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Trade policy uncertainty and exports: Evidence from China's WTO accession☆

Ling Feng [a], Zhiyuan Li [b,*], Deborah L. Swenson [c]

[a] School of Finance, Shanghai University of Finance and Economics, Shanghai 200433, China
[b] Department of World Economy and Institute of World Economy, School of Economics, Fudan University, Shanghai 20043, China
[c] Department of Economics, University of California, Davis, CA 95616, USA

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ABSTRACT

This paper studies how reduction in trade policy uncertainty affects firm export decisions. Using a firm–product level dataset on Chinese exports to the United States and the European Union in the years surrounding China's WTO accession, we provide strong evidence that reduction in trade policy uncertainty *simultaneously* induced firm entries to and firm exits from export activity within fine product-level markets. In addition, we uncover accompanying changes in export product prices and quality that coincided with this reallocation: firms that provided higher quality products at lower prices entered the export market, while firms that had higher prices and provided lower quality products prior to the changes, exited. To explain the simultaneous export entries and exits, as well as the fact that new entrants are more productive than exiters, we provide a model of heterogeneous firms which incorporates trade policy uncertainty, tracing the effects of the changes in policy uncertainty on firm-level payoffs and the resulting selection effects.

1. Introduction

This paper studies how trade policy uncertainty affects firm export decisions. In particular, we study the micro firm-level response margins which shaped firm export changes following changes in trade policy uncertainty. To answer these questions, we take advantage of the trade activities of Chinese firms that exported to the United States at the time of China's 2001 WTO entry.[1]

Three factors make this setting especially suitable for addressing our question. First, Chinese exports to the United States during this period were characterized by strong dynamics. As Fig. 1 shows, the exceptional acceleration of China's export growth coincided almost exactly with China's WTO entry. More important, as we show in detail in Section 2, there was remarkable reallocation of export activities across firms. Firms who exited the export market between 2000 and 2006 were responsible for 76% of China's total export value just prior to China's WTO accession. Indeed, while some of the reallocation led to market share expansion by established exporters, new exporters who started to export following China's WTO entry were responsible for 67% of China's export activity in 2006.

Second, China's WTO entry provided exporters with a substantial reduction in trade policy uncertainty in the U.S. market as it gained the promise of Most Favored Nation (MFN) treatment which is guaranteed to all WTO members. Since MFN prohibits countries from setting applied tariffs that exceed their negotiated bound duty rates, China's WTO entry implied that the worst-case tariffs on their U.S. exports would now be capped above by U.S. bound tariff rates. From a practical standpoint, China's WTO accession eliminated the threat that the U.S. might at some future time revoke its MFN treatment of China's exports, reverting instead to the much higher general tariff rates levied by the U.S. on non-MFN countries. Thus, uncertainty reduction followed from the guarantee tariffs no higher than U.S. bound duties which implied a

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* Corresponding author.
E-mail addresses: feng.ling@mail.shufe.edu.cn (L. Feng), zhyli@fudan.edu.cn (Z. Li), deswenson@ucdavis.edu (D.L. Swenson).

[1] Prior to China's WTO entry each of its trade partners was free to decide whether to provide China access to their MFN treatment. MFN status for China, which was suspended in 1951 by the United States, was restored in 1980, though its continuation was subject to annual extensions. Following 1989, the annual renewal of China's MFN status became a source of considerable debate in the U.S. Congress (Dumbaugh, 2001).

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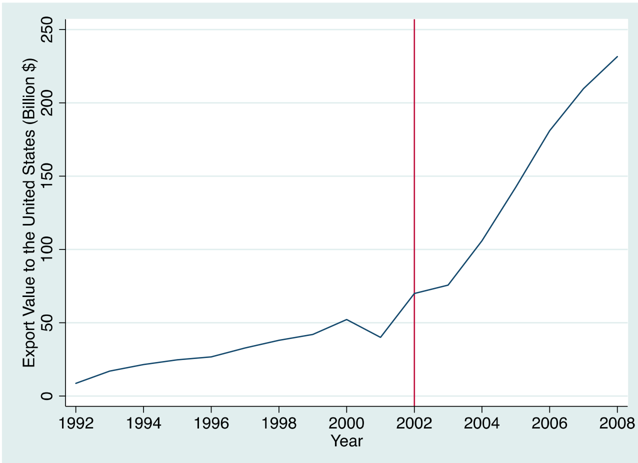

Fig. 1. China's exports to the United States, 1992–2008.
Data source: Chinese customs data obtained from UC Davis Center for International Data.

significant reduction in the gap between applied duty rates and the worst-case duties.

As a result, following China's WTO accession, the worst-case tariff was capped above by U.S. bound tariff rates. China's WTO accession eliminated the threat that the U.S. might at some future time revoke its MFN treatment of China's exports, reverting instead to the much higher general tariff rates levied by the U.S. on non-MFN countries. Thus, uncertainty reduction followed from the guarantee of small U.S. bound duties which implied a significant reduction in the gap between applied duty rates and the worst-case duties.

Third, the United States is one of the most important markets for Chinese exporters. For firms that ever exported to the U.S. during the 2000 to 2006 interval, 25% of their export value was shipped to the United States, followed by 18% to the European Union and 12% to Japan.

Analysis of China's exports to the U.S. reveals a number of robust links between trade policy uncertainty reduction and firm exports. First, we find that trade volume growth associated with new export entry was positively related to product-level uncertainty reduction following from China's WTO accession. These product level responses to uncertainty reduction were apparent by 2002 and grew in magnitude over the longer horizon. More importantly, we also find a positive relationship between the degree of trade policy uncertainty reduction and *exits* by some of the incumbent firms that were engaged in U.S. export prior to the policy changes.

To understand why trade policy uncertainty reduction induced export entry by one group of firms while it caused another group of firms to cease their export activities, we compare the export characteristics of new exporters with the characteristics of exiters.[2] We find strong evidence that new exporters charged lower prices while they exported higher quality goods than did exiting firms.[3] Moreover, we find that the advantages of new exporters relative to exiting exporters were larger for products that experienced larger reductions in trade policy uncertainty.

Our discovery of simultaneous export entry and export exit at the product-level is not initially intuitive. In particular, it is commonly assumed that lower tariff uncertainty, which facilitates entry by new exporters, will also benefit, or at worst be harmless to incumbents in the export market. Consequently heterogeneous firm models, such as Melitz (2003) and Melitz and Ottaviano (2008), do not predict an increase in the exit from export by some exporting incumbents following favorable trade policy developments. In other words, while trade liberalization expands export opportunities and induces export entry, these models do not predict that trade liberalization will also cause some incumbents to exit the export market.

Nonetheless, recent work on the effects of trade liberalization, demonstrates the value of modeling and evaluating effects stemming from the reallocation of activities across firms and products. For example, Mayer et al. (2014) consider how changes in export competition lead to changes in product export composition, with consequences for firm-level productivity, while Melitz and Redding (2013) demonstrate how endogenous firm selection has the potential to influence aggregate productivity.

To explain the simultaneous entries by new exporters and exits by incumbent firms, we provide a parsimonious extension of Melitz (2003) which incorporates trade policy uncertainty in a setting where congestion effects influence the fixed costs of export. In particular, our model demonstrates how trade policy uncertainty reduction, which lowers firm expectations about the level of tariff payments, encourages export entry due to the expectation of increased export profits. In turn, as an increasing mass of firms seek to serve the export market, congestion externalities raise the per-period fixed costs of export. These fixed costs are tied to specific factors, such as skilled labor, marketing services, external funds or finding a reliable importer, which are imperfectly elastically supplied (see Bergin and Lin (2012)). Ultimately, as congestion externalities raise the fixed costs of export, and therefore the cutoff productivity for export, lower productivity incumbent firms whose productivity falls short of the raised export productivity thresholds cease to export. Nonetheless, while the lowest productivity exporters may be driven out of the market due to rising cutoff levels, the total number of exporting firms may increase through the fresh export entry by firms lured to export by the improved trade policy environment.

By demonstrating a connection between reductions in trade policy uncertainty and firm export activities, our work adds to the recent literature on trade policy uncertainty and international trade, pioneered by Handley (2014) and Handley and Limao (2014, 2015).[4] Our paper is closest to Handley and Limao (2014) which also studies the effects of trade policy uncertainty reductions on China's U.S.-destined exports and the welfare implication for US consumers. However, while Handley and Limao (2014) focus on export growth changes at the product-level, our study provides insights on the diverse changes within products which are tied to firm-level decisions within industries. Notably, our work is the first to document and explain the simultaneous entry and exit responses which stem from trade policy uncertainty reduction.[5]

Our main finding – that Chinese firm export responses involve reallocation through simultaneous entries and exits – also supports recent work in international trade that shows that the effects of trade

[2] The term "new exporter" refers to a firm that was not involved in export in 2000, but exported in one of the years following China's WTO accession. The export "exiters" are defined as firms that exported to the U.S. in 2000 but ceased their US export following China's WTO accession. Further details about the definitions are provided in Section 2.

[3] Quality of products is measured following Khandelwal et al. (2013).

[4] Another type of uncertainty, market-specific demand uncertainty, has been studied in the literature. For example, in a partial equilibrium representative firm setting, Conconi et al. (2016) study how demand uncertainty in a foreign market leads firms to experiment with exports before engaging in FDI. In a heterogeneous though still partial equilibrium setting, Nguyen (2012) shows how demand uncertainty may cause firms to delay exporting in order to gather information about foreign demand and to use previous demand realizations to forecast unknown levels of demand in as yet untested destinations. In contrast, our analysis of trade policy uncertainty focuses on the simultaneous entry and exit of firms in the same market which crucially hinges on *general* equilibrium conditions.

[5] Khandelwal et al. (2013) also show that following the removal of quotas on Chinese textile and clothing exports in *2005*, high-productivity new entrants entered the export market with relatively low prices as they replaced low-productivity firms who exported high-priced exports. However, their explanation, the removal of inefficient institutional arrangements, favored a subset of firms who were active in quota-limited industries, while our results extend to a period several years before the final removal of quota system and extends to other industries that did not experience similar changes in quota treatment.

policy changes are often observed on the extensive margin.[6] Indeed, by tracking the margins of China's export changes associated with China's WTO accession, including shifts in export activity from low-quality high-price exiters to high-quality low-price new exporters, our paper also contributes to the understanding of resource reallocations induced by trade liberalization. While the current literature, (e.g., Melitz (2003) and Melitz and Ottaviano (2008)) sheds light on the resource reallocation between domestic firms and exporting firms, our study identifies an additional margin, the reallocation towards more productive new exporters and away from less productive exiting exporters.[7] The reallocation effects we observe are also similar to the reallocation effects uncovered in Alfaro and Chen's (2015) work on FDI spillovers, due to the role for selection effects.[8] The characteristics of new exporters and exiters we document in our work are also consistent with the observations of Chinese export prices in Mandel (2013) which studies how competition from Chinese exporters affected the mark-ups and marginal costs of other exporters who shipped their products to the U.S.

Finally, our paper also contributes to the literature that seeks to understand how changes in trade policy have influenced U.S. economic outcomes. The relevance of this issue is made apparent by the work of Autor et al. (2013), and Autor et al. (2014), both of which show how increased imports from China affected U.S. labor markets. In addition, Pierce and Schott (2016) find that the uncertainty reduction associated with China's WTO accession can help explain changes in U.S. manufacturing employment and wages. Indeed, our results suggest that the unusually strong downturn in the U.S. manufacturing labor market noted by Pierce and Schott (2016) may have been driven *not only* by the growth in overall exports that followed the trade policy uncertainty reduction, *but also* by the intensification of product market competition in the U.S. stemming from the exits of less capable Chinese exporters and the entry of more capable exporting firms.

The rest of the paper is organized as follows. Section 2 discusses the salient features of Chinese export dynamics between 2000 and 2006, and introduces the key policy developments tied to China's WTO accession. Section 3 provides a model which helps to explain the developments of this period, explaining the mechanism through which trade policy uncertainty reductions may induce simultaneous entries and exits. Section 4 introduces the data and presents our empirical results regarding the impacts of uncertainty reductions on firms' entry and exit decisions. Section 5 further examines the impact of uncertainty reduction as manifested by the intensification of market competition. Section 6 concludes.

2. Background: aggregate reallocation and trade policy uncertainty

In this section, we document two stylized facts that are potentially linked. The first notable feature of Chinese exports was a dramatic reallocation of export activities across firms following China's WTO accession, largely due to shifts in export value tied to extensive margin of export entries and exits. The second observation is that China's WTO entry provided exporters with a substantial reduction in trade policy uncertainty. In succeeding sections, we examine whether the aggregate reallocations can be explained by the reductions in trade policy uncertainty.

2.1. Aggregate reallocation

To provide information on the export dynamics in China's 2000 to 2006 U.S. exports, we decompose changes according to the margins of adjustment. Throughout the paper, we define four margins of adjustment: "exiters", "incumbents", "new exporters" and "adders". The "new exporters" and "adders" are summed together to form the aggregate we term, "new entrants". For each year t after WTO accession ($t = 2002$ through 2006), the margins of "exiters", "incumbents", and "new entrants" are defined respectively as the *firm–product* combinations that were exported to the U.S. in 2000 but not in year t, that were exported both in 2000 and in year t, and that were exported in year t but not in year 2000. Within the "new entrants" group, the "new exporters" margin refers to year t firms that were not involved in exports in 2000, while the "adders" margin encompasses the export of new goods in year t by firms which exported other goods in 2000.

After we classified our firms based on their export activities, we calculated the market share changes associated with each margin between 2000 and 2006, to provide information for overall exports as well as firm groups classified by ownership. We start by calculating the market share, $EXshare_{mht} = EX_{mht}/(\sum_{mh} EX_{mht})$, tied to each margin m (including the incumbent, exiter, new exporter, and adder) for each HS 6-digit product h in each year t, where EX denotes export value. Next we take the difference in the market share between 2000 and 2006 for each product h, and then calculate the average difference for each margin across products.

Panel A of Table 1 reports the changes in export market shares disaggregated by response margin and ownership.[9] Column 1 provides the average share changes for China's overall exports, while columns 2 through 4 provide those for each type of ownership: state-owned enterprises (SOE), foreign-invested enterprises (FIE) and domestic private firms (DOM). It should be noted that for each margin, market share changes made by the different ownership groups sum to the market share change for overall exports at the same margin. In other words, for each row, the last three columns sum to the first column.

The dramatic aggregate reallocation of China's U.S. exports between new entrants and exiters is reflected by the market share change data reported in Panel A of Table 1. Overall export growth was disproportionately driven by the changes along the extensive margin, with the largest reallocation occurring between exiting exporters (who experienced a 76 percentage point market share reduction) and the activities conducted by new exporter entrants (an increase in share of 67 percentage points). Among new entrants, the market share growth generated by the adders (a 19 percentage point increase) was considerably smaller than contributions associated with new exporters.

One limitation of calculations in Panel A is that the shares of new entrants and exiters are calculated based on the total export values in two different years, 2006 and 2000 respectively. Since the total export value grew during this interval, different weights used for different years may underestimate the importance of new entrants. To avoid this, we follow Eaton et al. (2007) to calculate the contribution of new entrants and exiters to the growth of total exporting firm number.

Specifically, the contribution of each margin m to the exporting firm number growth of each product h is defined as $\frac{\mathrm{dEXNum}_{mh}}{(\mathrm{N}_{h06}+\mathrm{N}_{h00})/2}$, where N_{ht} is the total number of firms exporting product h in year t and dEXNum_{mh} is the change in the number for exporting firms by margin m and product h.[10] These contribution measures were then averaged across all products and reported in Panel B/column 1 of Table 1. In turn, each

[6] For example, Debaere and Mostashari (2010) provide evidence that extensive margin responses to U.S. tariff policy changes had an effect on U.S. country-product imports.

[7] A growing strand of macroeconomics literature, including Ghironi and Melitz (2005), Alessandria and Choi (2007) and Ruhl and Willis (2014), studies firms' entry and export decisions in business cycles through the lens of dynamic, stochastic general equilibrium (DSGE) models.

[8] Alfaro and Chen (2015) discover that increases in aggregate productivity following FDI are due to between-firm selection effects which lead to the exit of the least productive firms in addition to the beneficial within firm productivity spillovers which enhance the productivity of ongoing firms.

[9] Differences in the table are marked with stars if they are statistically significant. Triple stars, ***, represent a significance level of 1%. We obtain the statistics by regressing the changes in market shares on a constant. To evaluate the robustness of our findings, we also examined the decomposition based on changes in market shares between 2000 and 2002. The results, which are very similar, are reported in Appendix Table 1.

[10] Note that the change in the number of exporting firms for the incumbent margin is zero.

Table 1
Aggregate reallocation of export activities.

Panel A: Market share changes 2000–2006, overall and by firm ownership

Margin	All	SOE	FIE	DOM
	(1)	(2)	(3)	(4)
(1) Incumbents net entry	−10.484***	−5.484***	−4.663***	−0.336***
(2) Exiters	−75.995***	−52.107***	−19.761***	−4.127***
(3) New exporters	67.144***	9.906***	26.836***	30.402***
(4) Adders	19.335***	11.468***	5.989***	1.879***
(5) Total net entry	10.484***	−30.734***	13.064***	28.154***
(6) Total	0	−36.218***	8.401***	27.817***

Note: This table reports the average U.S. market share changes for different margins for the period 2000 to 2006. The data are averaged across HS 6-digit products, according to the margins of adjustment and the form of firm ownership. In each column, the contributions due to exiters, new exporters, and adders (displayed in rows 2 to 4) sum up to the values reported in row 5 (total net entry). Similarly, the market share changes due to incumbents (row 1) can be summed with the market share changes caused by total net entry (row 5) to compute the value displayed in row 6. Since the data are also disaggregated to show changes by ownership (SOE, FIE and Domestic), the values in the associated rows for columns 2 to 4, can be summed to arrive at the overall change by margin, displayed in column 1. Results are generated by regressing the changes in market shares for HS 6-digit products on a constant. Products, which are not exported in any of the two years, are dropped before taking average. Triple-starred values represent statistical significance at 1% level.

Panel B: Decomposition of firm number growth rate 2000–2006, by margin and by firm ownership

Margin	All	SOE	FIE	DOM
	(1)	(2)	(3)	(4)
(1) Incumbents	0	0	0	0
(2) Exiters	−54.387***	−40.009***	−11.515***	−2.863***
(3) New exporters	105.094***	16.024***	26.340***	62.730***
(4) Adders	29.891***	20.611***	6.471***	2.809***
(5) Net growth rate	80.597***	−3.374***	21.295***	62.676***

Note: This table reports the contributions to the exporting firm number growth for different margins and different firm ownerships for the period 2000 to 2006. The data are averaged across HS 6-digit products, according to the margins of adjustment and the form of firm ownership. In each column, the contributions due to exiters, new exporters, and adders (displayed in rows 2 to 4) sum up to the values reported in row 5 (net growth rate). Since the data are also disaggregated to show contributions by ownership (SOE, FIE and Domestic), the values in the associated rows for columns 2 to 4, can be summed to arrive at the overall contribution by margin, displayed in column 1. By definition, the contributions due to incumbents (row 1) are zero. Results are generated by regressing the contributions to exporting firm number growth rate for HS 6-digit products on a constant. Triple-starred values represent statistical significance at 1% level.

contribution margin can be further decomposed, which we do in columns 2 to 4 to give information on the firm responses by ownership form.

Compared with Panel A, the contribution of the new exporter margin is magnified in Panel B. The total number of new exporters is about twice as large as the number of exiters. Further, within new exporters, the number of domestic private firms exceeds the total number of exiting firms. Although the precise magnitudes differ, the two panels in Table 1 convey a consistent message; China's trade involved tremendous aggregate reallocation between new exporters and exiters, with mainly domestic private new firms replacing SOE exiters. Since these are intriguing developments, our paper seeks to evaluate whether the reallocation was related to the reductions in trade policy uncertainty following China's WTO accession.

2.2. Trade policy uncertainty reduction

As an outsider to the multiple rounds of tariff negotiations conducted through the GATT and successor WTO framework, China missed out on the formalized tariff reductions, which were conferred by the GATT/WTO process. Although the U.S. allowed China to benefit from the same tariff concessions that were offered to GATT/WTO members who received MFN treatment, China's MFN treatment was extended on a provisional basis that was subject to annual renewal.

Dumbaugh (2001) and Pregelj (2005) describe the politically controversial annual renewals of China's MFN tariff treatment prior to China's WTO accession. Since continued access to MFN treatment was not assured, any exporters had to consider the possibility of sharp tariff increases on their exports to the United States. Indeed, the possibility of trade action has not disappeared entirely following China's WTO accession, as there has been political pressure for U.S. trade action against China, to pressure China to increase the value of its currency "in accordance with accepted market-based trading policies".[11]

Nonetheless, China's WTO accession lowered the possibility for tariff adjustment via the loss of MFN treatment, and thereby, mitigated the worst-case tariffs, and the risk of change, that Chinese exporters needed to consider. The worst-case tariff before China's WTO accession, if China lost its MFN tariff treatment, was the United States' special rate of duty assigned to trade restricted countries.[12] After China's WTO accession the worst-case tariff became the much lower WTO bound tariffs.[13] As Fig. 2 shows, the reductions in the worst-case tariff were substantial. The mean non-MFN tariff was roughly 32% while the mean bound tariff was only 3.6%. Moreover, the non-MFN tariff varied widely across product lines.

In contrast to the large reductions in trade policy uncertainty, changes in U.S. applied tariffs on imports were almost imperceptible in the early 2000's. As Table 2 shows, U.S. applied tariffs on imports averaged over the years 2000 and 2002 were roughly 3.65%. Further, U.S. applied

[11] In contrast with the implied tariff penalty associated with loss of MFN, which would differ product by product, the proposed penalty for currency manipulation is often a single tariff (e.g., 25%) which would be applied *uniformly* to all China's exports to the U.S., and which would be set to offset the degree to which China's currency was deemed to be underpriced.

[12] These tariffs are also interchangeably referred to as non-Most Favored Nation treatment tariffs (non-MFN), non-normal trade relation tariffs (non-NTR) or column 2 tariffs (Feenstra et al., 2002). They were originally set in the Smoot–Hawley Tariff Act of 1930.

[13] In October 2000 the United States agreed to extend permanent MFN treatment to China, effective upon China's entry to the World Trade Organization. Negotiations on China's terms of membership in the WTO concluded in September 2001. Permanent MFN tariff treatment for China by the U.S. became effective on Jan. 1, 2002. See http://www.wto.org/english/news_e/pres01_e/pr243_e.htm.

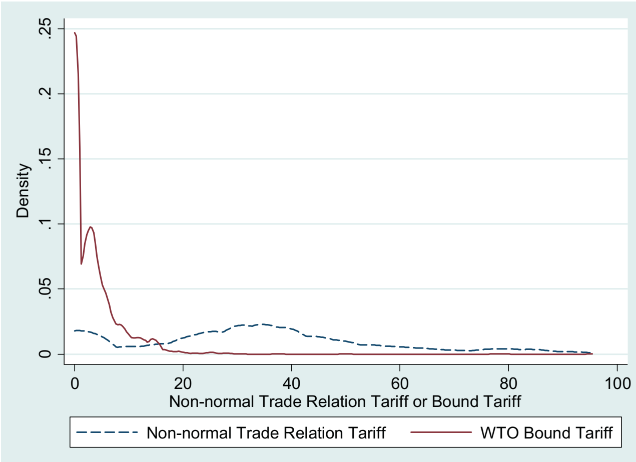

Fig. 2. Distribution of worst-case tariffs across tariff lines (before and after China's WTO accession). Note: This figure displays the kernel density of non-MFN tariffs (or alternatively called non-normal trade relation tariffs, the worst-case tariff for China prior to its WTO accession) and the bound tariffs (the worst-case tariff following China's WTO accession) imposed by the United States across HS 6-digit tariff lines.

Table 2
Tariff measure summary statistics.

Variable	Obs. #	Mean	Std. Dev.	Min	Max
Tariff policy uncertainty reduction					
dgap (percentage points)	4721	29.99	20.37	−56.56	145.5
Change in applied tariff rate					
$d\tau$ (percentage points)	4721	0.16	7.10	−262.5	35
Average tariff rate					
τ (percentage points)	4721	3.65	7.39	0	218.75

Notes: Tariffs are measured at the HS 6-digit product level, totally 4721 product lines. The variable "avt" measures U.S. tariff rates averaged over the years 2000 and 2002. The definition for the variable measuring changes in applied tariffs, or "dat", is *dat* = the year 2000 (before WTO accession) applied tariff − the year 2002 (after WTO accession) applied tariff. Positive values reflect the reductions in applied tariffs. We define "gap" as the difference between the worst-case tariff and the applied tariff. The reduction in uncertainty, or "*dgap*", is then defined as *dgap* = (gap_2000, before WTO accession) − (gap_2002, after WTO accession). Positive values of the variable *dgap* imply that tariff uncertainty fell after China's WTO accession.

MFN tariffs declined by a mere 0.16 percentage points between 2000 and 2002.[14]

Fig. 3 provides more detail on the distribution of non-MFN tariffs by sector. Two patterns stand out. First, all U.S. sectors had worst-case tariffs that applied to non-MFN countries, and the worst-case tariff rates were very high. If the U.S. decided to revoke its MFN treatment of China's exports, no sector was immune from the threat of sizeable tariff increases. Second, within each sector, the non-MFN tariff varied dramatically across products. Since non-MFN tariffs were not uniform even within sectors, we can exploit the product-level tariff variation to identify exporters' responses to changes in trade policy uncertainty.

The worst-case tariffs were arguably exogenous. Pierce and Schott (2016) argue that, non-MFN tariffs were set decades ago and remained stable over recent decades. Similarly, since U.S. bound tariffs were also set well in advance of China's WTO entry, and were applied to all GATT/WTO members, they too should have been exogenous from Chinese considerations.

3. Theory and predictions

In this section we develop a heterogeneous firm model to study the impact of trade policy uncertainty reduction on firms' export decisions. We find that uncertainty reductions induce new export entry, and more important, may also drive out incumbent firms when new entry increases competition in export markets.

3.1. Basic setting

There are two countries, home and foreign. In addition, there is a single industry in which firms produce a continuum of differentiated goods. This industry is characterized by monopolistic competition, as in the Melitz (2003) framework. In this representative industry, we focus on the home firms' decisions regarding export to the foreign market.[15] Thus all demand side variables in our model involve foreign country variables while all supply side variables in our model involve the home country.

Following Melitz (2003), there are an infinite number of time periods and the discount rate is ρ. In each period, the foreign country's preference for home products is given by CES preferences, or $U=\left[\int_{\omega\in\Omega} q(\omega)^{\frac{\sigma-1}{\sigma}}d\omega\right]^{\frac{\sigma}{\sigma-1}}$, where $\sigma>1$ is the elasticity of substitution between varieties, ω denotes varieties and Ω is the set of available varieties. Consequently demand for each variety follows $q(\omega)=Q[p(\omega)/P]^{-\sigma}$, where $p(\omega)$ is the price of variety ω, $P=\left[\int_{\omega\in\Omega} p(\omega)^{1-\sigma}d\omega\right]^{\frac{1}{1-\sigma}}$ is the aggregate price and Q is the total quantity demanded in this industry. Similarly, the revenue each firm collects (tariff inclusive) is

$$r(\omega)=R[p(\omega)/P]^{1-\sigma}, \tag{1}$$

where $R=\int_{\omega\in\Omega} r(\omega)d\omega$ and $Q=U=R/P$.

3.2. Trade policy and uncertainty

We follow Feenstra and Romalis (2014), Caliendo et al. (2015) and Handley and Limao (2014) in assuming that exporting firms face an ad valorem tariff v charged by the foreign country such that $\tau=1+v>1$. That is, for a given Free on Board price p^* received by the firm, it must charge consumers in the destination foreign market a price $p=\tau p^*$. Alternatively, given tariff inclusive revenue $r=pq$, the earnings received by the firm are r/τ, and the tariff collected by the foreign government is $r((\tau-1)/\tau)$.

We follow Handley and Limao (2015) in assuming that policy uncertainty concerns the applied tariff rate. Absent the protection of WTO membership, the foreign country may at any time decide to change its tariffs. The probability that the foreign country will choose to replace its current tariff with an alternative tariff is denoted as an arrival rate, λ. If the foreign country decides to adjust its tariffs, the new tariff will be drawn from a distribution $H(\tau)$ with support $[1,\overline{\tau}]$, where $\overline{\tau}\geq\tau$ is the highest possible tariff levied by the foreign country. In our setting, this is equivalent to the U.S. removing China's MFN treatment, and applying the higher non-MFN tariffs to Chinese imports instead.

3.3. Firm decisions

On the supply side, prior to production each firm must pay a one-time sunk entry cost, f_e, to learn its productivity, φ, which is drawn from a common distribution with c.d.f. $G(\varphi)$ and p.d.f. $g(\varphi)$. When firms make their entry decisions, they are aware of the current applied tariff rate and the degree of all future trade policy uncertainty.

[14] There were no further large adjustments to applied tariffs through the period of 2002 to 2006.

[15] Since our empirical work focuses on firms' export outcomes, we only present our model's implications for firm exports. However, a simple extension of our model would enable us to study firm sales in the home market as well. For simplicity, we also ignore foreign firms producing in this industry. Implicitly, this assumes that Chinese firms have comparative advantage in their export goods, or that importers devote a fixed share of their expenditures to imports in each industry.

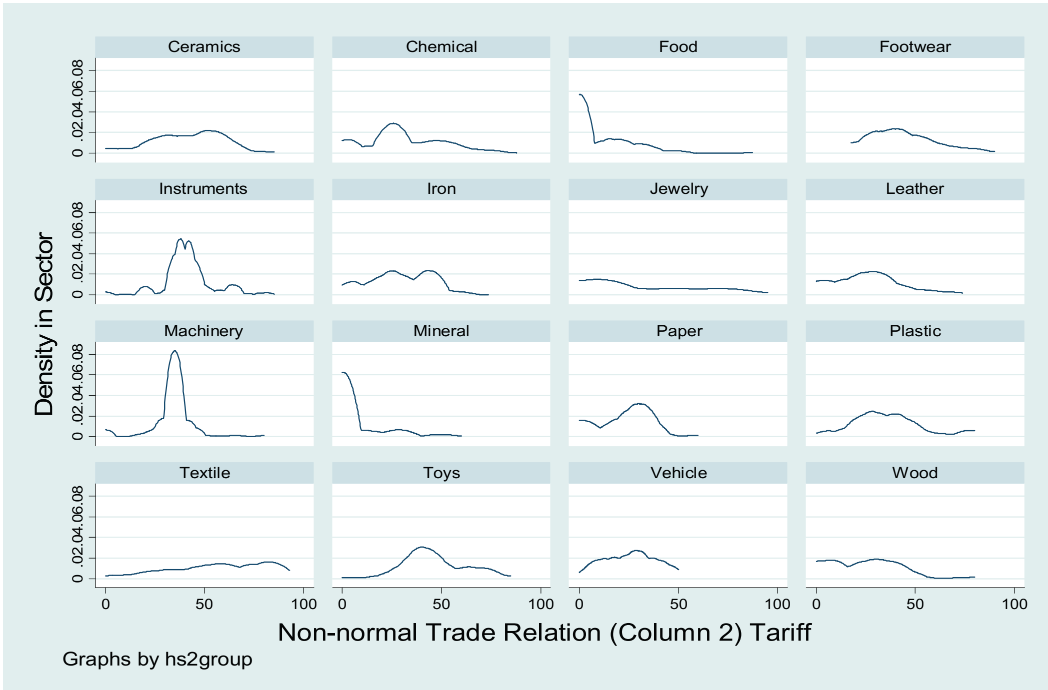

Fig. 3. Distribution of worst-case U.S. tariffs before China's WTO accession, by sector. Note: Figures show the kernel density of non-MFN tariffs across HS 6 digit product lines by sector. Sectors are defined according to HS classification (See Appendix Table 2). Some sectors, such as art products and ammunition, are dropped due to small export values.

Upon learning their productivities, firms decide next whether to produce (and export). If the firm decides to export to the foreign market, it pays a per-period fixed export cost, $M^{\eta}f$, where M is the total mass of exporting firms, and $\eta \geq 0$ represents the degree of congestion externalities involved in entering export markets. In our setting the fixed export cost rises with the number of exporters due to increased competition from other exporting firms for the resources that are used in the provision of the export fixed costs. Note that $\eta > 0$ as long as the specific factor which is required for entry, is supplied with an elasticity less than infinite.[16] We note that the increase in export fixed costs in the face of intensified export activity is also consistent with our later empirical finding (see Section 5) that new exporters charged lower prices while producing higher quality export goods as compared with exiting firms.

The firm problem can be solved backward. First, conditional on given aggregate variables, the firm calculates its profits at varying tariff levels. Second, based on information on tariff levels and trade policy uncertainty, the firm calculates its present value of expected profits. Third, the firm compares export profits with the per-period fixed costs of export as it determines whether to export or not. Finally, potential entrants decide whether to pay the entry cost and to learn their productivity.

3.3.1. Firm production in each period

Without loss of generality, we assume that foreign expenditure in each period, R, is given exogenously. We assume further that the home wage is fixed and normalized to unity.

Given tariffs charged by the foreign government, the variable profit that the firm will earn is $v(\varphi) \equiv \left(\frac{p}{\tau} - \frac{1}{\varphi}\right) q$. Profit maximization given CES preferences over varieties leads to the firm's pricing rule,

$$p(\varphi) = \frac{\sigma}{\sigma-1}\frac{\tau}{\varphi}. \tag{2}$$

Consequently, the firm's variable profit is given by

$$v(\varphi) = \left(\frac{\sigma}{\sigma-1} - 1\right)\frac{q}{\varphi} = \frac{\sigma}{\sigma-1}\frac{\tau q}{\varphi}\frac{1}{\sigma\tau} = \frac{r(\varphi)}{\sigma\tau}.$$

Substituting the pricing rule, Eq. (2), into the firm's revenue function, Eq. (1), and the variable profit equation, we get, respectively,

$$r(\varphi) = R\left[\frac{\sigma-1}{\sigma}\frac{P\varphi}{\tau}\right]^{\sigma-1} \tag{3}$$

and

$$v(\varphi) = \frac{R}{\sigma}\left(\frac{\sigma-1}{\sigma}P\varphi\right)^{\sigma-1}\tau^{-\sigma}. \tag{4}$$

Since all firms with the same productivity will charge the same price, the aggregate price index can be rewritten as $P = \left[\int_0^\infty p(\varphi)^{1-\sigma} M\mu(\varphi)d\varphi\right]^{\frac{1}{1-\sigma}}$, where $\mu(\varphi)$ is the p.d.f. of the productivity distribution for surviving firms. Substituting the pricing rule, Eq. (2), into the aggregate price, it becomes $P = \frac{\sigma}{\sigma-1}\frac{\tau}{\tilde{\varphi}}M^{\frac{1}{1-\sigma}} = p(\tilde{\varphi})M^{\frac{1}{1-\sigma}}$, where $\tilde{\varphi} \equiv \left[\int_0^\infty \varphi^{\sigma-1}\mu(\varphi)d\varphi\right]^{\frac{1}{\sigma-1}}$ is the average productivity of surviving firms.

When we substitute the aggregate price into Eqs. (3) and (4), each firm's revenue and variable profit become

$$r(\varphi) = \frac{R}{M}\left(\frac{\varphi}{\tilde{\varphi}}\right)^{\sigma-1} \tag{5}$$

[16] See Bergin and Lin (2012), Berentsen and Waller (2010) and Rocheteau and Wright (2005) for examples motivated by search and advertising costs. More details on the micro-foundation for this assumption are provided in Appendix A.1.

and

$$v(\varphi) = \frac{1}{\tau\sigma}\frac{R}{M}\left[\frac{\varphi}{\tilde{\varphi}}\right]^{\sigma-1}. \tag{6}$$

Similar to Melitz (2003), it is easy to derive the following conditions,

$$R = Mr(\tilde{\varphi}), V = Mv(\tilde{\varphi}), \text{ and } Q = M^{\frac{\sigma}{\sigma-1}}q(\tilde{\varphi})$$

where V is the total variable profit obtained by all participating firms.

3.3.2. Export participation

A firm's export participation decision is based on its present value of variable profit and the fixed cost of export. The present value of variable profits for a firm with productivity, φ, is

$$v_p(\tau_t,\varphi) = v(\tau_t,\varphi) + \rho\big((1-\lambda)v_p(\tau_t,\varphi) + \lambda E_\tau v_p(\tau_{t+1},\varphi)\big) \tag{7}$$

where the expectation term is taken based on the distribution of possible tariffs. Taking expectations on both sides, we have $E_\tau v_p(\tau,\varphi) = \frac{1}{1-\rho}E_\tau v(\tau,\varphi)$. Substituting this back into Eq. (7), the present value of profits becomes,

$$v_p(\tau_t,\varphi) = \frac{1}{1-\rho}(\delta_a v(\tau_t,\varphi) + \delta_E E_\tau v(\tau,\varphi)) \tag{8}$$

where $\delta_a = \frac{1-\rho}{1-\rho(1-\lambda)}$, $\delta_E = \frac{\rho\lambda}{1-\rho(1-\lambda)}$ and $\delta_a + \delta_E = 1$. Substituting the variable profit function, Eq. (6) into Eq. (8), we further simplify the present value of variable profit as

$$v_p(\tau_t,\varphi) = BRT_t\,\varphi^{\sigma-1} \tag{9}$$

where $B = \frac{1}{M\sigma(1-\rho)\tilde{\varphi}^{\sigma-1}}$ and $T_t = \delta_a {\tau_t}^{-1} + \delta_E E_\tau(\tau^{-1})$.

To gain intuition about the compound tariff term, T, note that this term is a weighted average, depending on the current applied tariff, as well as an expected term related to the tariff distribution and weights. The uncertainty facing exporting firms can now be summarized by two terms. The first term is the expectation term, $E_\tau(\tau^{-1})$. If the unconditional tariff distribution is further away from the applied tariff, τ_t, then this expectation term is smaller. For example, if the tariff distribution follows a uniform distribution, then the larger is the upper bound of the tariff distribution, the smaller is this expectation term. In practice, as discussed in Section 2, considering that the worst case scenario tariffs faced by Chinese firms in the U.S. are the non-MFN tariffs before WTO accession and a much lower WTO bound tariff after WTO accession, there is then a shift for the tariff distribution towards the applied low tariffs and thus the expectation term increases. In our empirical application, since the reductions in the worst-case tariffs differ across products, the variation in the expectation term is our main source of identification.

The second factor which influences the level of trade policy uncertainty is the weights, δ_a and δ_E, which in turn depend on the arrival rate, λ, for trade policy shocks. Assuming ${\tau_t}^{-1} > E_\tau(\tau^{-1})$, a larger arrival rate indicates a larger probability that tariffs will rise compared with the currently low applied rate. The firm will increase the weight on the term for the expected tariff, while decrease the weight it places on the current applied tariffs. Thus, the compound tariff, T, is decreasing in the arrival rate. In practice, China's WTO accession reduced the arrival rate characterizing the possibility of tariff increases since WTO membership guarantees MFN treatment. Thus WTO accession implies an increase in the level of T. However, since the reduction in the arrival rate tied to MFN treatment is identical for all products, we cannot use this term to estimate the effects of uncertainty reduction on firm export decisions.

Also note that the term, $RT_t/(1-\rho)$, is the present value of expected revenue received by exporting firms.[17] Thus, changes in the compound tariff term translate directly into changes in the revenue received by firms.A firm starts to produce and export if the expected profit of exporting net of entry cost is greater than zero. I.e. for firms with expected profit of exporting, $\pi_p(\tau_t,\varphi) = BRT_t\varphi^{\sigma-1} - M^\eta f/(1-\rho)$, the productivity cutoff, φ^*, can be determined as[18]

$$\pi_p(\tau_t,\varphi^*) = 0 \text{ or } {\varphi^*}^{\sigma-1} = (M^\eta f)/((1-\rho)BRT_t). \tag{10}$$

3.3.3. Entry decision and equilibrium

Given the cutoff productivity, the productivity distribution for surviving firms is given by,

$$\mu(\varphi) = \begin{cases} \frac{g(\varphi)}{1-G(\varphi^*)} & \text{if } \varphi \geq \varphi^* \\ 0 & \text{if } \varphi < \varphi^* \end{cases}$$

Accordingly, the average productivity is given by

$$\tilde{\varphi} = \left[\frac{1}{1-G(\varphi^*)}\int_{\varphi^*}^{\infty}\varphi^{\sigma-1}g(\varphi)d\varphi\right]^{\frac{1}{\sigma-1}}.$$

Let $\overline{\pi}_p = \pi_p(\tau_t,\tilde{\varphi})$ denote the average export profit for surviving firms. Free entry requires the expected value of export activity based on potential productivity draws to equal to the entry cost,

$$0 * G(\varphi^*) + \overline{\pi}_p * [1-G(\varphi^*)] = f_e.$$

The free entry condition (FE) can then be rewritten as

$$\overline{\pi}_p = \frac{f_e}{1-G(\varphi^*)}. \tag{11}$$

Note that $\overline{\pi}_p = v_p(\tau_t,\tilde{\varphi}) - M^\eta f/(1-\rho)$ and $\frac{v_p(\tau_t,\tilde{\varphi})}{v_p(\tau_t,\varphi^*)} = \left(\frac{\tilde{\varphi}}{\varphi^*}\right)^{\sigma-1}$, a second relation between the average profit and cutoff productivity level, the zero cutoff profit condition (ZCP), can be derived as

$$\overline{\pi}_p = M^\eta f k(\varphi^*)/(1-\rho), \tag{12}$$

where $k(\varphi) = \left(\frac{\tilde{\varphi}(\varphi)}{\varphi}\right)^{\sigma-1} - 1$.

The free entry condition (FE) and the zero cutoff profit condition (ZCP) here are almost identical to the ones derived in Melitz (2003), except that the mass of exporting firms positively affects fixed export costs. Thus, given the mass of firms, M, there exists a unique solution for the average profit and the cutoff productivity. Since the equilibrium solutions are functions of the mass of firms, $\overline{\pi}_p(M)$ and $\varphi^*(M)$, Appendix A.2 shows that these functions are increasing in the mass of firms, M.

To solve the equilibrium mass of firms, substituting in B and $\tilde{\varphi}$ in Eq. (9), we get the variable profit for the average productivity firm as

$$v_p(\tau_t,\tilde{\varphi}) = \frac{RT_t}{(1-\rho)M\sigma}. \tag{13}$$

Consequently, the average profit is given by the following condition, which we name as the "market clearing condition" (or MC),

$$\overline{\pi}_p = v_p(\tau_t,\tilde{\varphi}) - \frac{M^\eta f}{1-\rho} = \frac{1}{1-\rho}\left(\frac{RT_t}{M\sigma} - M^\eta f\right). \tag{14}$$

[17] To see this, note that R/τ is the revenue received by firms in each period (exclusive of tariffs).

[18] In our model, firms endogenously exit the market only when their expected profit is less than zero. This is different from Melitz (2003) where firms may exit due to an exogenous death shock.

Eq. (14) defines another relation between the average profit $\overline{\pi}_p$ and the mass of firms, M. In this equation, the average profit is a decreasing function in the mass of firms.

Thus there exists a unique pair of firm mass, M, and average profit, $\overline{\pi}_p$ which solves Eqs. (11), (12) and (14). The cutoff productivity, φ^*, is also jointly determined when the mass of firms, M, is determined. Simple calculation on the equilibrium conditions, Eqs. (11), (12) and (14), leads to the following proposition:

Proposition 1. *With congestion externality, $\eta>0$, reductions in trade policy uncertainty, e.g. lower $\overline{\tau}$, will lead to higher average profit, $\overline{\pi}_p$, higher cutoff productivity, φ^*, and larger mass of firms, M. Absent of congestion externality, $\eta=0$, reductions in trade policy uncertainty will increase the mass of firms, but leave the average profit and cutoff productivity unchanged.*[19]

3.3.4. Entry and exit dynamics

Proposition 1 indicates that in the presence of a congestion externality, reductions in trade policy uncertainty will lead to simultaneous entries (larger M) and exits (higher φ^*). Moreover, the new exporters are more productive than the exiters, since the exiters have productivity that falls below the new elevated cutoff productivity.

To understand the entry and exit dynamics for the economy, it is helpful to review the equilibrium conditions for firm decisions. As there is no limit on firm entry, the equilibrium will be achieved in each and every period. Let us start from a hypothetical “first” period. In this initial period, a pool of identical entrants, denoted by M_e, pay the entry cost and learn their productivities. Among these entrants, a mass, M, learn that their productivity exceeds the equilibrium cutoff productivity, φ^*, and become surviving firms. The remaining firms exit.

In subsequent periods, assume that the current applied tariff rate and the degree of future trade policy uncertainty do not change. If new entrants were to pay the entry cost and draw their productivities, some of them would draw high productivities and the mass of surviving firms, M, would increase. However, this would reduce the average profit as in Eq. (14) and consequently reduce the expected payoff of entry in Eq. (11). Thus, in the absence to changes to the economic conditions which shape profit opportunities, entry in subsequent periods is not predicted. As a result, all entries occur in the first period and there are no further entry and exit in subsequent periods unless conditions change.

Changes in applied tariff rates or the trade policy uncertainty introduce the type of change which will influence the mass of active firms. For instance, when the worst-case tariff, $\overline{\tau}$, declines, the expectation term $E_\tau(\tau^{-1})$ rises and the compound tariff term, T_t, rises.[20] As an increase in T_t implies higher expected payoffs to entry, as in Eq. (14), it will induce more entries to the market. Further entries increase the mass of firms and congestion externality consequently results in an increase in the cutoff productivity, φ^*. Since surviving firms from earlier period, are required to pay the per-period fixed cost if they continue to export, they need to decide whether to produce or not based on Eq. (10). Incumbent firms with productivities above the new cutoff productivity level will find it profitable to remain in the market and thus will continue their participation in export. In contrast, as congestion costs raise the fixed costs of continued export, some lower productivity incumbent firms will exit the market if they find that their productivities fail to meet the new cutoff level.

[19] In non-CES demand system, congestion externality in fixed export cost tends to increase the cutoff productivity and average profit, similar to our CES setting. The number of firms is determined differently though.

[20] When the current applied tariff rate is low compared with the worst case tariff, decreases in the arrival rate, λ, or a reduction in the applied tariff have similar effects, since both changes increase T_t.

In sum, our model predicts that reduced trade policy uncertainty will lead to an increase in the mass of firms exporting to the foreign market.[21] Moreover, as the mass of exporting firms leads to increases the fixed cost of exporting faced by each exporter, some of the lower-productivity incumbent exporting firms can no longer survive and have to exit the export market. Therefore we will observe export entry by more productive firms (new entrants with productivity level above the increased new cutoff productivity) at the same time that some less productive incumbent firms exit from export (incumbent firms with productivity between the old and new cutoff productivities). This market reallocation outcome is the key prediction we test when we turn to our data.

4. Data and empirical results

Our theory predicts that trade policy uncertainty reductions will lead to a larger mass of exporting firms. In turn, due to general equilibrium effects, the cutoff productivity for continued export will increase, driving some of the lower-productivity incumbent exporting firms out of the export market. In this section we empirically test whether trade policy uncertainty reductions due to China's WTO accession led to firm entries and exits that support the predictions of our model.

4.1. Data

Our empirical analysis uses China's transaction-level customs data, which track the universe of exports by Chinese firms between the years 2000 and 2006. The dataset provides detailed information including firm identifiers, product codes (8-digit codes which we aggregate to the internationally comparable 6-digit HS codes), destination country (we only make use of the exports to the United States and countries of the European Union), trade regime (ordinary trade or processing trade), transaction value and quantity.

We obtain the MFN applied tariff and bound tariff for the years 2002 to 2006 from the WTO Tariff Download Facility.[22] The dataset lists the tariff rates for all WTO members reported for each 6-digit HS code.[23] The MFN applied tariff and non-MFN (column 2) tariff of the U.S. for years 2000 and 2001 are from Feenstra et al. (2002).[24] Similar to the customs data, the HS tariff code taxonomy includes a few changes over time due to the 2002 HS revision. To preserve comparability over time in light of the revision, we transform all observations with HS 2002 codes into HS 1996 codes based on the concordance provided by United Nation.[25]

We measure the trade policy environment using three variables. These variables are average applied import tariffs (τ_h), the change in applied import tariffs ($d\tau_h$), and the change in tariff uncertainty ($dgap_h$). Tariffs are measured at the HS 6-digit product level.

[21] Without uncertainty, Caliendo et al. (2015) also show how changes of ad valorem tariffs may lead to firm entry in a Melitz type model.

[22] See http://tao.wto.org/default.aspx and http://tariffdata.wto.org/ReportersAndProducts.aspx.

[23] The dataset provides information about the MFN applied tariff such as, for each 6-digit HS code, number of subheadings, number of tariff lines, number of national tariff lines with ad valorem duty, average of all ad valorem duties, minimum and maximum of ad valorem duty, percentage of applied duty free national tariff lines, and number of national tariff lines with non-ad valorem duty. Similar information is also provided for the MFN bound tariffs. We take the average of all ad valorem applied duties within a 6-digit HS code as its applied MFN tariff while the average of all ad valorem bound duties as its bound tariff. Note that for the ad valorem applied duties, no ad valorem equivalents for non-AV duties are included.

[24] The dataset reports, at 8-digit HS code level, the estimated MFN ad valorem equivalent duty (so MFN specific rates are taken into account), the MFN ad valorem duty, the estimated ad valorem equivalent of Column 2 duty, and the ad valorem of Column 2 duty, for years 2000 and 2001. To make it comparable to the tariff data from WTO Tariff Download Facility, we take the simple average, respectively, within 6-digit HS codes for the MFN ad valorem duty and the ad valorem of Column 2 duty. These averages are considered, respectively, MFN applied duty and non-MFN duty for the years 2000 and 2001.

[25] http://unstats.un.org/unsd/trade/conversions/HS%20Correlation%20and%20Conversion%20tables.htm.

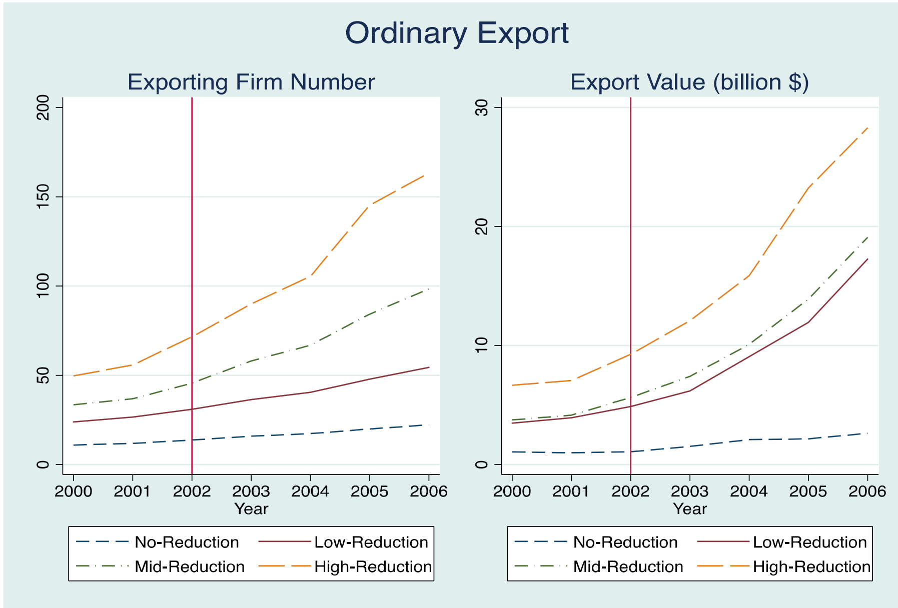

Fig. 4. Tariff uncertainty reduction and export growth: export firm numbers and export value. Notes: Each figure is based on China's ordinary exports to the U.S. Products were assigned to the four groups, based on the degree of trade policy uncertainty reduction for China's U.S. exports following China's WTO accession. The vertical axis of the left figure is the number of exporting firms averaged across HS 6-digit products within each group and the vertical axis for the right figure is the total export value for products in each group. Results for processing exports are similar.

The first tariff variable, τ_h, measures the average U.S. tariff rate which was applied to imports of product h between 2000 and 2002. The variable, $d\tau_h$, is constructed by subtracting the applied tariff rate in 2002 (after China's WTO accession) from the tariff rate applied tariff in 2000 (prior to China's WTO accession). Positive values of this measure imply that Chinese exporters benefitted from a reduction in applied tariffs. Finally, if we define *gap* as the difference between the worst-case tariff and the applied tariff in a given year, the reduction in uncertainty, $dgap_h$, is then defined as $dgap_h = (gap_{2000}, before\ WTO\ accession) - (gap_{2002}, after\ WTO\ accession)$. Positive values of $dgap_h$ indicate that trade policy uncertainty was reduced.[26] Summary statistics in Table 2 provide information on tariff levels, tariff changes and the degree of uncertainty reduction that followed China's WTO entry.

Before we turn to estimation, we check raw data correlations to check whether the changes in China's U.S.-destined exports were consistent with an explanation based on uncertainty reduction. To this end, we assign each product to one of the four groups based on the degree of uncertainty reduction. Products that had no change in uncertainty were assigned to the group one (*No-Reduction*). This group accounts for about 15% of all HS 6-digit products. Remaining products, which experienced non-zero changes in trade policy uncertainty, were assigned to three groups, *Low-Reduction*, *Mid-Reduction* and *High-Reduction*. Of the products in this group the 1/3rd of the goods that had the smallest reductions in uncertainty were assigned to the group *Low-Reduction*. Similarly, 1/3rd of the goods with medium reductions in tariff uncertainty were assigned to group *Mid-Reduction*, and the last 1/3rd with the largest reductions in tariff uncertainty were assigned to the group *High-Reduction*.[27]

If uncertainty reduction influenced export decisions, we should observe that China's export growth was most pronounced for products that benefitted from the largest reductions in trade policy uncertainty. Consistent with this prediction, Fig. 4 shows that the largest growth in trade value and in the number of exporting firms was in the *High-Reduction* group, which benefited from the strongest reductions in tariff uncertainty.

As we formed our dataset, we constructed two measures of fixed export costs. The first is constructed based on the China's manufacturing survey data, and is given as the fixed assets of exporting firms.[28] In particular, it is the weighted average of total fixed assets per 1000 RMB sales across firms exporting the good (*F_asset*), where each firms' share in the exports of the good is used as weights. While this measure does not directly measure fixed export costs, work by Castro et al. (2013) on the fixed cost of exporting indicates that fixed costs of export are correlated with such firm characteristics.

For a second measure of fixed export costs, we construct the intermediary share of exports as a proxy.[29] The intermediary share of exports, *IM_share*, is calculated as the intermediary export value as a share of the total export value for each product in 2006. Our use of *IM_share* is motivated by the work of Ahn et al. (2011) and Bernard et al. (2015), which show that the intermediary share of trade is higher for markets that are costlier to enter. To avoid endogeneity while ensuring that the market conditions are similar to those of the U.S., we use China's exports to non-US G7 countries to construct our product-level measures of the intermediary share.

Finally, to control for the impacts of anti-dumping measures applied to China's US based exports on exporter dynamics, we obtained anti-dumping information from the World Bank database (Bown, 2016).

4.2. Baseline results: impacts and reallocation

Our main regressions are based on a sample defined at the margin–product–destination–year level. This sample includes observations of Chinese exports to the United States and the EU countries. Such a

[26] If we construct our tariff measures replacing 2002 with later years in the 2002–2006 interval the tariff measure changes only slightly, since U.S. tariffs were stable during this period.

[27] *No-Reduction* group includes all products whose $dgap_h$ was zero. The values for $dgap_h$ for products in *Low-Reduction* Group ranged from 2.2 to 29.5 percentage points, while the value for products in *Mid-Reduction* Group spanned from 29.5 to 40.1 percentage points. The value exceeded 40.1 percentage points for products in *High-Reduction* Group.

[28] For details about this dataset, see Feng et al. (2016a).

[29] We define a firm as an intermediary firm if the firm data had at least one of the two following indicators: 1) if its Chinese name includes characters such as international trade, import, export, shopping mall, supermarket, and commercial, as in Ahn et al. (2011), and/or 2) if the firm was observed in China's 2008 enterprise census and the census categorized the firm as a wholesaler or retailer.

Table 3
Trade policy uncertainty and the number of firms, difference in differences estimates: US comparison with the EU as the control group.

Dependent	Log firm number (year *t*)				Log firm number at year 2000 exited by year *t*			
	New entrants (new exporter *and* adders)				Exiters			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
US ∗ *dgap* ∗ 2001	0.012***	0.014***	0.013***	0.012***	0.012***	0.014***	0.012***	0.012***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
US ∗ *dgap* ∗ 2002	0.015***	0.017***	0.015***	0.015***	0.012***	0.014***	0.012***	0.012***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
US ∗ *dgap* ∗ 2003	0.016***	0.018***	0.016***	0.016***	0.011***	0.013***	0.012***	0.011***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
US ∗ *dgap* ∗ 2004	0.017***	0.021***	0.019***	0.018***	0.012***	0.014***	0.012***	0.012***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
US ∗ *dgap* ∗ 2005	0.021***	0.022***	0.020***	0.019***	0.012***	0.014***	0.012***	0.012***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
US ∗ *dgap* ∗ 2006	0.020***	0.022***	0.019***	0.018***	0.012***	0.014***	0.013***	0.012***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	0.244***	0.244***	0.259***	0.264***	0.169***	0.169***	0.180***	0.183***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
HS 6 ∗ year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
US ∗ year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
X in US ∗ year ∗ *X*								
$d\tau$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
τ		Yes	Yes	Yes		Yes	Yes	Yes
F_asset			Yes	Yes			Yes	Yes
IM_share				Yes				Yes
N	278,446	278,446	259,476	254,968	278,446	278,446	259,476	254,968
R^2	0.738	0.738	0.747	0.749	0.724	0.725	0.734	0.736
Adj. R^2	0.738	0.738	0.747	0.749	0.724	0.725	0.734	0.736
F	6138.980*.**	4646.850	4083.272	3520.625	4309.669	3249.056	2689.484	2264.383

Notes: Standard errors in () are clustered at HS 6-digit product ∗ year level. The change in tariff uncertainty is labeled with (*dgap*). Coefficients for the triple interaction with (*dgap*) by year (2001–2006) are reported, while other variables are suppressed. The average applied import tariff is given by (τ), and the change in the applied tariffs is given by ($d\tau$). Industry fixed_assets relative to sales is measured by (*F_asset*), while the intermediary share of trade at the 6-digit level is given by (*IM_share*).
Statistical significance denoted by: *p < 0.10, ** p < 0.05, *** p < 0.01.

sample enables us to employ the technique of using a control group which was not subject to comparable uncertainty reduction during our sample period. I.e., we study and compare the outcomes of U.S.-bound exports with exports that were destined for the European Union. In contrast to the United States, the European Union granted permanent MFN status to China long before 2000 (in 1985).[30] China's accession to the WTO, therefore, had little effect on either the applied tariff or the policy uncertainty facing Chinese exports to the EU.

Our baseline regression thus estimates[31]

$$dln\text{Num}_{\text{mhct}} = \sum_{j=2001}^{2006}\beta_j 1\{j=t\}1\{c=us\}dgap_h + \sum_{j=2001}^{2006}\delta_j 1\{j=t\}1\{c=us\} + \sum_{j=2001}^{2006}\gamma_j 1\{j=t\}1\{c=us\}X_h + \delta_{ht} + \varepsilon_{hct}. \quad (15)$$

The dependent variable is the change in the log number of exporting firms in margin *m* for product *h* exported to destination *c* in year *t*. As our focus is the extensive margin adjustment, we primarily study the new entrant and exiter margins.

The exact definition of the dependent variable varies across margins. Since the new entrant margin is zero by definition in year 2000, the variable $\text{dlnNum}_{\text{mhct}}$ is the log number of new entrants for product *h* in destination *c* in year *t* after WTO accession. In contrast, the dependent variable for the exiter margin is the log number of firms, which are categorized as exiters by year *t* following China's WTO accession, for product *h* in destination *c* in year 2000.

On the right-hand-side of the specification, the triple interaction term between the uncertainty reduction, $dgap_h$, the indicator for the U.S., $1\{c=us\}$, and year dummies, $1\{j=t\}$, is our coefficient of interest. This coefficient indicates whether differences in the U.S. realizations of the dependent variables compared with those for the EU countries in year *t* were correlated with our measures of U.S. tariff uncertainty reduction.

To see the value of this estimation approach, suppose that there are some unobservables, e.g. Chinese industrial policies, technological advances, and/or China's own WTO accession policy reform, that are correlated with uncertainty reduction and also affect the dependent variable. Assuming that these unobservables had a common effect on trade, regardless of destination, our specification will still deliver unbiased estimates of $\beta_j s$ since the impacts of the unobservables are controlled by the control group, exports to the EU countries.

To provide further certainty, however, we include further triple interaction term, $1\{j=t\}1\{c=us\}X_h$, which explicitly controls for some observable factors. In this term, *X* is an array of product specific characteristics. In our reported results, we include the applied tariff level, τ_h, the change of the applied tariff, $d\tau_h$, and the measures of fixed costs in the vector *X*.

The average tariff level, τ_h, is included in the vector *X* to control for the possibility that tariff levels may have affected the cutoff productivity and therefore had an effect on the number of new firms entering or exiters exiting the market. For similar reasons, the measures of fixed export costs: the average fixed asset to sales ratio for exporting firms (*F_asset*), and the product-level intermediary share of exports (*IM_share*) are also included in the vector *X*. To see that, note in Eq. (10), fixed export costs are related to the cutoff productivity level. In particular, industries with higher fixed costs have a higher cutoff productivity. If the lower end of the productivity distribution is more densely populated with smaller firms, then the number of new firms entering the market may be larger in low fixed cost industries than in high fixed cost industries when trade policy uncertainty declines.

Finally, since we have cross-country and cross-product variations in the dataset, we can include very strong fixed effects in the estimation equation, including HS 6-digit *product* ∗ *year* fixed effects and *destination* ∗ *year* fixed effects. Further, HS 6-digit *product* ∗ *country* fixed effects are also implicitly included, as shown in Appendix A.3.

[30] http://europa.eu/legislation_summaries/external_relations/relations_with_third_countries/asia/r14206_en.htm.
[31] The derivation of this estimation equation is detailed in Appendix A.3.

Before we turn to the estimation results, one important point should be noted. Although there was no policy uncertainty reduction in the EU market, our identification is based on the assumption that the uncertainty reductions in the U.S. market have *no* impact on the EU outcomes. This assumption might be violated if there was spillover across markets. I.e., multi-market firms' views of the benefits of serving the EU market might be reduced by developments in the U.S. market, for example, due to capacity constraints. Alternatively, there might be learning by exporting so that succeeding in the U.S. increases the likelihood of succeeding in the EU market. To alleviate this concern, in our EU sample of firms, we drop all firms that also exported to the U.S. market.

Table 3 provides the first set of results.[32] Columns 1–4 report results for the new entrant margin while columns 5–8 report the results for the exiter margin. For parsimony, we only report the coefficients for the triple interaction term between uncertainty reduction, $dgap_h$, the indicator for the U.S., $1\{c=us\}$, and the year dummies, $1\{j=t\}$. Since positive values of $dgap_h$ indicate that firms faced reduced uncertainty following China's WTO accession, we expect the improved environment to increase export activity and $\beta_j>0$. All standard errors are clustered at HS 6-digit product ∗ year level in Table 3 and in all subsequent regressions in this section.

As shown in column 1, the coefficients are positive and highly significant for all years. These coefficients indicate that, for products which experienced larger uncertainty reduction in the U.S., the strength of firm export entry to the U.S. exceeded the strength of entry to the EU market. In other words, changes in U.S. trade policy uncertainty differentially affected China's exports to the U.S., compared with China's exports to the EU. Moreover, the coefficient grows over time, implying that the export effects stimulated by developments in trade policy uncertainty take time to be fully realized. These patterns are preserved when we include more control variables in the vector *X*, as shown in columns 2 to 4.

In columns 5–8, we turn to the exiter margin. Similar to findings on the new entrant margin, our results also show that larger magnitude reductions in tariff uncertainty were positively correlated with larger difference in the strength of export destruction in the U.S. market, through the disappearance of Chinese exporters who had formerly been active in the U.S. market in 2000, compared with the strength of export destruction from the EU market. The magnitude of the difference in export destruction between the two markets changes little, though, as we move to longer intervals. Including more control variables in the vector *X*, as shown in columns 6 to 8, does not change the magnitude or significance of the estimates.

In choosing the EU as the control group, we are seeking to ensure that any omitted variables in our specification would have the *same* impacts on the U.S. as on the control group countries. Since the question of similarity is vital to our estimation, we estimated a second set of regressions which uses a more stringently selected group of EU countries rather than the full EU sample. To create this second country control group, we restricted our control group to the set of EU member countries whose import structures were the most similar to those of the U.S. Based on the import structure similarity index introduced in Appendix A.4, the stringent EU control group includes the United Kingdom, France and Germany.

Table 4 reports the estimation results based on the more stringently selected EU control group. We now observe that the coefficients on the triple interaction terms are slightly smaller than those in Table 3. Nonetheless, our Table 4 coefficients, whether for the new entrant margin or for the exiter margin, remain positive and highly significant. Moreover, the patterns that the coefficient grows over time for the entrant margin and that the coefficient remains stable in magnitude for the exiter margin are also present in Table 4. Thus, we have further confidence that our primary coefficient results are not driven by omitted variable bias.

The above reported estimation results enable us to evaluate the relative importance of impacts of trade policy uncertainty reduction on Chinese exports in the U.S. market compared with the impacts of other factors. Conditional on the assumptions that the above-mentioned unobservables have impacts that are the same across markets, and that the uncertainty reduction impacts will not spillover across market, reviewing estimation equation Eq. (15), it is clear that the different terms in the RHS of Eq. (15) capture impacts tied to different factors. The first term, the triple interaction term between the uncertainty reduction, $dgap_h$, the indicator for the U.S., $1\{c=us\}$, and year dummies, $1\{j=t\}$, captures the effects of uncertainty reduction. The second term, the interaction term between year dummies and the US indicator, captures the effects of U.S. market specific factors, which were common across products.[33] The third term, the triple interaction term between other control variables included in the vector, *X*, the US indicator and year dummies captures the effects of other observables. Finally, the product ∗ year fixed effects capture product specific trends and the impacts of unobservables that are across destination countries.

Based on estimation results reported in columns (4) and (8) in Table 4, we calculated the shares of firm export entries to and those of firm exits from the U.S. market related to different factors.[34] The results are reported in Table 5. For the new entrant margin, the majority (around 80%) of the new entrants in the U.S. market can be attributed to the U.S. market specific factors (column 3 Table 5). This is reasonable as U.S. is a much larger market than the control group countries. Note that also included in this effect are the uncertainty reduction impacts induced by the smaller probability of U.S. revoking the MFN treatment on Chinese exports after China's WTO accession. These impacts are included in this term because such impacts are common across products and we cannot disentangle them with other market specific factors.

Interestingly, columns 1 and 2 show that the contributions to the new entrant margin by the uncertainty reduction induced by worst-case tariff reduction and those by product specific factors, including market-invariant unobservables, are of similar magnitudes. The former contributed around 13% while the latter contributed around 15% to the new entrant margin. Moreover, over time the uncertainty reduction's contribution is increasing while the contribution by product specific factors is decreasing. The contributions by other observables, column 4 of Table 5, are negative, showing that the control variables included in the *X* vector impeded new entrants.

Turning to the exiter margin displayed in columns 5 to 8 of Table 5 reveals similar patterns as we found for the new entrant margin. The influence of U.S. market-specific factors is substantial, around 80%. The contributions of uncertainty reduction and by product specific factors are also sizable and of similar magnitudes, accounting for around 12% and 15% of total exits respectively. Finally, we again find that over time the contributions by the uncertainty reduction are increasing and those of product specific factors are decreasing.

In sum, in support of our model predictions, we provide evidence that reductions in tariff policy uncertainty led to simultaneous export

[32] Note that countries included in the EU sample are: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and United Kingdom. These are the countries that were EU members by the year 2000.

[33] Note that the uncertainty reduction in the first term refers to the uncertainty reduction induced by lower *dgap*, but not that induced by smaller probability of U.S. revoking the MFN treatment on Chinese exports after China's WTO accession. The latter effects are captured by the second term, the U.S. market specific factors. For simplicity, we call the former "uncertainty reduction" effects, unless otherwise noted.

[34] Specifically, we substitute in the coefficients estimated in columns (4) and (8) respectively in the new entrant sample and the exiter sample. Insignificant coefficients are set to zero. Calculating the value of each term in the RHS of Eq. (15) using the estimated coefficients and the data of the variables, we obtain the value of the impacts by each term. Notice that the product ∗ year fixed effects are achieved by subtracting the first three terms from the predicted values of the dependent variable. We then divide the value of the impacts by each term by the predicted value of the dependent variable and then average across all products. The results are the shares contributed by impacts of different factors.

Table 4
Trade policy uncertainty and the number of firms, difference in differences estimates: US comparison with the UK, Germany, France as control group.

Dependent	Log firm number in year *t*				Log firm number at year 2000 exited by year *t*			
	New entrants (new exporter *and* adders)				Exiters			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
US * *dgap* * 2001	0.009***	0.012***	0.010***	0.010***	0.010***	0.012***	0.011***	0.010***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
US * *dgap* * 2002	0.012***	0.014***	0.013***	0.012***	0.010***	0.011***	0.010***	0.010***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
US * *dgap* * 2003	0.012***	0.015***	0.013***	0.013***	0.009***	0.011***	0.010***	0.009***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
US * *dgap* * 2004	0.013***	0.017***	0.015***	0.014***	0.010***	0.012***	0.010***	0.010***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
US * *dgap* * 2005	0.016***	0.018***	0.016***	0.015***	0.009***	0.011***	0.010***	0.010***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
US * *dgap* * 2006	0.015***	0.016***	0.014***	0.013***	0.010***	0.012***	0.011***	0.010***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	0.455***	0.455***	0.485***	0.493***	0.319***	0.319***	0.339***	0.345***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
HS 6 * year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
US * year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
X in US * year * *X*								
$d\tau$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
τ		Yes	Yes	Yes		Yes	Yes	Yes
F_asset			Yes	Yes			Yes	Yes
IM_share				Yes				Yes
N	79,556	79,556	74,136	72,848	79,556	79,556	74,136	72,848
R^2	0.864	0.865	0.874	0.876	0.830	0.831	0.839	0.841
Adj. R^2	0.864	0.865	0.874	0.876	0.830	0.831	0.839	0.841
F	6601.847*,**	5032.622	4378.683	3774.275	4567.925	3456.139	2840.160	2393.718

Notes: Standard errors in () are clustered at HS 6-digit product * year level. The change in tariff uncertainty is labeled with (*dgap*). Coefficients for the triple interaction with (*dgap*) by year (2001–2006) are reported, while other variables are suppressed. The average applied import tariff is given by (τ), and the change in the applied tariffs is given by ($d\tau$). Industry fixed_assets relative to sales is measured by (*F_asset*), while the intermediary share of trade at the 6-digit level is given by (*IM_share*).
Statistical significance denoted by: *p < 0.10, ** p < 0.05, *** p < 0.01.

entry and export exit in the affected products with the strongest changes observed in those product sectors which experienced the greatest reductions in tariff policy uncertainty.

4.3. Robustness

In this section we check the robustness of our results to a number of factors: whether the results are industry specific, trade-regime specific or induced by other possible trade policy uncertainties such as anti-dumping investigations.

One concern regarding our results is that they might be driven by some special rapidly-expanding industries. For example, Amiti and Freund (2010) note that between 2000 and 2006 Chinese exports shifted substantially away from low-tech products towards high-tech products. Alternatively, Khandelwal et al. (2013) show how removal of quotas on Chinese textile and clothing exports and related institutional changes in China caused China's textile and apparel exports to grow at a high pace. To check whether our results are mainly driven by these special industries, we run regressions for a subset of China's exports which excludes the high-tech machinery and instrument sector and previously quota-restricted textile and apparel sector. Results for this subsample are reported in Table 6, columns 1 and 6, for the new entrant and exiter margins respectively. For both margins our coefficient signs remain similar to those reported in Table 3, while the coefficient magnitudes become yet larger than their Table 3 counterparts. This finding suggests that our results are not restricted to unusual features of a handful of sectors or coincident policy changes such as the removal of quotas.

A second concern regarding our results is that Chinese firms might be exporting either through ordinary export or through processing export and that China's processing and ordinary exports are fundamentally distinct. For example, given the inherently vertical nature of processing trade, processing exporters' decisions may be determined by factors such as the relative presence of long-term offshoring contracts,

Table 5
Decomposition of contributions to the new entrant margin and the exiter margin: trade policy uncertainty reduction and other factors.

Year	Contributions to the new entrant margin				Contributions to the exiter margin			
	Uncertainty reduction	Product specific factors	U.S. market specific factors	Other observables	Uncertainty reduction	Product specific factors	U.S. market specific factors	Other observables
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
2001	12.49	18.01	81.63	−12.13	14.61	16.78	80.50	−11.89
2002	13.58	15.50	81.71	−10.79	13.25	15.40	82.96	−11.62
2003	13.31	15.00	82.98	−11.28	12.23	15.80	83.39	−11.43
2004	14.64	13.33	83.74	−11.70	12.98	15.47	83.22	−11.67
2005	14.35	11.87	80.94	−7.16	13.24	15.49	83.88	−12.61
2006	12.70	10.67	83.52	−6.88	13.32	14.45	84.94	−12.71

Notes: This table reports the contributions to the new entrant margin and the exiter margin for Chinese exporters in the U.S. market by different factors. Values in the table are percentage points. Uncertainty reduction refers to the uncertainty reduction induced by lower worst-case tariffs. "Other observables" includes product characteristics included in the vector *X* of estimation Eq. (15): the average tariff level, τ, the change of the applied tariff, $d\tau$, the average fixed asset to sales ratio for exporting firms (*F_asset*), and the product-level intermediary share of exports (*IM_share*). Values are calculated based on the estimation results reported in column 4 for the new entrant margin, and column 8 for the exiter margin respectively, of Table 4.

Table 6
Trade policy uncertainty and the number of firms, difference in differences estimates: robustness.

Dependent	Log firm number in year *t*					Log firm number at year 2000				
	New entrants (new exporter *and* adders)					Exiters				
	Non-MFA	Ordinary	Processing	Non-AD	AD control	Non-MFA	Ordinary	Processing	Non-AD	AD control
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
US * *dgap* * 2001	0.019***	0.011***	0.005***	0.012***	0.012***	0.018***	0.011***	0.006***	0.012***	0.012***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
US * *dgap* * 2002	0.020***	0.014***	0.006***	0.015***	0.015***	0.018***	0.011***	0.006***	0.012***	0.012***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
US * *dgap* * 2003	0.020***	0.015***	0.009***	0.015***	0.015***	0.017***	0.010***	0.007***	0.011***	0.011***
	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
US * *dgap* * 2004	0.022***	0.017***	0.011***	0.018***	0.018***	0.018***	0.011***	0.007***	0.012***	0.012***
	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)
US * *dgap* * 2005	0.022***	0.018***	0.013***	0.019***	0.019***	0.019***	0.010***	0.007***	0.012***	0.012***
	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
US * *dgap* * 2006	0.022***	0.018***	0.012***	0.018***	0.018***	0.019***	0.011***	0.008***	0.012***	0.012***
	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)
US * AD * 2001					0.233***					0.138***
					(0.045)					(0.043)
US * AD * 2002					−0.866***					−0.716***
					(0.310)					(0.231)
US * AD * 2003					−0.956***					−0.713***
					(0.248)					(0.202)
US * AD * 2004					−0.145					−0.433
					(0.301)					(0.274)
US * AD * 2005					−0.413					−0.470**
					(0.275)					(0.229)
US * AD * 2006					−0.448					−0.521**
					(0.277)					(0.252)
HS 6 * year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
US * year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
US * year * *X*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	147,756	249,340	140,812	252,476	254,968	147,756	249,340	140,812	252,476	254,968
R^2	0.759	0.741	0.701	0.750	0.749	0.744	0.731	0.660	0.736	0.736
F	1827.133	3211.993	1046.489	3508.714	3126.402	1270.274	2109.892	750.270	2257.256	1962.324

Notes: Notes are the same as Table 3. In all columns of Table 6 vector *X* includes τ, $d\tau$, *F_asset* and *IM_share*, as in columns 4 and 8 in Table 3.

capacity constraints, and limits on input substitutability in processing operations. Further, the striking difference in ownership for these two trade regimes may also shape contractual and organizational differences: foreign-owned firms handled the majority of processing trade, while the vast majority of ordinary trade was handled by private firms in China.

Due to the differences between ordinary and processing trade, it is important to check how trade policy uncertainty affected each of these forms of export. For this evaluation we run separate regressions for ordinary and processing exporters, displaying the results for the new entrant margin and the exiter margin in columns 2 to 3 and columns 7 to 8, respectively in Table 6. We find that trade policy uncertainty reduction affected ordinary exporters on both the new entrant margin and exiter margin. The coefficient patterns are very similar to those for the full sample reported in Table 3. Processing exporters are also affected, however, by a much smaller magnitude. The coefficients for the processing export are about one third to one half smaller than the coefficients for the ordinary exports. These findings are reasonable since processing exports are more likely to be involved in long-term contracts with foreign partners.

Finally, given that there were anti-dumping investigations during our sample period and that anti-dumping investigations may have caused additional trade policy uncertainty for exporters, we need to evaluate whether our results are biased by the possibility of anti-dumping investigations. To check whether this concern is valid or not, we first run regressions for a subset of products excluding all products that have ever faced anti-dumping investigations or treatment by the U.S. up to year 2014.[35] Excluding these products has little impact on the estimates, as shown by results reported in columns 4 and 8 of Table 6.

We further run regressions, controlling for anti-dumping investigation impacts by including triple interaction terms between the anti-dumping measures, the indicator for the U.S., and year dummies. The anti-dumping measure, *AD*, for a product in year *t* is set to one if the product faced an anti-dumping investigation in that year or if the product faced an anti-dumping investigation in earlier years. However, controlling for anti-dumping activity does not change the magnitude or significance of the coefficients on the triple interaction term involving uncertainty reduction measure, $dgap_h$, as shown in columns 5 and 10 of Table 6. Furthermore, we find that anti-dumping investigations in general reduced firms' entry and exits to the U.S. market, which is consistent to our theory, if anti-dumping investigation increases trade policy uncertainties.

5. Uncertainty reductions and a more competitive market

Our theory predicts that tariff policy uncertainty reductions will drive some exporting firms out of the market as market congestion raises the costs of export. Moreover, the theory is clear that firms which are induced to leave the export market, will have lower productivity as compared with the new export market entrants. While Section 4 has confirmed the presence of strong reallocation effects tied to product-level tariff uncertainty reduction, we now turn to this second prediction. In particular, we now seek to confirm whether the new export entrants were more productive than the exiting exporters and whether tariff uncertainty reduction intensified market competition.

To address these questions, we now compare the price and the quality of HS 6-digit products sold by new exporters and exiting exporters in the U.S. market. Further, we analyze whether there were

[35] Alternatively, regressions based on a subsample excluding products that have faced anti-dumping investigations or treatments by the U.S. during our sample years deliver similar results.

Table 7
Aggregate price changes at the 6-digit product level for Chinese exports to the United States.

Dependent	Percentage change of aggregate unit price (from year 2000 to year t) for HS 6-digit products					
	T = 2002	T = 2002	T = 2004	T = 2004	T = 2006	T = 2006
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.291***	0.422***	0.485***	0.712***	0.720***	0.967***
	(0.049)	(0.078)	(0.0603)	(0.080)	(0.098)	(0.130)
dgap		−0.004***		−0.007***		−0.007***
		(0.001)		(0.002)		(0.002)
$d\tau$		0.002		−0.003		−0.009
		(0.002)		(0.006)		(0.011)
N	3244	3244	3255	3255	3290	3290
Adj. R^2	0.000*,**	0.002	0.000	0.005	0.000	0.004

Notes: The change in tariff uncertainty is labeled (*dgap*), while the change in the applied tariffs is given by ($d\tau$).
Statistical significance denoted by: *p < 0.10, ** p < 0.05, *** p < 0.01.

any differences between the characteristics of goods sold by the two groups of firms, and whether the differences were related to uncertainty reduction.[36]

5.1. Price

We begin by testing whether the degree of uncertainty reduction had an influence on aggregate product prices. If the reallocations due to uncertainty reduction intensified competition, we expect smaller aggregate price increases in products that experienced larger declines in trade policy uncertainty.

In this exercise we first calculate the weighted average price for each HS 6-digit product h in each year t across all firms exporting the product to the United States, using each firm's export quantity share, θ_{fht}, as weights, or $\overline{P}_{ht} = \sum_f \theta_{fht} p_{fht}$. In this expression firm export quantity shares are given by $\theta_{fht} = q_{fht}/\sum_f q_{fht}$, where the quantity of product h exported by firm f in year t is q_{fht}. We then compute the percentage change in average product price for each product h between year t and year 2000, using the formula $\Delta\overline{P}_{ht} = (\overline{P}_{ht} - \overline{P}_{h2000})/\overline{P}_{h2000}$. Following our variable construction we regress the product price change measures on the product-level measures of uncertainty and applied tariff reductions.[37]

Table 7 displays the results from regressions of product level price changes between 2000 and year t (t = 2002, 2004 and 2006) on the magnitude of trade policy uncertainty reduction. For reference, column 1 of Table 7 regresses our measures of product price changes on a constant only, to uncover the average change in unit export prices for all products. We find that average product prices increased by roughly 29% between 2000 and 2002. When we add the trade policy measures to the regression, our results in column 2 reveal a negative and significant coefficient on uncertainty reductions, which indicates that products that experienced larger tariff uncertainty reduction were characterized by smaller price increases. If we apply this regression framework to the longer time spans running to 2004 or 2006, the data reveal the same dampening effect of uncertainty reduction on export product prices.

The Table 7 observation that products that experienced larger tariff uncertainty reductions were characterized by smaller unit export price increases, could arise if market reallocation induced entry by more productive new exporters, who were capable of exporting products at lower prices than were the firms that decided to exit from export. To search for evidence of this mechanism, we compare the product-level prices charged by new exporters with the prices charged by exiting exporters and check how the differences in the price are related to trade policy uncertainty reduction.

Since new exporters and exiters are not simultaneously observed, the estimation involves a comparison of new exporter prices in a post-entry year t (t = 2002, 2004 and 2006) with exiter's prices in 2000, prior to their exit from export and prior to China's WTO entry.[38] We thus pool new exporters and exiters in a single sample. To control for possible unobservables that are correlated with trade policy uncertainty reduction, *dgap*, which may also affect exports prices, we form a similar sample of new exporters and exiters for the EU market, and use the EU sample as a control group.[39]

We then run the following regression:

$$\begin{aligned}\text{price}_{fhc} = \alpha + \beta_1 1\{new\}_{fc} + \beta_2 1\{new\}_{fc} 1\{c = us\} \\ + \beta_3 1\{new\}_{fc} dgap_h + \beta_4 1\{new\}_{fc} 1\{c = us\} dgap_h + \delta_{hc} + \varepsilon_{hct}\end{aligned} \quad (16)$$

where price_{fhc} is the export unit price for product h, sold by firm f in destination country c. As stated above, the dependent variable is the price in year t for new exporters, and the price in 2000 for exiting firms. To make price changes comparable across products, we normalize the unit prices using the median price for each product. The dummy variable, $1\{new\}_{fc}$, is an indicator which denotes whether a firm is a new exporter to country c. While this variable is likely to capture differences related to firms by age cohort, it also captures differences that arise due to the fact that our observation of firm prices for export exiters is necessarily observed at a point in time prior to our observed prices for new entrants.

The interaction term interacts the new exporter indicator variable with the product-level policy variable capturing reductions in tariff uncertainty. To account for unobservables which are destination-invariant in impact but potentially correlated with trade policy uncertainty, we include a triple interaction term between the new exporter indicator, an indicator variable indicating whether the firm is exporting to the United States, and the trade policy uncertainty reduction. The coefficient of this triple interaction term indicates whether price differences between the new exporters and exiters realized in U.S.-bound exports, controlling for general effects which were also noted in exports to EU countries, in year t were correlated with our measures of U.S. tariff uncertainty

[36] In our earlier working paper (Feng et al., 2016b), we also compared the measured productivities (total factor productivities) of the new exporters and exiters. There, consistent with the price and quality results presented here, we find that new exporters were generally more productive than were exiting exporters. We do not, however, focus on TFP comparison here for two reasons. First, the TFP comparison involves a small subset of the firms from our full sample of trade transactions. Second, TFP measures are firm-specific, rather than market or product specific. As firms may export multiple products and a single firm may have different productivities for the products it produces, the use of a single productivity estimate, TFP, for all products produced by the same firm, masks important information of firm productivity at product level.

[37] We drop products whose price change measures were either below the first or above the ninety-ninth percentile.

[38] We do not observe contemporaneous activity since the new exporter becomes active over the same interval over which the exiter is leaving, while the new exporter was absent from the earlier year when the now exiting exporter was active.

[39] Similar to Section 4, we drop all firms that exported to both the U.S. and the EU to avoid spillover effects.

Table 8
Price and quality difference between new exporters and exiters.

Dependent	Price in year t (for new exporters) or in year 2000 (for exiters)			Quality in year t (for new exporters) or in year 2000 (for exiters)		
	$t = 2002$	$t = 2004$	$t = 2006$	$t = 2002$	$t = 2004$	$t = 2006$
	(1)	(2)	(3)	(4)	(5)	(6)
New	−11.083	1.095	5.549	0.955***	0.261	0.972***
	(70.740)	(41.401)	(28.853)	(0.207)	(0.161)	(0.143)
New * US	138.291	154.868**	130.370***	−0.284	−0.109	−0.697***
	(103.393)	(61.549)	(42.976)	(0.303)	(0.239)	(0.213)
New * *dgap*	0.246	−0.248	−0.302	−0.011**	0.004	0.002
	(1.540)	(0.888)	(0.611)	(0.005)	(0.003)	(0.003)
New * US * *dgap*	−4.187*	−4.836***	−4.080***	0.009	0.003	0.013***
	(2.308)	(1.374)	(0.955)	(0.007)	(0.005)	(0.005)
Constant	28.624	34.185**	32.229***	50.773***	50.674***	50.154***
	(27.928)	(16.571)	(11.667)	(0.082)	(0.064)	(0.058)
Prod * Cty FE	Yes	Yes	Yes	Yes	Yes	Yes
N	260,387	441,467	732,152	260,387	441,467	732,152
R^2	0.059	0.021	0.014	0.166	0.158	0.154
Adj. R^2	0.037	0.008	0.006	0.147	0.147	0.147
F	2.028	6.259	8.880	90.863	297.128	675.937

Notes: The change in tariff uncertainty is labeled with (*dgap*). New export transactions are denoted by an indicator variable (New).
Statistical significance denoted by:
* $p < 0.10$.
** $p < 0.05$.
*** $p < 0.01$.

reduction. Finally, to account for inherent product-country-specific variation in prices we include HS 6-digit product * destination fixed effects.

Our new regressions are reported in columns 1–3 of Table 8. The first set of results, included in columns 1, is based on comparison of new exporters who did not export in 2000 but appeared by 2002, with exiters who exported in 2000 but ceased export by 2002. The coefficient on the triple interaction regressor that interacts the new exporter dummy, the US dummy with tariff uncertainty reduction is negative and significant at 10% level. This suggests that the US realization of the price differences between the new exporters and the exiters compared with that for the EU countries is larger particularly for products that experienced larger tariff uncertainty reduction.

When we perform similar comparisons, which define new entry and exit using changes between 2000, and the later years 2004 and 2006, in columns 2 and 3 of Table 8, we have similar findings as in column 1. Again the coefficients on the triple interaction term are negative and highly significant, showing that products which experienced larger policy uncertainty reductions had lower relative prices charged by new entrants when compared with exiter prices than products that experienced smaller changes in policy uncertainty. Thus, our results suggest that, due to the role of policy uncertainty reduction in encouraging entry by new exporters who charged relatively lower prices, uncertainty reductions increased market competition.

5.2. Quality

Although we conjecture that new entrants offered lower prices relative to exiters due to higher productivity, an alternative explanation could be that the lower price for new exporters arose since new exporters chose to produce and sell lower quality products. To investigate whether this alternative is consistent with the data, we adopt the approach used by Khandelwal et al. (2013) to gain evidence regarding the relative quality of exports that were sold by new exporters compared with the quality provided by firms that exited from export.

Following Khandelwal et al. (2013), we incorporate quality levels in the utility function and use data on sales to estimate quality levels. For this exercise, we assume that utility is given by the CES function: $U = (\int(\eta q)^{\frac{\sigma-1}{\sigma}} d\omega)^{\frac{\sigma}{\sigma-1}}$, where η represents the quality of the variety. The demand function for each variety is then $q = \eta^{\sigma-1} p^{-\sigma} P^{\sigma-1} Y$, where p is the variety's price, P is the aggregate price level and Y is the aggregate expenditure on the good. Taking logs of the demand equation, we obtain $\ln q = -\sigma \ln p + \ln(P^{\sigma-1}Y) + (\sigma-1)\ln\eta$. This provides us with the following regression specification,

$$\ln q_{fht} = -\sigma \ \ln p_{fht} + \alpha_{ht} + \mu_{fht}$$

which applies to individual firm f exports of HS 6-digit products, h. In this regression equation product-year fixed effects, α_{ht} capture the effects connected to aggregate price (P), and aggregate expenditure (Y) as well as other year-specific unobservable factors that affect product-level export costs or demand.

Following estimation of the demand equation, we could potentially back out quality levels by using the estimated residual $\eta_{fht} = e^{\hat{\mu}_{fht}/(\sigma-1)}$. However, since we plan to compare quality differences across firms *within* the same HS 6-digit product and the estimation for quality is performed for *each* HS 6-digit product, we could simply use the estimated residual term as the measure of quality.[40] With the estimated quality for each firm export to each country in each year for both the U.S. and EU markets, we perform the regressions in which we replace the dependent variable in estimation equation Eq. (16), now using our firm–product–destination quality measures derived from estimation of the demand equation.

Columns 4 to 6 of Table 8 display the quality regression results. In columns 4 and 5 we do not find that the magnitude of the quality premium in the U.S. market provided by new exporters, compared with that in the EU market, was statistically significantly related to the magnitude of the trade policy uncertainty reduction. Nonetheless, the coefficient on the new exporter indicator is positive and large compared with the coefficients on the interaction terms, suggesting that new exporters provided higher, not lower, quality exports. Moreover, in column 6, when we compare the quality difference between new exporters in 2006 with exiters in 2000, the positive and significant coefficient on the triple interaction term suggests that the quality premium was larger for products which experienced larger trade policy uncertainty reductions.

Based on the results for quality regressions, we do not believe that the lower prices associated with new firm exports were attributable to a choice to provide new exports of inferior quality. Instead, our results suggest that new exporters were more productive, produced higher quality goods and charged lower prices than exiting exporters. In turn, this trend may explain Mandel's (2013) observation that U.S. exports

[40] The estimated residual term is normalized, ranging from zero to one hundred, so that its difference can be compared across products.

from other countries responded to Chinese competition by reducing mark-ups by a magnitude of 30%, and increasing marginal costs by 50% (presumably in a move to provide distinctly higher quality products compared with China).

Combining the results in Table 8 with the fact that market share reallocations associated with the activities of new exporters and exiting exporters were the most important drivers of changes in extensive margin market share reallocation, shown in Table 1, we find that trade policy reductions induced the reallocation of export market share from high-price low-quality exiting exporters to low-price high-quality new exporters. Moreover, products which experienced larger policy uncertainty reductions had lower relative prices charged by new entrants when compared with exiting exporter prices, than was the case for the relative price differences for products that experienced smaller changes in tariff policy uncertainty. Taken together, these features of China's export market reallocation suggest that reductions in tariff policy uncertainty intensified product market competition.

6. Conclusion

In this paper, we document two salient features of Chinese exports to the United States in the early 2000's. The first notable feature is that at the fine product-level there was a dramatic reallocation of export activities across firms following China's WTO accession. In particular, within product-level export lines, substantial export market share expansions by new exporters coincided with similar magnitude export market share losses by exiting exporters. The second important development at this time was the sizeable reduction in U.S. trade policy uncertainty which was provided by China's WTO entry in 2001.

We argue that these two facts are related since these aggregate reallocations can be explained by the reductions in trade policy uncertainty. To make the connection explicit, we develop a model of heterogeneous firms which incorporates trade policy uncertainty. Due to general equilibrium effects that operate through changes in the mass of exporting firms, our model generates simultaneous export entries and exits by firms within sectors when trade policy uncertainty is reduced — a reallocation effect on which current literature is typically silent.

Empirically, we exploit the rich firm-level Chinese Customs dataset to test how the uncertainty reductions associated with China's WTO entry contributed to exporter dynamics. We find very strong export entry and exit responses by firms in response to reductions in trade policy uncertainty. More importantly, when we compare the price and quality of exported products for new exporters with those of exiting exporters, we find strong evidence that the new exporters charged lower prices and the largest effects for products that experienced larger uncertainty reduction.

When considered as a whole, our results suggest that tariff policy uncertainty reductions contributed to the aggregate reallocation of Chinese exports. In particular, tariff uncertainty reduction led to churning at the fine product level and encouraged the entry of high-productivity low-price new exporters at the expense of low-productivity high-price exiting exporters. Overall, since trade policy uncertainty reduction for Chinese exporters may have intensified the competitiveness of China's U.S. exports, through increased quality and reduced prices, this change in policy may help explain the potency of the effects of China's increased exports to the U.S. on the US manufacturing sector and labor market.

Appendix A

A.1. Congestion externality

We illustrate the micro-foundations of congestion externality in the export market. Following Mortensen and Pissarides (1994), we view successful export by each exporter in each period as involving a successful match between the exporter and an intermediary who supports their export. The arrival rate of intermediaries to exporters is given by $\Pr = m(M,I)/e$, where $m(M,I)$ is a constant-return-to-scale (CRS) matching function, M is the measure of exporters and I is the measure of intermediaries. The $m(M,I)$ function is increasing in both arguments, M and I. With such a matching technology, when the measure of exporters and that of intermediaries both double, the arrival rate of an intermediary to each individual exporter is unchanged.

The intermediary service market is characterized by a demand function $I^d(p_I,M)$, where p_I is the intermediary service price, and a supply function $I^s(p_I)$. The demand function is HOD-1 in the measure of exporters M and is decreasing in the intermediary service price. The supply function has a non-negative price elasticity. It is easy to show that, in such a market, *unless* the intermediary supply is *perfectly elastic*, the equilibrium I(M) and $p_I(M)$ satisfies $dI/dM<1$ and $dp_I/dM>0$.

Assume that each exporter pays a unit cost per unit of time to find an intermediary. Once the exporter finds an intermediary, it pays the intermediary service price. Hence, the total fixed cost to successfully export is given by $p_I(M)+1/\Pr(M)$, where the arrival rate can be rewritten as $\Pr(M)=m(1,I(M)/M)$ due to the CRS property. Since $dI/dM<1$ and the matching function m is increasing in both arguments, we then have $d\Pr(M)/dM<0$. I.e., in economies with more exporters, it takes longer time to match with an intermediary, for any given exporter. Since the price of intermediary service is also increasing in the number of exporters, the fixed export cost is higher when there are more exporters.

A.2. Proof of existence and uniqueness of equilibrium solution

We can rewrite the ZCP and FE conditions as $j(\varphi^*)=\frac{(1-\rho)f_e}{M^{\eta}f}$, where $j(\varphi)\equiv[(\frac{\tilde{\varphi}(\varphi)}{\varphi})^{\sigma-1}-1][1-G(\varphi)]$. As shown by Melitz (2003), $j(\varphi)$ goes from ∞ to 0 when φ goes from 0 to ∞. This proves the existence and uniqueness of the solution φ^* and $\overline{\pi}_p$ for any given value of M. This property of $j(\varphi)$ also necessarily implies that the solutions of φ^* and $\overline{\pi}_p$ are increasing functions of M. Specifically, when M goes to infinity, $\varphi^*(M)$ goes to infinity. When M goes to zero, $\varphi^*(M)$ goes to zero. The same applies to $\overline{\pi}_p(M)$.

A.3. Derivation of estimating Eq. (15)

The full empirical specification is as follows:

$$\begin{aligned}\ln EXNum_{mhct} = \alpha &+ \sum_{j=2001}^{2006}\beta_j 1\{j=t\}1\{c=us\}dgap_h \\ &+ \sum_{j=2001}^{2006}\gamma_j 1\{j=t\}1\{c=us\}X_h \\ &+ \sum_{j=2001}^{2006}\delta_j 1\{j=t\}1\{c=us\} + \sum_{j=2001}^{2006}\delta_{2j} 1\{j=t\} \\ &+ \sum_{j=2001}^{2006}\delta_{3j} 1\{j=t\}dgap_h + \sum_{j=2001}^{2006}\delta_{4j} 1\{j=t\}X_h \\ &+ \delta_5 1\{c=us\}dgap_h + \delta_6 1\{c=us\}X_h + \delta_{ch} + \delta_{ht} + \varepsilon_{hct}.\end{aligned}$$

In this specification, we included *very* comprehensive fixed effects: product ∗ year fixed effects country ∗ year fixed effects and country ∗ product fixed effects.

Note that the product ∗ year fixed effects, δ_{ht}, absorb the terms $\sum_{j=2001}^{2006}\delta_{2j}1\{j=t\}$, $\sum_{j=2001}^{2006}\delta_{3j}1\{j=t\}dgap_h$ and $\sum_{j=2001}^{2006}\delta_{4j}1\{j=t\}X_h$. Similarly, the terms $\delta_5 1\{c=us\}dgap_h, \delta_6 1\{c=us\}X_h$ are absorbed by the country ∗ product fixed effects, δ_{ch}. Thus, we can simplify the estimation equation as:

$$\begin{aligned}\ln EXNum_{mhct} = \alpha &+ \sum_{j=2001}^{2006}\beta_j 1\{j=t\}1\{c=us\}dgap_h \\ &+ \sum_{j=2001}^{2006}\gamma_j 1\{j=t\}1\{c=us\}X_h \\ &+ \sum_{j=2001}^{2006}\delta_j 1\{j=t\}1\{c=us\} + \delta_{ch} + \delta_{ht} + \varepsilon_{hct}.\end{aligned}$$

Taking differences across periods, the equation can then be written as

$$dlnEXNum_{mhct} = \sum_{j=2001}^{2006}\beta_j 1\{j=t\}1\{c=us\}dgap_h + \sum_{j=2001}^{2006}\gamma_j 1\{j=t\}1\{c=us\}X_h + \sum_{j=2001}^{2006}\delta_j 1\{j=t\}1\{c=us\} + \delta'_{ht} + \varepsilon'_{hct}$$

which is estimation Eq. (15).

A.4. Import structure similarity

We construct the import similarity index based on the approach of Finger and Kreinin (1979). We first calculate the import share of product h in a country c's total imports from China in year t, $s_{hct} = EX_{hct}/(\sum_h EX_{hct})$. We then construct the similarity index by comparing these shares to the shares in the reference country, which is U.S. in our case, $SI_{ct} = 100\sum_h \min(s_{hct}, s_{ht}^{US})$. This index is bounded by zero and one hundred, with higher values indicate higher similarity. Appendix Table 3 shows the similarity index for the EU countries.

Appendix Table 1
Market share changes 2000–2002, overall and by firm ownership.

Margin	All	SOE	FIE	Dom
	(1)	(2)	(3)	(4)
(1) Incumbents net entry	−6.479***	−3.808***	−2.677***	0.006
(2) Exiters	−53.489***	−38.069***	−12.418***	−3.002***
(3) New exporters	25.845***	8.826***	10.196***	6.824***
(4) Adders	34.123***	24.756***	6.812***	2.555***
(5) Total net entry	6.479***	−4.487***	4.589***	6.377***
(6) Total	0	−8.295***	1.912***	6.383***

Note: Similar to Panel A of Table 1, this table reports the average market share changes for different margins for the period from 2000 to 2002. The data are averaged across HS 6-digit products, according to the margins of adjustment and the form of firm ownership. In each column, the contributions due to exiters, new exporters, and adders (displayed in rows 2 to 4) sum up to the values reported in row 5 (total net entry). Similarly, the market share changes due to incumbents (row 1) can be summed with the market share changes caused by total net entry (row 5) to compute the value displayed in row 6. Since the data are also disaggregated to show changes by ownership (SOE, FIE and Domestic), the values in the associated rows for columns 2 to 4, can be summed to arrive at the overall change by margin, displayed in column 1. Results are generated by regressing the changes in market shares for HS 6-digit products on a constant. Products, which are not exported in any of the two years, are dropped before taking average. Triple-starred values represent statistical significance at 1% level.

Appendix Table 2
Sectors in HS classification.

Sector name	HS 2 digit	Sector name	HS 2 digit	Sector name	HS 2 digit
Food	1–24	Paper	47–49	Machinery	84–85
Minerals	25–27	Textiles	50–63	Vehicles	86–89
Chemicals	28–38	Footwear	64–67	Instruments	90–92
Plastics	39–40	Ceramics	68–70	Arms	93
Leather	41–43	Jewelry	71	Toys	94–96
Wood	44–46	Iron	72–83	Arts	97

Appendix Table 3
Import similarity index for EU countries with the U.S.

Country	Similarity	Country	Similarity	Country	Similarity
United Kingdom	.71	Sweden	.52	Finland	.48
Germany	.64	Austria	.52	Denmark	.46
France	.64	Belgium	.50	Greece	.46
Spain	.56	Italy	.50	Ireland	.33
Netherlands	.55	Portugal	.49	Luxembourg	.17

Note: method for computing import similarity indices described in Appendix A.4.

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