Online Appendix
Policy Uncertainty, Trade and Welfare: Theory and Evidence for China and the U.S.

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The Online Appendices contain derivations for the general equilibrium model, empirical robustness tests and any tables and figures labeled with a prefix "A" in the text, including a notation table.

Online Appendix: Empirics

A Export Growth Partial Effects: Robustness

A.1 Nontariff barriers (Table A2)

The regressions in columns 3 and 4 of Table 2 also control for any sector level changes in nontariff barriers (NTBs). Nevertheless, some of those barriers can also vary at the industry (HS-6) level. We address this with binary indicators for whether an industry had any of the following barriers in a given year: anti-dumping duties, countervailing duties and China-specific special safeguards. Following China's accession to the WTO it also became eligible to benefit from the phase-out of quotas in textiles that had been agreed by WTO members prior to China's accession under the Multi-Fiber Agreement (MFA), which was already fully implemented by 2005. We have indicators for the HS-6 industries where such quotas were lifted. In column 2 of Table A2 we control for the change in the binary indicator for both MFA quotas and NTBs and find they have the expected negative sign. Those panel estimates are robust to dropping products that ever had an MFA quota regardless of the year it was removed. Their inclusion does not affect the other coefficients whether or not we control for sector effects. Finally, The yearly panel evidence in Table A8—described below—shows that the baseline results in 2000-2005 are similar to those in 2000-2004, which was a period when the quotas were mostly still in place.

NTBs may respond to import surges from China. To the extent that these surges are more likely in some sectors, our sector effects in column 3 already control for this potential endogeneity. To address the possibility that this reverse causality could also occur within sectors, we instrument the change in NTB with its level binary indicator in earlier years—1997 and 1998. Column 4 shows that instrumenting does not affect the coefficient for uncertainty relative to the OLS version (column 3 of Table A2) or the specification without the NTB variable (column 3 of Table 2). The two instruments pass a Sargan overidentifying restriction test and we also fail to reject the exogeneity of the TTB variable using a Durbin-Wu-Hausman test. The instruments have significant explanatory power in the first stage, with the relevant F-statistic above 10. We also find that the constrained version ($b_\tau = \frac{\sigma}{\sigma-1} b_d$) yields very similar coefficients for the uncertainty, tariff and transport variables if we include the NTB and MFA (column 5 of Table A2) or not (column 4 of Table 2).

A.2 Elasticity of substitution, outliers and sample selection (Table A3)

Table A3 summarizes the robustness of the baseline linear estimates of b_γ (replicated in the first two unnumbered columns for comparison). The specifications also include tariff and transport cost changes as well as a constant or sector effects, which are not reported due to space considerations. The central point is that the sign and significance of b_γ in the baseline are robust to the following potential issues:

Alternative elasticity of substitution. The semiparametric evidence suggests $\sigma = 3$ is a reasonable value; this is also the median value for the U.S. estimated by Broda and Weinstein (2006). In columns 1-4 of panel A we use $\sigma = 2, 4$ to compute the uncertainty measure. To address the possibility that some industries have elasticities very different from the overall median we do the following. Let $\widehat{\sigma}_V$ denote the median HS-10 elasticity estimate (from Broda and Weinstein) in each HS-6 industry. In columns 5 and 6 we use $\widehat{\sigma}_V$ directly to recompute the uncertainty measure and obtain similar results.[48]

Potential outliers. In columns 1 and 2 of Table A3 Panel B we employ a robust regression procedure that downweights outliers.

Sample selection. Over 98 percent of export growth occurred in the industries contained in the baseline sample. However, when there is no trade in 2000 or 2005 we can't compute the log change, which reduces the sample size. In columns 3 and 4 of Table A3 Panel B we address this by using the mid-point growth rate, which can accommodate zeroes, as our dependent variable. The baseline also excludes industries that only have specific tariffs. Columns 5 and 6 add these additional industries by calculating ad valorem equivalents (given by specific tariff$_V$/unit value$_V$) and incorporating them into both the change in applied tariffs and the uncertainty measure.

[48] As we can see from the estimating equation when there is variation in σ_V the parameters are not constant so we obtain an average effect. We can take this into account by estimating different coefficients for the tariff and uncertainty variables, one for each tercile of $\widehat{\sigma}_V$, doing so we can't reject the equality of those coefficients. We obtain similar results if we instead assume $\sigma = 3$ but drop any industry with $\widehat{\sigma}_V \notin [1.5, 4.5]$.

A.3 Processing trade (Table A3)

Chinese exports in certain industries primarily reflect processing trade – foreign firms supply inputs and parts that are assembled in China and returned to the foreign firm . If our results were driven by processing industries, then they could reflect changes in Chinese policies towards them. In columns 7 and 8 of Table A3 Panel B we find the results are robust to dropping all the HS-6 industries in section XVI of the Harmonized System (HS84xxxx, HS85xxxx), which has the largest share of processing trade (Kee and Tang, 2016) and accounted for over 40 percent of exports to the US in 2005 (Table A1).

A.4 Capital intensity (Table A4)

We employ capital to labor intensity measures for two robustness checks. First, U.S. import growth may be higher in industries that are labor intensive and if they also have differential initial uncertainty then our estimates would be biased. In Table A4, we report the baseline estimation for the subsample in column 1 where U.S. capital intensity is from the NBER-CES Manufacturing Productivity database.[49] In columns 2 and 3 we see that the baseline coefficient for uncertainty is not sensitive to controlling for capital intensity, nor are the coefficients for other variables. Moreover, capital intensity is not significant when controlling for sector dummies (column 3).

Second, we check for heterogeneity in the effect of uncertainty by interacting it with the capital intensity measure. We de-mean capital intensity within the sample before interacting so that the coefficient on the uncertainty measure can be interpreted as the marginal effect at the mean capital intensity across industries. Including the control and interaction for capital intensity does not significantly affect the baseline results. Recall the model predicts a stronger effect of uncertainty for industries with export sunk costs, as we verify in the text. If U.S. capital intensity was perfectly correlated with export sunk costs then we should find a similar result here. In columns 4 and 5, there is a stronger effect for these industries that is marginally significant at best. Rather than suggesting some inconsistency with the model, U.S. industry capital intensity may be a poor proxy for Chinese export sunk costs at this level of disaggregation; its rank correlation with our sunk cost measure is only 0.08 in the estimation sample.

[49] We concord 6 digit NAICS manufacturing codes to the 6 digit level of the HS using the correspondence in the NBER trade data. Where multiple NAICS codes match to a single 6 digit HS, we take the mean of the log of the K/L ratio. Results are robust to taking the median K/L ratio as well. Capital is measured is real dollars and labor is measured in total employment.

A.5 Unobserved Export Supply Shocks (Table A5)

We addressed omitted variable bias thus far by controlling for specific variables at the HS-6 level and unobserved contemporaneous sector shocks. In Table A5 we go one step further and provide evidence that the baseline results are robust to controlling for unobserved HS-6 industry export supply shocks.

Suppose there was an unobserved shock to Chinese production (and/or consumption) that was correlated with our measure of TPU. In that case our baseline estimates would be biased. If the shock was specific to China then it would affect its exports to all markets, particularly those with similar size and income per capita as the U.S. We test this in Table A5 by regressing Chinese export growth to the European Union and Japan on their respective tariff changes (from TRAINS) and the U.S. TPU measure. Whereas for the U.S. we found a positive and significant effect of the TPU measure (column 1), we do not find significant effects of the US TPU for Chinese exports to the E.U. or Japan (columns 2 and 3 respectively).[50] In column 4 we pool all three samples, include a full set of HS-6 effects, and cluster standard errors at the HS-6 level. Thus we control for narrowly defined Chinese supply shocks, including any Chinese policy changes induced by WTO accession and technology changes that are not export market specific. The coefficient on the TPU measure remains positive and significant and now identifies the average differential growth effect of U.S. TPU on Chinese exports to the U.S. relative to the E.U. or Japan in the same industry.

A.6 Unobserved Import Demand Shocks (Table A6)

In Table A6 we provide evidence that the baseline results are robust to controlling for unobserved HS-6 industry demand shocks.

If U.S. production decreased (and/or its consumption increased) in industries where China faced higher initial uncertainty, then the baseline estimates could be biased upward. But such shocks would also increase U.S. imports from other countries. We do not find support for this. In Table A6 we pool U.S. imports from China and other countries that in 2005 faced the same policy regime as China, i.e. WTO members without a U.S. PTA.[51] In column 1 we estimate a positive and significant effect of U.S. TPU on Chinese imports and no significant effect on non-Chinese imports. We cluster by HS-6 industry because we have no variation in applied tariffs or the TPU measure by country. In column (2) we include an additional set of HS-6 digit industry effects to control for any U.S. demand or production shocks. These

[50] Column 1 shows this specification for the U.S. applied to the common subsample of industries exporting to both destinations. We do not include the transport cost since we do not have that data for the E.U. and Japan.

[51] Japan, Korea, Taiwan, Norway, Switzerland and E.U.-15.

industry effects also control for any unobserved change in industry trade barriers and observable MFN tariffs, which are no longer identified. The differential effect on Chinese imports remains positive and significant. In columns 3 and 4 we focus solely on Taiwan and China, which allows us to keep a number of other important factors constant. First, Taiwan also acceded to the WTO in January 2002, right after China. Second, prior to accession Taiwanese exporters faced MFN tariffs in the U.S. and if they had lost MFN status they would have faced the same column 2 threat tariffs as China's exporters. But Taiwan was never subject to an annual renewal process for its MFN status so the model would predict little or no change in the probability of losing MFN status upon accession. The results in column 3, with sector-country effects, and column 4, which adds HS-6 dummies, support this prediction.

B Pre-accession Export Trends (Table A7)

We examined the effects of TPU on export growth between 2000-2005, which assumes a specific pre- and post-shock period. We now examine the timing assumptions as follows. First, we ask if there are pre-existing trends, which would weaken the assertion that the shock was due to WTO accession. Second, we allow the data to identify when exactly the shock occurred.

Pre-accession growth trends could also generate an omitted variable bias if they persisted and were correlated with the uncertainty measure. To examine this we first run our baseline estimation on pre-accession Chinese trade. In Table A7, column 3 we find no significant effect of the uncertainty measure in 1996 on Chinese trade growth in 1996-99. To eliminate any HS-6 industry growth trends that persist from the pre-accession period we subtract the pre-accession equation (in changes) from the baseline equation (also in changes). This difference of differences identification approach is similar to Trefler (2004) and the econometric details are given below. Columns 1 and 2 of Table A7 show the baseline results are not driven by pre-accession growth trends.

B.1 Double difference specification derivation (Table A7)

If there is an industry specific growth rate trend in export growth, θ_V, and θ_V is correlated with our policy or trade cost variables, then identification is still possible via a difference-of-differences approach. Including this trend in the difference specification between 2000-2005 we have

$$\Delta_{10} \ln R_V = b_\gamma \left(1 - \left(\frac{\tau_{2V}}{\tau_{1V}}\right)^{-\sigma}\right) + b_\tau \Delta \ln \tau_V + b_d \Delta \ln D_V + b + \theta_V + u_V$$

where Δ_{10} is subscripted to denote the difference over a transition from 1 to 0.

Now consider taking the difference between two years that remain in state 1. The difference above uses 2000 (1) and 2005 (0), but we can also use the difference between 1999(1) and 1996(1) and denote it by Δ_{11}

(47)

$$\Delta_{11} \ln R_V = -\Delta_{11} b'_\gamma \left(1 - \left(\frac{\tau_{2V}}{\tau_{1V}}\right)^{-\sigma}\right) + b_\tau \Delta_{11} \ln \tau_V + b_d \Delta_{11} \ln D_V + b' + \theta_V + u'_V.$$

Since both our uncertainty measure and the estimated parameters on the uncertainty measure could change over time, we denote the parameter on uncertainty by b'_γ and note that there are two components to the change in the first term

$$-\Delta_{11} b'_\gamma \left(1 - \left(\frac{\tau_{2V}}{\tau_{1V}}\right)^{-\sigma}\right) = -b'_\gamma \Delta_{11} \left(1 - \left(\frac{\tau_{2V}}{\tau_{1V}}\right)^{-\sigma}\right) - \left(1 - \left(\frac{\tau_{2V}}{\tau_{1V}}\right)^{-\sigma}\right) \Delta_{11} b'_\gamma$$

The second term is evaluated at final period tariffs, which are very close to 2000 levels. Because τ_{2V} is fixed during this period and any variation in $\left(\frac{\tau_{2V}}{\tau_{1V}}\right)$ is due to small changes in τ_{1V}, already controlled for by $\Delta_{11} \ln \tau_V$, we take $\Delta_{11} \left(1 - \left(\frac{\tau_{2V}}{\tau_{1V}}\right)^{-\sigma}\right) \approx 0$ to obtain

$$\begin{aligned} -\Delta_{11} b'_\gamma \left(1 - \left(\frac{\tau_{2V}}{\tau_{1V}}\right)^{-\sigma}\right) &\approx -\left(1 - \left(\frac{\tau_{2V}}{\tau_{1V}}\right)^{-\sigma}\right) \Delta_{11} b'_\gamma \\ &= -\left(1 - \left(\frac{\tau_{2V}}{\tau_{1V}}\right)^{-\sigma}\right) \frac{k - \sigma + 1}{\sigma - 1} \frac{\beta \lambda_2}{1 - \beta} (\Delta_{11} \gamma) \\ &= -\left(1 - \left(\frac{\tau_{2V}}{\tau_{1V}}\right)^{-\sigma}\right) b'_\gamma. \end{aligned}$$

We then normalize each differenced RHS variable by the length of the time period to obtain magnitudes comparable to our first differenced results

$$\frac{\Delta_{11} \ln R_V}{3} = b'_\gamma \frac{\left(1 - \left(\frac{\tau_{2V}}{\tau_{1V}}\right)^{-\sigma}\right)}{3} + b_\tau \left(\frac{\Delta_{11} \ln \tau_V}{3}\right) + b_d \left(\frac{\Delta_{11} \ln D_V}{3}\right) + b' + u'_V$$

This regression is similar to our OLS baseline regression in 2000-2005, but for the pre-WTO accession period 1996-1999. The main difference is that the coefficient on the uncertainty measure b'_γ reflects possibility of a change in the probability of a policy shock $\Delta_{11}\gamma$ in 1996-1999. In columns 3 and 4 of Table A7 we show this coefficient is nearly zero and insignificant. We then double difference the annualized change in exports in both periods to obtain

$$\begin{aligned}\frac{\Delta_{10}\ln R_V}{5}-\frac{\Delta_{11}\ln R_V}{3}&=b_\gamma\frac{\left(1-\left(\frac{\tau_{2V}}{\tau_{1V}}\right)^{-\sigma}\right)}{5}+b_\tau\left(\frac{\Delta_{10}\ln\tau_V}{5}-\frac{\Delta_{11}\ln\tau_V}{3}\right)\\&+b_d\left(\frac{\Delta_{10}\ln D_V}{5}-\frac{\Delta_{11}\ln D_V}{3}\right)+b-b'+u_V-u'_V\end{aligned}\tag{48}$$

The coefficients from estimating equation (48) have the same interpretation as our OLS baseline. The sample size drops since we can only use HS-6 industries traded in 2005, 2000, 1999, and 1996. Further, the double differenced variables are somewhat noisy so we employ a robust regression routine that downweights outliers more than 6 times the median absolute deviation from the median residuals, iterating until convergence.

C Timing of TPU shocks (Table A8)

The results thus far focus on specific years and a balanced panel. For comparison to our earlier results we hold fixed the profit loss measure calculated using applied tariffs from 2000. In section C.1 we show that the structural interpretation of the full panel estimates is $b^{panel}_{\gamma t}=\frac{k-\sigma+1}{\sigma-1}\frac{\beta g\lambda_2}{1-\beta}\Delta\gamma_t$, where $\Delta\gamma_t=\gamma_{2000}-\gamma_t$ for any year t. The estimates from Table A8 are plotted in Figure A1 and show no significant difference in the TPU effect in the pre-accession period: 1996-2001. This indicates that minor changes in the legislation or in the relations between the U.S. and China did not significantly affect Chinese firms' beliefs about losing the MFN status.[52] Those beliefs seem to have been revised only after China accedes to the WTO. From 2002-2005 we find a positive and significant coefficient and its magnitude in 2005 is similar to the baseline. This timing evidence indicates that accession did lower uncertainty as predicted by the model.

[52] These insignificant changes in γ during 1996-2001 are also consistent with the lack of variability in the vote share to revoke MFN status in the house of representatives. According to the Congressional Quarterly Almanac that share increased slightly from 33 percent in 1996 to 40 percent in 1997 and remained around that level (except for 2000, 34 percent). We also constructed and found that a news index of U.S. TPU did not fall significantly during 1996-2002 but did so between 2002-2006, both of which are consistent with the panel estimates of changes in γ. We thank two referees for these suggestions.

C.1 Yearly panel specification derivation (Table A8)

The full panel specification used to obtain the coefficients in Figure A1 allows us to examine how the uncertainty coefficient changed over time. Consider a generalized version of the level equation (10) that allows the uncertainty coefficient to vary by year, t, and includes time *by* sector effects, b_{tS}, in addition to industry (HS-6) fixed effects b_V.

$$\ln R_{tV} = -b_{\gamma t}\left(1-\left(\frac{\tau_{2V}}{\tau_{tV}}\right)^{-\sigma}\right)+b_\tau \ln \tau_{tV}+b_d \ln D_{tV}+b_{tS}+b_V+u_{tV} \quad ; t=1996\ldots 2006$$

We estimate two versions of this equation. First, recall that there is almost no variation over 2000-2005 in the uncertainty variable over time so in the baseline we focused in the change in coefficient. To compare the panel results with the baseline we initially use $\tau_{tV}=\tau_{2000V}$ to construct the uncertainty measure. In this case we cannot identify $b_{\gamma t}$ for each year since the uncertainty regressor only varies across V and we include b_V. Instead, we estimate the coefficient change over time relative to a base year, namely $b^{panel}_{\gamma t} = -\left(b_{\gamma t}-b_{\gamma 2000}\right) = \frac{k-\sigma+1}{\sigma-1}\frac{\beta g\lambda_2}{1-\beta}\Delta\gamma_t$, where $\Delta\gamma_t = \gamma_{2000}-\gamma_t$. We obtain similar results to Figure A1 (from Table A8, column 1) if we drop the year 2001, constrain $b^{panel}_{\gamma t}$ to a single value for pre-WTO and a single value post-WTO (Table A8, column 2), or both. All the results are available upon request.

D Sunk cost estimation

Approach

In the model, uncertainty only has an effect for industries with positive sunk costs. To empirically identify those industries we explore variation in export persistence across countries exporting to the U.S. A standard approach (cf. Roberts and Tybout, 1997) is to use firm-level data to estimate a probability model where, after conditioning on firm characteristics to capture their current incentive to participate, any correlation with lagged participation provides evidence of sunk costs. Our objective is not to estimate the magnitude of sunk costs in each industry but simply to determine which subset is more likely to have sunk costs and then use it to test if uncertainty has stronger effects in those industries.

More formally, let the export participation variable be $Y_{vct}=\{0,1\}$ for firm v from export country c at t. We define an indicator for a sunk versus fixed export cost industry: $\kappa_V=1$ if $K_V>0$ and $f_V=0$ and $\kappa_V=0$ if $K_V=0$ and $f_V>0$. Clearly there are country and time dimensions to these costs, which we are ignoring in the exposition. Denote the equilibrium industry threshold for new exporters from country c at t, i.e. those with $Y_{vc,t-1} = 0$, as $c_{ct}(\kappa_V)$. This is the cutoff we solved for in the model when $\kappa_V = 1$; for an industry with fixed costs we would obtain $c_{ct}(\kappa_V = 0) = \left[\frac{a_{Vct}}{f_{Vc}}\right]^{\frac{1}{\sigma-1}}$. The participation equation for a firm with cost parameter c_{vct} in period t under fixed export costs is independent of prior participation and given by

$$Y_{vct}(\kappa_V = 0) = \begin{cases} 1 \text{ if } c_{vct} \leq c_{ct}(\kappa_V) \\ 0 \ \text{ otherwise.} \end{cases} \tag{49}$$

Alternatively, under sunk costs, a firm will export in the current period if (i) its marginal cost parameter satisfies the current cutoff condition $c_{vct} \leq c_{ct}(\kappa_V)$, or; (ii) its marginal cost exceeds the cutoff but it exported in the previous period ($c_{vct} > c_{ct}(\kappa_V) \wedge Y_{vc,t-1} = 1$). The participation equation is

$$Y_{vct}(\kappa_V = 1) = \begin{cases} 1 \text{ if } c_{vct} \leq c_{ct}(\kappa_V) \vee Y_{vc,t-1} = 1 \\ 0 \text{ otherwise.} \end{cases} \tag{50}$$

We capture firm participation by using HS-10 product data over 1996-2000 for a set of exporters to the U.S. market. Each industry V is composed of a group of HS-10 categories, denoted by $\tilde{V} \in V$. Within each country×HS-10 category there is a subset of firms and we denote the cost of the most productive one by $c_{\tilde{V}ct}$. We note three points about mapping from the model to the product data. First, even if the productivity distribution at the HS-6 level is unbounded, it is possible to have certain HS-10 products where $c_{\tilde{V}ct} > c_{ct}(\kappa_V)$ so no trade would be observed under fixed costs (or under sunk costs if $Y_{vc,t-1} = 0$). Thus the variation in export participation that we explore at the HS-10 level is consistent with the TPU augmented gravity equation we derived. Second, the model does not assume any correlation between the product category $\tilde{V} \in V$ that a given firm v produces and that firms' productivity. Thus we treat each set of firms $v \in \tilde{V}$ as a random partition of the productivity distribution of its respective HS-6 industry and model the minimum cost as an unobserved parameter: $c_{\tilde{V}ct} = c_{\tilde{V}} c_{ct} \exp(\varepsilon_{\tilde{V}ct})$ where $\varepsilon_{\tilde{V}ct}$ is a random error term.

Defining the latent variable $z_{\tilde{V}ct}(\kappa_V) \equiv \ln\left(c_{ct}(\kappa_V)/c_{\tilde{V}ct}\right)$ we can write the HS-10 counterpart of (49) as $T_{\tilde{V}ct}(\kappa_V = 0) = 1$, if $z_{\tilde{V}ct}(\kappa_V = 0) \geq 0$ and 0 otherwise; and for (50) we have $T_{\tilde{V}ct}(\kappa_V = 1) = 1$, if $z_{\tilde{V}ct}(\kappa_V = 1) \geq 0 \vee T_{\tilde{V}c,t-1} = 1$ and 0 otherwise.

Identification and estimation

The theoretical model and the assumption made about $c_{\tilde{V}ct}$ allows us to write the latent variable as a function of fixed effects and an error term, $z_{\tilde{V}ct}(\kappa_V) = \alpha_{Vct} + \alpha_{\tilde{V}} + \varepsilon_{\tilde{V}ct}$, which applies whether $\kappa_V = 0, 1$. The country-year-industry effects capture all the factors the theory allows for in the economic conditions variable, a_{Vct}, that enters $c_{ct}(\kappa_V)$, e.g. it subsumes the aggregate U.S. expenditure and price index effects, allows for (HS-6) industry tariffs, transport and other export costs to differ across countries. If a country is particularly productive in a given industry then this is controlled for by α_{Vct}. We allow for the possibility that certain products contain more (or less productive) firms via the HS-10 effect, $\alpha_{\tilde{V}}$.

We estimate a linear probability model to handle the large set of fixed effects:

$$T_{\tilde{V}ct} = b_V^{sunk} T_{\tilde{V}ct-1} + b_{V,96} T_{\tilde{V}c,96} + \alpha_{Vct} + \alpha_{\tilde{V}} + \epsilon_{\tilde{V}ct} \text{ for each } V.$$

To address any remaining unobserved heterogeneity in initial conditions at the HS10-country level we also control for the export status in the first year of the sample, $T_{\tilde{V}c,96}$. In order to identify b_V^{sunk} there must exist sufficient changes in trade status in an industry and some firms that are exporting even though their marginal cost is above the current cutoff. This requires us to have a sufficiently large number of time-country-HS10 observations. We restrict the countries to exclude China and the time period to the one prior to China's WTO accession, 1996-2000, to avoid these results being affected by China's export boom. To increase the number of observations and better identify b_V^{sunk} we estimate the model at the HS-4 level. Doing so implicitly restricts the HS-6 industries in each HS-4 to have similar parameters. This restriction is more likely to be met by a group of countries that face similar trade protection, so we estimate the model using U.S. imports from nonpreferential partners other than China: the same set used in Table A6 (Japan, Korea, Taiwan, Norway, Switzerland and E.U.-15) plus Australia, which was excluded as a nonpreferential partner in the 2000-2005 regressions because it implemented a PTA with the U.S. in 2005.

Estimates

The coefficient of interest is b_V^{sunk}. The null hypothesis in a model with fixed costs and no sunk costs is that $b_V^{sunk} = 0$; we interpret $b_V^{sunk} > 0$ as evidence for the presence of sunk costs. Figure A3 plots the t-statistics against the estimated coefficients. The results appear reasonable along a couple of dimensions. First, only 29 of 1,084 estimates are negative and all but two of those negative estimates are insignificantly different from 0. Second, the increase in the probability of exporting due to lagged exporting is always lower than one, the maximum is 0.81.

Figure A3 also shows there is heterogeneity in persistence across industries. This is useful in providing us with a ranking that allows us to distinguish between industries according to how likely they are to have sunk costs. To do so we rank industries by the persistence coefficients' t-statistic; those industries where we reject fixed costs (no persistence) with a higher confidence level are those we classify as having relatively higher sunk costs.[53] About three quarters of the industries have a t-statistic above 2.58 (around 1 percent significance level) and two thirds are above 3.09 (around 0.2 percent significance), represented by the red line.

We match these estimates to the HS-6 sample used in table 2 and define $\tilde{\kappa}_V = 1$ for those industries with t-statistics in the top two terciles of that sample as more likely to have sunk costs than those in the bottom tercile, $\tilde{\kappa}_V = 0$. There is no obvious metric to compare our estimates to since there is no accepted measure of export sunk costs for this large a set of industries. However, we can ask if the estimates are informative about persistence and thus sunk costs for China. To do so we note that one of the underlying assumptions of the estimation is that sunk export costs have an important industry dimension, which is similar across exporters to the same destination. If this is true then we expect to find a significantly higher autocorrelation in export status for the subset of industries that we identify as higher sunk cost for countries *not* used in the estimation. The more relevant for us is China's exports to the U.S., for which we obtain:

$$T_{\tilde{V}china,t} = \underset{(.009)}{.63}\, T_{\tilde{V}china,t-1} + \underset{(.085)}{.29} \text{ for all } \tilde{\kappa}_V = 1$$

$$T_{\tilde{V}china,t} = \underset{(.023)}{.55}\, T_{\tilde{V}china,t-1} + \underset{(.022)}{.41} \text{ for all } \tilde{\kappa}_V = 0$$

Thus, China's lagged exporting in a product has a significant effect on current exporting and, more importantly, that effect is stronger for industries that our procedure identifies as high sunk cost. We obtain a similarly significant difference in persistence if we run these specifications while using HS-4 effects to control for the possibility that China may be more productive in those industries where $\tilde{\kappa}_V = 1$ (coefficient is 0.56) than $\tilde{\kappa}_V = 0$ (0.49). These results hold whether we focus on $t = 2000$, as described, or we include additional years.

E Industry Price Indices: Measurement, Predictions, and Aggregation

We describe the measurement and model predictions for the following change in ideal prices in an industry across two periods t and $t-5$:

$$\Delta \ln P_{V,x} \equiv \ln \left[\frac{\int_{\Omega^x_{tV}} (p_{tv})^{1-\sigma}}{\int_{\Omega^x_{t-5V}} (p_{t-5v})^{1-\sigma}} \right]^{1/1-\sigma} \tag{51}$$

Measurement

[53] The number of observations is not the same across V but they are large enough in each of them such that higher t-statistics translate into higher confidence intervals.

Feenstra (1994) shows that exact changes in the CES ideal price index can be computed as a function of weighted changes in the prices of continuing varieties, and a term accounting for changes in varieties. Applying the derivation to (51) we obtain

$$\Delta \ln P_{V,x} = \sum_{v \in \Omega_{V,x}^{cont}} w_{v,t} \ln(\frac{p_{v,t}}{p_{v,t-5}}) + \ln(\frac{\psi_{V,t}}{\psi_{V,t-5}})^{1/(\sigma-1)} \tag{52}$$

where $\Omega_{V,x}^{cont}$ is the set of imported varieties in industry V traded in both periods, $p_{v,t}$ is their consumer price in t and $w_{v,t}$ are ideal variety share weights defined by

$$w_{v,t} \equiv \frac{(s_{v,t} - s_{v,t-5})/\left(\ln(s_{v,t}) - \ln(s_{v,t-5})\right)}{\sum_{v \in \Omega_{V,x}^{cont}} \left((s_{v,t} - s_{v,t-5})/(\ln(s_{v,t}) - \ln(s_{v,t-5})\right)}$$

$$s_{v,t} \equiv \frac{p_{v,t} q_{v,t}}{\sum_{v \in \Omega_{V,x}^{cont}} p_{v,t} q_{v,t}} \;;\; s_{v,t-5} \equiv \frac{p_{v,t-5} q_{v,t-5}}{\sum_{v \in \Omega_{V,x}^{cont}} p_{v,t-5} q_{v,t-5}}$$

The variety adjustment measures the change in the expenditure share of continuing varieties.

$$\psi_{V,t} \equiv \frac{\sum_{v \in \Omega_{V,x}^{cont}} p_{v,t} q_{v,t}}{\sum_{v \in \Omega_{V,x,t}} p_{v,t} q_{v,t}} \;;\; \psi_{V,t-5} \equiv \frac{\sum_{v \in \Omega_{V,x}^{cont}} p_{v,t-5} q_{v,t-5}}{\sum_{v \in \Omega_{V,x,t-5}} p_{v,t-5} q_{v,t-5}}$$

We follow Broda and Weinstein (2006) in defining a variety as an HS-10 product by country observation. Our calculation differs from theirs in three ways. First, we assume σ is similar across industries. Second, we compute the change for $t =$ 2005. Third, we compute separate sub-price indices for China (and other U.S. trading partners), which can be aggregated across industries (as done in Broda and Weinstein, 12) and similarly across countries. More specifically, we do the following:

1. Concord HS-10 data over time using an algorithm similar to Pierce and Schott (2010) modified to account for details of the tariff classification.

2. Compute unit values at HS-10 for each year if quantity is available and $\Delta \ln p_v$ if v is traded in both periods and its quantity is reported in the same units.

3. Define $\mathbf{V}^{cont}$ as the set of industries with at least one measured variety price change, $\Delta \ln p_{v \in V} \neq \emptyset$, and the associated set of continuing varieties, $\Omega_{V,x}^{cont}$ for each $V \in \mathbf{V}^{cont}$. The baseline defines V at the HS-6 level.

4. Compute $\psi_{V,t}, \psi_{V,t-5}$, $w_{v,t}$ and use eq.(52) to obtain $\Delta \ln P_{V,x}$ for each $V \in \mathbf{V}^{cont}$.

Sample selection and measurement error:

Using the procedure above the number of HS-6 industries where $V \in \mathbf{V}^{cont}$ and for which the variables in the gravity estimation are available is $n = 2714$. Thus we can compute ideal price changes for 85 percent of the HS-6 export sample (2714/3211) either because the index is not defined or because of unavailability of quantity data. Thus in some of the robustness tests we define V at the HS-4 level, which ensures that a smaller fraction of industries is dropped since $\Omega^{cont}_{HS-6,x} \subseteq \Omega^{cont}_{HS4,x}$.

We measure price changes with error by using changes in average unit values. Given this is our dependent variable we treat this error as random across industries. If unit values are poorly measured in some sectors then the specification with sector effects control for it. Nonetheless, there are outliers both at the top and bottom (about 6.5 percent of the sample is mild outliers and 3 percent severe, i.e. +/- 3 times the interquartile range). To minimize their potential effect we trim the top and bottom 2.5 percentiles leaving 2579 observations.

Predictions

To obtain the estimating equation (12) we use the price change defined in (51) and the derivation in eq.(57). Allowing for exogenous changes in export costs other than tariffs in eq.(57) the log change in the import index in a temporary state s relative to a deterministic baseline b is

$$\ln\left(\frac{P_{sV,x}}{P_{bV,x}}\right) = \ln\left(\frac{\tau_{sV}}{\tau_{bV}}\frac{d_{sV}}{d_{bV}}\right) + \left(1 - \frac{k}{\sigma-1}\right)\ln\left(\frac{c^U_{sV}}{c^D_{bV}}\right)$$

The estimation uses $\Delta \ln x = \ln \frac{x_{bV}}{x_{sV}}$ since the post period is the deterministic baseline, and $s = 1$. Using this and the generalized version of the formula in (18): $c^U_{1V}/c^D_{0V} = U(\omega g, \gamma) \times \left(\frac{a_{1V}}{a_{0V}}\right)^{\frac{1}{\sigma-1}}$, we obtain:

$$\begin{aligned}
\Delta \ln P_{V,x} &= \Delta \ln(\tau_V) + \Delta \ln(d_V) + \left(1 - \frac{k}{\sigma-1}\right)\left[\frac{1}{\sigma-1}\Delta\ln(a_V) - \ln U_V\right] \\
&= \left(1 - \frac{k}{\sigma-1}\right)(-\ln U_V) + \left(\frac{\sigma k}{\sigma-1} - 1\right)\frac{1}{\sigma-1}\Delta\ln\tau_V + \frac{k}{\sigma-1}\Delta\ln d_V \\
&\quad + \left(1 - \frac{k}{\sigma-1}\right)\Delta\ln\left(PE^{\frac{1}{\sigma-1}}\right) \qquad (53)
\end{aligned}$$

where the second equality uses $a_V \equiv (\tau_V \sigma)^{-\sigma}((\sigma-1)P/d_V)^{\sigma-1}E$. The last term captures any aggregate changes, which are endogenous to the policy change in the general case, or exogenous in the small exporter case. The empirical counterpart in (12) reflects an error term due to potential measurement problems in the price indices, as described above, and possibly from measuring d_V with D_V, i.e. with freight and insurance information alone.

Aggregation

When aggregating industry import price index changes using the $P_{V,x}$ constructed from the data we use

$$\Delta \ln P_x \equiv \sum_V w_{Vt,x} \Delta \ln P_{V,x}, \text{ where } w_{Vt,x} \equiv \frac{(s_{V,t} - s_{V,t-5}) / \left(\ln(s_{V,t}) - \ln(s_{V,t-5})\right)}{\sum_V \left((s_{V,t} - s_{V,t-5})/(\ln(s_{V,t}) - \ln(s_{V,t-5})\right)}.$$

F Entry: Measurement and Predictions

Predictions

The model predicts the growth in imported varieties, $\Delta \ln n_V$, after switching from a temporary policy state, 1, to a permanent one, 0, is

$$\begin{aligned} \Delta \ln n_V &= k \ln c^D_{0V}/c^U_{1V} = -k \ln U_V + \frac{k}{\sigma - 1} \Delta \ln (a_V) \\ &= k\left(-\ln U_V\right) - \frac{\sigma k}{\sigma - 1} \Delta \ln \tau_V - k \Delta \ln d_V + \frac{k}{\sigma - 1} \Delta \ln \left(PE^{\frac{1}{\sigma-1}}\right) \end{aligned} \tag{54}$$

where the second quality in the first line uses the generalized version of the formula in eq. (18): $c^U_{1V}/c^D_{0V} = U(\omega g, \gamma) \times \left(\frac{a_{1V}}{a_{0V}}\right)^{\frac{1}{\sigma-1}}$. The second line uses $a_V \equiv (\tau_V \sigma)^{-\sigma} \left((\sigma - 1) P/d_V\right)^{\sigma-1} E$ and allows for any aggregate changes, which are endogenous to the policy change in the general case, or exogenous in the small exporter case. The empirical counterpart in eq. (13) reflects an error term due to potential measurement problems in the number of varieties, as described below, and measuring d_V with D_V, i.e. with freight and insurance information alone.

Measurement and estimation

We measure varieties as HS-10 products by country and thus variety growth is the growth in traded HS-10 within an industry V. The growth is censored for any HS-6 industries where all HS-10 categories are traded in both periods and it provides no information about variety growth. Thus using the full sample to estimate (13) yields attenuated estimates of the coefficients and we can minimize it by focusing on the uncensored sample, as shown in Table 4.

Moreover, under certain conditions we can identify the coefficients implied by (54) up to a factor, $\nu' \in [0, 1]$. Assume there is a continuous, increasing, differentiable function $\nu(\cdot)$ that maps varieties to product counts: $\ln(pcount_{sV}) = \nu(\ln n_{sV})$. If there was only one firm in an HS-6 industry and it produced a single variety then we would observe one traded HS-10 within that industry. We cannot observe more traded products than the maximum number tracked by customs in each industry, i.e. the total number of HS-10 categories in an HS-6. So clearly we have a lower bound

$\nu\left(\ln n_{sV}=0\right)=0$ and an upper bound $\ln\left(pcount_{tV}^{\max}\right)=\nu\left(\ln n_{hV}\right)$ for all $\ln n_{tV}$ at least as high as $\ln n_{hV}$—the (unobserved) threshold where all HS-10 product categories in an HS-6 industry have positive values. If we assume product counts and true varieties are continuous, then $\nu' \geq 0$ for $n_V \in (0, n_{hV})$ and zero otherwise. The weak inequality accounts for the possibility that different firms export within the same HS-10 category so there is true increase in variety that is not reflected in new HS-10 categories traded. If we log linearize the equation of product counts around $\ln n_{t-5V}$ the change in products between t and and $t-5$ is $\Delta \ln\left(pcount_V\right) \approx \nu'\left(\ln n_{s-1V}\right) \Delta \ln n_V$. Therefore, if we use $\Delta \ln\left(pcount_V\right)$ as a proxy for $\Delta \ln n_V$ we can identify the coefficients in (54) up to a factor, $\nu'\left(\ln n_{s-1V}\right)$, if that factor is similar across industries.

Online Appendix: General Equilibrium and Quantification

G Entry and Prices

G.1 Derivation and comparative statics under deterministic policy baseline

The equilibrium baseline price index change in equation (17) and the comparative statics can be derived as follows. First, the price index is

$$P^D\left(c_m^D, c_{mh}^D, \tau_m\right) = \left[N \int_0^{c_m^D} \left(\tau_m d c_v / \rho\right)^{1-\sigma} dG\left(c\right) + N_h \int_0^{c_{mh}^D} \left(c_v / \rho\right)^{1-\sigma} dG_h\left(c\right)\right]^{1/(1-\sigma)}. \tag{55}$$

Second, we use the cutoff expressions, (3) for exports and the counterpart evaluated at a_h, K_h, β_h for domestic firms. We can then write $c_{mh}^D = c_m^D \tau_m^{\frac{\sigma}{\sigma-1}} \left[\frac{(1-\beta)K}{(1-\beta_h)K^h}\right]^{\frac{1}{\sigma-1}}$, and reduce the system to two equations and show their unique intersection. For any given fixed tariff value the entry schedule, c_m^D, is linear and increasing in P_m^D and $c_m^D|_{P_m \to 0} = 0$ whereas $P^D\left(c_m^D, c_m^D \tau_m^{\frac{\sigma}{\sigma-1}} \left[\frac{(1-\beta)K}{(1-\beta_h)K^h}\right]^{\frac{1}{\sigma-1}}, \tau_m\right)$ is positive and decreasing in c_m^D. We replace each cutoff change in (16) and simplify to obtain (17).

G.2 Price index expectations, transition dynamics and exact changes

Expectations of future price index: P_s^e

Firms can derive P_s^e as follows. To predict the import component of P_s firms use the observed policy realization, τ_m, and must infer the set of exported varieties, Ω_s^x, over which to integrate. The latter is simply $\Omega_s^x = \Omega_s^{cont} \cup \Omega_s^{entry}$ where Ω_s^{cont} represents the set of foreign producers that exported to this market both in the previous and current periods (so $\Omega_s^{cont} = \emptyset$ in the initial trading period). The measure of continuers is given by the measure of previous period exporters—observed in Ω_{t-1}—adjusted by the exogenous survival probability, β, applied to all subsets. So Ω_s^{cont} is independent of the current tariff and economic conditions. New exporters are represented by the subset Ω_s^{entry} of all potential firms in the foreign country that (i) did not export in the previous period—known from Ω_{t-1}—and (ii) have a cost such that entry is optimal in state s according to (4). To predict the domestic component they do the same using the optimal cutoff obtained by solving the Bellman equation for the domestic entrant, given by (4) when evaluated at K_h, $a_{s,h}$ and β_h.

Transition Dynamics

Starting from the stationary equilibrium of the intermediate state 1 with cutoffs c_1^U and $c_{1}^U{}_{,h}$, the price index for all $T \geq 0$ after switching to policy state $m = 0$ or $m = 2$ is

(56)
$$
\begin{aligned}
(P_{m,T})^{1-\sigma} = N\tau_m^{1-\sigma} & \left(\int_0^{c_{m,T}} (c_v/\rho)^{1-\sigma}\, dG(c) + \beta^{T+1} \int_{\min\left\{c_{m,T},c_1^U\right\}}^{c_1^U} (c_v/\rho)^{1-\sigma}\, dG(c) \right) \\
& + N_h \left(\int_0^{c_{m,T,h}} (c_v/\rho)^{1-\sigma}\, dG(c) + \beta_h^{T+1} \int_{\min\left\{c_{m,T,h},c_{1,h}^U\right\}}^{c_{1,h}^U} (c_v/\rho)^{1-\sigma}\, dG(c) \right)
\end{aligned}
$$

where in equilibrium we find $\min\left\{c_{m,T}, c_1^U\right\} = c_{m,T}$ if $m = 2$ (conditions worsen for foreign firms under high protection) and c_1^U otherwise and $\min\left\{c_{m,T,h}, c_{1,h}^U\right\} = c_{1,h}^U$ if $m = 2$ and $c_{m,T,h}$ otherwise. The representation holds for all $T \geq 0$ when states $m = 0, 2$ are absorbing.

Exact changes

Aggregate price index change and price sub-indices eq. (15). We use the definition of P_s and rewrite it using the sub-indices $P_{s,i} \equiv \left[\int_{\Omega_{s,i}} (p_{vs})^{1-\sigma}\, dv\right]^{1/(1-\sigma)}$, $i = x, h$ and $\hat{y}_s \equiv y_s/y_b$

$$
\begin{aligned}
(P_s)^{1-\sigma} &= (P_{s,x})^{1-\sigma} + (P_{s,h})^{1-\sigma} \\
\left(\frac{P_s}{P_b}\right)^{1-\sigma} &= \left(\frac{P_{s,x}}{P_b}\right)^{1-\sigma} + \left(\frac{P_{s,h}}{P_b}\right)^{1-\sigma} \\
\left(\hat{P}_s\right)^{1-\sigma} &= \left(\frac{P_{b,x}}{P_b}\right)^{1-\sigma} \left(\hat{P}_{s,x}\right)^{1-\sigma} + \left(\frac{P_{b,h}}{P_b}\right)^{1-\sigma} \left(\hat{P}_{s,h}\right)^{1-\sigma}
\end{aligned}
$$

Eq. (15) follows once we use $I \equiv \frac{\tau_b R_b}{E} = \left(\frac{P_{b,x}}{P_b}\right)^{1-\sigma}$. This equality is obtained from rewriting aggregate expenditure on imports and using the optimal demand in a baseline period:

$$
\tau_b R_b = \int_{\Omega_{b,x}} p_v q_v = \frac{E}{P_b^{1-\sigma}} \int_{\Omega_{b,x}} p_v^{1-\sigma} \Rightarrow \frac{\tau_b R_b}{E} = \left(\frac{P_{b,x}}{P_b}\right)^{1-\sigma}
$$

Stationary aggregate price index change as a function of cutoffs, eq. (16)

Above we show (15) holds for all s so, under an unbounded Pareto distribution, (16) holds for all *stationary* policy states m iff $\left(\hat{P}_{m,x}\right)^{1-\sigma} = (\hat{\tau}_m)^{1-\sigma}(\hat{c}_m)^{k-(\sigma-1)}$ and $\left(\hat{P}_{s,h}\right)^{1-\sigma} = (\hat{c}_{m,h})^{k-(\sigma-1)}$. For the foreign index we have

(57)

$$\left(\hat{P}_{m,x}\right)^{1-\sigma} = \frac{\int_{\Omega_{m,x}}(p_{vm})^{1-\sigma}dv}{\int_{\Omega_{b,x}}(p_{vb})^{1-\sigma}dv} = (\hat{\tau}_m)^{1-\sigma}\frac{\int_0^{c_m}c_v^{1-\sigma}dG(c)}{\int_0^{c_b}c_v^{1-\sigma}dG(c)} = (\hat{\tau}_m)^{1-\sigma}(\hat{c}_m)^{k-(\sigma-1)}$$

where the first equality is the definition, the second follows from replacing the optimal price and uses a constant cutoff due to the stationary equilibrium. The last equality uses the Pareto. Similarly we find

$$\hat{P}_{m,h} = (\hat{c}_{m,h})^{k-(\sigma-1)} \tag{58}$$

Deterministic price index change, eq.(17)

Substituting the deterministic cutoff from eq.(3) and the definition of a_m and doing similarly for an analogous expression for the domestic cutoff we obtain.

$$\hat{c}_m^D = (\hat{a}_m)^{\frac{1}{\sigma-1}} = (\hat{\tau}_m)^{\frac{-\sigma}{\sigma-1}}\hat{P}_m$$
$$\hat{c}_{m,h}^D = (\hat{a}_{m,h})^{\frac{1}{\sigma-1}} = \hat{P}_m$$

replacing these in (16) and solving for $\hat{P}_m$ we obtain eq.(17).

General aggregate price index transition as a function of cutoffs

To derive an expression for P_{mT}/P_1 as a function of the cutoffs we derive $P_{m,T,i}/P_{1,i}$ and replace in (15) to obtain

$$\left(\frac{P_{m,T}}{P_1}\right)^{1-\sigma} = I_1\left(\frac{P_{m,T,x}}{P_{1,x}}\right)^{1-\sigma} + (1-I_1)\left(\frac{P_{m,T,h}}{P_{1,h}}\right)^{1-\sigma}$$

Using the transition expression in (56) we can write

$$\left(\frac{P_{m,T,x}}{P_{1,x}}\right)^{1-\sigma} = \left(\frac{\tau_m}{\tau_1}\right)^{1-\sigma} \frac{\int_0^{c_{m,T}} c_v^{1-\sigma} dG(c) + \beta^{T+1} \int_{\min\left\{c_{m,T}, c_1^U\right\}}^{c_1^U} c_v^{1-\sigma} dG(c)}{\int_0^{c_1^U} c_v^{1-\sigma} dG(c)}$$

$$= \begin{cases} \left(\frac{\tau_2}{\tau_1}\right)^{1-\sigma} \left(\left(1-\beta^{T+1}\right)\left(\frac{c_{2,T}}{c_1^U}\right)^{k-(\sigma-1)} + \beta^{T+1}\right) & \text{if } m=2 \\ \left(\frac{\tau_0}{\tau_1}\right)^{1-\sigma} \left(\frac{c_{0,T}}{c_1^U}\right)^{k-(\sigma-1)} & \text{if } m=0 \end{cases}$$

$$\left(\frac{P_{m,T,h}}{P_{1,h}}\right)^{1-\sigma} = \frac{\int_0^{c_{m,T,h}} c_v^{1-\sigma} dG(c) + \beta_h^{T+1} \int_{\min\left\{c_{m,T,h}, c_1^U\right\}}^{c_{1,h}^U} c_v^{1-\sigma} dG(c)}{\int_0^{c_{1,h}^U} c_v^{1-\sigma} dG(c)}$$

$$= \begin{cases} \left(\frac{c_{2,T,h}}{c_{1,h}^U}\right)^{k-(\sigma-1)} & \text{if } m=2 \\ \left(1-\beta_h^{T+1}\right)\left(\frac{c_{0,T,h}}{c_{1,h}^U}\right)^{k-(\sigma-1)} + \beta_h^{T+1} & \text{if } m=0 \end{cases}$$

We use the stationary value of state 0 as a baseline, i.e. I_0, so below we rewrite $\hat{y}_s \equiv y_s/y_0^D$

$$\left(\frac{P_{m,T}}{P_0^D}\right)^{1-\sigma} = I_0 \left(\frac{P_{m,T,x}}{P_{0,x}}\right)^{1-\sigma} + (1-I_0)\left(\frac{P_{m,T,h}}{P_{0,h}}\right)^{1-\sigma}$$

$$\left(\hat{P}_{m,T}\right)^{1-\sigma} = I_0 \left(\frac{P_{m,T,x}}{P_{1,x}} \hat{P}_{1,x}\right)^{1-\sigma} + (1-I_0)\left(\frac{P_{m,T,h}}{P_{1,h}} \hat{P}_{1,h}\right)^{1-\sigma}$$

Replacing eqs. (57), (58) and $P_{m,T,i}/P_{1,i}$ derived above and simplifying we have

(59)
$$\left(\hat{P}_{0,T}\right)^{1-\sigma} = I_0 \left(\hat{c}_{0,T}\right)^{k-(\sigma-1)} + (1-I_0)\left(\left(1-\beta_h^{T+1}\right)\left(\hat{c}_{0,T,h}\right)^{k-(\sigma-1)} + \beta_h^{T+1}\left(\hat{c}_{1,h}\right)^{k-(\sigma-1)}\right)$$

(60)
$$\left(\hat{P}_{2,T}\right)^{1-\sigma} = I_0 \left(\hat{\tau}_2\right)^{1-\sigma}\left(\left(1-\beta^{T+1}\right)\left(\hat{c}_{2,T}\right)^{k-(\sigma-1)} + \beta^{T+1}\left(\hat{c}_1\right)^{k-(\sigma-1)}\right) + (1-I_0)\left(\hat{c}_{2,T,h}\right)^{k-(\sigma-1)}$$

Multi-industry version

As we show below the domestic cutoff changes are function of aggregate variables. So the multi-industry version requires aggregation of only the foreign variables. We can then rederive all the expressions by defining $\hat{P}_{s,x,V}$ at the industry level and aggregating the effects as required by the theory using the import share across industries: $r_{Vb} \equiv \tau_{Vb} R_{Vb} / \sum_V \tau_{Vb} R_{Vb}$.

$$\left(\hat{P}_s\right)^{1-\sigma} = I \sum_V r_{Vb} \left(\hat{P}_{s,x,V}\right)^{1-\sigma} + (1-I) \left(\hat{P}_{s,h}\right)^{1-\sigma}$$

Similarly for all other price expressions we replace the foreign variety variables such as cutoff changes by their mean using r_{Vb} as the weight.

G.3 Entry cutoffs

We derive the export and domestic cutoffs in the intermediate state presented in eqs. (18) and (21). We also derive their counterparts after a transition to either high ($m = 2$) or low protection ($m = 0$), which are used in the solution algorithm to obtain expressions for the transition prices in eqs. (59) and (60).

We focus on the comparisons of the steady state under intermediate protection with uncertainty ($m = 1$) versus without. Similarly to the partial effect derivation there is a positive probability of policy change at $m = 1$. The key difference is that now the exporter is large so after any change the domestic price index is affected and the exogenous death of firms generates transition dynamics. Thus the relevant states are no longer only $m = 0, 1, 2$. They are now $s = 1; m, T$ for $m = 0, 2$ and all $T \geq 0$ where T is the number of periods since the change from $m = 1$.

Transition cutoffs: $\hat{c}_{m,T}$

If $m = 0, 2$ are absorbing states then the sequence of business conditions, a_s, is deterministic for any $s = m, T$ and its path is determined by $P_{m,T}$ in (56). Moreover, along the transition path the conditions are improving due to gradual exit (from exporters if $m = 2$ or domestic if $m = 0$) so $a_{m,T+1} > a_{m,T}$. Since conditions are improving but firms still face a risk of death they still have an option value of waiting. Therefore the marginal firm is the one indifferent between entering today and tomorrow so the future profit terms cancel and we obtain

$$\pi\left(a_s, c_s^U\right) / (1-\beta) = K \Leftrightarrow c_s^U = \left[a_s / (1-\beta) K\right]^{\frac{1}{\sigma-1}} \quad \text{if } s = 0, T; 2, T;$$

which has a similar functional form as the deterministic cutoff evaluated at current conditions.[54]

[54] We prove this formally in the working paper for $m = 2$ with exogenous domestic entry. When domestic entry is endogenous then the initial price jump in the price index after a tariff increase is smaller but there is still gradual exit of exporters.

A similar expression applies to the cutoff for domestic firms: $c_s^U = [a_{s,h}/(1-\beta_h) K_h]^{\frac{1}{\sigma-1}}$. So we can rewrite either relative to some respective baseline and obtain $\hat{c}_s = \hat{a}_s^{\frac{1}{\sigma-1}}, \hat{c}_{s,h} = \hat{a}_{s,h}^{\frac{1}{\sigma-1}}$.

Intermediate state cutoff: exporter, $\hat{c}_1$

To obtain the formula for $\hat{c}_1 \equiv c_1^U / c_b^D$ in (18) we derive

$$c_1^U = \left[\frac{1+u(\gamma)\omega g}{1+u(\gamma)}\right]^{\frac{1}{\sigma-1}} \left[\frac{a_1}{(1-\beta) K}\right]^{\frac{1}{\sigma-1}} \tag{61}$$

and combine it with the definitions for a_1, c_b^D in eq.(3), g in eq.(20) and U in eq. (19). The derivation is identical to part (a) of proposition 1 except now we change (37) to reflect the transition dynamics in P after the tariff increases, so we have

$$\mathbb{E}_{s=2,T} V_s' = \lambda_{22} \left[\beta \mathbb{E}_{s=2,T+1} V_s' - \pi(a_{s=2,T+1}, c) + K(1-\beta)\right] \quad \text{if } c \leq c_s^U \tag{62}$$

Solving forward we obtain $\mathbb{E}_{s=2,0} V_s' = -\lambda_{22} \sum_{t=0}^{\infty} (\beta\lambda_{22})^t \pi(a_{s=2,T+1}, c) + \frac{\lambda_{22}}{1-\beta\lambda_{22}} K(1-\beta)$. Replacing this in (36), using the absorbing state, $\lambda_{22} = 1$, and simplifying we obtain

$$\mathbb{E}_{s=1} V_s' = \frac{\lambda_{12}}{1-\beta} \left[K(1-\beta) - (1-\beta) \sum_{t=0}^{\infty} (\beta)^t \pi(a_{s=2,T}, c)\right] \tag{63}$$

The cutoff expression for the marginal firm in $s = 1$ solves $V_1\left(c_1^U\right) = 0$, which we obtain as in proposition 1 but using (63):

$$\beta \mathbb{E}_{s=1} V_s'\left(c_1^U\right) - \pi\left(a_1, c_1^U\right) + K(1-\beta) = 0$$

Using the definition of π, u and rearranging we have

$$a_1 \left(c_1^U\right)^{1-\sigma} \left[1 + u(\gamma)(1-\beta) \sum_{t=0}^{\infty} \beta^t \left(\frac{a_{s=2,T}}{a_1}\right)\right] = K(1-\beta)(1+u(\gamma))$$

where the key difference relative to (40) is the term in [ ], which reflects average profits during the transition (instead of the fixed profits $\pi(a_2, c)$). Re-arranging and using the definitions of ω and g we obtain eq. (61).

Intermediate state cutoff: domestic, $\hat{c}_{1,h}$

The general entry problem for domestic firms is similar to the one for exporters (see section 2). The cutoff expression will differ in two ways. First, the domestic firms fear the low protection state rather than the high. Second, the deterioration in conditions for the domestic firms reflects only the general equilibrium effects due to entry of foreign firms and consequent reductions in the price index (it does not reflect a direct tariff effect).

To derive the cutoff we first write the option value of waiting for each potential domestic entrant (the domestic entry version of equation (35)):

$$V_s^h = \max\left\{0, \beta_h \mathbb{E}_s V_s^{h\prime} - \pi\left(a_{s,h}, c\right) + K_h\left(1-\beta_h\right)\right\}$$

where $V_s^h \equiv \Pi(a_{s,h}, c, \gamma) - \Pi_e(a_{s,h}, c, \gamma) + K_h$ and $\mathbb{E}_s V_s^{h\prime} \equiv \mathbb{E}_s\left[\Pi(a'_{s,h}, c, \gamma) - \Pi_e\left(a'_{s,h}, c, \gamma\right) + K_h\right]$.

To obtain the formula for $\hat{c}_{1,h} \equiv c^U_{1,h}/c^D_{b,h}$ in eq. (21) we must derive

$$c^U_{1,h} = \left[\frac{1+u_h\left(\gamma\right)g_h}{1+u_h\left(\gamma\right)}\right]^{\frac{1}{\sigma-1}}\left[\frac{a_{1,h}}{\left(1-\beta_h\right)K_h}\right]^{\frac{1}{\sigma-1}} \tag{64}$$

and then combine it with the definitions for $a_{1,h}$, $c^D_{b,h}$, g_h in eq.(23) and U_h in (22).

We derive (64) similarly to (61) except the worst case for domestic is the low protection state so instead of (62) we use

(65)
$$\mathbb{E}_{s=0,T}V_s^{h\prime} = \lambda_{00}\left[\beta_h \mathbb{E}_{s=0,T+1}V_s^{h\prime} - \pi\left(a_{s=0,T+1,h}, c\right) + K_h\left(1-\beta_h\right)\right] \quad \text{if } c \le c^U_{s,h}$$

Solving forward we obtain $\mathbb{E}_{s=0,0}V_s^{h\prime} = -\lambda_{00}\sum_{t=0}^{\infty}\left(\beta_h\lambda_{00}\right)^t \pi\left(a_{s=0,t+1}, h, c\right) + \frac{\lambda_{00}}{1-\beta_h\lambda_{00}}K_h\left(1-\beta_h\right)$. Replacing in $\mathbb{E}_1 V_s^{h\prime}$ using $\lambda_{00}=1$ and simplifying we obtain

$$\mathbb{E}_1 V_s^{h\prime} = \lambda_{10}\left[\beta_h \mathbb{E}_{0,0}V_s^{h\prime} - \pi\left(a_{0,0h}, c\right) + K_h\left(1-\beta_h\right)\right]$$

$$\mathbb{E}_1 V_s^{h\prime} = \frac{\lambda_{10}}{1-\beta_h}\left[K_h\left(1-\beta_h\right) - \left(1-\beta_h\right)\left(\textstyle\sum_{t=0}^{\infty}\beta_h^t \pi\left(a_{0,t,h}, c\right)\right)\right] \tag{66}$$

The marginal domestic firm in $s=1$ satisfies $V_1^h\left(c^U_{1,h}\right) = 0$, which we use to solve for $c^U_{1,h}$ similarly to the export cutoff but using (66) instead of (63)

$$\beta_h \mathbb{E}_1 V_1'\left(c^U_{1,h}\right) - \pi\left(a_{1,h}, c^U_{1,h}\right) + K_h\left(1-\beta_h\right) = 0$$

$$a_{1,h}\left(c^U_{1,h}\right)^{1-\sigma}\left[1 + u_h\left(\gamma\right)\left(1-\beta_h\right)\textstyle\sum_{t=0}^{\infty}\beta_h^t\left(\dfrac{a_{0,t,h}}{a_{1,h}}\right)\right] = K_h\left(1-\beta_h\right)\left(1+u_h\left(\gamma\right)\right)$$

where $u_h \equiv \frac{\beta_h\lambda_{10}}{1-\beta_h\lambda_{00}}$ and we obtain (64) by using $\frac{a_{0,t,h}}{a_{1,h}} = \left(\frac{P_{0,t}}{P_1}\right)^{\sigma-1}$, g_h from eq.(23) and solving for $c^U_{1,h}$.

H General Equilibrium Model Solution

H.1 Algorithm

For completeness we first restate the basic elements and notation from Section IV and then provide additional details on the solution algorithm and its implementation.

Basic elements and notation

- Inputs: the model and its solution require
  - A set of exogenous parameters: $\Theta \equiv \{k, \sigma, \Lambda(\tau_m, \gamma), \beta, \beta_h\}$
  - Baseline equilibrium import shares: $\mathbf{I} \equiv \{I_V(\tau_b, \gamma = 0)\}$, where $I(\tau_b, \gamma = 0)= \Sigma_V I_V(\tau_b, \gamma = 0)$.
- Equilibrium: using the entry conditions in eqs. (18) and (21) and the definitions for U, U_h we obtain a nonlinear system of equations for
  - the relative stationary price index in the intermediate state: $\hat{P}_1(g, g_h, \Theta, \mathbf{I})$ in eq. (24).
  - the sequence of relative price indices after a switch to low or high protection, respectively $\hat{P}_{0,T}\left(g_h, \hat{P}_1, \Theta, \mathbf{I}\right)$, (59) and $\hat{P}_{2,T}\left(g, \hat{P}_1, \Theta, \mathbf{I}\right)$, eq(60) in appendix G.2.
  - the average profit change due to prices after a switch to high or low protection, respectively $g\left(\hat{P}_{2,T}/\hat{P}_1, \Theta\right)$ in (20) and $g_h\left(\hat{P}_{0,T}/\hat{P}_1, \Theta\right)$ in (23).
    where $\hat{P}_{\cdot}$ denotes a price index relative to the baseline.
- Solution: $\Upsilon(\Theta, \mathbf{I}) \equiv \left\{\hat{P}_1; g; g_h; \left(\hat{P}_{2,T}; \hat{P}_{0,T}\right)_{T=0}^{\infty}\right\}$ found by
  - Fixing a set Θ consistent with our estimation and data $\mathbf{I}$.
  - Iterating n times until we obtain a fixed point such that $\Upsilon^{(n)}(\Theta, \mathbf{I}) = \Upsilon^{(n-1)}(\Theta, \mathbf{I})$.

Solution algorithm

1. Make an initial guess for $g^{(0)}$ and $g_h^{(0)}$.

2. Let $\Upsilon^{(n)}(\Theta, \mathbf{I})$ denote the values in the n-th iteration. Given two values, $g^{(n-1)}$ and $g_h^{(n-1)}$, Θ and $\mathbf{I}$ we compute the price transition paths for 250 periods $\left\{\hat{P}_{2,T}^{(n)}, \hat{P}_{0,T}^{(n)}\right\}_{T=1}^{250}$.

3. Given $\left\{\hat{P}_{2,T}^{(n)}, \hat{P}_{0,T}^{(n)}\right\}_{T=1}^{250}$ we compute updated values for $g^{(n)}$ and $g_h^{(n)}$ using

$$\begin{aligned}
g^{(n)} &= (1-\beta)\textstyle\sum_{T=0}^{\infty}(\beta)^T\left(\dfrac{P_{2T}}{P_1}\right)^{\sigma-1} \\
&\approx (1-\beta)\textstyle\sum_{T=0}^{250}(\beta)^T\left(\dfrac{P_{2T}}{P_1}\right)^{\sigma-1} + (\beta)^{251}\left(\dfrac{P_{2,250}}{P_1}\right)^{\sigma-1} \\
g_h^{(n)} &= (1-\beta_h)\textstyle\sum_{T=0}^{\infty}(\beta_h)^T\left(\dfrac{P_{0T}}{P_1}\right)^{\sigma-1} \\
&\approx (1-\beta_h)\textstyle\sum_{T=0}^{250}(\beta_h)^T\left(\dfrac{P_{0T}}{P_1}\right)^{\sigma-1} + (\beta_h)^{251}\left(\dfrac{P_{0,250}}{P_1}\right)^{\sigma-1}
\end{aligned}$$

4. Check for numerical fixed point.
   - If the norm $\left\|g^{(n)} - g^{(n-1)}, g_h^{(n)} - g_h^{(n-1)}\right\| < 0.000001$, then stop.
   - Otherwise, return to step 2 using $g^{(n)}$ and $g_h^{(n)}$ as the updated starting values.

5. Check for convergence of the solution by computing the norm of difference at the steady state price index changes $\hat{P}_1^{(n)}$ and $\hat{P}_2^{(n)}$ at $g^{(n)}$ and $g_h^{(n)}$ and the terminal value of the transition price indices
   (a) To obtain the steady state solution for $\hat{P}_1^{(n)}$, we use $g^{(n)}$ and $g_h^{(n)}$ to compute U_{1V} and U_1^h and replace them in eq (24) We then directly compute $\hat{P}_2^{(n)} = \left(I_1\hat{\tau}_2^{1-k\sigma/(\sigma-1)} + (1-I_1)\right)^{-1/k}$.
   (b) If $\left\|\hat{P}_1^{(n)} - \hat{P}_{1,250}^{(n)}, \hat{P}_2^{(n)} - \hat{P}_{2,250}^{(n)}\right\| < 0.0001$ then stop
   (c) Otherwise: increase precision in step 4 or the number of time periods in step 3. In practice, $T = 250$ and precision in step 4 of 10^{-6} are sufficient for convergence.

Initial values and convergence

We use $g^{(0)} = \left(P_2^D/P_1^D\right)^{\sigma-1}$and $g_h^{(0)} = \left(P_0^D/P_1^D\right)^{\sigma-1}$ as the initial guess, which we compute using the deterministic equation in (17).These are upper bounds because $P_1^D < P_1^U$ and because $P_{2,T}$ and $P_{0,T}$ converge respectively to P_2^D and P_0^D from below. Using our baseline parameters and data, the algorithm typically converges to a solution in 6-20 steps for a given set of parameters. Alternative guesses, e.g. $g^{(0)} = g_h^{(0)} = 2$, take longer but converge to the same solution.

Precision and discretization

Increasing the precision beyond 10^{-6} increases computing time substantially but does not change our reported quantification results.

For our figures and quantifications over alternative values of γ or τ_1 we use 25 gridpoints. Each figure takes 2-4 minutes to produce in Matlab for Windows using a 4 core Intel processor.

H.2 Equilibrium Price Transition Paths

We use the multi-industry version of equations (59), (60), and the definitions of U_1, U_1^h, g, and g^h to derive the price transition equations for T=0,...:

(67)

$$\left(\frac{\hat{P}_{0T}}{\hat{P}_1}\right)^{-k} = \frac{I_1 \sum_V r_{V1} \left(\hat{\tau}_{0V}\right)^{1-\frac{\sigma k}{\sigma-1}} + (1-I_1)\left(\left(1-b^{T+1}\right) + b^{T+1}\left(\frac{\hat{P}_{0T}}{\hat{P}_1}\right)^{-k+(\sigma-1)} \left(U_1^h\right)^{k-(\sigma-1)}\right)}{I_1 \sum_V r_{V1} \left(U_{1V}\right)^{k-(\sigma-1)} + (1-I_1)\left(U_1^h\right)^{k-(\sigma-1)}}$$

(68)

$$\left(\frac{\hat{P}_{2T}}{\hat{P}_1}\right)^{-k} = \frac{I_1 Z + (1-I_1)}{I_1 \sum_V r_{V1} \left(U_{1V}\right)^{k-(\sigma-1)} + (1-I_1)\left(U_1^h\right)^{k-(\sigma-1)}}$$

(69)

$$Z \equiv \left(1-\beta^{T+1}\right) \sum_V r_{V1} \hat{\tau}_{2V}^{1-\frac{\sigma k}{\sigma-1}} + \beta^{T+1} \left(\frac{\hat{P}_{2T}}{\hat{P}_1}\right)^{-k+(\sigma-1)} \sum_V r_{V1} \left(\hat{\tau}_{2V}\right)^{1-\sigma} \left(U_{1V}\right)^{k-(\sigma-1)}$$

(70)

$$U_{1V} = \left(\frac{1+u\left(\hat{\tau}_{2V}\right)^{-\sigma} g}{1+u}\right)^{\frac{1}{\sigma-1}}, \quad U_1^h = \left(\frac{1+u_h g^h}{1+u_h}\right)^{\frac{1}{\sigma-1}} \quad \text{s.t. } u_h \leq \bar{\alpha} u \text{ ; } g \leq \bar{g} \text{ ; } g^h \leq \bar{g}^h$$

We compute these using $u = \tilde{b}_\gamma / g, k = \tilde{b}_k, \sigma = 3, I_1 = .045$ and alternative $\bar{\alpha} \in \{0, 2, 4, 6\}$ as reported in Table A11. With our estimated parameters and data alone we can compute the following weighted terms required for the multi-industry solution

$$\sum_V r_{V1} \left(\hat{\tau}_{0V}\right)^{1-\frac{\sigma k}{\sigma-1}} \tag{71}$$

$$\sum_V r_{V1} \hat{\tau}_{2V}^{1-\frac{\sigma k}{\sigma-1}} \tag{72}$$

$$\tilde{U}_1 \equiv \sum_V r_{V1} \left(1 + \left(\hat{\tau}_{2V}\right)^{-\sigma} \tilde{b}_\gamma\right)^{\frac{k}{\sigma-1}-1}. \tag{73}$$

We can then replace $\sum_V r_{V1} \left(U_{1V}\right)^{k-(\sigma-1)} = \tilde{U}_1 \left(1+u\right)^{1-\frac{k}{\sigma-1}}$. Similarly we compute

$$\hat{U}_1 \equiv \sum_V r_{V1} \left(\hat{\tau}_{2V}\right)^{1-\sigma} \left(1 + \left(\hat{\tau}_{2V}\right)^{-\sigma} \tilde{b}_\gamma\right)^{\frac{k}{\sigma-1}-1} \tag{74}$$

and replace the term $\sum_V r_{V1} \left(\hat{\tau}_{2V}\right)^{1-\sigma} \left(U_{1V}\right)^{k-(\sigma-1)} = \hat{U}_1 \left(1+u\right)^{1-\frac{k}{\sigma-1}}$.

H.3 Computing AVEs

As we describe in the main text, we compute AVE tariff changes that would replicate the change in outcome variables due to uncertain in our quantification. The AVE is defined as the deterministic log change in the uniform tariff factor, $\ln \Delta_y$, that generates the same change in an outcome y as TPU. Formally, Δ_y is the implicit solution to $y\left(\tau_1 \Delta_y, \gamma = 0\right) = y\left(\tau_1, \gamma > 0\right)$. The formulas for these AVEs are in the table below in terms of $\widehat{\tau}$. We report $\ln \widehat{\tau}$ as the factor $\ln \Delta_y$ in Table 8. Note that due to the structure of the model of the implicit function for change in tariffs $\widehat{\tau}$ is the same for various outcomes, but the LHS values differ depending on the outcome variable (predicted sign in brackets).

Outcome Variable from Quantification	Implicit Formula for $\widehat{\tau}$
Chinese (real) Export Value [−]	$= \widehat{\tau}^{-k\sigma/(\sigma-1)}\widehat{P}(\widehat{\tau})^k$
Chinese Export Entry & Invest. [−]	$= \widehat{\tau}^{-k\sigma/(\sigma-1)}\widehat{P}(\widehat{\tau})^k$
Chinese Export Price Index [+]	$= \widehat{\tau}\left[(\widehat{\tau})^{-\frac{\sigma}{\sigma-1}}\hat{P}(\widehat{\tau})\right]^{1-\frac{k}{\sigma-1}}$
U.S. Price index [+]	$= [\widehat{P}(\widehat{\tau})]^{-1/k}$
U.S. Consumer Welfare [−]	$= [\widehat{P}(\widehat{\tau})]^{-1/k}$
U.S. (real) domestic sales (manuf.) [+]	$= [\widehat{P}(\widehat{\tau})]^{k}$
U.S. firm Entry & Invest. (manuf) [+]	$= [\widehat{P}(\widehat{\tau})]^{k}$
U.S. domestic employment (manuf.) [+]	$= [\widehat{P}(\widehat{\tau})]^{k-1}$

In practice we solve for each AVE tariff change as system of equations that satisfies the implicit functions above and a price index change $\widehat{P}(\widehat{\tau})$. Each tariff change implies a different price index, which endogenously determines exports, entry, and import price index changes. For the baseline endogenous entry model the price index change is given by

$$\widehat{P}(\widehat{\tau}) = \left[I_1\widehat{\tau}^{(1-k\sigma/(\sigma-1))} + (1-I_1)\right]^{-1/k}.$$

H.4 Exogenous Entry Model Solution

The exogenous entry model reference in section G.3 uses the same solution method, but requires fewer equations since there are not transition dynamics when applied tariffs decrease. We solve the model for g and the transition path for $\hat{P}_{2,T}$ only. Since $g^h = 1$ and therefore $U_1^h = 1$

For the AVE results, the exogenous entry model solves the same implicit formulas in the table above. The only difference is that the implicit price index change is given by

$$\widehat{P}(\widehat{\tau})^{(1-\sigma)} = I_1\widehat{P}(\widehat{\tau})^{(k-\sigma+1)}\widehat{\tau}^{(1-k\sigma/(\sigma-1))} + (1-I_1).$$

H.5 Baseline Parameter Values for Quantification and Sensitivity

The baseline parameters are listed in Table A11. The endogenous domestic entry model requires a value for the expected duration of an agreement, u_h, to compute general equilibrium effects. As discussed in the main text, we cannot empirically identify this parameter because the relevant domestic uncertainty factor, U_h, does not vary across industries. Our baseline parameterization assumes $\alpha \equiv u_h/u = 4$.

Our estimate of $\gamma\lambda_2 = 0.13$ implies that $\lambda_2 \in [0.13, 1]$ The range consistent with the estimates is $\alpha \in [0, 12]$. For the central case, $\alpha = 4$ we obtain $\lambda_2 = 0.28$. In Table

A10, we report aggregate outcomes for exports, the share of risk in export growth, and values of λ_2 for the set $\alpha \in \{0, 2, 4, 6\}$. The export growth from reducing uncertainty is not sensitive to the choice of α, ranging from 32 to 33 log points. The share of risk is increasing in α because higher values imply lower probabilities of a bad tariff shock, λ_2. This reduces the expected mean tariff toward the current applied tariff, attributing more of the export growth to a risk reduction.

I Expenditure share, import penetration and risk counterfactuals

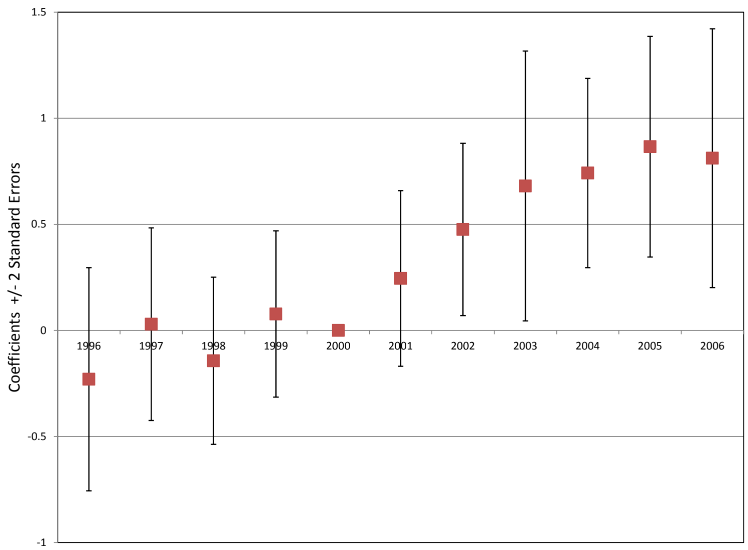
Import penetration in manufacturing is Chinese imports over U.S. expenditure on manufacturing, $R_{Ch,t}/E_t$. We define total manufacturing expenditure, $E = \mu L$ in the model, as total manufacturing shipments less net manufacturing exports, E_t =Manuf. Shipments$_t$ $-$ $Exports_t + Imports_t$. We compute $\mu = 0.86$ as the share of manufacturing in total expenditure on tradables (=Gross Output - Total Net Exports) in 2005.

For each year from 1990 to 2010 we obtain manufacturing shipments from the U.S. Census Bureau and manufacturing exports and imports from the USITC. We include tariffs and transport costs in total imports, as our model requires. To compute the counterfactual imports if uncertainty were reintroduced in year t, we follow the exact same steps as for the baseline year (2005). Thus we employ the observed import penetration for each year $t = 2002 \ldots 2010$, adjust it to account for the change in tariffs relative to 2000, and compute the change in imports due to TPU. We use this to compute the counterfactual imports from China normalized by expenditure, $R^{CF}_{Ch,t}/E_t$, which we plot in Figure 1.

To find the share of average import growth from a pure risk reduction, we compute import growth from reducing uncertainty as if the tariffs were at the long run mean for each industry. We adjust import penetration to the level implied by the resulting weighted mean tariff of $\overline{\tau} = 1.14$. The procedure uses the 2005 import penetration to compute the price elasticity to a tariff change. With the model quantities all adjusted to their levels at the mean of the tariff distribution, we can then compute the GE effect on exports, entry, and other quantities around the mean. We follow the same procedure to compute the GE solution over a grid of counterfactual initial applied tariff regimes in the last column of Figure 6.

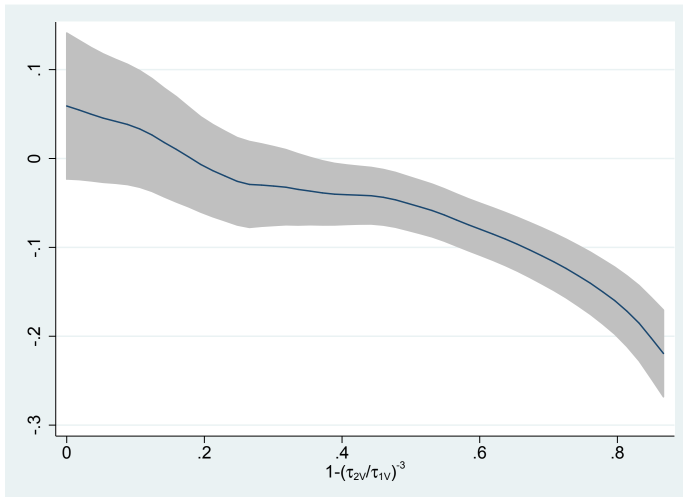
Online Appendix: Figures and Tables

Figure A1: Panel Coefficients on Uncertainty Measure by Year



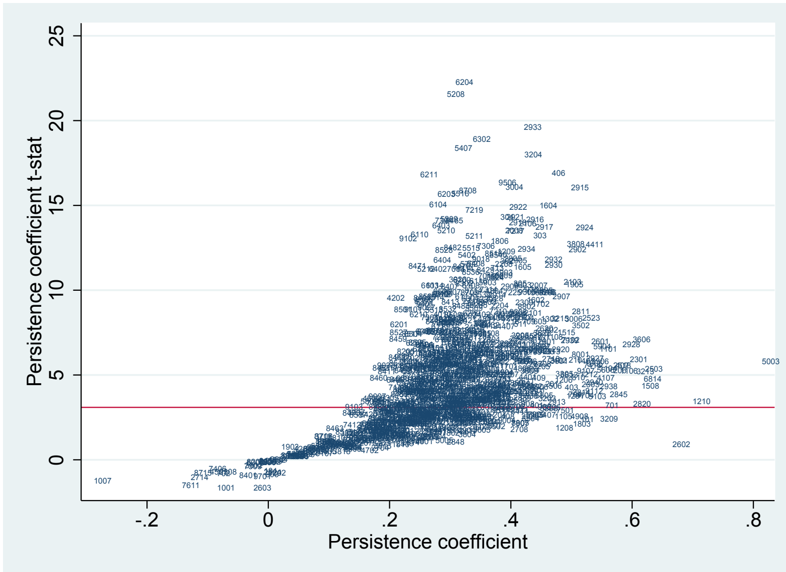
Notes: Results from an OLS unblanced panel regression on log trade flows. Uncertainty measure in 2000 interacted by year. Coefficients are changes relative to the omitted year 2000. Controls for applied tariffs, transport costs and dummy variables for section×year and HS-6 industry. Standard errors are clustered by HS-6. Two standard error bars plotted for each coefficient.

Figure A2: Chinese price index ($\Delta \ln$) of continuing varieties vs initial policy uncertainty



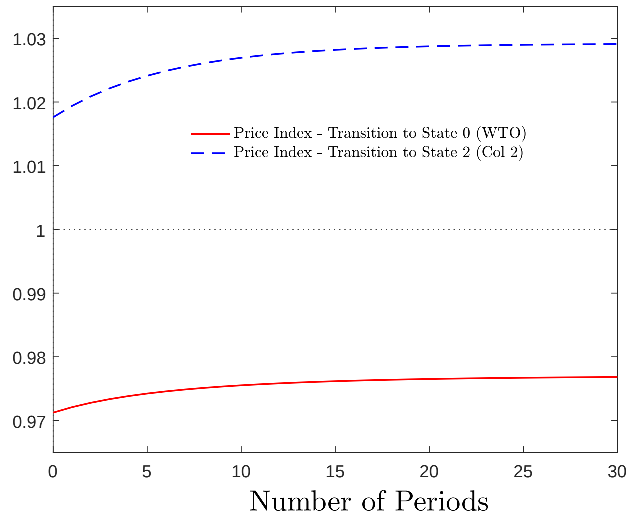
Notes: Local polynomial fit on $1 - (\tau_{2V}/\tau_{1V})^{-3}$ where τ_{2V} and τ_{1V} are the column 2 and MFN tariff factors in 2000.

Figure A3: Sunk Cost Estimates — t-statistics vs. estimated coefficients



Notes: Estimated coefficients and t-statistics from product level persistence regressions at the HS-4 industry level described in Appendix D. Points are represented by the 4 digit industry code. Red line represents a t-statistic of 3.09. Two thirds of the associated t-stats are above this level.

Figure A4: Price index transition dynamics from intermediate to high or low protection state



Notes: General equilibrium solution of the model for estimated and assumed parameters in Table A11 and $\gamma = 0.248$

Table A1: Uncertainty and Export Growth (Δln) by Sector — Summary Statistics

Sector	Import Share (2005)	Mean		Median		St. Dev.		C.V.		Min		Max		Obs.
		Uncertainty	Exports	Uncertainty	Exports	Uncertainty	Exports	Uncertainty	Exports		Exports	Uncertainty	Exports	
1 Animals	0.26	0.15	0.43	0.00	0.68	0.18	1.42	1.27	3.29	0.00	-3.15	0.49	3.01	48
2 Vegetables	0.18	0.23	0.81	0.20	0.72	0.22	1.34	0.98	1.66	0.00	-2.28	0.60	5.20	81
3 Fats & Oils	0.00	0.25	0.55	0.29	0.58	0.18	1.21	0.71	2.21	0.00	-1.30	0.48	2.54	9
4 Prepared Foodstuffs	0.44	0.37	1.39	0.37	1.11	0.15	1.63	0.41	1.17	0.00	-2.21	0.65	7.22	68
5 Minerals	0.30	0.20	0.91	0.00	0.76	0.26	1.93	1.34	2.12	0.00	-3.96	0.73	4.66	50
6 Chemicals	1.73	0.41	1.17	0.43	1.03	0.19	1.63	0.46	1.39	0.00	-4.35	0.88	6.67	417
7 Plastics, Rubber & Articles	3.78	0.52	1.73	0.52	1.51	0.18	1.77	0.36	1.02	0.00	-3.50	0.81	7.38	148
8 Hides, Leather, & Articles	2.48	0.46	0.88	0.49	0.66	0.22	1.35	0.47	1.53	0.00	-1.05	0.77	5.73	43
9 Wood, Straw & Articles	0.89	0.46	1.95	0.54	1.39	0.20	1.66	0.45	0.85	0.00	-0.72	0.81	6.52	42
10 Pulp, Paper & Articles	1.17	0.44	1.26	0.52	1.09	0.20	1.63	0.45	1.30	0.00	-3.09	0.64	6.60	78
11 Textiles & Articles	9.73	0.64	1.50	0.70	1.24	0.17	1.87	0.27	1.25	0.00	-3.33	0.86	8.91	610
12 Footwear, Headgear, other	6.58	0.54	0.60	0.54	0.46	0.15	0.76	0.27	1.27	0.23	-1.52	0.82	2.50	53
13 Stone, Plaster, Cement, other	1.64	0.60	1.37	0.64	1.24	0.14	1.61	0.23	1.18	0.00	-3.66	0.83	7.97	123
14 Precious stones, Metals, Jewellery,...	0.94	0.48	0.94	0.50	0.86	0.31	1.45	0.64	1.54	0.00	-2.41	0.86	4.66	28
15 Base Metals & Articles	5.72	0.51	1.38	0.56	1.26	0.18	1.83	0.35	1.33	0.00	-7.59	0.84	9.97	373
16 Machinery; Elec. Equip.; Electronics	42.71	0.56	1.33	0.59	1.16	0.11	1.55	0.20	1.17	0.00	-4.36	0.83	6.86	644
17 Vehicles, Aircraft, Vessels	2.11	0.42	1.54	0.45	1.60	0.18	1.86	0.42	1.20	0.00	-4.26	0.70	7.10	81
18 Optical, Medical & other instruments	2.10	0.61	0.94	0.62	0.85	0.10	1.60	0.16	1.70	0.00	-5.20	0.86	7.80	182
19 Arms and Ammunition	0.03	0.59	1.62	0.67	1.54	0.24	1.59	0.41	0.98	0.00	-1.15	0.76	4.43	8
20 Miscellaneous Manufactures	17.09	0.65	0.86	0.65	0.73	0.11	0.97	0.17	1.13	0.25	-1.75	0.87	4.99	118
21 Art and Antiques	0.12	0.00	0.77	0.00	0.73	0.00	0.51	n/a	0.66	0.00	-0.02	0.00	1.47	7
Overall	**100.00**	**0.52**	**1.28**	**0.57**	**1.10**	**0.20**	**1.68**	**0.39**	**1.31**	**0.00**	**-7.59**	**0.88**	**9.97**	**3211**

Notes: Uncertainty measure is pre-WTO level in 2000. Exports are in log changes. Sectors correspond to the UN defined "Sections", which are coherent groups of HS-2 industries, as described in http://unstats.un.org/unsd/tradekb/Knowledgebase/HS-Classification-by-Section

Table A2: Chinese Export Growth (2000-2005, U.S., Δln) — Robustness to NTBs

	1	2	3	4	5
Specification:	Baseline	+MFA/TTB	+MFA/TTB +Sector FE	+MFA/TTB +Sector FE IV (NTB)	+MFA/TTB +Sector FE Constrained
Uncertainty Pre-WTO	0.743	0.679	0.72	0.726	0.744
[+]	[0.154]	[0.152]	[0.185]	[0.185]	[0.184]
Change in Tariff (Δln)	-9.967	-8.979	-8.272	-8.397	-4.3
[-]	[4.478]	[4.559]	[5.058]	[5.048]	[0.672]
Change in Transport cost (Δln)	-2.806	-2.797	-2.818	-2.825	-2.867
[-]	[0.455]	[0.452]	[0.452]	[0.450]	[0.448]
Change in MFA quota status		-0.188	-0.313	-0.313	-0.304
		[0.101]	[0.136]	[0.136]	[0.135]
Change in NTB status		-0.944	-0.974	-1.309	-0.968
		[0.317]	[0.330]	[0.904]	[0.330]
Constant	0.851	0.871			
	[0.0853]	[0.0845]			
Observations	3,211	3,211	3,211	3,211	3,211
R-squared	0.03	0.04	0.06	0.06	.
Sector fixed effects	no	no	yes	yes	yes
F-stat, 1st Stage	.	.	.	10.21	.
Over-ID restriction (p-value)	.	.	.	0.592	.
Restriction p-value (F-test)	0.204	0.3	0.428	0.414	1

Notes:
Robust standard errors in brackets. Predicted sign of coefficient in brackets under variable. Specifications 1-3 employ OLS and 5 imposes theoretical constraint on tariffs and transport cost coefficients: $b_\tau = b_d(\sigma/(\sigma-1))$. Specification 4 employs IV. Excluded instruments for Change in NTB are NTB indicators for 1998 and 1997. Uncertainty measure uses U.S. MFN and Column 2 Tariffs to construct profit loss measure at $\sigma=3$

Table A3: Export Growth from China (2000-2005) Robustness

Panel A: Elasticity of substitution

(Δln) by Sector — Summary Statistics			Magnitude of common σ				Industry variation in σ	
Estimation	OLS , σ=3		OLS , σ=2		OLS ,σ=4		OLS , σ_V	
Sample change vs. baseline	none		none		none		drop V if unavailable σ_V	
			1	2	3	4	5	6
Uncertainty Pre-WTO	0.743	0.716	0.869	0.838	0.692	0.666	0.648	0.595
[+]	[0.154]	[0.186]	[0.189]	[0.226]	[0.138]	[0.168]	[0.138]	[0.149]
(…)								
Observations	3211	3211	3211	3211	3211	3211	2,733	2,733
R-squared	0.03	0.05	0.03	0.05	0.03	0.05	0.03	0.06
Sector fixed effects	no	yes	no	yes	no	yes	no	yes
Restriction p-value (F-test)	0.20	0.54	0.34	0.72	0.17	0.48	0.15	0.26

Panels B: Outliers, Selection, Specific tariffs, Processing Trade

Potential Issue			Outliers		Selection (ln growth)		Specific Tariffs		Processing Trade	
Estimation	OLS		Robust regression		OLS (midpoint growth)		OLS (AVE tariffs)		OLS	
Sample change vs. baseline	none		none		+ Rt>0, t=0 or 1		+ AVE		-(HS84x, HS85x)	
			1	2	3	4	5	6	7	8
Uncertainty Pre-WTO	0.743	0.716	0.521	0.51	0.43	0.434	0.956	0.877	0.787	0.808
[+]	[0.154]	[0.186]	[0.124]	[0.149]	[0.0900]	[0.108]	[0.131]	[0.154]	[0.162]	[0.198]
(…)										
Observations	3211	3211	3211	3211	3848	3841	3565	3565	2567	2567
R-squared	0.03	0.05	0.04	0.07	0.02	0.04	0.04	0.06	0.03	0.06
Sector fixed effects	no	yes	no	yes	no	yes	no	yes	no	yes
Restriction p-value (F-test)	0.20	0.54	0.00	0.02	0.03	0.20	0.04	0.03	0.17	0.52

Notes: Robust standard errors in brackets. Predicted sign of coefficient in brackets under variable.

(…) Constant or sector fixed effects included as noted. Tariff and transport cost changes included but not reported for space considerations. The typical coefficient is b_d=-2.5 for transport cost and $b_\tau=b_d(\sigma/(\sigma-1))$ can't be rejected at p-values listed in last row. Uncertainty similar to Table 2 with σ=3 except in Panel A columns 5 and 6 (uses listed values, σ_V = median estimate within HS6) and Panel B columns 5 and 6.

Panel B, columns 1 and 2: Robust regression downweights outliers more than 7 times the median absolute deviation from the median residual.

Panel B: columns 3 and 4: Midpoint growth of export level R is given by 2*(R(t)-R(t-1))/(R(t)+R(t-1)) for t=2005 and t-1=2000.

Panel B columns 5 and 6 : use both ad valorem tariff and the ad valorem equivalent of specific tariffs (AVE=specific tariff / unit value).

Panel B: columns 7 and 8 drop HS Section XVI: machinery and electrical applicances; electrical equipment; parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and poarts and accessories of such articles.

Table A4: Export Growth Robustness to Industry Variation in Capital Intensity

Specification:	Baseline Subsample	+ Capital Intensity Controls		+ Uncertainty Interaction	
	1	2	3	4	5
Uncertainty pre-WTO (US)	0.564	0.706	0.659	0.655	0.624
[+]	[0.173]	[0.191]	[0.205]	[0.188]	[0.201]
Change in importer MFN tariff	-4.998	-4.945	-4.865	-4.944	-4.854
[-]	[0.697]	[0.695]	[0.696]	[0.696]	[0.697]
Change in bilateral transport cost	-3.332	-3.297	-3.243	-3.296	-3.236
[-]	[0.465]	[0.463]	[0.464]	[0.464]	[0.465]
Capital Intensity (K/L) in 2000 (ln)		0.0744	0.0772	-0.0759	-0.0276
[+/-]		[0.0383]	[0.0534]	[0.0975]	[0.115]
Unc*Cap. Intensity (demeaned)				0.287	0.193
[+/-]				[0.171]	[0.186]
Observations	3,055	3,055	3,055	3,055	3,055
R-squared	-	-	-	-	-
Sector Fixed Effects	no	no	yes	no	yes
Restriction p-value (F-test)	0.31	0.38	0.83	0.35	0.83

Notes:
Robust standard errors in brackets. Predicted sign of coefficient in brackets under variable. All specifications employ OLS and impose theoretical constraint on tariffs and transport cost coefficients: $b\tau=bd(\sigma/(\sigma-1))$. Column 1 is the baseline specification the subsample where K/L ratio is observed in the NBER-CES productivity database. Uncertainty measure uses U.S. MFN and Column 2 Tariffs to construct profit loss measure at $\sigma=3$.

Table A5: Chinese Export Growth (2000-2005, Δln) — Robustness to unobserved HS-6 export supply shocks

Dependent variable	**Chinese export** growth to:			
	U.S.	**EU-15**	**Japan**	**Pooled**
	1	2	3	4
Uncertainty pre-WTO (U.S.)	0.554	0.0174	0.208	-
	[0.193]	[0.186]	[0.176]	
Uncertainty pre-WTO (U.S.) x 1(U.S.)				0.428
				[0.210]
MFN Tariff (Δln)	-6.042	-7.97	-8.306	-5.08
	[5.120]	[2.949]	[5.678]	[2.640]
Observations	3,100	3,004	2,723	8,827
R-squared	0.03	0.04	0.08	0.05
Sector Fixed Effects	yes	yes	yes	no
HS6 Fixed Effects	no	no	no	yes
Sector*Country Fixed Effects	no	no	no	yes
Equality of Tariff Coeffs (p-value)				0.122
Equality of EU & Japan Uncertainty Coef. (p-value)				0.261

Notes:

Robust standard errors in brackets for columns 1-3. HS6 product clustered standard errors in column 4. Uncertainty pre-WTO is defined as in the baseline US sample. The MFN tariff change is the tariff applied to China by the importing country. Transport cost data for Chinese exports to EU and Japan is unavailable. The pooled sample in column 4 is the subset of HS6 products with trade in 2000 and 2005 for Chinese exports to US matched to export flows to either the EU-15, Japan, or both. Columns 1-3 are the export destination subsets of the pooled sample.

Table A6: U.S. Import Growth (2000-2005, Δln) — Robustness to unobserved HS-6 import demand shocks

	U.S. import growth from China and all non-Preferential MFN partners		U.S. import growth from China and Taiwan	
	1	2	3	4
Uncertainty x **1**(China)	0.751	0.626	0.503	0.706
	[0.185]	[0.199]	[0.233]	[0.304]
Uncertainty x **1**(non-China)	0.072	-	-0.2	-
	[0.0998]		[0.237]	
Change in Tariff (Δln)	-4.633	-	-13.81	-
	[2.331]		[5.123]	
Change in Transport Costs (Δln)	-3.465	-3.605	-4.063	-3.343
	[0.240]	[0.252]	[0.447]	[0.605]
Observations	16,472	16,472	4,662	4,662
R-squared	0.15	0.19	0.24	0.38
Sector*Exporter Fixed Effects	yes	yes	yes	yes
HS6 Fixed Effects	no	yes	no	yes

Notes:
Robust standard errors in brackets clustered on HS6 industry. Uncertainty pre-WTO is defined as in the baseline US sample. The change in the US MFN tariff does not vary across non-preferential partners and is not identified in columns 2 and 4 when HS6 effects are included. Likewise, the uncertainty coefficient is not separately identified for non-Chinese imports. For columns 1-2, sample is the subset all HS6 products with imports from in 2000 and 2005 from China and one or more non-preferential MFN partner: Japan, Korea, Taiwan, Norway, Switzerland and E.U.-15. For columns 3-4, sample is the subset of HS6 products with trade in 2000 and 2005 for US imports from both Taiwan and China.

Table A7: Export growth from China: Robustness to HS-6 level and Pre-Accession Trends

	1	2	3	4
Dependent variable (ln):	Annualized Difference in Export Growth (2005-2000)/5-(1999-1996)/3		Pre-Accession Export Growth (1999-1996)	
Uncertainty Pre-WTO (2000)	0.506	0.415		
[+]	[0.224]	[0.225]		
Uncertainty Pre-WTO (1996)			-0.00501	0.0303
[~0]			[0.109]	[0.109]
Change in Tariff (Δln) [1]	-5.699	-5.157	-4.506	-4.311
[-]	[1.954]	[1.960]	[1.594]	[1.587]
Change in Transport Cost (Δln) [1]	-3.354	-3.424	-3.437	-3.444
[-]	[0.309]	[0.308]	[0.290]	[0.289]
Change in MFA quota status [1]		-0.408		0.469
		[0.112]		[0.160]
Change in NTB status [1]		-0.23		-0.51
		[0.219]		[0.302]
Observations	2,571	2,571	2,571	2,571
R-squared	0.047	0.054	0.055	0.06

Notes:

Standard errors in brackets. Predicted sign of coefficient in brackets under variable. Subsample of baseline observations with exports in 1999 and 1996. Robust regression employed to address potential outliers or influential individual observations due to double differencing. The estimation routine downweights outliers more than 6 times the median absolute deviation from the median residual. Uncertainty measure uses U.S. MFN and Column 2 Tariffs to construct profit loss measure at σ=3.

(1) In columns 1 and 2 the change in tariff and transport cost variable represents double differences. In columns 3 and 4 they are single differences. Similarly for MFA and NTB variables.

Table A8: Export Growth from China – Yearly Panel Fixed Effects Estimates (1996-2006)

	1	2
Tariff (ln)	-5.563	-8.223
[-]	[1.941]	[2.024]
Transport Costs (ln)	-2.468	-2.471
[-]	[0.226]	[0.226]
Uncertainty Pre-effect (1996-2001)		-2.179
[-]		[0.957]
Uncertainty Post-effect (2002-2006)		-1.491
[~0]		[0.953]
Uncertainty effect relative to 2000		
1996	-0.23	
[~0]	[0.263]	
1997	0.0295	
[~0]	[0.227]	
1998	-0.143	
[~0]	[0.197]	
1999	0.0776	
[~0]	[0.196]	
2001	0.245	
[~0]	[0.207]	
2002	0.476	
[+]	[0.203]	
2003	0.681	
[+]	[0.318]	
2004	0.742	
[+]	[0.223]	
2005	0.866	
[+]	[0.260]	
2006	0.812	
[+]	[0.305]	
Observations	37,002	37,002
R-squared	0.87	0.87
HS6 & Section by year FE	yes	yes
Restriction p-value (F-test)	0.006	0.046

Notes:

Robust standard errors with two-way clustering on HS6 and section-year, in brackets. Predicted sign of coefficient in brackets under variable. Uncertainty measure uses U.S. MFN and Column 2 Tariffs to construct profit loss measure at σ=3. All specifications employ OLS. In column 1, uncertainty measure is fixed at 2000 level and interacted with year indicators (omitting 2000).

Table A9: US import prices growth (2000-2005, Δln) — Robustness to unobserved import demand shocks

	Matched Sample of China and non-Preferential MFN partners import price index changes		Matched Sample of China and Taiwan import price index changes	
	1	2	3	4
Uncertainty x **1**(China)	-0.287	-0.217	-0.201	-0.404
	[0.0835]	[0.0943]	[0.0909]	[0.149]
Uncertainty x **1**(non-China)	-0.0738	-	0.205	-
	[0.0527]		[0.117]	
Change in Tariff (Δln)	-0.46	-	0.264	-
	[0.991]		[1.534]	
Change in Transport Costs (Δln)	-0.537	-0.399	-0.279	-0.138
	[0.259]	[0.282]	[0.237]	[0.321]
Observations	4,872	4,872	3,356	3,356
R-squared	0.11	0.15	0.08	0.07
Sector*Exporter Fixed Effects	yes	yes	yes	yes
HS6 Fixed Effects	no	yes	no	yes

Notes:
Robust standard errors in brackets clustered on HS6 industry. Uncertainty pre-WTO is defined as in the baseline US sample. The change in the US MFN tariff does not vary across non-preferential partners and is not identified in columns 2 and 4 when HS6 industry effects are included. The uncertainty coefficient is also not separately identified for non-Chinese imports. For columns 1-2, sample is the subset all HS6 industries with at least one continuer HS-10 variety import from in 2000 and 2005 from China and one or more non-preferential MFN partner. For columns 3-4, sample is the subset of HS6 industries continuer HS-10 traded varieity in 2000 and 2005 for US imports from both Taiwan and China. The price index dependent variable is trimmed for outliers at the 2.5% tails of the matched sample.

Table A10: Sensitivity of quantification to alternative parameterization of α=U_h/U

α =	0	2	4	6
Implied λ_2	1	0.44	0.28	0.21
Export growth from lower uncertainty (Δln)	33.2	32.6	32.4	32.3
Growth share from Risk Reducation at Mean	0	0.54	0.71	0.78

Notes:
Each column uses a different value for α to compute the GE quantification. We use the NLLS estimates (column 1, Table 6) and include adjustments for price index effects. The share from risk reduction is the growth in exports when uncertainy is reduced from an initial equilibrium where tariffs are at their long run mean. See text for formulas.

Table A11: Parameter Values for Quantification and Counterfactuals

Parameter	Value	Definition/Source
Data-based inputs and assumptions for aggregate trade, price and welfare effects:		
$1-\beta$	0.15	Death rate of foreign exporters
$1-\beta_h$	0.1	Death rate of U.S. firms
I_t	0.045	Chinese import penetration in 2005 to compute price effects, range is $[.022, .067]$ from 2000-10
σ	3	Median elasticity, Broda and Weinstein (2006)
τ_0	1.038	MFN tariff mean in 2005, used in Figures 5, 6
τ_1	1.041	MFN tariff mean in 2000, used in Figures 5, 6
τ_2	1.38	Col. 2 tariff mean in 2000, used in Figures 5, 6
Model-based estimates for key structural quantities		
k	4.45	Pareto parameter, Table 6, column 1, NLLS
$u = \frac{\beta\lambda_{12}}{1-\beta}$	0.73	Expected spell at $m = 2$ for exporter at $m = 1$, NLLS
$\hat{g}$	1.004	Computed average price effect adjustment to expected export profits for 2000
$\hat{g}_h$	0.989	Computed average price effect adjustment to expected domestic profits for 2000
Baseline assumption for relative spells		
$\alpha = u_h/u$	4	Assumes U.S. firms expected duration of WTO state to be 4x longer than chinese exporter expected duration of column 2 state

Notes: See data appendix for data sources and online appendix for exact definitions of expressions used in quantification. Estimated $\hat{g}$ and $\hat{g}_h$ are the solution implied by empirical point estimates only. The solutions are determined endogenously for each counterfactual exercises with variation over import penetration, initial tariffs, or policy shock arrival rates.

Notation Reference

Symbol	Description	Section
Ω	set of available differentiated goods	II
E	total expenditure on differentiated goods	II
p_v	consumer price of variety v	II
P_s	price index for differentiated goods in state s	II
c_v	unit labor cost for variety v	II
w_e	wage in exporting country e	II
d_V	advalorem transport cost for industry V	II
$\pi(a_s, c_v)$	operating profits	II
K, K_z	sunk cost to start exporting or upgrading (z)	II
a_{sV}	demand conditions for industry V in state s	II
β	probability that the exporting firm survives	II
Π_e, Π	value function of exporting (e), and firm Π	II
τ_m	trade policy state $m \in 0, 1, 2$ where $\tau_2 > \tau_0$ and $\tau_1 \in [\tau_0, \tau_2]$	II
$U(\omega, \gamma)$	Uncertainty factor affecting entry and upgrade cutoffs	II
γ	policy uncertainty parameter, $\gamma \equiv 1 - \lambda_{11}$	II
ω	Operating profit change at col. 2 (τ_2) vs. MFN (τ_1)	II
$u(\gamma)$	expected spell of state 2 if starting at $s = 1$	II
λ_2	probability of state $s = 2$ conditional on exiting MFN state	II
ζ_V	upgrading factor $\zeta_V \equiv 1 + \frac{K_z}{K} (\phi_V)^k > 1$.	IIE
$f(\frac{\tau_{2V}}{\tau_{1V}}, \gamma)$	uncertainty effect on exports	III
$P_{sV,x}$	consumer import price index for industry V	III
μ	share of income spent on differentiated goods	IV
$\tilde{\mu}$	indirect utility parameters: $\tilde{\mu} = w_e \ell \mu^\mu (1 - \mu)^{(1-\mu)}$	IV
ℓ	labor endowment	IV
N_V	mass of entrepreneurs in industry V	IV
R_{sV}	export level of industry V in state s	IV
k	Pareto distribution shape for productivity $G_V(c)$	IV
$\hat{P}_s$	ratio of price index in state s to its baseline value	IV
I_m	tariff inclusive import penetration in total expenditure	IV
T	time elapsed since transition from $s = 1$	IV
g, g_h	average change in exporter or domestic(h) profits after a transition to high or low protection, respectively	IV
$\hat{P}_{m,T}$	Price index change T periods after transition to state m	IV
$\alpha = u_h/u$	ratio of domestic firm's expected spell in agreement ($m = 0$) to exporter's expected spell in high protection ($m = 2$)	V