are in square brackets; these are derived from wild bootstraps as in Cameron et al. (2008) in columns (1), (2), (3) and (5) because of the small number of clusters.

additional simple specifications motivated by this observation. First, I aggregate to the level of the two-digit industry, at which intra-industry trade is more relevant, and consider the relationship between 1999 import tariffs and post-accession rises in export taxes at this level. Column (2) of Table 3 shows that at the two-digit level, the relationship between 1999 tariffs and changes in export taxes remains negative and significant, and is now approximately one-to-one.

I next return to the four-digit industry level, but change how the two policy variables are defined. For the regressions above, I have calculated industry-level tax and tariff rates by taking a simple average across all products in each industry. For each industry, I now instead average import tariffs across products of which China was a net importer in 1999, and average export taxes across products of which China was a net exporter in 1999. This means that different sets of products within each industry are used for the calculation of each of the two policy variables. Industries for which China was a net exporter or net importer of all products in 1999 are therefore dropped from the analysis. This exercise nonetheless still includes 211 industries, and yields similar results to the baseline regression, as shown in column (3) of Table 3.

Finally, I run a regression at the product level, including only products of which China was both an importer and an exporter in 1999. Specifically, the sample consists of the 1,118 products for which the share of Chinese exports in the total value of Chinese imports and exports was between 25% and 75% in 1999. Column (4) of Table 3 suggests that the relationship of interest is qualitatively unchanged by this strategy.

A related issue is that goods subject to high post-accession export taxes might be traded much less intensively than the goods on which pre-WTO tariffs were imposed. I therefore examine whether China's 2012 export taxes and 1999 import tariffs were incident on trade flows of similar size. To do this, I multiply China's 2012 exports and imports (by value) by 2012 export taxes and 1999 tariffs respectively, and find that estimated 2012 export tax revenue is 34% of what tariff revenue would have been if 1999 tariffs applied to 2012 trade flows.[21] Since export taxes likely have a negative effect on export volumes (a hypothesis I investigate in Section 5), I also repeat the same exercise using trade flows from 1999 instead of 2012, and find that the counterfactual export tax revenue is 40% of estimated 1999 import tariff revenue. Finally, I note that the simple average across six-digit nonagricultural products of China's 2012 export taxes (7.3%) is 44% of the simple average of its 1999 import tariffs (16.1%). This back-of-the-envelope exercise therefore suggests that post-accession export taxes apply to trade flows of comparable size to those on which pre-WTO import tariffs, if restored in 2012, would be incident.[22]

The regressions above have focused only on import tariffs rather than non-tariff barriers to imports, but China's pre-WTO import policy regime included both types of instruments. While I do not observe all of China's pre-WTO non-tariff import restrictions, China's WTO accession agreement included a list of products for which non-tariff barriers to imports were to be removed. Treating this list as a proxy for the full set of 1999 non-tariff import restrictions, I add the share of products included in this list in each industry to the baseline regression as a second right-hand-side variable. The results, in column (5) of Table 3, suggest that both 1999 import tariffs and 1999 non-tariff barriers are independently related to subsequent changes in Chinese export taxes, although the p-value for the latter result is slightly above 0.1.

So far, I have shown that changes in China's export policies after its WTO accession are systematically related to its pre-accession import policies at the level of the industry. I next progress from the simple analysis above by exploring the interaction of these policies with input-output relationships between industries. Across countries and time, the most prominent relationship between trade policy and the value chain is the widespread phenomenon of 'tariff escalation', in which tariffs on downstream goods are systematically higher than those on upstream products.[23] I find that variation in trade policy by stage of production is also highly relevant to the context studied here.

[21] I first deduct export taxes due to VAT policy from reported Chinese exports by value, so as to avoid double-counting.

[22] Note that this calculation does not take account of the fact that these policies are generally inapplicable to goods imported or exported via processing trade.

[23] See Balassa (1965) and Cadot et al. (2004) for empirical evidence on tariff escalation covering two different time periods.

Table 4 displays the results of regressions of 1999 tariffs and changes in export taxes from 2002 to 2012 on indicators for whether a four-digit industry is a producer of primary raw materials, semiprocessed raw materials, or capital goods; the omitted category is industries producing consumer goods.[24] Column (1) shows that on average, China's 1999 applied tariffs were 8 percentage points lower for semiprocessed raw materials industries and 19 percentage points lower for primary industries as compared to tariffs for industries producing products for final consumption. Export tax rises, on the other hand, have varied in the opposite way with the value chain: these are 7 points higher for the semiprocessed stage and 22 points higher for the primary stage on average relative to industries producing consumer goods. Moreover, approximately one-third of variation in 1999 tariffs and one-half of variation in export tax rises, as measured by R^2, is explained via this simple model of the value chain. It should be noted that the inverse relationship between the two policies is not present for capital goods industries; although these industries had smaller pre-WTO import tariffs than those of sectors producing consumer goods, export taxes on capital-producing and other final goods industries both remained relatively low after 2002.

These results suggest that much of the strong industry-level relationship between export tax rises and 1999 tariffs is due to their incidence by stage of production. However, there is also variation in Chinese export tax increases across industries within stages of production. Most of this variation is between upstream industries: while the average rise in export taxes from 2002 to 2012 for downstream industries was 1.5% with a standard deviation of 2.7%, the corresponding mean and standard deviation across raw materials industries was 12.0% and 11.1% respectively. In order to examine how this variation relates to China's pre-WTO tariff schedule, I estimate the following augmented version of the baseline regression specification, including 1999 tariffs, a dummy for industries producing primary or semiprocessed raw materials, and an interaction term:

$$\Delta exporttax_i = \alpha + \beta tariff_i^{1999} + \gamma rawmaterials_i + \theta(tariff_i^{1999} * rawmaterials_i) + \epsilon_i \quad (2)$$

The results of this regression, in column (1) of Table 5, further demonstrate the relative simplicity of China's post-WTO export policy. In particular, 62% of the variation across industries in export tax increases is explained by two factors: the asymmetric incidence of export tax rises across stages of production, and a nearly one-to-one relationship between initial tariffs and subsequent changes in export taxes across raw materials industries.[25] Meanwhile, the much more limited variation in export policy changes across downstream industries is unrelated to those industries' pre-WTO tariffs.

Although downstream industries do not themselves appear to have experienced large changes in export taxes, they have presumably been differentially affected by the widely varying changes in export taxes on different raw materials. To better understand this

[24] I classify industries into these categories using the United Nations Broad Economic Categories (BEC) product classification; see the online appendix for details.

[25] This is not simply because of variation across primary and semiprocessed raw materials; when I instead include regressors and interaction terms for each of these in equation (2), the estimated coefficients are negative and statistically significant for both interaction terms (results available upon request).

Table 4: Changes in export taxes and pre-WTO import tariffs by stage of production

	(1)	(2)
Dependent variable:	Tariff 1999	Δ Export tax
Primary	-.19	.22
raw materials	(.02)	(.03)
	[.002]	[.000]
Semiprocessed	-.08	.07
raw materials	(.02)	(.02)
	[.004]	[.000]
Capital goods	-.08	-.01
industry	(.01)	(.01)
	[.002]	[.43]
Observations	402	402
Clusters	35	35
R^2	.31	.52

The dependent variable in column (1) is China's 1999 applied tariffs, and in column (2) it is the difference between 2012 and 2002 export taxes. Both regressions include dummies for primary raw materials industries, semiprocessed raw materials industries and capital goods industries. The omitted category is other downstream industries. The unit of observation is a four-digit industry. Both regressions are estimated using ordinary least squares. Robust standard errors (in round brackets) are clustered at the two-digit industry level. p-values are in square brackets; these are derived from wild bootstraps (as in Cameron et al. 2008) because of the small number of clusters.

upstream-downstream relationship, I construct variables relating the trade policies of raw materials and downstream industries, using China's 2002 input-output table. Unfortunately, the sectors in this input-output table sometimes include more than one stage of production (e.g. paper pulp, paper and paper products) and often aggregate a wide range of four-digit industries (e.g. 'Mining of non-ferrous metal ores'). To link raw materials and downstream industries together at the four-digit level, I assume that the relative importance of each four-digit industry in each input-output sector is equal to its share in the total value added of that sector, as observed in China's 2003 survey of industrial production.[26] I use this simple assumption to construct an input-output table at the level of the four-digit industry. For each downstream industry and year, I then take a weighted average of tariffs and export taxes of raw materials industries, setting the weights according to the downstream sector's

[26]This data, collected by China's National Bureau of Statistics, includes all non-state industrial firms with sales above five million Renminbi and all state-owned industrial firms. I use the 2003 survey because this is the first year of data using the Chinese industrial classification employed in the rest of this paper.

Table 5: Changes in export taxes and pre-WTO import tariffs within and across stages of production

Dependent variable:	Δ Export tax	Δ Upstream export tax	Δ ERP via taxes
	(1)	(2)	(3)
Unit of observation:	4-digit industry	4-digit industry	I/O sector
Tariff 1999	-.001	.001	
	(.02)	(.03)	
	[.99]	[.95]	
Raw materials industry	.22		
	(.03)		
	[.000]		
Tariff 1999 * raw materials	-.91		
	(.18)		
	[.002]		
Upstream tariff 1999		-1.04	
		(.13)	
		[.002]	
ERP via tariffs 1999			.50
			(.15)
			[.001]
Observations	402	224	71
Clusters	35	21	71
R^2	.62	.81	.22

Column (1) displays the results of a regression of changes in the joint export tax equivalent of China's export VAT rebate policies and its export duties between 2002 and 2012 on China's 1999 applied tariffs, a dummy for raw materials industries and its interaction with 1999 tariffs. Column (2) limits the sample to downstream industries, and shows the results of a regression of the change in upstream export tax equivalents on 1999 tariffs and upstream 1999 tariffs. Column (3) shows the results of a regression of the difference in effective rates of protection (ERP) between the 2002 and 2012 schedules of Chinese export taxes on the ERPs due to China's 1999 tariff schedule. The unit of observation is a four-digit industry in columns (1) and (2) and an input-output sector in column (3). All regressions are estimated using ordinary least squares. Robust standard errors (in round brackets) are clustered at the two-digit industry level in columns (1) and (2) and at the input-output sector level in column (3). p-values are in square brackets; these are derived from wild bootstraps as in Cameron et al. (2008) in columns (1) and (2) because of the small number of clusters.

relative usage of inputs from each of these. Details of the construction of these variables are available in the online appendix.

The procedure above allows me to regress, for the subsample of downstream industries, changes in upstream taxes between 2002 and 2012 on both upstream and downstream tariffs in 1999. Column (2) of Table 5 shows that downstream industries whose raw materials inputs had lower input tariffs in 1999 experienced larger export tax rises for inputs from the same industries. As already suggested by the results of column (1), this relationship is approximately one-to-one. However, controlling for this relationship, I find no additional increase in upstream export taxes for downstream industries with higher pre-WTO tariffs.

The findings in Tables 4 and 5 have greater empirical relevance if export restrictions have been imposed on raw materials of which China is a relatively important world producer. This is because for an exporter of raw materials, an export tax can generate a wedge between domestic and world prices of those materials, lending an input cost advantage to local downstream firms. This effect will be more important in practice if the country's exports make up a relatively larger share of world trade. Using international trade data for 2012 from UN COMTRADE, I therefore calculate the share of Chinese exports in the total value of world trade for each product. I find that among the six-digit nonagricultural products for which China's 2012 export taxes are greater than or equal to 10% (which encompasses approximately 25% of these goods), Chinese exports constitute more than 10% of world trade for one third. Among raw materials products above the 10% export tax threshold, China's exports exceed 10% of total world trade in 31% of cases. Indeed, according to the British Geological Survey (2010), China was the world's leading producer in at least 37 categories of minerals and metals as of 2008, in 12 of which it produced more than half of total world output. China is thus a large player in world trade for a wide variety of the products on which it has placed high export taxes, despite the likely negative impact of these taxes on export volumes (which is examined in Section 5). Of course, this finding suggests a potential link between China's export restrictions and terms-of-trade considerations; I will consider this in Section 6.

Finally, I jointly summarize both the within-industry and across-industry relationships between export tax increases and 1999 tariffs, using the effective rate of protection (ERP) as defined by Corden (1966). This is a simple measure of the protection resulting from trade policies incident on both an industry itself and its inputs. I use China's 2002 input-output table to calculate the ERPs resulting from China's 1999 tariff schedule, as well as the changes in ERPs due to changes in export taxes between 2002 and 2012.[27] Column (3) of Table 5 shows that when the latter variable is regressed on the former at the input-output sector level, a statistically significant relationship is again observed. In particular, if the ERP due to import tariffs was one percentage point higher for an input-output sector in 1999, then it experienced a larger rise in the ERP via export taxes of one-half percentage point from 2002 to 2012. Note, however, that while this estimate neatly encapsulates the full relationship between the two policies in principle, it should be treated with some caution in practice; as noted above, the sectors in China's input-output table are quite broadly defined.

[27]See the online appendix for details of my calculations of ERPs.

5 Export restrictions and exports

In practice, the argument that China's export restrictions have partly restored its pre-WTO trade policy also relies on two additional assumptions that have not yet been discussed. The first is that export restrictions imposed by the Chinese government have actually influenced economic outcomes. The second is that other changes in China's trade policy during this period – which I do not observe – have not offset the effects of the export policies discussed above. If both of these assumptions hold, we should observe that trends in Chinese exports after WTO accession track the evolution of its export restrictions. In particular, we should expect a negative relationship between export taxes on a product and exports of that product, but a positive relationship between upstream export taxes and exports of downstream products. In this section, I examine the evidence for these hypotheses, and also check whether industries subject to larger export restrictions sell a greater share of their output on the domestic market. As shown below, I find that all of these correlations are present in the data.

I first use panel trade data by six-digit product p (in section s of the Harmonized System product classification) and year t to estimate the following specification:

$$\ln exports_{pst} = \alpha + \beta exporttax_{pst} + \beta^U exporttax_{pst}^{upstream} + \theta_p + \phi_{st} + X'_{pst}\eta + \epsilon_{pst} \qquad (3)$$

The sample covers 2002 to 2012, the period over which my data on export restrictions is observed at the product level. As above, an export tax is defined as the joint export tax equivalent of China's export VAT rebate policies and its export duties. All regressions include product and section-year fixed effects. This means that the results are based on a comparison of product-level trends in exports within each of the sections of the HS product classification, such as chemicals ('Products of the Chemical and Allied Industries') or metals ('Base Metals and Articles of Base Metal').[28] All specifications also include a set of additional variables X_{pst}, including import tariffs, upstream import tariffs and the logarithm of the value of world trade by product and year. The hypotheses of interest are that $\beta < 0$ and $\beta^U > 0$, though I will conservatively present p-values based on two-sided tests.[29]

A key challenge in the estimation of this specification is to define input-output relationships between products. I use two different measures of upstream taxes and tariffs. I first calculate these based on information on sector-level input usage from China's 2002 input-output table. However, because the products in the sample span only 69 broadly defined input-output sectors, this information is quite coarse, as discussed in the previous section.

[28] As before, agricultural products and agricultural inputs are excluded from the sample. Also, because the end of the Multifiber Arrangement presumably had a significant impact on textiles and apparel exports during this period, I additionally drop all products in section 11 of the HS product classification (which covers textiles and apparel). After these adjustments, twelve HS sections (out of a total of 21) are represented in the sample.

[29] Note also that because the left-hand-side variable is the logarithm of export value, observations with zero trade flows are dropped, and so the coefficients should be interpreted as pertaining to the intensive margin of trade. Since Chinese exports are equal to zero in fewer than 3% of the product-year observations in the sample, this is a reasonable specification here. Trade flow data is from UN COMTRADE (see the online appendix for details).

Table 6: Export taxes and exports

Upstream definition:	Input-output table			HS product descriptions		
Dependent variable:	ln(value)	ln(value)	ln(qty)	ln(value)	ln(value)	ln(qty)
Sample:	Baseline	HS descr	Baseline	Baseline	Excl iron	Baseline
	(1)	(2)	(3)	(4)	(5)	(6)
Export tax	-5.10	-7.51	-5.58	-7.46	-5.57	-8.30
	(1.11)	(1.70)	(1.23)	(1.03)	(1.29)	(.98)
	[.000]	[.000]	[.000]	[.000]	[.000]	[.000]
Upstream tax	6.99	6.55	6.88	.59	.66	.58
	(1.39)	(1.42)	(1.72)	(.29)	(.26)	(.35)
	[.000]	[.000]	[.000]	[.046]	[.02]	[.10]
Product FEs	YES	YES	YES	YES	YES	YES
Section-year FEs	YES	YES	YES	YES	YES	YES
Observations	31,470	6,371	29,408	6,371	3,707	6,325
Clusters	69	38	68	42	41	42
R^2	.45	.42	.29	.41	.32	.28

This table displays the results of panel regressions of log export value (or log export quantity in columns (3) and (6)) on export taxes, upstream export taxes, import tariffs, upstream import tariffs, log value of world exports (or log quantity of world exports in columns (3) and (6)) and product and HS section-year fixed effects. Upstream policies are calculated using China's 2002 input-output table in columns (1) to (3) and HS product descriptions in columns (4) to (6). See the text for details of changes in the sample in columns (2) and (5). The unit of observation is a six-digit product-year. All regressions are estimated using ordinary least squares. Robust standard errors (in round brackets) are clustered at the input-output sector level in columns (1) to (3) and at the level of the primary raw material in columns (4) to (6). p-values are in square brackets.

I thus also define input-output linkages between goods using a different source that provides me with product-level information: information on materials usage embodied in the Harmonized System product classification. In particular, I identify all nonagricultural primary raw materials in the HS classification (such as 'copper ores and concentrates'), and then find all other (nonprimary) HS products for which at least one of these raw materials is mentioned in the product description (such as 'copper springs'). For this, I use both the English-language descriptions of six-digit products and Chinese-language descriptions of products at the more detailed eight-digit level to identify six-digit goods containing these materials; further details may be found in the online appendix.

This results in a total of 42 raw materials for which both primary and nonprimary products can be found. The sample consists of the nonprimary products, for each of which I define the upstream export tax (or import tariff) as the export tax (or import tariff) on the primary raw material with which the good is associated. For the regressions below, I keep only nonprimary products linked to exactly one material, so that I can cluster all standard errors by primary raw material. This leaves a total of 588 products in the sample, mostly semiprocessed raw materials.

I present the results of estimating specification (3) in columns (1) and (4) of Table 6. In

column (1), I use the input-output table to calculate upstream taxes and tariffs, while in column (4) I use HS product descriptions. The estimated coefficients on export taxes are negative, statistically significant and of a similar magnitude in both cases. The estimated coefficient in column (1) indicates that a rise in export taxes of one percentage point is associated with a 5.10 percentage point decline in the value of Chinese exports, while the analogous estimate in column (4) is -7.46.[30]

The estimated coefficients on upstream export taxes in columns (1) and (4) are also both of the predicted sign, although they differ greatly in magnitude. Using data from China's 2002 input-output table, a one percentage point increase in upstream export taxes is associated with a rise in exports of 6.99 percentage points, and this estimate is statistically significant at the 1% level. Meanwhile, using data from HS descriptions, the estimated magnitude of the relationship is much smaller (0.59) but remains significant at the 5% level.[31]

The difference between the two estimates is not due to the narrower sample used in column (4). When the regression in column (1) is re-estimated with the sample from column (4), the estimated coefficient on upstream export taxes is similar to the estimate in column (1); see column (2) of Table 6. Instead, it is simply the case that the two sets of variables reflect different measures of upstream policy. While the HS descriptions variable is based only on primary raw materials, for which rises in China's export taxes have been particularly high, the input-output measure is diminished by the inclusion of other intermediate inputs subject to much lower export taxes. It is thus unsurprising that the estimated effect of upstream export taxes in column (1) is larger in magnitude.

One issue with the data based on HS product descriptions is that a large proportion (41%) of products in the sample are linked to a single primary raw material, iron ore. This is due to the detailed subdivision of iron and steel products in the HS classification. In column (5), I thus rerun specification (3), but dropping all products of this raw material. This does not substantially change the coefficient estimates or standard errors.

Since export taxes are likely to directly affect the prices of both exports and downstream exports, in columns (3) and (6) I run the baseline specification using log export quantity instead of log export value. This makes little difference to the estimated coefficients of interest. I also perform two additional robustness checks, the results of which may be found in Table A2 in the online appendix. First, while it is important to account for trends in world demand that are unrelated to China, the control for world export value is potentially endogenous because Chinese exports often form a substantial share of total world trade. I thus estimate a specification without this control, in which I instead use China's log share of world trade as the left-hand-side variable. Second, I address the possibility that export trends are driven by changes in trade policy uncertainty in the US, which also vary by

[30]These estimates are in line with the large estimated effects of incomplete export VAT rebates on exports found in two other studies, Chandra and Long (2013) and Gourdon et al. (2016b). Neither of these studies looks at indirect effects via upstream policies.

[31]The estimated relationship between upstream import tariffs and exports (not shown in the table but available upon request) is negative as expected in both columns (1) and (4), although very imprecisely estimated, and the estimate in column (4) is again of much smaller magnitude.

product and which Feng et al. (2017) have found have predictive power for Chinese exports, by excluding Chinese exports to the US from the dependent variable. Both strategies yield very similar results to those in columns (1) and (4) of Table 6.[32]

Finally, I examine whether industries subject to larger rises in export restrictions have experienced steeper falls in the share of exports in total sales. To do this, I draw upon industry-level tabulations of China's annual firm-level survey of industrial production, which I have for the years 2002 to 2007.[33] I use reported sales by value and export value (both in current Renminbi) from the survey data to calculate the proportion of exports to foreign markets in firms' sales in each industry and year. I then run a panel regression of the export share of sales on export taxes, controlling for import tariffs as well as year and industry fixed effects. I find that during this period, the estimated impact of a one percentage point increase in export taxes is to decrease the share of exports in total sales by 0.27 percentage points; this result is statistically significant at the 10% level (see Table A3 in the online appendix). The estimated coefficient remains of similar magnitude and statistical significance when the sample is restricted to raw materials industries.[34]

These results provide suggestive evidence that China's export restrictions have had actual effects on exports, and that these have not been offset by other policies, and therefore strengthen the conclusions of Section 4. However, I characterize this evidence as suggestive because changes in other Chinese trade policies during the post-accession period might also have contributed to relative growth in exports for the same products. I will discuss some possible policies of this kind at the end of the next section.

6 Discussion

In this section, I attempt to interpret the findings of the paper and to explore their consequences for the trade policy literature. I first note that the dataset used here provides a new source of variation with which to investigate the motivation for trade policy, which is normally explored using data on import tariffs. I therefore provide a preliminary assessment of the relative importance of terms-of-trade and political economy considerations in shaping China's export tax schedule. Next, I consider the implications of China's apparent partial continuation of its pre-WTO trade policy through export taxes. Finally, I discuss possible

[32] In Table A2, I also display the results of an additional regression in which I add indicator variables for other export-side policies – prohibition of exports via processing trade, and the incidence of either an export license requirement, export quota or state trading requirement – to the right-hand side. The coefficients on the export tax variables are not substantially affected by this new specification, while the estimated coefficient on export processing prohibitions is negative and statistically significant as expected. However, the incidence of other export policies is positively associated with exports, suggesting that the imposition of these policies may be endogenous to expected export growth.

[33] As before, I omit textiles and apparel industries from the sample. See the online appendix for details.

[34] When I add other export restrictions to the baseline specification (see Table A3), I find that a higher share of products prohibited from export via processing trade is associated with a lower share of exports in total sales, while the coefficient estimate for other export restrictions is insignificantly different from zero. The estimated coefficient on export taxes remains similar, but is now less precisely estimated.

explanations of the observation that Chinese export restrictions have been mainly incident on raw materials rather than downstream goods.

A substantial body of work has attempted to understand observed trade policies worldwide via terms-of-trade considerations (e.g. Broda, Limão and Weinstein 2008) or political economy preferences (e.g. Grossman and Helpman 1994, Goldberg and Maggi 1999). Another highly influential literature has explored the principles of international trade negotiations using a framework based on the terms of trade (e.g. Bagwell and Staiger 1999), with an alternative perspective emphasizing the potential importance of production relocation motives (Ossa 2011). The empirical evidence in both of these literatures is underpinned by the observed variation in import tariffs rather than export taxes, and so the data collected for this paper may lend new insights on the relative importance of the possible motivations behind trade policy and trade agreements.

Here, I conduct a preliminary analysis of the potential motives behind Chinese export restrictions by exploring the relationship between changes in export taxes and three potentially important factors: terms-of-trade considerations, industrial policy priorities and special interest groups.[35] First, I use China's share of world exports in each industry in 2002 as a measure of its market power. If variation in Chinese export restrictions is related to potential terms-of-trade gains, we should observe higher export tax rises in industries where Chinese market power is greater. Second, using China's 2002 guidance catalogue for foreign investment, which identifies products for which FDI is 'encouraged', 'restricted' or 'prohibited', I construct a measure of China's industrial policy priorities as of 2002 – though an imperfect one, as it may also represent industry-specific reasons why foreign rather than domestic ownership might be preferred. Conveniently, the catalogue is organized by two-digit industry, so I construct variables counting the number of entries in the 'encouraged' category, as well as the number of 'restricted' or 'prohibited' entries, for each two-digit industry. Finally, I consider China's possible political economy preferences for firms owned by the state (as suggested, for example, by Branstetter and Feenstra 2002), using the share of state-owned enterprises (SOEs) in the value added of each four-digit industry in 2003.[36]

The results of this analysis may be found in Table 7. I begin by regressing the change in the export tax of a four-digit industry between 2002 and 2012 on the four measures introduced above. As shown in column (1), there is no statistically significant relationship between China's share of world trade in 2002 and the change in the industry's export tax. However, export tax increases are smaller if an industry has a larger number of 'encouraged' entries in the FDI guidance catalogue, and larger when there are more 'restricted' or 'prohibited' entries. Finally, and perhaps unexpectedly, it is industries with a larger SOE share that have faced steeper rises in export taxes. In column (2), I add the four dummies for stage of production from Table 4 to the specification. This eliminates the apparent relationship between tax rises and China's industrial policy priorities, suggesting that this holds across

[35] As noted earlier, Gourdon et al. (2016a) and Eisenbarth (2017) also explore potential motivations for Chinese export policies in contemporaneous work.

[36] I source this information from China's 2003 firm-level survey of industrial production. I use the 2003 survey because this is the first year of data using the Chinese industrial classification employed in the rest of this paper. See the online appendix for details on the construction of each of these variables.

Table 7: Possible motivations for export tax changes

Dependent variable:	Δ Export tax		Δ Upstream export tax	Δ Export tax	
	(1)	(2)	(3)	(4)	(5)
Unit of observation:	4-digit industry	4-digit industry	4-digit industry	4-digit industry	6-digit product
China share of trade	.05	.12	-.10	.08	.05
	(.09)	(.07)	(.05)	(.07)	(.03)
	[.73]	[.23]	[.07]	[.46]	[.10]
Share of SOEs	.13	.07	.014	.005	.03
	(.05)	(.03)	(.009)	(.012)	(.03)
	[.052]	[.08]	[.16]	[.75]	[.40]
Entries FDI encouraged	-.002	-.0004	.0003		
	(.001)	(.0003)	(.0006)		
	[.046]	[.53]	[.77]		
Entries FDI discouraged	.012	.004	.003		
	(.006)	(.002)	(.004)		
	[.052]	[.16]	[.59]		
2-digit industry FEs	NO	NO	NO	YES	YES
Observations	397	397	224	397	3,172
Clusters	33	33	21	33	33
R^2	.21	.56	.24	.77	.53

This table displays the results of regressions of changes in the joint export tax equivalent of China's export VAT rebate policies and its export duties between 2002 and 2012 (or the change in upstream export taxes in column (3)) on China's share of world trade, the share of value added produced by state-owned enterprises in 2003, and (in columns (1) to (3)) the number of entries in the 'encouraged' category and the number of entries in the 'restricted' or 'prohibited' categories in China's 2002 FDI guidance catalogue. Column (2) also includes dummies for primary raw materials industries, semiprocessed raw materials industries and capital goods industries. Columns (4) and (5) also include two-digit industry fixed effects. The unit of observation is a four-digit industry in columns (1) to (4) and a six-digit product in column (5). Only downstream industries are in the sample in column (3). All regressions are estimated using ordinary least squares. Robust standard errors (in round brackets) are clustered at the two-digit industry level. p-values are in square brackets; these are derived from wild bootstraps as in Cameron et al. (2008) because of the small number of clusters.

but not within stages of the value chain (though since the relevant regressors vary only by two-digit industry, statistical power may be an issue here).

These initial regressions provide suggestive evidence that variation by industry in China's export restrictions is better explained by preferences to shift production into certain industries than by terms-of-trade preferences, at least when we look across stages of production.[37] However, I do not find evidence that downstream industries targeted by the FDI guidance catalogue have seen higher export tax increases on their raw materials. Using the dependent variable from Table 5 column (2), I run a regression of upstream export tax rises on downstream market power, FDI preferences and SOE share, for downstream industries only. Only the estimated coefficient on China's 2002 share of world trade is now statistically significant. This implies that larger increases in upstream export taxes have been experienced by downstream industries in which China had a smaller initial share of world exports. This result might also be consistent with an industrial policy motive, in the sense that these downstream industries could be more likely to be subject to infant industry protection. But this is highly speculative, and future work will be required in order to better understand these results.

I further explore possible terms-of-trade motivations for these export restrictions by looking within rather than across sectors. In column (4), I present the results of a specification as in column (1), but now including two-digit industry fixed effects (which requires that I drop the FDI catalogue variables). The estimated coefficient on China's world trade share remains statistically insignificant. However, I also estimate the same regression at a finer level of observation, by six-digit product. The estimated coefficient on China's 2002 share of world trade is now on the margins of statistical significance, with a p-value of just over 0.1. This suggests that terms-of-trade considerations may have played a role in at least some of China's export policy changes, though perhaps not the industry-level differences mainly studied in this paper.

The observed relationship between China's pre-WTO tariffs and its post-accession export tax changes also provides suggestive evidence about the relative importance of terms-of-trade and political economy motivations in Chinese trade policy. Models based on either terms-of-trade considerations or profit-shifting predict that import tariffs should be positively related to characteristics of individual goods that make demand for them relatively inelastic, such as product differentiation (see Broda et al. 2008 and Ossa 2014 for evidence in favour of these predictions). In terms-of-trade models, such product characteristics increase countries'

[37]Such an explanation would also be consistent with various anecdotal evidence. A US government submission for the first WTO dispute relating to China's export restrictions argued that "China's industrial strategy is to leverage and exploit the differences in the international and domestic markets for raw materials and downstream, processed products, using restraints on exports as the linchpin" (WTO 2011). In the case of rare earths, an industry in which China holds a near-monopoly, the Vice Chairman of China's Inner Mongolia province stated in 2009 that: "We are certainly not focusing on the short-term benefits of raising the rare earth price. Our wish is for Baotou in Inner Mongolia to become the world's 'Rare Earths Valley', the world's rare earths industrial base" (china.com.cn 2009). Similarly, the 2004 notice in which I first observe changes to China's restrictions on processing trade declared that "[a]djustments and updates will be made annually to the list of prohibited processing trade goods ... in accordance with the country's economic development and industrial policies" (*Shangwu bu, haiguan zongshu, guojia huanjing baohu zongju gonggao* (2004) no. 55).

potential market power, so these goods should also be subject to relatively higher export taxes. However, these characteristics also increase the potential gains from profit-shifting, which could instead lead to relatively lower export taxes on those goods and thus a negative product-level correlation between the two policies, as observed in this paper.[38] The negative relationship between the two variables is also potentially consistent with terms-of-trade motives in the sense that both a higher tariff and lower export tax on a given product should lead to a decrease in world prices, and therefore benefit China if its imports of that product exceed its exports. However, I do not find a significant relationship between export tax rises and China's 2002 imports as a share of the total value of its imports and exports (results available upon request).

The findings of this paper also hold other potential implications for the literature on trade agreements. It is already well-known that in practice, multilaterally agreed tariff cuts are sometimes succeeded by other barriers to imports, such as anti-dumping duties (e.g. Bown and Crowley 2014).[39] The evidence in Section 4 suggests that changes to import tariffs may also be partly offset through export-side policies, implying that multilateral trade agreements may have been even less effective at restraining trade policy than previously understood. This raises the question of whether some countries might even be fully compensating for their WTO commitments through other measures that are difficult to observe, even if they are adhering to their import tariff bindings. However, even though they do not control for compensatory policy changes, empirical studies tend to suggest that tariff cuts do have effects on local outcomes, including in the case of China's accession to WTO (Brandt et al. 2017).

In practice, multilateral agreements might succeed in part by constraining countries to choose between relatively less appealing policy instruments. In an online theory appendix, I briefly explore this hypothesis as it applies to the instruments I observe here, by comparing the marginal effect on real income of an import tariff on a downstream industry and an export tax on an upstream industry. To do this, I use a simple model with two symmetric countries and two country-specific products in each industry. In the model, both of these policies move workers into downstream production in the country adopting the policy. However, an upstream export tax has a smaller marginal effect on real income than a downstream tariff. I identify three disadvantages of an upstream export tax relative to a tariff on downstream goods. First, it taxes only value added by the upstream stage, so its marginal effect on government revenue is smaller. Second, it passes through into the price of downstream products imported from abroad. Third, it distorts the worldwide allocation of labour across the upstream and downstream industries. In practice, an export tax may also be more

[38]There is a strong relationship between China's export tax increases and Rauch's (1999) measure of product differentiation (results available upon request). This is unsurprising, given that there is also a tight link between differentiation and stage of development: raw materials are much more likely to be homogeneous goods.

[39]Indeed, in the case of China, such an outcome was predicted in a 2002 *Journal of International Economics* article by Branstetter and Feenstra, who stated that "interviews of expatriate managers in China strongly indicate that these individuals believe tariff cuts will be at least partially undone by the simultaneous construction of more subtle non-tariff barriers".

difficult to impose politically than an import tariff, since goods produced by the directly affected industry are taxed rather than 'protected'.

The final result of the paper whose implications I will explore is the fact that Chinese export restrictions have been mainly incident on raw materials rather than downstream goods. As suggested above, this may be understood in light of China's pre-WTO policy of import tariff escalation, which seems to have been partly restored by a set of export taxes that are higher for earlier stages of production. However, Table 5 suggests that there has also been within-stage policy substitution for raw materials, but not for downstream sectors. Although downstream industries were presumably affected by changes in access to raw materials, as argued above, I also did not find evidence that downstream sectors with higher initial tariffs were subject to differential changes in upstream policies. Why do I not observe export taxes that are directly related to pre-WTO variation in downstream tariffs?

The most straightforward answer to this question is that there may be other policies affecting downstream industries that are not in my dataset but are also systematically related to China's pre-WTO tariffs. Recall from Section 3 that in this paper, I have limited my dataset to include only export-side instruments for which product-level schedules are available. This has allowed me to conduct an analysis using disaggregated information for a large cross-section of products and industries, but is likely to have led to the omission of other potentially important policies. Some of these might also directly affect exports, perhaps via export subsidies, which I do not observe in my dataset.

One simple way in which to check whether such instruments might exist is to take a closer look at the 19 WTO dispute settlement cases for which China was the respondent between 2002 and 2012. As noted in Section 2, two of these cases concerned a subset of the export restrictions on raw materials studied in this paper. However, five other disputes also mention export-side measures, including grants, tax exemptions, subsidies and other policies conditional on firms' export performance. While two of these disputes are not specific to any sector, the other three relate to automobiles, textiles and apparel, a set of downstream sectors with especially high pre-WTO tariffs. Indeed, when I run a regression of 1999 tariffs on a dummy for the 22 four-digit downstream industries belonging to one of these sectors, I find that these WTO cases concerned industries whose tariffs were 15 percentage points higher on average than those of the other 206 downstream sectors. The p-value for this estimated coefficient (based on clustering at the 2-digit industry level and derived from wild bootstraps) is 0.07. This is suggestive, though highly preliminary, evidence that if the full set of export policies (including industry-specific export subsidies) were in my dataset, I might also observe within-stage policy substitution for downstream sectors.

7 Conclusion

In this paper, I have studied the persistence of trade policy in China after its 2001 entry into the World Trade Organization. Specifically, I have documented the recent emergence of export restrictions that are likely to have partly restored China's pre-WTO trade policy. China's export taxes are mainly incident on raw materials, and I have observed that larger

rises in these taxes after WTO accession have been associated with greater downstream export growth.

My results suggest that without detailed information on Chinese export restrictions, observers might mistakenly overestimate the distance between the trade policy of China before and after its WTO accession. Yet even this study considers information on only two dimensions of China's policy regime: its restrictions on imports and exports. Recent changes to a number of other industry-specific policies, such as domestic content requirements and preferential loans, are also likely to have had important effects. Similarly, other countries might also seek to achieve their trade policy goals via a wide variety of different instruments, of which the restriction of imports or exports represent only two potential candidates. This suggests that the full impact of multilateral negotiations in reshaping trade policy worldwide will remain an open question as long as comprehensive information on policy instruments other than import tariffs remains sparse.

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