UNIVERSITY OF CAMBRIDGE
Faculty of Economics

Cambridge Working Paper Economics

Cambridge Working Paper Economics: 1676

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16 December 2016
(Revised March 2018)

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21 March 2018

Abstract

We estimate how a rise in uncertainty about future tariff rates impacts firm decisions to enter into and exit from export markets. Using Chinese customs transactions between 2000-2009, we exploit time-variation in product-level trade policy and find that Chinese firms are less likely to enter new foreign markets and more likely to exit from established foreign markets when their products are subject to increased trade policy uncertainty. Our analysis is based on the phenomenon of "tariff echoing" – after a tariff hike in one country, another country is likely to raise its tariff on the same product. Overall, we find that if there had been no trade policy uncertainty created by the use of contingent tariffs, Chinese entry into foreign markets would have been roughly 2 percent higher per year. We use our model to counterfactually estimate how much entry by Chinese firms over 2001-2009 was due to future trade policy certainty provided by membership in the WTO.

JEL classification: F12, F13, F14

Keywords: Trade policy uncertainty, trade agreements, China shock, Chinese exporters, antidumping, information spillovers

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1 Introduction

The establishment of the World Trade Organization (WTO) in 1995 introduced greater certainty about future trade policy around the world because WTO members committed to cap the tariff rates for almost all products traded internationally.[1] Nevertheless, trade agreements allow members to raise tariff rates if certain economic criteria are met; WTO members have increasingly turned to the contingency provisions of the WTO agreement to raise tariffs. Under these contingency provisions, a government can raise the tariff on a product or group of products from an exporting country if imports have risen sharply and the domestic import-competing industry is suffering a decline in employment or lower profits.[2] The imposition of a contingency tariff by one country has both a direct and an indirect effect on trade; a direct effect in reducing imports of targeted goods into the market with the higher tariff and an indirect effect that comes from the signal that future tariff uncertainty for this product has increased in all other markets. In this paper, we present new evidence on the indirect effect of contingent tariffs from increased trade policy uncertainty.

We improve upon previous work on trade policy uncertainty with a novel and unique identification strategy that enables us to identify firm responses to increases in trade policy uncertainty while controlling for unobserved time-varying fluctuations in product-level supply and demand. No existing empirical work has examined how an *increase* in uncertainty about future tariff rates impacts international trade. With a worldwide decline in popular enthusiasm for free trade agreements and customs unions, exemplified by Britain's popular referendum vote to leave the European Union and Donald Trump's election to the US presidency, understanding how the threat of tariff increases affects real outcomes is a question of first order importance. We examine how an increase in uncertainty impacts the extensive margin of trade, both product entry and exit and foreign market entry and exit, for approximately 193,000 Chinese exporters between 2000-2009. The empirical analysis centers around changes to tariff rates that Chinese firms might face in foreign markets under antidumping laws, the quantitatively most important of the WTO's contingency provisions.

Our analysis of rising trade policy uncertainty is premised on an important feature of antidumping duties - their use is correlated across countries. Thus, imposition of antidumping duties in one country can be used to identify an increase in trade policy uncertainty for the same product in other countries because the application of new antidumping duties against product-exporting country pairs is correlated over time across foreign markets.[3] Tabakis and Zanardi (2016) document global "antidumping echoing,"

[1]We observe that the European Union, the United States, Argentina, Brazil, China, Mexico, Russia, and Colombia capped their tariff rates for 100 percent of importable products under the universally recognized Harmonized System of product classification. Further, Australia, Canada, Japan, Indonesia, South Africa, Egypt, and Pakistan established tariff caps for more than 95 percent of importable products. See Bown and Crowley (2016), Table 1.

[2] See Bown and Crowley (2016) and Bown and Crowley (2013) for a discussion of contingent tariff policies under the WTO. Bown and Crowley (2016) report in "Table 3: Import Product Coverage by Temporary Trade Barriers over 1995-2013, by Country and Policy" that between 1995 and 2013 the cumulative share of products that faced a tariff increase under a WTO contingency clause was 22.9 percent for Mexico, 10.3 percent for the United States, 8.1 percent for the European Union, 8.0 percent for India, 4.8 percent for Argentina, 4.2 percent for Turkey, 3.4 percent for Canada, 3.1 percent for China, 2.8 percent for Brazil, 2.5 percent for Australia and 2.3 percent for Colombia.

[3]More precisely, the measure of uncertainty regarding future tariffs is an increase in variance of the tariff. While this increase in variance raises the expected value of the future tariff, ex post, we identify occurrences in which the tariff did not change.

correlations in new antidumping duties across markets and over time from 1980-2005. Empirically, the imposition of new antidumping duties in a destination market is a rare event; Tabakis and Zanardi (2016) calculate that the probability of a new antidumping duty for an origin-destination-product triplet among 15 destination countries and 39 origin countries from 1980-2005 is a mere 0.024 percent. Importantly for our purposes, they also document that the probability of a new antidumping duty in any of 14 destination markets in year t *conditional* on a new antidumping duty in a first market in year $t-1$ jumps to 0.721 percent. To summarize, tariff hikes under antidumping policy occur rarely, but if one importing country hikes its tariff, there is increased probability of a future tariff hike on the same product in other markets around the world.

To frame our analysis of the impact of a trade policy uncertainty shock, we turn to the theoretical model of Handley and Limão (2015) in which an increase in trade policy uncertainty reduces the value to a firm of becoming an exporter and leads to a decline in the rate of new market entry. Our analysis exploits the fact that uncertainty about the tariff rate of a product increases when an antidumping duty is imposed on that product somewhere in the world. To solidify ideas, we present the conditional probability that a firm will enter the EU (US) with a product given that it has previously sold in other foreign markets: 4.74 percent (5.56 percent). We then calculate the conditional probability that a firm enters the EU (US) market with a new product that it previously sold in a foreign market that imposed an antidumping duty. In this case, the conditional probability of entering the EU (US) falls to 2.95 percent (4.60 percent). The pattern that emerges is that firm-product pairs that faced an AD duty in a foreign market are less likely to enter the EU and US in the following period than firm-product pairs that did not face a foreign antidumping measure. This "tariff scare" effect that appears in the raw data sets the stage for our econometric analysis.

We begin our empirical analysis by identifying product-destination-year triplets in which trade policy uncertainty rose but no subsequent change in the tariff actually took place. We then estimate the impact of trade policy uncertainty shocks for three distinct cases: (1) entry into *other* foreign markets with the "targeted" product by firms that were hit with the tariff, (2) entry into *other* foreign markets with *other* products by multi-product firms that were hit with a tariff on one product, and (3) entry into *other* foreign markets by *other* firms that did NOT face the tariff hike because they did not export the product in question to the market that raised the tariff.

For each of these cases, we estimate a model of new market entry at the product level for individual firms. For the first case, entry with "targeted" products by firms that were hit with tariffs, we assume these "targeted" firms update their beliefs about the future tariffs in *other* markets, but that *other* firms which export the targeted product and were NOT hit with tariff increases anywhere do not change their beliefs about future tariffs. The strength of this approach is that it controls for possible time-varying product demand by identifying the impact of uncertainty shocks across firms.[4] We find that tariff scares, an increase in the threat of a tariff that subsequently does not materialize, reduce the probability of entry by 5.2 percent and 10.0 percent for manufacturing and trading firms, respectively.

Next, we sharpen our identification of uncertainty shocks by exploiting within-firm cross-market vari-

[4] If some firms not hit by a tariff do update their beliefs, then our identifying assumption means that the estimate on the measure of trade policy uncertainty will be biased toward zero.

ation in trade policy uncertainty. We divide countries around the world into two groups, activist users of contingency tariffs and others which rarely or never use antidumping duties to restrict imports. Only in the first group, countries with a track-record of raising tariffs through contingency measures, do we expect to observe an effect of increased tariff uncertainty. This is exactly what we find, thus confirming that our results are a firm-level response to uncertainty shocks rather than unobservable time-varying cost shocks within the firm.

We then turn to the second case and ask: Does a tariff hike for one product raise uncertainty about future trade policy for similar or closely-related products? To answer this question, we identify products within the same broad product group (i.e., HS04 classification) as a product subject to a new antidumping duty and examine the entry of these *other* products into markets *other* than that which imposed the antidumping duty.[5] We find trade policy uncertainty in one product spills over to other products within the firm; the probability of entering a new foreign market with closely-related products declines by 7.1 percent and 8.1 percent for manufacturing and trading firms, respectively.

Lastly, we ask if and how information on foreign trade policy disseminates to other exporting firms within China. Specifically, we investigate if information about likely future tariff increases spreads from firms that have been hit with new foreign duties to firms that export the same product to other destinations. We exploit firms' geographic locations within China to estimate how news about one country's antidumping duty can influence the export behavior of firms not directly affected by the foreign policy change. We construct product-level trade policy information shocks for all Chinese prefectures and find that firms exposed to a more intense trade policy information shock are far less likely to enter new markets. This finding suggests a benefit accruing to exporting firms located in industrial clusters - they acquire valuable information about foreign market conditions.

We conduct a similar analysis of exit from foreign markets by Chinese firms in the presence of trade policy uncertainty. We estimate substantial increases in exit under trade policy uncertainty. We document interesting heterogeneity in exit across firms according to their market share in the destination country and the position of the product within a multi-product firm.

Finally, we use the estimated parameters to construct two distinct sets of counterfactual estimates; (1) the lost trade due to the trade policy uncertainty associated with the WTO's contingency provisions and (2) the share of new firm-product entry from China over 2001-2009 that was due to the elimination of trade policy uncertainty that came with China's accession to the WTO. First, we conservatively estimate, within our sample, how much trade went "missing" over 2001-2009 due to the policy uncertainty caused by the use of WTO contingency tariffs. Second, if we assume that the trade policy uncertainty a country faces when it does not belong to a trade agreement is of the same magnitude as the trade policy uncertainty it faces under the WTO's contingency provisions and that increases and decreases in trade policy uncertainty have symmetric effects on entry, then we can use our model to estimate how much entry by Chinese firms was created by the reduction in trade policy uncertainty that came with China's WTO accession.

First, uncertainty arising from the use of contingent tariffs, which impacted about 4 percent of the

[5] Tabakis and Zanardi (2016) document positive cross-country correlations in the imposition of antidumping duties at the HS04 product level. They define antidumping echoing to include a positive correlation in tariff imposition across similar, but not necessarily identical, products.

products in our sample per year, created 1779 missing entrants among manufacturing firms, and 519 missing entrants among trading firms each year for a total number of missing entrants per year of 2,298. These missing entrants represent 2 (1) percent of annual manufacturing (trading firm) entrants per year. If we ascribe to these missing entrants the average value of exports by firms of their type, we estimate the cumulated missing trade value over 2001-2009 at $25.3 billion. We emphasize that this missing trade is due to rising uncertainty in only 4 percent of our product sample in each year and does not include the direct effect of the tariff. The magnitude of our results on the indirect effect of antidumping duties appears reasonable in light of previous work on the sizeable direct effect of antidumping on trade.[6]

Turning to China's WTO accession, we construct a counterfactual estimate of the impact of reducing trade policy uncertainty by assuming that if China had not joined the WTO, it would have faced trade policy uncertainty in all products equivalent to what it faced under antidumping policy. Of the actual 121,305 firm-product-destination entrants per year in our sample over 2001-2009, we estimate 56,385 per year were due to the reduced uncertainty over trade policy caused by China's entry into the WTO. This represents 46 percent of the new entrants per year. New entrants are typically smaller in terms of their total export value than more established exporters, but they still contribute substantially to overall export growth. One of the most important features of international trade over the last twenty years has been the dramatic rise of Chinese exports. Our analysis implies that the resolution of trade policy uncertainty was an important force behind this growth.

Our work contributes to three distinct literatures in international trade, the literature on trade policy uncertainty, that on optimal trade agreement design, and the literature on firm entry and exit into foreign markets.

First, we contribute to the literature on trade policy uncertainty by offering a new approach that cleanly identifies the effect of uncertainty from time varying shocks at the firm and product level. Our empirical work validates theoretical contributions (Handley and Limão (2015) and Limão and Maggi (2015)) which build upon the seminal work by Bloom (2009) and complements existing empirical work that largely relies on cross-sectional variation in trade policy uncertainty at a single point in time (Handley (2014), Pierce and Schott (2016), and Handley and Limão (2014)). Existing empirical work has used accession to a trade agreement as a natural experiment in which the elimination of pre-existing cross-sectional variation in tariff uncertainty identifies the impact on multiple outcomes including firm entry into exporting, trade volumes, and import-competing sector employment.[7] Handley (2014) examines the role that binding tariff commitments had on Australia's imports under the WTO. Handley and Limão (2015) estimate the impact of Portugal's EU accession. Pierce and Schott (2016) document how the

[6]Previously, Prusa (2001) documented a 50-60 percent decline in imports to the United States from targeted countries under US antidumping duties while Besedes and Prusa (forthcoming) found a dramatic extensive margin effect - US antidumping increases the likelihood of exit by a targeted country by more than 50 percent. Similarly, Lu, Tao and Zhang (2013), who focus on Chinese firms exporting to the US, found that a one standard deviation increase in US antidumping duties led to a 25 percent decrease in export volume and a 7 percent decline in the number of firms exporting to the US.

[7]A closely related literature examines the impact of the China shock, China's rapid export growth following its accession to the WTO, on numerous outcomes in China's trading partners. On the positive side, Bloom, Draca and Van Reenen (2015) find competition from Chinese imports stimulated innovation among European firms. More worryingly, Autor, Dorn and Hanson (2013) and Autor, Dorn and Hanson (2016) find large negative effects of competition from China on US manufacturing employment as well as marriage, family formation and child well-being while Keller and Utar (2016) find that imports from China contributed to job polarization in Denmark.

reduction in trade policy uncertainty associated with China's entry into the WTO contributed to the sharp drop in US manufacturing employment while Handley and Limão (2014) find that this reduction in trade policy uncertainty can explain 22-30 percent of China's subsequent export growth to the US.[8]

Second, we contribute to the literature on optimal trade agreement design by showing that contingency provisions have measurable costs arising from the uncertainty that they create. Further, we provide an estimate of the value created by a trade agreement's promise to provide policy stability. The theoretical literature on optimal trade agreement design has long focused on the tension between rigid commitments that provide credibility to government policy and flexibility provisions that soften the blow from economic or political shocks.[9] In a seminal paper, Staiger and Tabellini (1987) showed that politically-motivated governments face time consistency problems in introducing a liberalized trade regime. Since then, economists have argued that contingency provisions support trade agreements characterized by low tariffs (Bagwell and Staiger (1990)), that trade agreements aid governments in overcoming the problem of credible commitment (Maggi and Rodriguez-Clare (1998), Maggi and Rodriguez-Clare (2007), Limão and Maggi (2015), that trade agreements deliver politically-optimal efficiency (Bagwell and Staiger (1999)), that contract incompleteness and dispute settlement are integral to trade agreement flexibility (Horn, Maggi and Staiger (2010), Maggi and Staiger (2011), Staiger and Sykes (2011)), and that one-sided commitments that permit downward flexibility are welfare-superior to exact level commitments (Amador and Bagwell (2013) and Beshkar and Bond (forthcoming)). The paper most directly relevant to this work is by Limão and Maggi (2015) who have shown that a *reduction of uncertainty over future tariff rates* associated with a change in law or accession to a trade agreement leads to an expansion of trade and firm entry into export markets that goes beyond the direct effect of tariff reductions. Empirically, Vandenbussche and Zanardi (2010) examine the "chilling" effect of international trade rules that facilitate tariff increases by estimating a gravity model of trade on a panel of countries from 1980 through 2000. In their analysis, which encompasses the direct effect of higher tariffs and the indirect effect of greater trade policy uncertainty, the adoption of laws and procedures to introduce tariff hikes led to a decline in aggregate imports of 5.9 percent. Our paper complements this work by disentangling these two effects to provide cleanly identified estimates of the indirect effect of greater trade policy uncertainty caused by the use of contingent tariffs.

Finally, we contribute to the large literature concerned with the question of why do so few firms in an economy export. Although tariff rates appear to be quite low and transportation costs are modest, the majority of firms in major economies do not export.[10] We find, at the level of the firm, that even a small increase in trade policy uncertainty can have a large impact on entry. This finding contributes to the literature (Albornoz et al. (2012), Chaney (2014), Conconi, Sapir and Zanardi (2016), Defever, Heid and Larch (2015), Defever and Ornelas (2016), Fernandes and Tang (2014), and Schmeiser (2012)) that

[8]Handley and Limão (2014) estimate the total impact of uncertainty reduction arising from the intensive margin and the extensive margin of trade with China. Our estimation strategy precisely identifies and estimates the impact of uncertainty on the extensive margin of entry only.

[9]Maggi (2014) surveys the literature on trade agreements while Beshkar and Bond (2016) survey the literature on contingency provisions in trade agreements.

[10] Bernard et al. (2007) report only 18 percent of US manufacturing firms exported in 2002 while Eaton, Kortum and Kramarz (2011) report only 15 percent of French firms exported in 1986.

tries to deepen our understanding of barriers to exporting by examining the dynamic and spatial pattern of firm entry and exit.

The paper proceeds as follows. In section 2 we summarize the model of Handley and Limão (2015) which we use to guide our empirical analysis. Section 3 describes the identification strategy for the paper and presents estimating equations. We discuss the data used in the paper in section 4 and report our results in 5. Section 6 presents estimates from counterfactual experiments and section 7 concludes.

2 Theoretical Model

Our empirical analysis tests the theoretical predictions of Handley and Limão (2015) regarding trade policy uncertainty on firm entry into export markets. We briefly present their model and its main implications for firm entry and exit.

2.1 Consumer preferences and the firm's problem

Handley and Limão (2015) develop a model in which the representative consumer in all countries has preferences over differentiated goods and a numeraire commodity which is freely traded on world markets. The income share for differentiated goods in the consumer's utility function is given by μ and the subutility index for differentiated goods, Q, is a CES aggregator,

$$Q = \Big[\int_{\nu \in \Omega} q_\nu^\rho d\nu \Big]^{\frac{1}{\rho}}.$$

where the differentiated goods are indexed by ν from a set Ω of available goods and the elasticity of substitution is $\sigma = 1/(1-\rho) > 1$.

Each country has aggregate income Y_i, where i indexes the country, prices for varieties are denoted $p_{i\nu}$, the aggregate price index is P_i, and optimal demand for each variety in i is given by:

$$q_{i\nu} = \frac{\mu Y_i}{P_i} \Big(\frac{p_{i\nu}}{P_i}\Big)^{-\sigma}.$$

Firms produce according to a constant marginal cost of production technology, c. Ad valorem import tariffs are country and variety specific and denoted, τ_{ih}. Producers of variety $\nu \in h$ receive p_{ih}/τ_{ih} where $\tau_{ih} = 1$ for goods produced and sold in the country of production. With this structure, a firm decides at time t whether or not to enter a foreign market i with a variety ν in product set h. The one-time fixed cost to any firm of entering the market is K.

The per-period operating profits from sales of h in i are denoted $\pi(\tau_{ih}, c)$. Thus, a firm will enter market i with a variety in product set h if the discounted present value of operating profits exceeds the fixed cost of entry, $\frac{\pi(\tau_{ih})}{1-\beta} \geq K$.

Denote the value to the firm of being an exporter as $\Pi_e(\tau_{ih}, c)$ and the option value of waiting to enter as $\Pi_w(\tau_{ih}, c)$. Handley and Limao show that there exists a threshold tariff $\overline{\tau_{ih}}$ such that:

$$\Pi_e(\overline{\tau_{ih}}, c) - K = \Pi_w(\overline{\tau_{ih}}, c)$$

This implies the firm should enter if $\tau_{iht} < \overline{\tau_{ih}}$

2.2 Trade policy and entry dynamics

Handley and Limão (2015) define a stochastic trade policy process in which shocks to trade policy are described by a Poisson process with an arrival rate γ_h. If a shock arrives, the policymaker selects a new policy denoted τ'_{ih}. Firms form their beliefs about future trade policy based on γ_h and a probability measure of tariff outcomes, $H(\tau'_{ih})$, with support $\tau'_{ih} \in [1, \tau^H_{ih}]$, where τ^H_{ih} is the worst case scenario. Let τ_{iht} be the current tariff. If no policy change occurs, then $\tau_{ih,t+1} = \tau_{ih,t}$. If a policy change occurs, then $\tau_{ih,t+1} = \tau'_{ih}$.

With this notation, the value of starting to export at time t is:

$$\Pi_e(\tau_{iht}) = \pi(\tau_{iht}) + \beta[(1-\gamma_h)\Pi_e(\tau_{iht}) + \gamma_h E_t \Pi_e(\tau'_{ih})]$$

where the first term on the right hand side represents the operating profits in period t, the second term is the discounted value of being an exporter if no trade policy change occurs (times the probability of no policy change), and the final term is the discounted expected value of being an exporter under a new policy, τ'_{ih}, times the probability of a trade policy change.

The option value of waiting can be written:

$$\begin{aligned}\Pi_w(\tau_{iht}) = 0 + \quad & \beta[(1-\gamma_h)\Pi_w(\tau_{iht}) + \gamma_h(1 - H(\overline{\tau_{ih}}))\Pi_w(\tau_{iht}) \\ & + \gamma_h H(\overline{\tau_{ih}}) E_t \Pi_e(\tau'_{ih} | \tau'_{ih} < \overline{\tau_{ih}}) - K]\end{aligned}$$

where the first term on the right hand side captures the zero operating profits at time t from not entering an export market, the second term is the discounted value of waiting if no trade policy change occurs (times the likelihood of no policy change), the third term represents the discounted expected value of waiting if a trade policy change arrives that is above the cutoff value for entry (times the likelihood that a policy change arrives that is above this cutoff), and the last term represents the discounted expected value of being an exporter if a tariff shock arrives below the cutoff tariff and the firm pays the sunk cost of entry (times the likelihood of a tariff shock in this range).

Handley and Limão (2015) derive the following empirical implications for their model:

1. A reduction in the tariff τ_{iht}, holding the probability of a future tariff change γ_h constant, reduces the productivity cut-off for entry, where productivity is the inverse of the marginal production cost c. That is, higher cost firms enter when the tariff is reduced.

2. For a given current tariff τ_{iht}, a reduction in the probability of a trade policy change increases the value of being an exporter. Thus, on the margin, a reduction in uncertainty about future trade policy increases entry by higher cost firms. Conversely, this implies an increase in uncertainty about future trade policy reduces entry by higher cost firms.

While the Handley and Limão model was developed to understand firm entry dynamics in the case of a single foreign destination, it can be extended to consider multiple destinations in which K represents the fixed cost of entering each market. We assume that the probability of a tariff change, captured by the parameter γ_h, is product-specific and increases in the number of tariff changes implemented in other destination markets. From Tabakis and Zanardi (2016), we know the probability of a tariff hike for product h in country i increases in $t+1$ if another country increases its tariff for h at t.

This adds a third implication that can be empirically tested:

3. If a firm f observes a tariff change for product h in some market j, it learns that uncertainty about future trade policy for product h has increased in other markets. This increase in uncertainty arising from global correlations in trade policy at the product level deters entry of higher cost firms into new markets.[11]

2.3 Trade policy and exit dynamics

The Handley and Limão (2015) framework can also be used to understand the circumstances of firm exit from export markets. An increase in uncertainty about future trade policy impacts continuing participation in an established foreign market in the following way. The discount rate β in the firm's value functions incorporates a true discount rate, R, and an exogenous probability of death or exit shock, δ where $\beta = (1-\delta)/(1+R)$. If the trade policy uncertainty parameter γ_h increases, then firms that experience a death shock will find that the productivity threshold for re-entering has risen. This will result in an observed exit. In contrast, in the absence of a trade policy uncertainty change, firms will respond to a death shock in a destination market by re-entering immediately so that no exit by this firm is observed. In this way, we expect to observe increased exit by firms selling a product h in response to an increase in the tariff on h in a first destination.[12]

3 Empirical model

In this section, we present the empirical model and identification strategy we use to estimate firm entry and exit in response to increases in trade policy uncertainty.

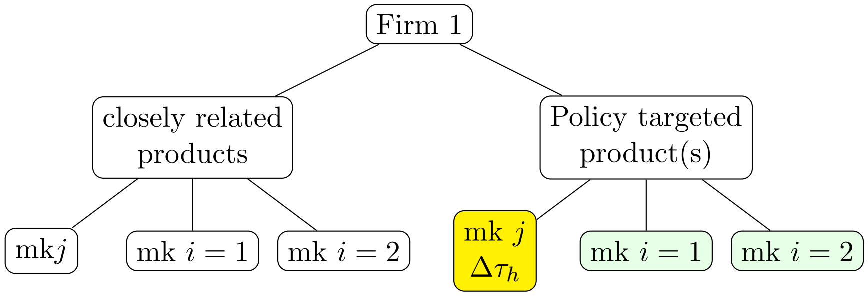
3.1 Entry and exit of products targeted by a contingent tariff

Our empirical strategy is to estimate a linear probability model of firm entry into foreign markets in which increases in trade policy uncertainty (specifically, increases in the expected future tariff) are identified from time $t-1$ increases in the tariff against Chinese exporters in some market j. These increases in

[11]It is worth elaborating that our analysis is based on a firm's response to changes in the value of γ_h at a point in time rather than on changes in the magnitude of the tariff under an antidumping measure. In the context of antidumping policy, suppose that the magnitude of the duty that would be imposed were known and is given by $\tau'_{ih} > \tau_{ih}$ so that $E_t\Pi_e(\tau'_{ih}) < E_t\Pi_e(\tau_{ih})$ and the expected loss under an antidumping measure were $L = E_t\Pi_e(\tau'_{ih}) - E_t\Pi_e(\tau_{ih}) < 0$. Then, an increase in γ_h at time t implies a decline in the value of becoming an exporter, $\Delta\Pi_e(\tau_{iht}) = \beta\Delta\gamma_h L < 0$. Thus, our work differs from important contributions on trade policy uncertainty like Handley and Limão (2014), Pierce and Schott (2016), and Feng, Li and Swenson (2017) which identifies the impact of uncertainty from differences in the level of tariffs under two different trade policy regimes.

[12]We thank Kyle Handley for pointing this out.

Figure 1: Entry and exit for targeted products



uncertainty are product-specific. In our baseline specification, we assume that only firms with direct experience of the tariff hike in j update their beliefs regarding expected tariffs in other markets i.

Figure 1 provides a schematic of a treated firm in our analysis. These treated firms produced and exported to market j an HS06 product that faced an antidumping duty in period $t-1$ in market j. In our empirical specification, market j is any foreign market that has applied an antidumping duty, for example, Canada, the EU, India, the US, etc. We estimate the probability of entry into previously unserved markets i. That is, entry is defined over firm-product-destination triplets. A firm selling socks in the EU in period $t-1$ will be counted as having a new market entry if the same firm enters the Canadian market by exporting socks to Canada in period t.

The control group consists of firm-HS06 product pairs that did not face a new antidumping duty anywhere in the world in period $t-1$. Notably, the control sample includes firms that export the treated product h, but did not export it to the market j which increased the tariff at $t-1$. This classification of some product h exporters as untreated firms amounts to an assumption about how firms acquire information about trade policy changes and update their beliefs about future trade policy.

First, we assume that firms update their beliefs about the likelihood of a policy shock for product h, γ_h, in all foreign markets i after directly observing a policy change for product h in market j to which the firm exported at time $t-1$. That is, we assume that firms which did not directly observe the trade policy change for jh do not update their beliefs about γ_h for other markets.[13] Empirically, this has two implications. If other firms that export this product understand the likelihood of a tariff hike has increased around the globe, our estimates understate the true value of trade policy uncertainty on entry. Secondly, identification of the impact of trade policy uncertainty shocks comes, at least partially, from differences across firms. Thus, our estimation strategy inherently controls for time-variation in demand for h in different destinations. Importantly, this approach also controls for any terms of trade effects associated with trade deflection (Bown and Crowley (2007)).

We include industry, destination country, and firm fixed effects in our linear probability model. The model is estimated using Correia et al. (2015)'s estimator for high dimensional fixed effects that allows for multi-way clustered standard errors (initially introduced by Cameron, Gelbach and Miller (2011)).

[13]We make this assumption because, firstly, we think that the experience of going through the antidumping process in one country gives a firm better information about the likelihood that a different country will raise tariff rates in the future. Second, public announcements about antidumping duties are typically reported at a lag; all countries must report new antidumping duties to the WTO biannually.

Standard errors are clustered on HS02 industry dummies and destination countries. Inclusion of HS02 industry fixed effects implies that some of the identification of the impact of an antidumping duty on firm-product entry comes from comparing entry into new markets of targeted versus untargeted products within the same HS02 industry. Inclusion of firm fixed effects implies that the antidumping effect on entry is also identified off intertemporal variation in a firm's new market entry for the targeted product. Finally, we include destination country fixed effects to capture propensities to enter different foreign markets that vary with features like market size, income per capita, and unobservable barriers to entry like domestic regulatory infrastructure or distribution networks. The basic estimating equation for entry is given by:

$$y_{fhit} = \alpha_i + \delta_f + \eta_{HS02} + \beta_1 AD_{fhjt-1} + \beta_2 \Delta ln(GDP)_{it} + \beta_3 ln(rxr)_{it} + \varepsilon_{fhit} \tag{1}$$

where j indexes the foreign market(s) in which an antidumping duty was imposed at time $t-1$, y_{fhit} is a dummy variable equal to one if firm f enters foreign market i with HS06 product h in year t and zero otherwise, α_i are fixed effects for foreign markets, δ_f are fixed effects for firms, η_{HS02} are industry fixed effects at the HS02 level, $\Delta ln(GDP)_{it}$ is the growth rate of GDP in country i in year $t-1$, $ln(rxr)_{it}$ is the natural log of the real exchange rate between China and country i in year $t-1$ expressed as foreign currency/RMB, and a change in beliefs about trade policy uncertainty in market i for product h at time t is captured by a dummy variable, AD_{fhjt-1}, which equals 1 if foreign market j imposed a tariff increase on h at $t-1$ AND firm f exported that product to j at $t-1$.

From our discussion in section 2.2 of the Handley and Limao model, we expect that the coefficient on our measure of increased trade policy uncertainty in market i, β_1, will be less than zero because an increase in γ_h, the likelihood of a policy change, reduces the value of being an exporter relative to waiting.

After estimating (1), we introduce a further refinement to address the concern that the measure of trade policy uncertainty might be picking up time-varying firm-specific demand or supply of product h. Guided by countries' usage of antidumping policy over 1995-2013, we split our sample into activist users of contingent tariffs and those that rarely or never use antidumping policy. Activist users are defined as those countries whose cumulative import coverage by antidumping over 1995-2013 was 2 percent or higher. We expect that a new antidumping duty in market j generates an increase in trade policy uncertainty only in activist countries. That is, in response to an antidumping duty in market j, firms' expectation about future tariffs in markets i that are activist users of antidumping duties increases. However, these same firms expect no change in the tariff in other markets. Returning to figure 1, firm 1's unserved markets at time t are market $i = 1$ which can be considered an activist user and market $i = 2$, a country in which no tariff change is expected. The expanded estimating equation is given by:

$$\begin{aligned} y_{fhit} = & \alpha_i + \delta_f + \eta_{HS02} + \beta_1 \left[AD_{fhjt-1} * I\{i\text{=activist}\}\right] + \beta_2 \left[AD_{fhjt-1} * I\{i\text{=other}\}\right] \\ & + \beta_3 \Delta ln(GDP)_{it} + \beta_4 ln(rxr)_{it} + \varepsilon_{fhit} \end{aligned} \tag{2}$$

If firms update their beliefs about trade policy in activist country i while at the same time concluding that there is no reason to expect changes in non-activist countries when trade policy changes in market

j, then we expect $\beta_1 < 0$ and $\beta_2 = 0$. The ten activist countries in our estimation sample received 50.97 percent (52.32 percent) of China's export value in 2001 (2009). Whereas our first specification exploited differences across firms' experience with past tariff changes to identify trade policy uncertainty shocks while controlling for time-varying demand and supply at the product-level, this specification adds differences in trade policy uncertainty across countries so that we are able to control for time-varying production costs at the firm-product level.

Next, we use (1) to estimate firm exit from established markets. In the exit specification, y_{fiht} is a dummy variable equal to 1 if firm f exited market i with product h in year t (and zero if it remains)[14] and AD_{fjht-1} is again a dummy variable equal to one if firm f was hit with a tariff increase against h in j in year $t-1$. The Handley and Limao model predicts $\beta_2 > 0$, an increased rate of exit from markets i associated with a tariff hike in country j.

To conclude this section, we analyze heterogeneity in exit across targeted firms that export targeted products. We introduce into the basic estimating equation (1) the firm's export market share for product h in country i and an interaction of this measure with the dummy for trade policy changes:

$$\begin{aligned} y_{fhit} =& \alpha_i + \delta_f + \eta_{HS02} + \beta_1 AD_{fhjt-1} + \beta_2 MS_{fhit-1} + \beta_3 \big[AD_{fhjt-1} * MS_{fhit-1}\big] \\ &+ \beta_4 \Delta ln(GDP)_{it-1} + \beta_5 ln(rxr)_{it-1} + \varepsilon_{fhit} \end{aligned} \tag{3}$$

where $MS_{fiht} = \frac{\text{value of exports}_{fiht}}{\sum_{f=1}^{F} \text{value of exports}_{fiht}}$ and F is the total number of Chinese firms exporting h to i in year t. In the Melitz (2003) model, firms with larger market shares are more productive and, thus, are expected to be less likely to exit. Thus, we expect the coefficient on the interaction of the dummy for a tariff hike in country j and the firm's market share for product h in country i to be negative, $\beta_3 < 0$.

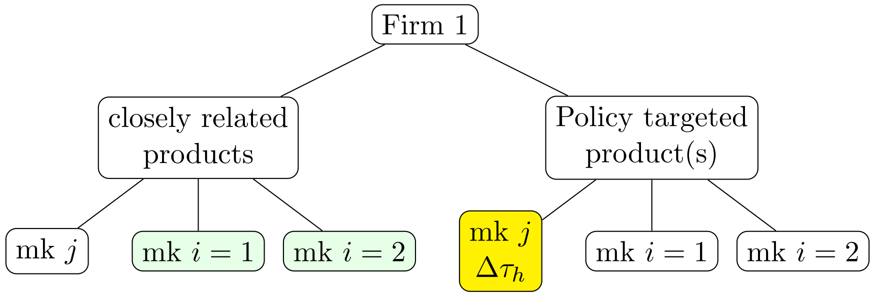
3.2 Entry and exit of products closely-related to targeted products

Does uncertainty about future tariff rates spillover across products within a firm? We examine if an antidumping action against one product impacts a firm's entry decision for *other* products in its product set in *other* markets. [15] The treated firm we examine is graphed in figure 2. For closely-related products, our interest is in a firm's decision to enter markets $i = 1$ or $i = 2$ with some product(s) that did not face any antidumping import restriction at $t-1$ but which are in the same industry (HS04) as a product that was targeted by an antidumping duty at $t-1$ in market j. We again estimate (1) but use as the outcome a dummy variable $y_{fh'it}$ which is equal to one if firm f enters foreign market i with HS06 product h' that is in the same HS04 group as the targeted product h (zero otherwise). We expect $\beta_1 < 0$ if a firm believes tariff hikes across similar products are correlated across countries. We also consider a specification like (2) in which we split the sample of potential destinations into those that are activist users of antidumping policy and those that never or rarely use contingent tariffs. As before, we expect a lower probability of entry into activist markets when country j raises its tariff.

[14] Precisely, a firm f exits in year t if firm f's exports of h to i are positive in year $t-1$ and zero in year t.

[15] To clarify, we do not examine product-switching, the entry decision for closely-related products into market j. Timoshenko (2015) documents that new exporters engage in more product switching than established exporters.

Figure 2: Entry and exit for closely-related products



To estimate the impact of increased trade policy uncertainty on exit across the products of a multi-product firms, we augment the empirical model with variables associated with the model of multi-product firms pioneered by Eckel and Neary (2010). We develop the following specification in which (a) the interaction between the tariff change dummy and a firm's market share in i in the previous period, $AD_{fhjt-1} * MS_{fhit-1}$, allows us to examine differences in exit across firms within a destination by market share (we take market share as a proxy for the firm's productivity relative to other firms) and (b) the interaction between the core product dummy and the tariff change dummy, $I\{fh{=}\text{core}\} * AD_{fhjt-1}$, allows us to examine differences in exit across products within a firm. The indicator variable, $I\{fh{=}\text{core}\}$ is equal to one for the product within each firm's set of HS06 products which accounts for 60 percent or more of the firm's global export revenues.

$$\begin{aligned} y_{fhit} =& \alpha_i + \delta_f + \eta_{HS02} + \beta_1 AD_{fhjt-1} + \beta_2 MS_{fhit-1} + \beta_3 \left[AD_{fhjt-1} * MS_{fhit-1}\right] \\ &+ \beta_4 I\{fh{=}\text{core}\} + \beta_5 \left[I\{fh{=}\text{core}\} * AD_{fhjt-1}\right] + \beta_6 \Delta ln(GDP)_{it} + \beta_7 ln(rxr)_{it} + \varepsilon_{fhit} \end{aligned} \tag{4}$$

As in the simpler case set out in (3), we expect a lower probability of exit for firms with higher market shares in trade policy uncertainty increases. Two parameters, β_4 and β_5, capture differences in exit across products within a firm. The parameter on the core dummy, β_4 will be positive if core products have higher exit rates than other products and negative otherwise. We might anticipate that core products would be less likely to exit a market i than a peripheral product, implying a negative value for β_4. However, because we are examining an unbalanced panel in which firms select into export markets, we might observe a negative β_4 if firms participate in marginal or fringe markets with core products more than they do with peripheral products. If this occurs, we would expect a positive β_4 which would be driven by differences in participation rates across products. For the interaction of the core product dummy with the trade policy change dummy, β_5, we expect a negative sign if a foreign antidumping duty on a similar product leads a firm to redirect resources toward its core product. A positive sign on this coefficient would suggest that the firm is diversifying its sales away from its core product toward more peripheral products in response to a climate of greater trade policy uncertainty.

3.3 Policy information transmission across exporting firms

Lastly, we ask: how do firms in China learn about policy changes in foreign markets ? While our empirical question is narrowly focused on the dissemination of information about trade policy, this directly relates to the more general question of how do firms acquire information about foreign demand conditions, foreign regulations, etc. Thus, the analysis can provide insights about the general value of industrial agglomeration to exporters. We exploit firms' geographic locations within China to estimate how news about one country's antidumping duty can influence the export behavior of firms not directly affected by the policy change. Specifically, if a firm's geographically proximate competitors face an adverse trade policy shock in a foreign market, how does the firm respond? Does it become more or less aggressive in entering foreign markets? To address this question, we construct a new sample of Chinese firms that did NOT experience changes in antidumping policy in the markets they served. By focusing on these "non-targeted" firms, we can study information diffusion among firms that produce the same product.[16]

China is geographically divided into 332 prefectures which are located within 30 provinces.[17] These 332 prefectures are defined by the first three digits of their postal codes which are reported for each firm in the Chinese Customs Database.[18] We examine regional information spillovers with two distinct measures, a traditional measure of export concentration among producers at the HS06 product level and a new measure that uses precise information to identify the trading partners of a firm's geographically proximate competitors at the product level.[19]

Figure 3 presents a schematic to illustrate the problem. Firms 1, 2, and 3 produce and export product h. Firms 1 and 2 are located in prefecture p. Firm 3 is located in another prefecture p'. At time $t-1$, firm 1 is hit with an antidumping duty for product h in destination j. However, neither firm 2 nor firm 3 is hit by the tariff increase in market j because neither of these firms exported product h to market j at $t-1$. Our estimation sample consists of data on firms like 2 and 3 that did not face antidumping duties. We look at the entry behavior of firms like 2 and 3 for product h into markets other than j relative to firms which export other products. The untreated or control firms export products that were not subject to an antidumping duty but are in HS04 product categories that faced an antidumping duty in at least one year between 2000-2009. Notably, this is a different identification strategy than that used earlier and the impact of the tariff in j on entry is identified off variation across products. More interestingly, we will focus on differences in entry between firms 2 and 3 based on geography and the total value of exports of the firms within their own prefectures.

We first construct a measure of export concentration at the HS06 product level in every prefecture. In

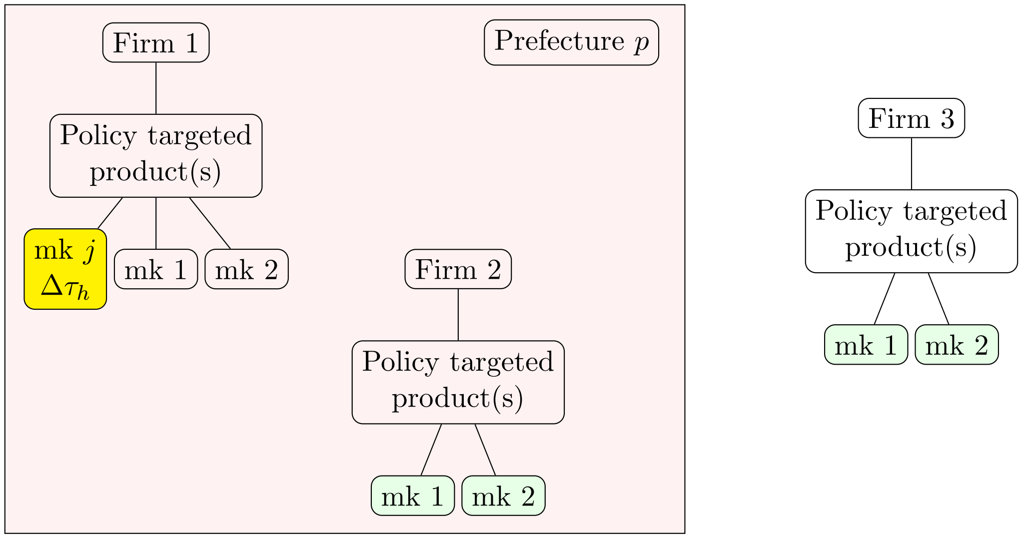
[16]The analysis we conduct is similar to Fernandes and Tang (2014) who develop a model of firms' learning to export from neighbors. An advantage of our empirical analysis is that we can identify "learning" or "spillovers" across firms from precisely measured time-variation in foreign trade policy shocks against specific firms.

[17]China has 30 administrative units referred to as provinces, municipal-provinces or autonomous regions.

[18]The basic geographical unit in our analysis is a 3 digit postal code. For 70 percent of China's prefectures, the entire prefecture has a unique 3 digit postal code. However, for large, densely populated metropolitan areas, including Beijing and Shanghai, a 3 digit postal code is a smaller geographical area within a prefecture. For these locations, the geographical area in which a firm is located is a sub-prefectural unit. For simplicity, we use the term "prefecture" to refer to both prefectures and sub-prefectural units.

[19]For multi-production location firms, geographic data on the location of the firm's headquarters is available in a more consistent form than that for production locations. We use the location of the headquarters in our analysis.

Figure 3: Trade policy information spillovers for targeted products



each year, for every prefecture, we calculate product h's share of China's total exports of h (by value). We next look at the distribution of the prefectural share of exports for each product h. We then discretize this share into a prefecture-product-year binary variable in which prefectures where product h's export share is at the 75th percentile or larger are designated "export agglomeration areas," and assigned a value of 1. Those with export shares at or below the 74th percentile are assigned a value of 0. With this approach, we assume that export agglomeration areas, with higher shares of exports at the product level, are more likely to contain firms that face foreign antidumping duties than other prefectures or are likely to contain a higher share of firms that face foreign antidumping duties than other prefectures. By then examining differences in the entry rates of firms that did not face foreign tariff hikes across export agglomeration areas and other areas, we can determine if exposure to neighbors subject to antidumping duties has an additional impact on entry and exit decisions.

$$\begin{aligned} y_{fhit} =& \alpha_i + \delta_f + \eta_{HS02} + \beta_1 AD_{fhjt-1} + \beta_2 I\{p\text{=ExportArea}\}_{pht-1} \\ &+ \beta_3 \left[AD_{fhjt-1} * I\{p\text{=ExportArea}\}_{pht-1}\right] + \beta_4 \Delta ln(GDP)_{it} + \beta_5 ln(rxr)_{it} + \varepsilon_{fhit} \end{aligned} \tag{5}$$

where p indexes the Chinese prefecture in which firm f is located. If firms use information about foreign trade policy changes in j to update their beliefs about future trade policy in i, we would expect a negative sign on β_1. If firms learn about future trade policy changes from neighboring firms that were hit with the tariff hike, we would expect to observe a negative sign on β_3, the coefficient on the interaction of the tariff change dummy and the export agglomeration dummy.

We begin with the use of an industrial agglomeration measure because this type of measure is common in the urban and regional literature on agglomeration effects. The shortcoming of this approach is the lack of precision in the measure of information exposure. Returning to figure 3, we see that the idea behind the export agglomeration area measure is that we expect that firm 2, which is located in prefecture p, would be more exposed or have greater contact with firm 1, a firm subject to a foreign tariff, than firm 3 would have. Firm 3's prefecture is not an area of export agglomeration for product h. That is, firms within firm 3's prefecture might have been hit by an antidumping duty, but the share of China's total exports of h originating from this prefecture is low. This suggests that a firm targeted by market j is unlikely to be located in firm 3's prefecture and firm 3 is less likely to learn about foreign trade policy changes than firm 2 is.

However, concern about the precision of the export agglomeration measure and the availability of detailed trading partner information for each firm in our sample leads us to adopt our preferred measure - a geographic information intensity measure based on firm-product counts. With information on exporters' addresses within China, in every period, we identify all the firms in a prefecture that faced a tariff hike on one of their products in a foreign market as well as all the firms that exported this policy-targeted product to other foreign markets where no tariff change occurred. From this we construct a measure of the intensity of the trade policy information shock in a prefecture. The intensity of policy information shock is defined as the number of firms in prefecture p that faced a tariff for product h at $t-1$ divided by the total number of firms in prefecture p that exported product h in $t-1$. If we consider the group of firms that export an HS06 product as a network linked by common input suppliers or workers who move across firms, this measure captures the intensity of the policy information that arrives into a prefecture when a foreign government changes its tariff. Our estimating equation is:

$$y_{fhit} = \alpha_i + \delta_f + \eta_{HS02} + \beta_1 intensity_{pht-1} + \beta_2 \Delta ln(GDP)_{it-1} + \beta_3 ln(rxr)_{it-1} + \varepsilon_{fhit} \tag{6}$$

where p indexes the Chinese prefecture in which firm f is located. We expect $\beta_1 < 0$ if firms with greater shares of neighbors subject to foreign tariff hikes are less likely to enter other foreign markets.

4 Data

We construct the dataset for our empirical analysis by bringing together a number of data sources: (1) the Chinese Customs Database (CCD) maintained by China's General Administration of Customs, (2) the Global Antidumping Database (GAD) produced by Chad Bown and maintained by the World Bank and (3) macroeconomic data on real GDP and real exchange rates from the World Bank's World Development Indicators and the USDA Economic Research Service, respectively. The CCD contains the universe of trade transactions for 2000-2009 with detailed information on the firm, product, origin, and destination of each transaction. The GAD includes information on increases in tariffs at the HS06 product level by 17 importing countries against China under the WTO's Agreement on Antidumping.[20]

[20] A number of papers have examined the determinants of antidumping tariffs around the world. In the US, antidumping follows origin-specific positive import surges for products whose export supply and import demand are relatively inelastic (Bown and Crowley, 2013). While duties are applied idiosyncratically against specific products, they are more likely to occur when an importing economy's real exchange rate is relatively strong vis-a-vis the exporting economy and when GDP growth is weak in both the exporting economy and the importing economy (Bown and Crowley, 2013 and Bown and Crowley, 2014). A complementary literature has examined the impact of tariffs and antidumping duties on product-level Chinese exports (Bown and Crowley (2010)) and Chinese firms (Lu, Tao and Zhang (2013), Chandra (2016), Crowley and Yu (2013), and Yu

Table 1: Countries in the dataset

Country	Cumulative coverage by AD 1995-2013	Activist user of AD policy	Country	Cumulative coverage by AD 1995-2013	Activist user of AD policy
Argentina	4.6	Yes	Peru	-	No
Australia	2.5	Yes	Philippines	0.3	No
Brazil	2.4	Yes	Romania	-	No
Canada	3.4	Yes	Russia	-	No
Colombia	1.2	No	Saudi Arabia	-	No
European Union	6.6	Yes	Singapore	-	No
Hong Kong	-	No	South Africa	2.1	Yes
India	7.6	Yes	South Korea	1.4	No
Indonesia	1.1	No	Trinidad & Tobago	-	No
Iran	-	No	Taiwan	-	No
Israel	-	No	Thailand	0.6	No
Jamaica	-	No	Turkey	2.5	Yes
Japan	0.1	No	U. A. E.	-	No
Malaysia	-	No	United States	9.0	Yes
Mexico	22.8	Yes	Vietnam	-	No
New Zealand	-	No	Hungary	-	No
Pakistan	0.4	No			

Notes: The cumulative coverage of a country's imports by antidumping duties over 1995-2013 comes from Bown and Crowley (2016), Table 5. A country is an "activist user" of antidumping policy (AD) if the cumulative share of imports under an antidumping duty over 1995-2013 is greater than or equal to 2 percent.

To construct our estimation dataset, we begin with the universe of customs transactions. First, in order to study how information about a trade policy change against one product affects entry by other products sold by the same firm, we restrict our sample to multi-product exporters. These are firms that export at least 2 products at the HS06 level in at least one year over 2000-2009. Second, we eliminate smaller trading partners; we restrict our sample to 33 countries that include China's top 20 destination markets by value in each year over 2000-2009 and 17 destinations that have applied antidumping duties against China. See table 1 for the list of countries in our dataset.[21] This sample accounts for the lion's share of China's exports to these 33 countries: in 2001, these firms were responsible for 90.9 percent of China's exports by value and in 2009 they were responsible for 92.1 percent. As will be described below, we further restrict the sample to 2225 HS06 product categories that are most likely to experience trade policy changes. Finally, we classify all the firms in this culled dataset as "manufacturers" or "trading" firms using the Chinese characters in the firm's name and use this classification to split our sample into two groups. See appendix A for details.

The next step is to incorporate trade policy data. The estimation procedures described in section 3 analyze changes in trade policy uncertainty for (1) targeted products, (2) closely-related products and (3) firms that are neighbors of targeted firms. Each requires a different dataset; we match trade policy changes to firm level trade flows for each dataset in a specific way. To examine entry and exit of targeted products, we first identify all broad product categories (i.e., HS04 products) in which China faced an antidumping duty between 2000 and 2009. We select for our estimation sample all HS06 products that are within these broad HS04 product categories.[22] By restricting the sample in this way, identification of trade policy uncertainty shocks does not rely on unobservable differences between products in broad categories that NEVER faced antidumping duties and those that have.[23]

From the Global Antidumping Database, we have data on 514 antidumping investigations against China involving 813 HS06 products during 2000-2009. This represents approximately 15 percent of HS06 products and 37 percent of the HS06 products in our estimation sample. To construct the dataset for studying trade policy uncertainty for targeted products and firms, we merge the CCD data with this GAD data and identify the firm-product-destination-year observations in which an antidumping duty was imposed. To study entry, for every firm-product that faced an antidumping duty in year t in country j, we flag the exports of that fh to all other destinations in the following year as having faced an increase in trade policy uncertainty for product h.[24] To examine entry and exit of closely-related products, we follow

(2015)).

[21]The 28 countries of the European Union are treated as a single trading partner. To be precise, our list of 33 countries is made by identifying the top 20 largest export destinations by value in each year and then supplementing this list with countries which are reported in the GAD to have used antidumping duties against China. We retain all observations to these 33 destinations in all years.

[22]In the CCD, there are 1362 HS04 product groups. Of these, over 2000-2009, China faced antidumping duties in 312 HS04 product groups. These 312 HS04 product groups contain 2225 HS06 detailed product categories which are the product categories in our estimation sample.

[23]Bown and Crowley (2013) estimate a model of contingent tariff formation for the US over 1997-2006. Cross-sectionally, they find that contingent tariffs are imposed in industries with relatively inelastic export supply and import demand. Intertemporally, contingent tariffs are applied when import volume surges in these industries. In appendix B, we estimate our baseline specifications on the universe of HS06 products and obtain results similar to those reported in section 5.

[24]To examine exit, our matching procedure yields a larger estimation sample because of the timing convention. For exit, an antidumping duty at $t-1$ induces exit the following period if a trade flow from $t-1$ is not observed in period t.

a similar procedure but "treat" products h' that are in the same HS04 product group as the targeted product. For every firm-product that faced an antidumping duty in year t in country j, we flag the exports of fh' to all other destinations in the following year as having faced an increase in trade policy uncertainty. Finally, in a robustness exercise, we examine entry and exit of firms for products that are in HS04 product categories that do not include the targeted product. These are "not closely related products" exported by firms that face antidumping duties. We do not expect that tariff changes against the targeted product raise the probability of a tariff hike in these unrelated product categories and, thus, use entry in these product catergories to help identify if the mechanism driving any observed decline in entry of targeted products is a response to the threat of a tariff hike or if it reflects a tightening of the financial constraint for a firm arising because of the antidumping duty on the targeted product.

Table 2: Summary statistics

	Manufacturers		Trading firms	
	Mean	SD	Mean	SD
Dependent variable				
$Entry_{fhit}$	0.1379	0.3447	0.0741	0.2620
Explanatory variables				
AD_{fhjt-1}	0.0986	0.2982	0.0947	0.2928
AD_{fhjt-1}*active	0.0473	0.2122	0.0451	0.2075
AD_{fhjt-1}*other	0.0514	0.2208	0.0496	0.2171
$\Delta ln(GDP)_{it-1}$	0.0384	0.0253	0.0383	0.0252
$ln(realexrate)_{it-1}$	0.1163	2.622	0.0085	2.598
Observations	5,076,685	5,076,685	4,468,809	4,468,809
Dependent variable				
$Exit_{fhit}$	0.1511	0.3211	0.0836	0.2767
Explanatory variables				
AD_{fhjt-1}	0.0929	0.3137	0.1044	0.3058
MS_{fhit-1}	0.0480	0.1530	0.0463	0.1494
$AD_{fhjt-1} * MS_{fhit-1}$	0.0030	0.0357	0.0028	0.0360
$\Delta ln(GDP)_{it-1}$	0.0382	0.0262	0.0388	0.0252
$ln(realexrate)_{it-1}$	0.1019	2.623	0.0520	2.631
Observations	7,047,849	7,047,849	7,007,425	7,007,425

Table 2 reports summary statistics on entry and exit for both manufacturers and trading firms. The variable $Entry_{fhit}$ ($Exit_{fhit}$) is a 0-1 indicator equal to 1 if a firm enters (exits) destination country i with product h in year t. Our preferred measure of entry is *market entry with existing products* which, we believe, provides the cleanest identification of the tariff scare effect. In each period t, a firm f has its own history of exporting; a destination can be defined as new if the firm did not export to that market previously and a product can be defined as new if the firm did not export the product previously. Thus, at time t each firm could be observed exporting to: (1) a new market with a new product, (2) a new market with an existing product, (3) an existing market with a new product, or (4) an existing market with an existing product. Of these four possibilities, (1), (2) and (3) are different types of entry and (4) represents continuation. In our baseline estimates we exclude from the sample new product entry by a firm in each period t; the sample consists of observations of types (2) and (4) so that entry is restricted to refer to new market entry with existing products. We think this measure is the most appropriate for studying the impact of tariff hikes because products affected by tariff hikes are in the firm's existing product set at time $t-1$.

We also consider a broader measure of *market entry with new and existing products*. In the relevant specifications, we include all four types of observations and define entry as entry into new markets with new and existing products. In practice, this expands the control group in each period to include entry into new markets with new products. The identification using this definition is slightly weaker if one believes that new product entry into new markets is different from entry into new markets with existing products (i.e., the relevant definition of entry at time t for products targeted by an antidumping duty at $t-1$).

Table 2 documents that manufacturers have much higher probability of entry and exit than trading firms. For the entry margin, the average probability of entry by manufacturers is almost twice as high as that for trading firms. This is related to the different distributions of foreign market scope for manufacturers and trading firms. See appendix A.2. On average, trading firms have more export destinations than manufacturers. The average number of product-destination pairs is less than or equal to 31 for 50 percent of manufacturing firms, while it is 212 for 50 percent of trading firms. Table 2 also tells us that manufacturers have larger market shares than trading firms, which further demonstrates there are important differences between manufacturers and trading firms. For these reasons, we estimate all models separately for these two groups of firms.

The variable AD_{fjht-1} is a dummy variable that captures whether a firm-product-destination observation was exposed to trade policy uncertainty arising from the imposition of a tariff hike in one of China's export markets. In our entry samples, approximately 10 (9) percent of binary observations on entry for manufacturing (trading) firms are potentially affected by trade policy uncertainty. On the exit side, similar shares of exit observations by manufacturers and trading firms are subject to increased trade policy uncertainty.

5 Empirical Results

We find that tariff hikes in country j are associated with a reduction in new foreign market entry by Chinese firms. We interpret this as evidence that Chinese firms are deterred from entering new markets by small increases in the expectation of the future tariff rate. This effect is more pronounced when we examine entry into markets which are activist uses of contingent tariff policies. We find that these basic results extend beyond products directly impacted by tariff hikes to those that are within a similar product grouping (HS04).

Turning to exit decisions, we find exporters are more likely to exit established markets in a climate of greater trade policy uncertainty. We document heterogeneity in the effect of trade policy uncertainty on exit that varies by a firm's market share in its foreign markets. We also find that the probability of exit in response to a tariff hike falls for the closely-related products of a multi-product firm and this decline in exit is larger for a firm's core product relative to its peripheral products. This suggests that firms redirect their resources toward maintaining core product markets in an environment of greater policy risk.

Lastly, we turn to the importance of regional agglomeration for information dissemination regarding foreign market conditions. We find that firms located in prefectures where a larger share of peer firms is hit by a foreign tariff hike are less likely to enter new markets than firms in other prefectures. We interpret this as evidence that information about foreign policy changes disseminates across firms in close geographic proximity.

5.1 The impact of an antidumping duty on targeted products

In table 3 we present estimates for the market entry and exit behavior of manufacturing and trading firms that confronted a new antidumping measure somewhere in the world between 2000 and 2008. Results in table 3 show that increased uncertainty about the future tariff rate in destination i reduces participation in exporting activity; entry into foreign markets declines while exit from foreign markets rises. Columns (1) and (4) report the impact on new market entry for products that existed in a firm's product set at $t-1$. We see that there is a 0.72 percentage point decline in the entry for manufacturing firms and a 0.74 percentage point decline in entry for trading firms. Estimates of the tariff scare effect are slightly larger when we consider new market entry for both the new and existing products of a firm in columns (2) and (5). Notably, the negative impact on entry is statistically different from zero while the impact of GDP growth in the destination has the expected positive sign, but is imprecisely estimated. Interestingly, columns (3) and (6) show that there are 2.67 and 2.86 percentage point increases in the probability of market exit for manufacturing and trading firms, respectively. We emphasize that the sample of exit observations we study does not include observations on market j. That is, we estimate the treatment effect of a change in antidumping in market j on exit from all markets in which no antidumping trade policy change took place.

In our estimation sample, the average probability of new market entry (fhi) is 13.79 percent for manufacturing firms and 7.41 percent for trading firms. Thus, the threat of a tariff hike reduces the probability of entry by 5.2 percent for manufacturing firms and 10.0 percent for trading firms. As for market exit, the average probability for a firm-product-destination is 15.11 percent for manufacturing firms and 8.36 percent for trading firms in our sample. The impact of a tariff threat on market exit is substantial – a 17.7 percent increase for manufacturing firms and a 34.2 percent increase for trading firms.

In section 6.1, we use the parameters from the model to calculate the number of "missing" entrants in each year caused by the increase in trade policy uncertainty associated with the use of antidumping policy.

Next, in table 4, we examine heterogeneity in the impact of antidumping on new market entry into foreign markets that are activist users of antidumping policy and foreign markets that, for the most part, rarely apply antidumping duties on imports from any origins. The sample of firms is identical to that in table 3 but here we distinguish between entry into countries which actively use antidumping policy versus countries that could impose antidumping duties, but rarely or never do. The coefficient estimates on our measure of increased trade policy uncertainty in activist markets in columns (1), (2), (4) and (5)are negative and larger than those in table 3, while the estimates of the impact on entry into other markets

Table 3: Impact on a product targeted by trade policy in a third market

	Manufacturers			Trading firms		
	Entry existing products	Entry all products	Exit	Entry existing products	Entry all products	Exit
	(1)	(2)	(3)	(4)	(5)	(6)
AD_{fhjt-1}	-0.00718**	-0.00893**	0.0267**	-0.00740**	-0.0112**	0.0286***
	(0.00337)	(0.00370)	(0.0112)	(0.00307)	(0.00410)	(0.00921)
$\Delta ln(GDP)_{it-1}$	0.197	0.241	-1.362	0.254	0.526*	-1.850*
	(0.160)	(0.196)	(1.151)	(0.167)	(0.278)	(1.084)
$ln(realexrate)_{it-1}$	0.00111	-0.00903	-0.0764	-0.0437	-0.0674	-0.0698
	(0.0402)	(0.0465)	(0.112)	(0.0336)	(0.0511)	(0.109)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Firms	122,586	144,258	144,258	41,160	48,711	48,711
Treated firms	12,683	13,609	13,609	4,591	4,784	4,784
Observations	5,076,685	7,047,849	7,047,849	4,468,809	7,007,425	7,007,425
Treated obs	500,727	654,581	654,581	423,039	627,267	627,267
R-squared	0.199	0.244	0.181	0.231	0.317	0.215

Notes: Robust standard error in parentheses, clustered at the industry and country level; ***, **, * denote significance at the 1%, 5% and 10% level.

are indistinguishable from zero. For manufacturing (trading) firms, the probability of entry declines 5.8 (10.1) percent into activist markets for a firm's existing products. We take this evidence as confirmation of our hypothesis that Chinese firms use information about policy changes in market j and historical use of antidumping policy in other markets to update their beliefs about future trade policy changes in other markets. They then act on this updated information through their entry decisions.[25]

We examine differences in the propensity to exit foreign markets according to firms' time $t-1$ export share among all Chinese exporters to the relevant destination. Table 4 columns (3) and (6) report the relationship between a new antidumping duty in market j and exit from *other* foreign markets. Firstly, the coefficient on lagged export market share tells us that firms with larger market shares are less likely to exit than smaller market share firms. Secondly, the coefficient on the interaction between the tariff hike in market j and the firm's market share in destination i is negative. This tells us that the larger market share firms are less likely to exit when trade policy uncertainty rises than smaller market share firms. For example, from column (3) we can calculate that a firm with a 30 percent market share has

[25]In unreported results, we consider a further refinement of our country sample in which the countries labelled "other" are divided into two groups - one which is characterized by a high baseline level of tariff uncertainty, i.e. countries for which the average applied tariff rate is about one-half of the average maximum tariff rate that it can charge under WTO rules, and a second group with low baseline tariff uncertainty, i.e., countries for which the average applied tariff rate is close to the average maximum tariff rate. Interestingly, although both groups almost never use antidumping policy, there is some evidence that the antidumping uncertainty shock deters entry into countries with low baseline tariff uncertainty. This suggests that not only levels, but changes in uncertainty matter to firms. We thank Mostafa Beshkar and Maurizio Zanardi for raising this issue.

an exit probability of 12.93 percent in the face of a tariff scare whereas a firm with a smaller 10 percent market share has a much larger 16.21 percent probability of exit when uncertainty rises. Small market share firms are *more likely* to exit when trade policy uncertainty rises while large market share firms are *less likely* to exit.

The exit of smaller market share firms is consistent with a Melitz model in which marginal production costs are constant; firms with smaller export market shares typically have higher marginal costs and would be less likely to participate in exporting if the expected tariff rises. Moreover, the decline in exit for larger market share firms is consistent with these larger firms having increasing marginal costs. For larger market share firms, a decline in marginal production costs due to reduced production for sale to the country that has imposed a tariff might dominate any expected future tariff increase. These results suggest an asymmetry between small and large market share firms. Small market share firms appear to be operating with relatively high, but constant, marginal production costs. In contrast, the larger market share firms appear to have production technologies characterised by increasing marginal costs. This difference in not only the level of marginal costs (or productivity) by the slope of the firms' cost curves could explain the asymmetry in their responses to a tariff hike in one market and greater trade policy uncertainty in others.

5.2 The impact of an antidumping duty on closely-related products

In table 5, we see that an antidumping duty on product h has a negative effect on the probability of entry for the closely-related products of an impacted firm. From columns (1) and (3), we can see that there is a 0.97 percentage point decline in the probability of new market entry at the firm-product-destination level for manufacturing firms and a 0.60 percentage point decline in the probability of new market entry for trading firms. These are substantial declines in entry rates of of 7.1 and 8.1 percent, respectively. From columns (2) and (4) we observe that the impact on the probability of market exit both for manufacturing and trading firms is negative. Surprisingly, firms facing a tariff hike in one market are less likely to exit their other markets with their closely-related products. One possible explanation is that firms respond to the increased risk of a tariff hike in product h by reducing new market entry of similar products while at the same time devoting additional resources to maintaining their presence in existing markets with those products that are somewhat less likely to experience a tariff hike.

As with directly targeted products, in section 6.1, we use the parameters from the model to calculate "missing" entry of a targeted firm's closely related products caused by the increase in trade policy uncertainty.

Next, table 6 presents estimates for the augmented specification for closely-related products (4) described in section 3.2. Column (1) presents results that conform to earlier findings for targeted and closely-related products. Tariff hikes in market j against a firm's exports of h are associated with a decline in new market entry for closely-related products into activist markets of about 1 percentage point. In column (1) we also observe that the entry rate of a firm's core product is considerably higher than that of other products; a 7.2 percentage point increase. This is consistent with what we would expect of an Eckel and Neary (2010) multiproduct firm; the core product has the lowest marginal cost of production

Table 4: Heterogeneous impact on a product targeted by trade policy in a third market

	Manufacturers			Trading firms		
	Entry existing products	Entry all products	Exit	Entry existing products	Entry all products	Exit
	(1)	(2)	(3)	(4)	(5)	(6)
AD_{fhjt-1}*active	-0.00806**	-0.00985**		-0.00777**	-0.0120***	
	(0.00371)	(0.00403)		(0.00313)	(0.00427)	
AD_{fhjt-1}*other	-0.00261	-0.00416		-0.00509	-0.00670	
	(0.00240)	(0.00337)		(0.00336)	(0.00460)	
AD_{fhjt-1}			0.0274**			0.0295***
			(0.0119)			(0.00967)
MS_{fhit-1}			-0.0905***			-0.0471***
			(0.00848)			(0.00765)
$AD_{fhjt-1} * MS_{fhit-1}$			-0.0732***			-0.0507**
			(0.0250)			(0.0199)
$\Delta ln(GDP)_{it-1}$	0.198	0.241	-1.372	0.254	0.527*	-1.853*
	(0.160)	(0.196)	(1.152)	(0.167)	(0.278)	(1.084)
$ln(realexrate)_{it-1}$	0.00108	-0.00906	-0.0709	-0.0437	-0.0675	-0.0670
	(0.0402)	(0.0465)	(0.113)	(0.0335)	(0.0510)	(0.110)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Firms	122,586	144,258	144,258	41,160	48,711	48,711
Treated firms	12,683	13,609	13,609	4,591	4,784	4,784
Observations	5,076,685	7,047,849	7,047,849	4,468,809	7,007,425	7,007,425
Treated obs	500,727	654,581	654,581	423,039	627,267	627,267
R-squared	0.199	0.244	0.182	0.231	0.317	0.216

Notes: Robust standard error in parentheses, clustered at the industry and country level; ***, **, * denote significance at the 1%, 5% and 10% level.

Table 5: Impact on closely-related products in third markets

	Manufacturers		Trading firms	
	Entry	Exit	Entry	Exit
	(1)	(2)	(3)	(4)
AD_{fhjt-1}	-0.00978***	-0.0301**	-0.00603*	-0.0328**
	(0.00323)	(0.0131)	(0.00306)	(0.0129)
$\Delta ln(GDP)_{it-1}$	0.150	-1.449	0.249	-1.918*
	(0.158)	(1.205)	(0.170)	(1.120)
$ln(realexrate)_{it-1}$	-0.0841	-0.0466	-0.0783	
	(0.0395)	(0.118)	(0.0340)	(0.115)
Industry FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Firms	119,412	142,147	40,060	48,137
Treated firms	1,552	1,705	1,055	1,165
Observations	4,621,180	6,465,280	4,084,582	6,468,551
Treated obs	215,283	252,522	352,312	454,128
R-squared	0.203	0.183	0.231	0.217

Notes: Robust standard error in parentheses, clustered at the industry and country level; ***, **, * denote significance at the 1%, 5% and 10% level.

and is therefore more likely to overcome the fixed and variable costs of entering distant destinations than peripheral products would be. In column (3) trading firms are less likely to enter markets with closely-related products if destination j hikes its tariff on a similar product exported by the firm, but this effect is imprecisely estimated.

Results for exit by multi-product manufacturing firms are reported in column (2) while those for trading firms are presented in column (4). Larger market share firms are less likely to exit in the face of an increase in trade policy uncertainty; a manufacturing firm with a 30 percent market share has an exit probability of 10.75 percent whereas one with a 10 percent market share has an exit probability of 11.63 percent.

Further, column (2) demonstrates that the rate of exit of core products in our sample is higher than for peripheral products. A relatively high rate of exit is the flip side of the relatively high rate of entry for core products which almost certainly reflects the fact that core products are used to experiment with exporting to more distant or fringe markets. Interestingly, the negative coefficient on the interaction of the core product indicator and the tariff scare indicator implies that firms are less likely to exit a market with their core product when a peripheral product faces increased tariff risk. One possible interpretation of this is that multi-product firms facing increased trade policy uncertainty for peripheral products re-direct resources toward well-established, central product lines. The fact that exit declines for both core and peripheral products suggests that a multiproduct firm has an increasing marginal cost of production function that spans closely-related products. An antidumping duty in market j might drive an increase in net marginal revenue in destinations i for closely-related core and peripheral products. This, then, increases the firm's incentive to continue as an exporter.

Table 6: Heterogeneous impact on closely-related products in a third market

	Manufacturers		Trading firms	
	Entry	Exit	Entry	Exit
	(1)	(2)	(3)	(4)
AD_{fhjt-1}*active	-0.00963**		-0.00570	
	(0.00406)		(0.00362)	
AD_{fhjt-1}*other	0.00132		-0.00735	
	(0.0113)		(0.00857)	
AD_{fhjt-1}		-0.0304**		-0.0355**
		(0.0138)		(0.0137)
MS_{fhit-1}		-0.105***		-0.0562***
		(0.00891)		(0.00744)
$AD_{fhjt-1} * MS_{fhit-1}$		0.0610***		0.0570***
		(0.0200)		(0.0183)
AD_{fhjt-1}*core		-0.0107*		-0.0194
		(0.00632)		(0.0184)
core	0.0717***	0.0979***	0.0783***	0.142***
	(0.00318)	(0.00568)	(0.00458)	(0.0101)
$\Delta ln(GDP)_{it-1}$	0.151	-1.461	0.249	-1.921*
	(0.157)	(1.206)	(0.170)	(1.120)
$ln(realexrate)_{it-1}$	0.00488	-0.0798	-0.0466	-0.0758
	(0.0388)	(0.118)	(0.0341)	(0.115)
Industry FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Firms	119,412	142,147	40,060	48,137
Treated firms	1,552	1,705	1,055	1,165
Observations	4,621,180	6,465,280	4,084,582	6,468,551
Treated obs	215,283	252,522	352,312	454,128
R-squared	0.206	0.189	0.232	0.219

Notes: Robust standard error in parentheses, clustering at industry and country level; ***, **, * denote significance at 1%, 5% and 10%.

5.3 Policy information transmission across neighboring exporters

In the previous two sections, we examined how firms respond to the information they receive about trade policy changes in a foreign market. In previous results, every treated firm had direct experience with trade policy change in destination j because it was exporting to destination j at the time the trade policy change took place. In this section, we examine firms that did not export to the market with the policy change. We ask two questions about these firms: (1) Do they apparently acquire and act on information about the trade policy change in market j by changing their entry and exit behavior for other markets i and (2) Does their geographic proximity to the firms that were hit with the tariff hike in destination j matter for their entry decisions into other markets?

Table 7: Export agglomeration and trade policy shocks

	Manufacturers		Trading firms	
	Entry	Exit	Entry	Exit
	(1)	(2)	(3)	(4)
AD_{fhjt-1}	-0.0124***	-0.0114	-0.00564***	-0.00735
	(0.00368)	(0.0126)	(0.00164)	(0.0125)
ExpArea_{pht-1}	0.0134***	0.0189***	0.00956***	0.0184***
	(0.00144)	(0.00334)	(0.00166)	(0.00222)
$AD_{fhjt-1}\text{ExpArea}_{pht-1}$	0.00629**	0.0206**	0.00313	-0.00282
	(0.00298)	(0.00309)	(0.00312)	(0.00469)
$\Delta ln(GDP)_{it-1}$	-0.0834	-1.047	-0.140	-1.469
	(0.175)	(1.043)	(0.0907)	(1.186)
$ln(realexrate)_{it-1}$	0.0648	-0.108	0.0356	-0.237
	(0.0471)	(0.116)	(0.0231)	(0.165)
Industry FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Firms	72,805	84,391	16,820	19,349
Treated firms	5,475	6,175	1,366	1,512
Observations	2,655,725	3,695,237	1,119,539	1,972,887
Treated obs	170,212	215,535	81,906	117,244
R-squared	0.168	0.162	0.175	0.195

Notes: Robust standard error in parentheses, clustering at industry and country level; ***, **, * denote significance at 1%, 5% and 10%.

Table 7 reports results on the probability of entry for firm-product-destination triplets when the relevant product is subject to a foreign antidumping duty in market j. Here we focus on the role of a firm's prefecture. Columns (1) and (3) show that antidumping has a significantly negative effect on new market entry for both manufacturers and trading firms. Although these parameter estimates are of the same sign and magnitude as those in table 3, this result is different because it identifies the impact on firms that were not directly hit by the foreign tariff change. In this table, identification comes from comparing entry of policy-targeted products with that of other products which were not subject to foreign antidumping changes in period $t-1$. The effect associated with this tariff hike is a reduction in the probability of entry of 1.24 and 0.56 percentage points for manufacturing and trading firms, respectively.

Second, both columns (1) and (3) show that location in an export agglomeration area has a positive effect on market entry for manufacturing and trading firms. For manufacturing (trading) firms, locating in an export agglomeration area adds about 1.3 (0.95) percentage points to the probability of market entry. Finally, the key variable to capture the difference in the dissemination of trade policy information between export agglomeration prefectures and others is the interaction of the trade policy change dummy and the export agglomeration prefecture dummy. The parameter estimate is small and postive for manufacturing firms and imprecisely estimated from trading firms. Because manufacturing firms in export agglomeration prefectures have a smaller decline in their probability of new market entry than firms in other areas, one could arrive at the weird conclusion that firms in export agglomeration prefectures have worse information about foreign trade policy than firms in other areas or that they don't use information about foreign trade policy in making decisions about new market entry. However, an alternative conclusion is that the export agglomeration dummy, which is based on global exports, is not a good measure of destination-specific trade policy information known by firms within a prefecture; this measure might not accurately reflect cross-prefecture differentials in the number of firms affected by a trade policy change in j. The final point from table 7 is that estimates of the impact of trade policy changes on exit are not statistically different from zero.

Table 8 reports that entry into new markets is lower for firms located in prefectures with more intense foreign trade policy information. Column (1) uses our baseline measure of intensity. The parameter estimate of -0.0360 tells us that entry is declining in the quantity of information that is available in a prefecture about the foreign trade policy shock. These results, which are based on detailed information about the location of firms hit with foreign tariff hikes across China's 332 prefectures, provide clear evidence that a firm's market entry decision is influenced by its neighbors. Column (2) splits potential markets into those that actively utilize antidumping measures and those that rarely or never do. In contrast to our previous results, the deterrent impact on new market entry for firms that learn of the tariff scare through neighbors is similar for activist and other markets. Columns (3) and (4) present similar results based on a dummy variable which is equal to 1 in the continuous intensity measure exceeds 0.1 and 0 otherwise. In column (3) we observe that new market entry among firms that have no direct experience of a foreign antidumping duty declines by 0.87 percentage points if the firm is located in a prefecture in which at least 10 percent of the exporters of its product were hit with a foreign tariff increase. Finally, column (4) documents that this decline is similar across destinations that are frequent uses of antidumping policy and those that are not. In section 6.1 we use the estimates from table 8 to construct a value of missing trade among the neighbors of firms targeted by antidumping duties.

To the best of our knowledge, we are the first to document evidence of geography-based trade policy information spillovers across firms. This is important because it implies that geographic clustering facilitates the dissemination of information about foreign market conditions that is valuable to potential exporters. This finding complements previous work by Fernandes and Tang (2014) on the role of neighboring firms in learning about foreign demand.

Table 8: The intensity of policy information in a prefecture and firm entry

	Entry (1)	Entry (2)	Entry (3)	Entry (4)
intensity$_{pht-1}$	-0.0360**			
	(0.0143)			
intensity$_{pht-1}$*active		-0.0388*		
		(0.0227)		
intensity$_{pht-1}$*other		-0.0341*		
		(0.0168)		
intensity dummy$_{pht-1}$			-0.00877*	
			(0.00461)	
intensity dummy$_{pht-1}$*active				-0.00917*
				(0.00499)
intensity dummy$_{pht-1}$*other				-0.00711*
				(0.00396)
$\Delta ln(GDP)_{it-1}$	-0.0813	-0.0813	-0.0807	-0.0807
	(0.176)	(0.176)	(0.176)	(0.176)
$ln(realexrate)_{it-1}$	0.0646	0.0646	0.0646	0.0646
	(0.0473)	(0.0473)	(0.0473)	(0.0473)
Industry FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Firms	72,791	72,791	72,791	72,791
Observations	2,654,662	2,654,662	2,654,662	2,654,662
R-squared	0.167	0.167	0.167	0.167

Notes: Robust standard error in parentheses, clustered at the industry and country level; ***, **, * denote significance at the 1%, 5% and 10% level.

5.4 Robustness

We demonstrate the robustness of our baseline estimates to an alternative identification scheme - propensity score matching - in this section. After documenting that tariff scares deter entry when we switch our estimation procedure, we then address the question of the mechanism behind declining entry by firms facing antidumping duties and provide evidence that a deterioration of a firm's financial position due to the imposition of an antidumping duty is unlikely to be the driver behind this decline in entry.

To examine the robustness of our findings, we adopt the propensity score matching (PSM) method to control for differences between treated firms that faced an antidumping duty at time $t-1$ somewhere in the world and control firms which did not. More specifically, the variables that were used in the first-stage PSM regression to match the treatment and control groups include GDP growth in the destination country in the previous year, the natural log of the exchange rate in the previous year, year fixed effects, HS02 industry fixed effects and country fixed effects. Table 9 reports the estimation results for a one-to-one match in which each treated observation in the sample is matched to a control observation.

Table 9: Impact of a tariff scare: propensity score matching with a one-to-one match

	Manufacturers		Trading firms	
	Entry	Exit	Entry	Exit
	(1)	(2)	(3)	(4)
AD_{fhjt-1}*active	-0.00158**		-0.00281***	
	(0.000799)		(0.000576)	
AD_{fhjt-1}*other	-0.000115		0.00223	
	(0.00171)		(0.00139)	
AD_{fhjt-1}		0.00147*		0.00555***
		(0.000862)		(0.000744)
MS_{fhit-1}		-0.0925***		-0.0334***
		(0.00329)		(0.00309)
$AD_{fhjt-1} * MS_{fhit-1}$		-0.0418***		-0.0126**
		(0.00562)		(0.00514)
$\Delta ln(GDP)_{it-1}$	0.378***	-1.780***	0.190***	-2.160***
	(0.0199)	(0.0222)	(0.0154)	(0.0203)
$ln(realexrate)_{it-1}$	-0.00797**	-0.263***	-0.0134***	-0.266***
	(0.00370)	(0.00412)	(0.00285)	(0.00376)
Industry FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	981,849	981,849	840,752	840,752
R-squared	0.260	0.344	0.277	0.474

Notes: Robust standard error in parentheses, clustered at the industry and country level; ***, **, * denote significance at the 1%, 5% and 10% level.

As in table 4, in table 9 we distinguish between entry into countries which actively use antidumping policy versus countries that could impose antidumping duties, but rarely or never do. We also examine differences in the propensity to exit foreign markets according to firms' time $t-1$ market share among all

Chinese exporters to the underlying destination. The coefficient estimates on trade policy uncertainty in activist markets in columns (1) and (3) are negative, implying that Chinese firms' entry rates into those countries which actively use antidumping decline when hit by antidumping in other countries. Consistent with results obtained in table 4, the estimates of the impact on entry into other markets (non-activist) are indistinguishable from zero. These results further confirm that Chinese firms' entry behavior into the two sorts of countries is different when facing policy uncertainty. As for the role of firms' market share (competiveness), the results in columns (2) and (4) further confirm the fact found in table 4 that more competitive firms with larger market shares among Chinese exporters to the destination market are less likely to exit when facing trade policy uncertainty.

To further check the robustness of our findings, we experiment with an alternative criterion to match the treated observations to controls based on the first stage PSM scores. Specifically, in table 10 we use a more stringent match criteria (i.e., a PSM score at or above the 90th percentile) and obtain estimation results are that qualitatively the same as in table 9 but closer in magnitude to the results in table 4 obtained from the conventional panel estimation approach. The key difference between tables 9 and 10 is that, in the later table with the more stringent match criteria, treated observations that do not have a good match in the untreated sample are dropped and the estimates are based on a smaller sample of well-matched observations. Interestingly, this well-matched dataset obtains results most similar to the panel data estimates.

What alternative explanations could account for the decline in firm entry into new markets? We indirectly examine the idea that a tightening of firms' financing caused by the imposition of antidumping duties might be driving our results. We approach this question with a placebo test: if the imposition of an antidumping duty for a targeted product has no impact on a firm's decision to enter new markets with products unlikely to face a tariff hike because they are in more distant sectors – specifically HS04 sectors that were not impacted by the antidumping duty–then we will conclude that the threat of tariff hikes, rather than any financial stress which should impact all products within a firm, are behind declining entry.

Table 11 shows that a tariff scare does not impact entry for distant products in unrelated sectors. The point estimates on the antidumping measure are very close to zero and imprecisely estimated. Because firms facing tariff hikes for products h reduce entry of these products into other destinations, reduce entry of closely-related (same HS04 sector) products h', but do *not* reduce the likelihood of new market entry for distant (different HS04 sector) products h'', we infer that the increased likelihood of future tariff hikes is the mechanism behind declining entry.

6 Counterfactual estimates

6.1 Estimating the cost of uncertainty created by antidumping policy

How much entry never occurs because of trade policy uncertainty? We calculate there were 2,299 missing firm-product-destination entrants on average per year. Among manufacturing firms, missing entrants include firms and products which were directly targeted by an antidumping duty, the *other* closely related

Table 10: Impact of a tariff scare: Matching with a PSM of score at or above the 90th percentile

	Manufacturers		Trading firms	
	Entry	Exit	Entry	Exit
	(1)	(2)	(3)	(4)
AD_{fhjt-1}*active	-0.00810***		-0.00575***	
	(0.00143)		(0.00108)	
AD_{fhjt-1}*other	0.00241		0.00330	
	(0.00322)		(0.00255)	
AD_{fhjt-1}		0.0392***		0.0325***
		(0.00149)		(0.00132)
MS_{fhit-1}		-0.104***		-0.0399***
		(0.00471)		(0.00550)
$AD_{fhjt-1} * MS_{fhit-1}$		-0.131***		-0.0773***
		(0.0112)		(0.0131)
$\Delta ln(GDP)_{it-1}$	0.574***	-2.121***	0.0701**	-2.782***
	(0.0338)	(0.0361)	(0.0326)	(0.0410)
$ln(realexrate)_{it-1}$	-0.0211***	-0.151***	-0.0235***	-0.401***
	(0.00631)	(0.00675)	(0.00603)	(0.00757)
Industry FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	408,388	408,388	310,813	310,813
R-squared	0.267	0.352	0.320	0.575

Notes: Robust standard error in parentheses, clustered at the industry and country level; ***, **, * denote significance at the 1%, 5% and 10% level.

Table 11: Impact on not closely-related products

	Manufacturers		Trading firms	
	Entry	Exit	Entry	Exit
	(1)	(2)	(3)	(4)
AD_{fhjt-1}	-0.00192	-0.0566**	0.00138	-0.0771**
	(0.00157)	(0.0232)	(0.00179)	(0.0316)
$\Delta ln(GDP)_{it-1}$	0.00204	-0.0107	0.00232*	-0.0141*
	(0.00146)	(0.00936)	(0.00134)	(0.00806)
$ln(realexrate)_{it-1}$	0.000234*	-9.96e-05**	2.94e-05	-3.18e-05
	(0.000137)	(3.76e-05)	(7.54e-05)	(3.13e-05)
Industry FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	5,127,986	15,551,092	7,791,007	14,178,504
R-squared	0.199	0.140	0.218	0.155

Notes: Robust standard error in parentheses, clustered at the industry and country level; ***, **, * denote significance at the 1%, 5% and 10% level.

products of firms targeted by an antidumping duty, and the neighbors of targeted firms which do not enter foreign markets with the targeted product. Among trading firms, missing entrants are comprised of targeted firms selling the targeted product and targeted firms selling closely related products. Using the estimated parameters reported in tables 3, 5 and 8, we calculate the total number of missing entrants into export markets due the tariff uncertainty caused by antidumping measures and report them in figure 4. Over 2001-2009, the average number of missing entrants per year among manufacturing firms is 1,779 while that for trading firms is 519. The total number of missing entrants grew from 867 in 2001 to a peak of 3925 in 2008. By 2009, the final year of the Great Trade Collapse, the number of missing entrants had subsided to 3,030.[26]

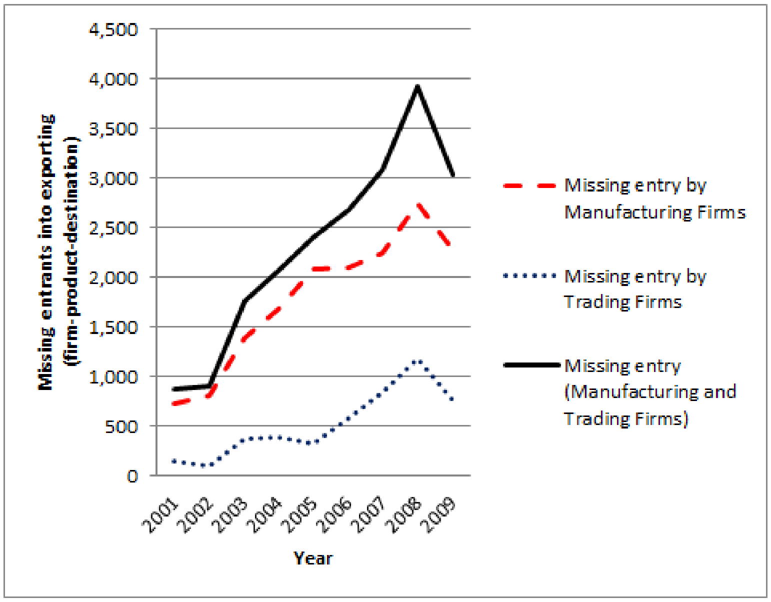


Figure 4: Missing entry caused by tariff uncertainty due to antidumping

In figure 5, we construct counterfactual estimates of the cumulated missing value of trade associated with missing entrants in each year, 2001-2009, under the assumption that each missing entrant never enters and would have exported the mean value of trade in subsequent years if it had entered. For example, the red hatched bar and the blue speckled area for 2001 indicates that if there had been no uncertainty about trade policy around the world, the 867 missing entrants in 2001 would have exported approximately \$2.2 billion over 2001-2009. We estimate the total value of missing trade from China over 2001-2009 associated with the uncertainty created by some countries' use of antidumping policy at \$25.3 billion. Importantly, a tariff increase in destination j has a direct effect in reducing trade because of the

[26]Precisely, we calculate the number of observed manufacturing firm-product-destination entrants for each year in three different data samples - the one used to estimate entry of targeted products, the one used to estimate entry of closely-related products and the one used to estimate entry of neighbors. There is some overlap in these samples, but the treatment effect applied to each pertains to a group of firm-products that are not captured by the other estimated effects. The average number of missing manufacturing entrants per year is comprised of 580 missing entries of targeted products by targeted firms, 803 missing entries of closely-related products by targeted firms, and 396 missing entries by neighbors of targeted firms. To produce figures 4 and 5, we calculate missing entries of each type in each year and ascribe to each missing entrant of each type the average value of exports for a firm-product-destination in each year that the firm-product-destination was "missing" over 2001-2009. We follow a similar procedure to calculate missing entry and missing export value by trading firms.

higher tariff on exports to that country as well as potentially increasing trade through "trade deflection." A tariff increase also has an indirect effect in reducing trade through the "tariff scare" effect that is the focus of this paper. This back of the envelope calculation only attempts to quantify the indirect "tariff scare" effect and thus cannot easily be compared to changes in aggregate trade over time which embody both the direct and the indirect effects of trade policy changes.

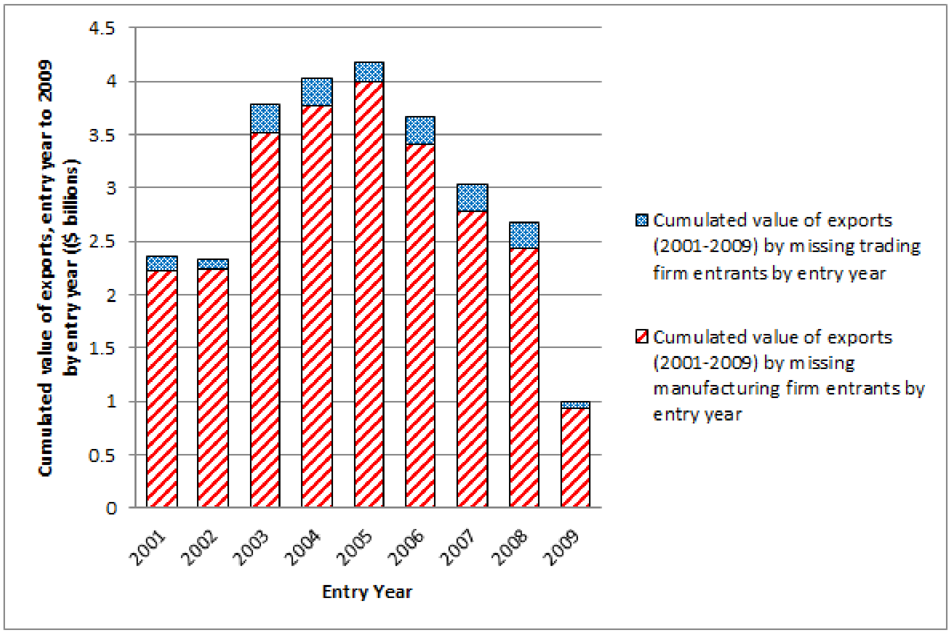


Figure 5: Cumulated missing export value, entry year - 2009, by entry year ($ billions)

To wrap up the analysis, we turn to the additional exit associated with one country's imposition of an antidumping duty. As noted previously, the exit margin is more complex than that for entry because of the heterogeneity associated with the destination market share and a product's position in the firm's hierarchy of products. We abstract away from this complexity and simply present estimates of exit associated with the simplest case of exit from *other* markets for a targeted product by firms hit by a tariff hike in a market j. That is, we estimate the additional exit for manufacturing and trading firms from table 3 columns (2) and (4) using exit rates in this estimation sample. We ignore the tempering effect of declining exit for closely-related products, core products, etc. and, for that reason, these estimates should be taken with a grain of salt. Figure 6 depicts the number of additional exiters in each year whose exit is induced by increased trade policy uncertainty. (The spike exit associated with trade policy uncertainty in 2009 arises because the underlying exit rate spiked in that year.) Figure 7 presents a cumulated value of lost trade from the exit year through 2009 by applying to each exiting observation the cumulated lost value of trade based on an assumption that each observation would have exported the mean value of exports for an exiting firms in future years if it had not exited because of increased trade policy uncertainty. These lost exports from exit year to 2009 peaked for the 2009 exit year at $2.9billion. When we sum over all entry years, we estimate the total lost trade due to exit induced by trade policy uncertainty at $18.6 billion. Notably, this number likely overstates the value of lost trade because exiters from export markets are weak firms that probably would have reduced their exports over time even without any policy change.

However, this estimate is also conservative in that it applies to exiters the mean value of exports for all exiters in each year, which is only about one-third of the unconditional mean in our sample.

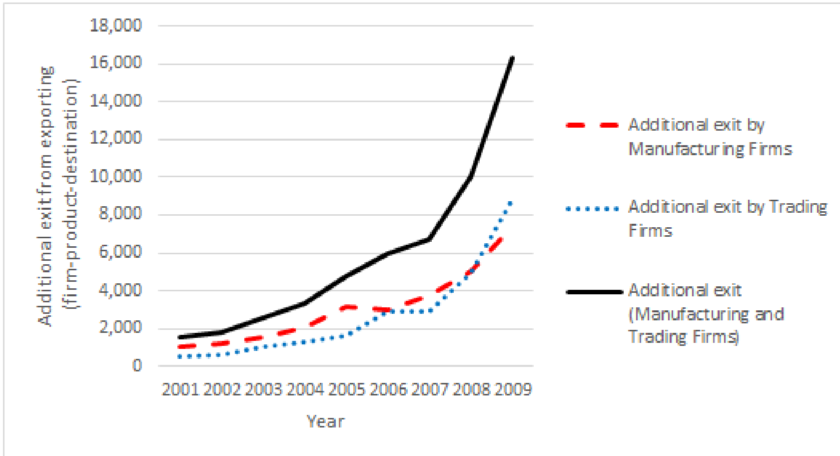


Figure 6: Additional exit caused by tariff uncertainty due to antidumping

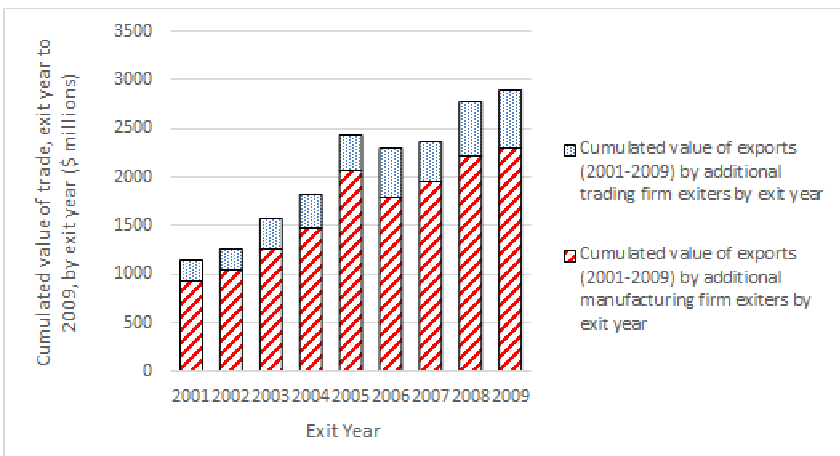


Figure 7: Lost export value from additional exit, entry year - 2009, by entry year ($ billions)

6.2 Estimating the value of trade policy certainty provided by the WTO

What can the trade policy uncertainty arising under the WTO's contingent tariff provisions teach us about the value of policy commitment in a trade agreement? We use firms' observed entry rates under trade policy uncertainty caused by antidumping to infer how much entry by Chinese firms over 2001-2009 was due to the WTO's promise of trade policy certainty. We first assume that joining the WTO reduced trade policy uncertainty in each year for all the HS06 products in our sample that were NOT the target of a foreign antidumping duty. We further assume that the effect on entry of increased certainty is the opposite of the effect on entry of increased uncertainty estimated in tables 3, 5 and 8. This implies that we can use the average number of missing entrants per year for each product subject to an antidumping measure to counterfactually estimate how many actual observed entrants would never have entered if

China had not joined the WTO. Over 2000-2008, China faced tariff hikes on an average of 90 products (4 percent of products in the sample) per year. We estimate that each antidumping measure created 20 (5) missing firm-product-destination entrants per year among manufacturing (trading) exporters. We use this, together with the average number of firm-product-destination entrants per HS06 product, which was 36 (18) for manufacturers (trading firms), to estimate that only 46 (69) percent of manufacturing (trading) entrants would have entered in the absence of WTO policy certainty.

In figure 8 we present both the number of actual firm-product-destination entrants from China in our sample and a counterfactual estimate of how many firm-product-destination entrants we would have observed if the WTO had not guaranteed trade policy certainty in member countries. This exercise suggests that the value of WTO tariff certainty is large. New entry from China peaked in 2008 with 221,777 entrants. We counterfactually estimate that only 122,252 entrants would have been observed if China had not joined the WTO. Averaging over all years, we argue that 46 percent of observed entrants would have never materialized if all products from China had faced the same level of trade policy uncertainty as those products subjected to antidumping measures.

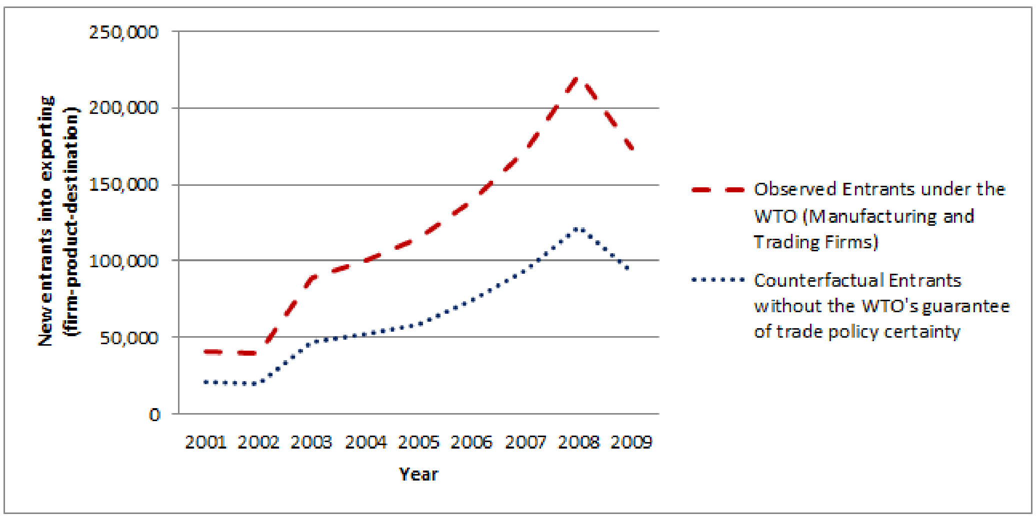


Figure 8: New and counterfactural product-market entry by Chinese firms

In figure 9, we use the entry numbers from 8 to calculate the cumulated value of trade by all entrants between a firm's entry year and 2009. We assume that each entrant exported the average value of exports of all firms exporting from China in the relevant year. In the figure, red hatched bars represent an estimate of cumulated export value from entry year through 2009 for observed entrants. The blue spotted bars represent the cumulated export value for from entry year through 2009 for counterfactual entrants who we predict would have entered if China had not joined the WTO. The difference between the two bars, which was $97.8 billion for entrants in 2005, gives us a value of the observed trade due to credible commitments to tariffs on the part of WTO members. Summing the difference between cumulated trade value by observed entrants and counterfactual entrants over all entry years yields $635 billion as the value of trade over this period due to greater entry because of trade policy certainty.

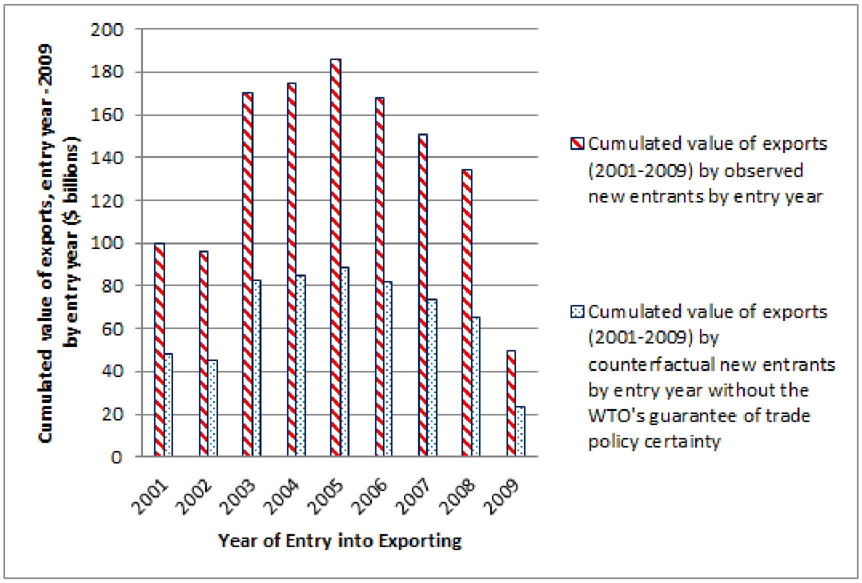


Figure 9: Cumulated export value, entry year - 2009, by entry year ($ billions)

7 Conclusion

In December 2014, China faced antidumping duties, contingent tariffs higher than the normal tariff rate promised to China under the WTO agreement, in 1132 distinct HS06 product categories.[27] This constituted more than 21 percent of products in the HS06 classification system. In terms of value, all temporary trade barriers, including antidumping duties, affected 7.1 percent of China's exports to the G20, or $100.3 billion, in 2013 (Bown and Crowley (2016)).

In this paper, we use the imposition of antidumping duties in one market as a measure of rising trade policy uncertainty for the same product in other markets around the world. We find that the use of a contingent tariff in one market leads to a decline in new market entry by firms serving this first market; we estimate a decline in entry both for the product which is subject to the tariff hike as well as for closely related products that did not face tariff hikes in the first market. Further, we identified spillovers across firms; within a prefecture, a firm that did not face a foreign tariff hike is less likely to enter foreign markets if a large share of its neighboring firms did face a foreign tariff hike.

The question of firm exit from markets has been less studied than that of firm entry. We examined a firm's exit from markets when uncertainty has risen, but no trade policy change has taken place. We find that exit from a firm's existing destination markets rises when one of its existing markets hikes its import tariff. We take this evidence as confirmation of the Handley and Limão (2015) model in which an increase in trade policy uncertainty reduces the value to a firm of being an exporter in multiple destinations for the same product. Our finding that uncertainty about trade policy in one of a firm's products leads to a large decline in exit of the firm's global core product from other markets suggests a fruitful area of future research. Future research can examine how uncertainty about export market conditions and trade policy interact with a firm's relative productivity across products to determine a firm's global trade pattern.

[27]Source: World Tariff Profiles 2015, WTO, ITC and UNCTAD joint publication, p. 193.

We conclude our analysis by examining the value of the credible commitment delivered by a trade agreement. Through an analysis of "tariff scares," i.e., trade policy uncertainty shocks, we estimate the value of lost trade due to the multilateral uncertainty created when one country imposes a contingency tariff. We quantify relatively modest declines in new firm-product-destination entry associated with inclusion of contingent tariff provisions in the WTO agreement. We find the cumulated loss of trade over 2001-2009 due to missing entrants who were discouraged by heightened trade policy uncertainty was on the order of $25.3 billion while lost trade due to additional exit under trade policy uncertainty was approximately $18.6 billion. We conclude by using our estimates to infer the value of credible commitment in a trade agreement. Back of the envelope calculations suggest that 46 percent of entrants into exporting over 2001-2009 would not have entered if they had been exposed to the level of trade policy uncertainty associated with the use of antidumping policy.

Acknowledgements

For helpful conversations and feedback, we thank two anonymous referees as well as seminar and conference participants at the Cambridge-INET macro workshop, the Ethiopian Development Research Institute, the 6th Annual Zhejiang University International Conference on Industrial Economics, the Plenary Session of the European Trade Study Group, and Mostafa Beshkar, Hector Calvo Pardo, Yongmin Chen, Ron Davies, David Dorn, Kyle Handley, Kaz Miyagiwa, Emanuel Ornelas, Mathieu Parenti, Alejandro Riano, Matthew Shum, Bob Staiger, John Turner, Mo Xiao, Maurizio Zanardi and Jidong Zhou. Song thanks the National Natural Science Fund of China (71573230) for research support.

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Appendix A Data

A.1 Sample construction

In this appendix, we elaborate on the structure of our dataset and how we construct our selected sample. See the flowchart in figure10. The Chinese Customs Dataset is a panel in which the unit of observation is a four-tuple: firm (f), product (h), destination (i) and year (t). The underlying purpose of imposing sample restrictions is two-fold: (1) to reduce the computational cost of estimating the model on a large sample with a sparse matrix of entry/exit and (2) to provide a control group that is similar to the treatment group.

Initially, the annual data from 2000-2009 consists of 41 million observations (361,358 firms, 5039HS06 products, 192 destinations, and 10 years). Our first step is to remove from the sample firms that never over 2000-2009 export more than one HS06 product in a single year. Equivalently, if a firm exports two distinct HS06 products in any year over 2000-2009, we retain the firm and all its observations in all years 2000-2009. This leaves some firms in our sample that are multiproduct in only a single year. We know from cross-sectional data that single product firms are quantitatively relatively unimportant; from the universe of Chinese Customs data in 2006, single product exporters accounted for only 6.15 percent of total exports in that year. This sample restriction leaves us with approximately 40.7 million observations.

The second step in our sample selection is to remove smaller trading partners (destinations). The primary reason for this selection is to reduce the data size because estimation with almost 200 potential export destinations is computationally costly. For this step, we dropped all observations of exports to destinations other than the 33 destinations listed in table 1. (One of these is the 28 country EU). This sample selection reduced the total number of observations to approximately 31 million observations. As a practical matter, this eliminates any consideration of firm-product entry into or exit from small, peripheral markets for which the rate of export participation by Chinese firms is low.

The third step was to remove any firm from our dataset that did not export any product to any destination in at least two consecutive years. In practice, the "treatment" we are estimating is the impact of a policy change in period $t-1$ (in destination j) on entry into new markets in period t (entry is defined as non-zero exports of fhi in t AND zero exports of fhi at $t-1$). As discussed below, our analysis focuses on entry into new markets with existing products. This step eliminates one-off exporters and leaves us with 26.8 million observations.

The last step is that we compile a list of all HS06 products against which China faced an antidumping measure in any of the 33 markets listed in table 1 over 2000-2009. We then compile a list of the HS04 industries in which these products are made. We keep all of the HS06 products within these HS04 industries. This consists of 2225 or about half of the roughly 5309 HS06 product categories. This leaves us with a dataset of 14.6 million observations. (In appendix B we present estimates from our baseline specifications using an alternative sample that includes all HS06 products. Results are similar.)

Finally, as a last step, the estimation sample is split into two groups based on each firm's classification as manufacturing or trading.

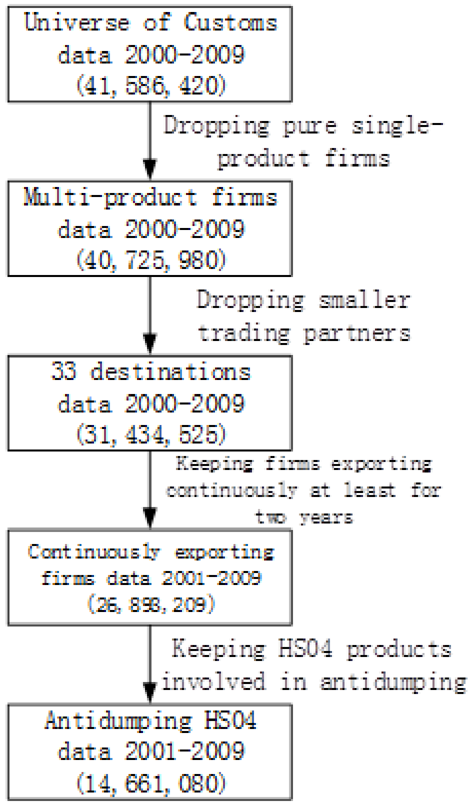

Figure 10: Construction of the estimation dataset from the universe of Chinese Customs Data

A.2 Classification of firms as manufacturers or trading firms

We identify trading firms by the inclusion of certain Chinese characters in the firm's name, i.e. "jinchukou" (import-export), "maoyi" (trade), "shangmao" (business and trade), "waimao" (international trade), "cangchu" (wareho "wuliu" (logistics). As described by Lu, Tao and Zhang (2013), the tradition of using Chinese characters that identify a firm's activities in a self-revealing name has been a feature of China's international engagement since before the reforms of 1978. This practice has continued to the present day. Ahn, Khandelwal and Wei (2011) document the use of specific characters in a name correlates with differences in trading volume, product categories, and export destinations.

We confirm manufacturing firms and trading firms are different from one another. Table A.2 shows that although transactions in our dataset are roughly evenly split between manufacturing and trading firms, manufacturing firms are responsible for about 75-80 percent of the total value of Chinese exports.

Figure 11 presents a histogram of the total number of foreign markets served by the universe of Chinese manufacturing firms that export at least one good to at least one foreign market in 2001. The same histogram is presented for the universe of Chinese manufacturing exporters in 2009. Figure 11 shows us that the distribution of foreign markets served by Chinese firms in our manufacturing dataset is roughly Pareto with a large number of firms serving between one and twenty-five foreign markets both in the start year for our sample of 2001 and in the final year, 2009. This distribution mirrors the observed Pareto distribution in firm productivity that has been documented by Bernard and Jensen (1999) and

Table 12: Composition of customs dataset

	Percent of manufacturing transactions	Percent of manufacturing value	Percent of trading transactions	Percent of trading value
2001	51.26	75.10	48.74	24.90
2002	53.25	75.93	46.75	24.07
2003	54.33	77.21	45.67	22.79
2004	55.25	77.10	44.75	22.90
2005	59.79	79.04	40.21	20.96
2006	61.69	80.32	38.31	19.68
2007	53.37	82.08	46.63	17.92
2008	48.82	80.99	51.18	19.01
2009	49.47	82.53	50.53	17.47

Notes: Share and value of trade for manufacturing and trading firms, respectively, for data used in estimation of entry reported in table 3 columns (1) and (3). Similar shares are observed in the universe of export transactions.

Melitz and Redding (2014). Trading firms are notably different. Figure 12 presents a histogram of the number of foreign markets served by the universe of trading firms. There is a large mass of firms serving between twenty five and seventy five foreign markets, giving the distribution a humped shape.

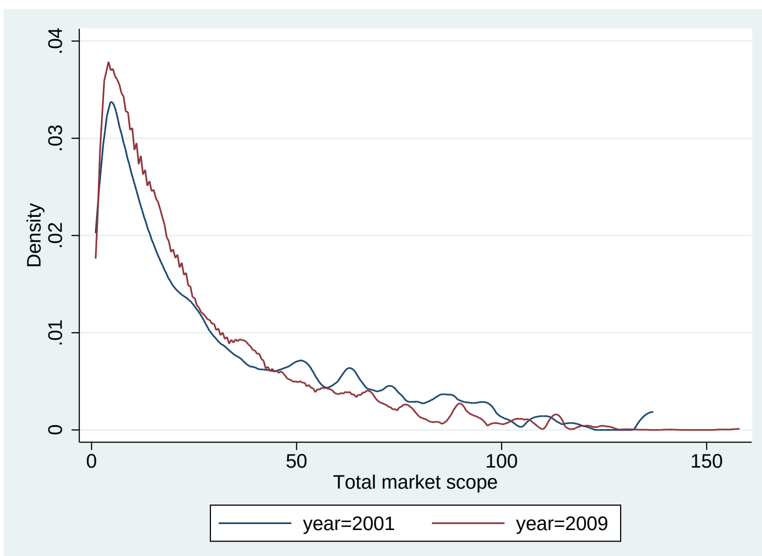

Figure 11: Distribution of manufacturing firms' total market scope 2001 vs. 2009

Appendix B Further robustness

In estimates reported in section 5 we restrict the sample to those HS04 product categories in which China faced an antidumping measure over 2000-2008. In the results reported in table 13 we include all HS06 product codes in our sample and obtain similar results.

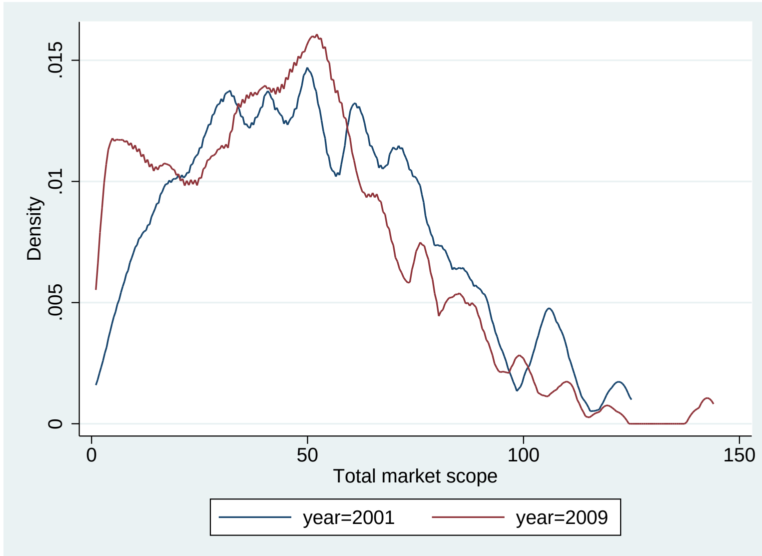

Figure 12: Distribution of trading firms' total market scope 2001 vs. 2009

Table 13: Table 3 and Table 4 entry estimates using data on all HS06 product codes

	Manufacturers		Trading firms	
	Entry	Entry	Entry	Entry
	(1)	(2)	(3)	(4)
AD_{fhjt-1}	-0.00664*		-0.00561**	
	(0.00327)		(0.00262)	
AD_{fhjt-1}*active		-0.00920**		-0.00681**
		(0.00352)		(0.00267)
AD_{fhjt-1}*other		0.00661		0.00172
		(0.00570)		(0.00455)
$\Delta ln(GDP)_{it-1}$	0.234	0.234	0.208	0.208
	(0.140)	(0.140)	(0.140)	(0.140)
$ln(realexrate)_{it-1}$	-0.00856	-0.00861	-0.0354	-0.0354
	(0.0357)	(0.0357)	(0.0279)	(0.0279)
Industry FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Firms	190,420	190,420	49,993	49,993
Treated firms	13,609	13,609	4,784	4,784
Observations	9,445,016	9,445,016	7,748,066	7,748,066
Treated obs	654,581	654,581	627,267	627,267
R-squared	0.202	0.202	0.218	0.218

Notes: Robust standard error in parentheses, clustered at the industry and country level; ***, **, * denote significance at the 1%, 5% and 10% level.

In table 14 we demonstrate that the estimates of the entry and exit responses to increased trade policy uncertainty are robust to using the growth rate of the real exchange rate, rather than the logged level, in our regression.

Table 14: The impact on targeted products with growth in the exchange rate

	Manufacturers		Trading firms	
	Entry	Exit	Entry	Exit
	(1)	(2)	(3)	(4)
AD_{fhjt-1}	-0.00736**	0.0278**	-0.00720**	0.0292***
	(0.00349)	(0.0117)	(0.00290)	(0.00987)
$\Delta ln(GDP)_{it-1}$	0.227	-1.533	0.241	-1.932
	(0.169)	(1.210)	(0.155)	(1.165)
$\Delta ln(realexrate)_{it-1}$	-0.0408	0.318	0.0691*	0.196
	(0.0290)	(0.216)	(0.0361)	(0.242)
Industry FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Firms	122,586	144,258	41,160	48,711
Treated firms	12,683	13,609	4,591	4,784
Observations	5,076,685	7,047,849	4,468,809	7,007,425
Treated obs	500,727	654,581	423,039	627,267
R-squared	0.199	0.185	0.231	0.217

Notes: Robust standard error in parentheses, clustered at the industry and country level; ***, **, * denote significance at the 1%, 5% and 10% level.

Appendix C The intensity of trade policy information

In table 15 we present information on the "intensity of policy information" regarding trade policy changes in each prefecture. Firstly, the vast majority of prefecture-product-year observations are for prefectures in which no firm faces an antidumping duty so the value of intensity is zero. However, there are a large number of observations on prefectures in which a sizeable share of firms that export product h were hit with an antidumping duty. In figure 13 we graph the histogram of the intensity variable conditional on $intensity_{pht} > 0$.

$$\text{intensity}_{pht} = \frac{\text{count of firms hit by antidumping on } h_{pt}}{\text{count of firms exporting } h_{pt}}$$

Table 15: Distribution of intensity

Intensity value	Freq.	Percent	Cum.
0	2,317,342	96.28	96.28
(0,0.1]	38,566	1.60	97.88
(0.1,0.2]	18,492	0.77	98.65
(0.2,0.3]	12,408	0.52	99.16
(0.3,0.4]	8,104	0.34	99.50
(0.4,0.5]	8,094	0.34	99.83
(0.5,0.6]	1,974	0.08	99.92
(0.6,0.7]	1,417	0.06	99.98
(0.7,0.8]	465	0.02	99.99
(0.8,0.9]	116	0.00	100.00
(0.9,1]	13	0.00	100.00

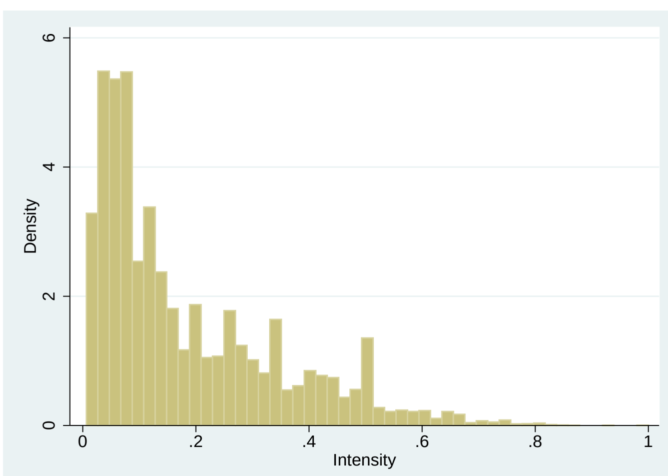

Figure 13: Distribution of the variable "intensity of policy information in a prefecture" conditional on at least one firm in a prefecture being subject to a foreign tariff