Online Appendix

A Analytical Results

A.1 Effect of Quality and Trade Wars on Average Costs

$$\left.\frac{\partial p_J}{\partial \underline{\theta}}\right|_{\underline{\theta}<\bar{\theta}} = \left[\left(e^{(r+\rho)x_J/q} - 1\right) x_J r\right] \Big/ \left[\Upsilon(e^{-rx/q} - 1)q\right] < 0$$

$$\left.\frac{\partial p_J}{\partial \bar{\theta}}\right|_{\underline{\theta}<\bar{\theta}} = x_J r e^{(r+\rho)x_J/q} \Big/ \left[\Upsilon(1 - e^{-rx_J/q})q\right] > 0$$

$$\frac{\partial p_J}{\partial \rho} = \left(e^{(r+\rho)x_J/q} x_J^2(\bar{\theta} - \underline{\theta})r\right)\Big/ q^2\Upsilon\left(1 - e^{-\frac{rx}{q}}\right) > 0$$

Finally, comparing procurement costs in both systems note that:

$$\frac{r}{q}\frac{f + \bar{\theta}\frac{1}{\Upsilon}x_J^* + (\bar{\theta} - \underline{\theta})\frac{1}{\Upsilon}x_J^*\left[e^{rx_J^*/q} - 1\right]}{1 - e^{-rx_J^*/q}} > \frac{r}{q}\frac{f + \bar{\theta}\frac{1}{\Upsilon}x_J^*}{1 - e^{-rx_J^*/q}} > \frac{r}{q}\frac{f + \bar{\theta}\frac{1}{\Upsilon}x_A^*}{1 - e^{-rx_A^*/q}}$$

The first inequality holds since $e^{rx_J^*/q} > 1$, and the second inequality holds because the batch size that minimizes average costs in the J system is strictly less than the batch size that minimizes average costs in the A system when $m = 0$, i.e., $x_J^* < x_A^*(m = 0)$. Hence, the average procurement cost under the J system is strictly greater than under the A system for any $\rho \geq 0$ when $m = 0$.

A.2 Proof of Proposition 2.1

For $\bar{\theta} - \underline{\theta} > 0$ and $\rho > 0$, when $m_A = 0$ average costs under the J system must be higher than under the A system by the discussion above Proposition 2.1 and in Appendix A.1. Since average costs under the A system grow without bound as $m_A \to \infty$, there must be an m^* such that average costs under the systems are equalized.

A.3 Proof of Proposition 2.2

Japanese System: We apply the implicit function theorem to the FOC (5):

$$\frac{\partial FOC_J}{\partial \rho} = \frac{2xe^{\frac{x\rho}{q}}\left(\bar{\theta} - \underline{\theta}\right)}{q^2\Upsilon(e^{-\frac{rx}{q}} - 1)}\left[\frac{x\rho}{2}\left(e^{\frac{rx}{q}} - 1\right) + q\left(\left(\frac{rx}{2q} + 1\right)e^{\frac{rx}{q}} - \frac{rx}{q} - 1\right)\right]$$

Define $y = rx/q$. Note that $\lim_{y \downarrow 0} \left(\frac{y}{2}+1\right)e^y - y - 1 = 0$ and $\frac{d}{dy}\left(\frac{y}{2}+1\right)e^y - y - 1 = -1 + \frac{1}{2}(y+3)e^y > 0$. Therefore $\frac{\partial FOC_J}{\partial \rho} > 0$. Then by the implicit function theorem

$$\frac{\partial x}{\partial \rho} = -\frac{\frac{\partial FOC_J}{\partial \rho}}{SOC_J} < 0,$$

where we denote by SOC_J the second-order condition, which is greater than zero as shown in Supplemental Appendix K.1 on the authors' websites.

Remember that $v_J(x_J, \rho) = f + \bar{\theta}\frac{1}{\Upsilon}x_J^* + (\bar{\theta} - \underline{\theta})\frac{1}{\Upsilon}x_J^*\left[e^{rx_J^*/q} - 1\right]$. Average costs in the "Japanese" system are then $\frac{r}{q}\frac{v_J(x_J,\rho)}{1-exp(-\frac{rx_J}{q})}$. Taking the first-order condition of these average costs and setting zero we can write.

$$\frac{\partial v(x_J, \rho)}{\partial x_J} = \frac{r}{q}\frac{v(x_J, \rho)exp(-\frac{rx_J}{q})}{1 - exp(-\frac{rx_J}{q})}$$

Now take the derivative of the unit value, $\frac{v_J(x_J,\rho)}{x_J}$,with respect to ρ to obtain

$$\left(\frac{\partial v(x_J, \rho)}{\partial x_J}\frac{\partial x_J}{\partial \rho}x + \frac{\partial v(x_J, \rho)}{\rho}x_J - v(x_J, \rho)\frac{\partial x_J}{\partial \rho}\right)\frac{1}{x_J^2}$$

Substituting for $\frac{\partial}{\partial x}v(x_J, \rho)$ from the equilibrium condition (22) into (23) we can rewrite (23) to obtain

$$\left[\left(\frac{rx_J}{q}\frac{exp(-\frac{rx_J}{q})}{1 - exp(-\frac{rx_J}{q})} - 1\right)\frac{\partial x_J}{\partial \rho}v(x_J, \rho) + \frac{\partial v(x_J, \rho)}{\rho}x_J\right]\frac{1}{x_J^2}$$

Note that $\frac{\partial v(x_J,\rho)}{\rho}x_J = \frac{x_J^3(\bar{\theta}-\underline{\theta})}{exp(-\frac{(r+\rho)x_J}{q})q\Upsilon} > 0$. Also note that $\frac{rx_J}{q}\frac{exp(-\frac{rx_J}{q})}{1-exp(-\frac{rx_J}{q})} - 1 < 0$ for $0 < \frac{rx}{q} < 1$. Then because $\frac{\partial x_J}{\partial \rho} < 0$ we have shown that $\frac{\partial}{\partial \rho}\frac{v_J(x_J,\rho)}{x_J} > 0$

American System: We apply the implicit function theorem to show:

$$\frac{\partial x_A^*}{\partial m} = -\frac{\frac{\partial FOC_A}{\partial m}}{SOC_A} = \frac{r^2 e^{-\frac{rx_A}{q}}}{q^2\left(1 - e^{-\frac{rx_A}{q}}\right)^2} > 0$$

Note that unit values in the "American" system are simply $\frac{v_A(x_A)}{x_A} = \frac{f}{x_A} + \frac{\bar{\theta}}{\Upsilon}$.Therefore, $\frac{\partial x_A^*}{\partial m} > 0 \Rightarrow \frac{\partial \frac{v_A(x_A)}{x_A}}{\partial m} < 0$.

A.4 Proof of Proposition 2.3

Part 1: Comparing shipping sizes: $x_J^* < x_A^*$ First note that if $m = 0$ and $\bar{\theta} - \underline{\theta} = 0$, then average costs in the two procurement systems are identical. If $\frac{\partial x_A^*}{\partial m} > 0$ and $\frac{\partial x_J^*}{\partial \underline{\theta}} > 0$, then $x_J^* < x_A^*$all else equal. We apply the implicit function theorem. Let $FOC_A$and FOC_J denote the first-order conditions to minimize average procurement costs, and, let $SOC_A > 0$ and $SOC_J > 0$ be the associated second-order conditions that are greater than zero as shown in Supplemental Appendix K.1.

American System

$$\frac{\partial x_A^*}{\partial m} = -\frac{\frac{\partial FOC_A}{\partial m}}{SOC_A} = \frac{r^2 e^{-\frac{r x_A}{q}}}{q^2\left(1 - e^{-\frac{r x_A}{q}}\right)^2} > 0$$

Japanese System

$$\begin{aligned}\frac{\partial x_J^*}{\partial \underline{\theta}} = -\frac{\frac{\partial FOC_J}{\partial \underline{\theta}}}{SOC_J} &= \left(\frac{r}{q}\right)\frac{1}{\Upsilon}\frac{\left[1 - e^{(r+\rho)x_J^*/q}\left[1 + \left(\frac{r+\rho}{q}\right)x_J^*\right]\right]\left[1 - e^{-r x_J^*/q}\right]}{\left(1 - e^{-r x_J^*/q}\right)^2} \\ &- \left(\frac{r}{q}\right)^2\frac{1}{\Upsilon}\frac{x_J^* e^{-r x_J^*/q}\left[1 - e^{(r+\rho)x_J^*/q}\right]}{\left(1 - e^{-r x_J^*/q}\right)^2}.\end{aligned}$$

For $(r+\rho)x_J^*/q > 0$, this expression is negative if and only if

$$\frac{\left[1 - e^{(r+\rho)x_J^*/q}\left[1 + \left(\frac{r+\rho}{q}\right)x_J^*\right]\right]}{\left[1 - e^{(r+\rho)x_J^*/q}\right]} > \frac{\left(\frac{r}{q}\right)x_J^* e^{-r x_J^*/q}}{\left[1 - e^{-r x_J^*/q}\right]}. \tag{A.1}$$

Note that the left-hand side is greater than 1. Hence, we need to show that the right-hand side is less than 1. Define $y \equiv r x_J^*/q$, where $0 < y < 1$. We find for the right-hand side $\lim_{y\to 0}\dfrac{y e^{-y}}{1 - e^{-y}} = \lim_{y\to 0} 1 - y = 1$. Next, note that $\dfrac{d}{dy}\dfrac{y e^{-y}}{1 - e^{-y}} = \dfrac{e^{-y}\left[(1 - y) - e^{-y}\right]}{\left[1 - e^{-y}\right]^2} < 0$. It follows that the right-hand side of (A.1) is never greater than 1. Therefore, $\partial FOC/\partial \underline{\theta} < 0$ and$\partial x_J^*/\partial \underline{\theta} > 0$.

Part 2: Comparing unit values: $v_A(x_A)/x_A < v_J(x_J)/x_J$

$$v_s(x_s)/x_s = \begin{cases} \frac{f}{x_A^*} + \frac{\bar{\theta}}{\Upsilon} & \text{if } s = A \\ \frac{f}{x_J^*} + \frac{\bar{\theta}}{\Upsilon} + \left(e^{\frac{(r+\rho)x}{q}} - 1\right)(\bar{\theta} - \underline{\theta})\frac{1}{\Upsilon} & \text{if } s = J \end{cases}$$

Comparing the expressions, $x_A^* > x_J^*$(see Part 1) and $\left(e^{\frac{(r+\rho)x}{q}} - 1\right)(\bar{\theta} - \underline{\theta})\frac{1}{\Upsilon} \Rightarrow v_A(x_A)/x_A < v_J(x_J)/x_J$.

A.5 Proof of Proposition 5.1

Part 1: Order size and shipping frequency increase in q.

American System We apply the implicit function theorem to the first-order condition in the "American" system. From the first-order condition and setting to zero we obtain $v'(x) = \frac{r(v(x)+m)e^{-rx/q}}{q\left(1-e^{-rx/q}\right)}$. Substituting this optimality condition into $\frac{\partial FOC_A}{\partial q}$we obtain

$$\frac{\partial x_A}{\partial q} = -\frac{\frac{\partial FOC_A}{q}}{SOC_A} = \frac{\left[1 - \frac{\frac{rx}{q}\mathrm{e}^{-\frac{rx}{q}}}{1-\mathrm{e}^{-\frac{rx}{q}}} - \frac{rx}{q}\right]}{SOC_A}\frac{r^2\left(v\left(x\right)+m\right)\mathrm{e}^{-\frac{rx}{q}}}{q^3\left(1-\mathrm{e}^{-\frac{rx}{q}}\right)^2}$$

Then, $0 < \frac{rx}{q} < 1 \Rightarrow [\cdot] < 0 \Rightarrow \frac{\partial x_A}{\partial q} > 0$ over the relevant parameter range where costs are positive.

For the shipment frequency, $d(x_A^*/q)/dq < 0$, define $\psi_A = x_A^*/q$. Then, simplifying the first-order condition under the "American" system we have

$$FOC(\psi_A) = \bar{\theta}\frac{1}{\Upsilon}\left[1 - e^{-r\psi_A}\right] - \left(\frac{r}{q}\right)e^{-r\psi_A}\left[f + m + \bar{\theta}\frac{1}{\Upsilon}q\psi_A\right] = 0.$$

Applying the implicit function theorem to this expression yields

$$\frac{\partial \psi_A}{\partial q} = -\frac{\frac{\partial FOC(\psi_A)}{\partial q}}{\frac{\partial FOC(\psi_A)}{\partial \psi_J}} = -\frac{[f+m]}{rq\left[f + m + \bar{\theta}\frac{1}{\Upsilon}q\psi_A\right]} < 0,$$

and hence the time between shipments decreases, i.e., shipping frequency increases.

Japanese System We follow the same strategy as in the proof for the American system. From the first-order condition, FOC_J, we obtain $\frac{\partial v_J(x_J,q)}{\partial x_J} = \frac{r v_J(x_J,q) e^{-\frac{rx}{q}}}{q\left(1-e^{-\frac{rx}{q}}\right)}$ which we substitute into $\frac{\partial FOC_J}{\partial q}$ to obtain:

$$\begin{aligned}\frac{\partial FOC_J}{q} &= \left[1 - \frac{rxe^{-\frac{rx}{q}}}{q\left(1-e^{-\frac{rx}{q}}\right)} - \frac{rx}{q}\right]\left(\frac{r^2 v(x,q)e^{-\frac{rx}{q}}}{q^3\left(1-e^{-\frac{rx}{q}}\right)^2}\right) \\ &- \frac{2(r+\rho)(\bar{\theta}-\underline{\theta})xre^{\frac{x\rho}{q}}}{q^4\Upsilon(e^{-\frac{rx}{q}}-1)^2}\left(\frac{x\rho}{2}\left(e^{\frac{rx}{q}}-1\right) + \left[\left(\frac{rx}{2q}+1\right)e^{\frac{rx}{q}} - \frac{rx}{q} - 1\right]q\right)\end{aligned}$$

Note that $0 < \frac{rx}{q} < 1 \Rightarrow \left[1 - \frac{rxe^{-\frac{rx}{q}}}{q\left(1-e^{-\frac{rx}{q}}\right)} - \frac{rx}{q}\right] < 0$ & $\left[\left(\frac{rx}{2q}+1\right)e^{\frac{rx}{q}} - \frac{rx}{q} - 1\right] > 0 \Rightarrow -\frac{\frac{\partial FOC_J}{q}}{SOC_J} > 0 \Rightarrow \frac{\partial x_J^*}{\partial q} > 0$, because all other terms are positive by inspection.

To see that $d(x_J^*/q)/dq < 0$, define $\psi_J = x_J^*/q$. The first-order condition under the "Japanese" system can then be simplified to

$$\begin{aligned}FOC(\psi_J) = &\left[\underline{\theta}\tfrac{1}{\Upsilon} + \left(\bar{\theta}-\underline{\theta}\right)\tfrac{1}{\Upsilon}e^{(r+\rho)\psi_J}\left[1+(r+\rho)\psi_J\right]\right]\left(1-e^{-r\psi_J}\right) \\ &- \left(\frac{r}{q}\right)e^{-r\psi_J}\left[f + \underline{\theta}\tfrac{1}{\Upsilon}\psi_J q + (\bar{\theta}-\underline{\theta})\tfrac{1}{\Upsilon}e^{(r+\rho)\psi_J}\psi_J q\right] = 0.\end{aligned} \tag{A.2}$$

Applying the implicit function theorem to this expression yields

$$\frac{\partial \psi_J}{\partial q} = -\frac{\frac{\partial FOC(\psi_J)}{\partial q}}{\frac{\partial FOC(\psi_J)}{\partial \psi_J}}.$$

For the numerator, we have

$$\frac{\partial FOC(\psi_J)}{\partial q} = \frac{r}{q^2}e^{-r\psi_J}f > 0.$$

For the denominator we find

$$\begin{aligned}\frac{\partial FOC(\psi_J)}{\partial \psi_J} &= (r+\rho)(\bar{\theta}-\underline{\theta})\tfrac{1}{\Upsilon}e^{(r+\rho)\psi_J}\left[2+(r+\rho)\psi_J\right]\left[1-e^{-r\psi_J}\right] \\ &+ \frac{r^2}{q}e^{-r\psi_J}\left[f + \underline{\theta}\tfrac{1}{\Upsilon}\psi_J + (\bar{\theta}-\underline{\theta})\tfrac{1}{\Upsilon}e^{(r+\rho)\psi_J}\psi_J\right] > 0.\end{aligned}$$

Therefore, $\partial FOC(\psi_J)/\partial q > 0$, and thus $d(x_J^*/q)/dq < 0$.

A.6 Proof of Lemma 5.2: Average cost curves are downward sloping, convex, and reach a limit

Part 1: Average cost curves are downward sloping

American System The average cost function under the "American" system is

$$AC(q) = \frac{\theta\frac{x}{q} + \frac{f}{q} + \frac{m}{q}}{1 - exp(-\frac{rx}{q})}.$$

Taking the first derivative of the expression with respect to q, and fully writing out also the terms that involve x, we get

$$AC'(q) = \frac{-\frac{f+m}{q^2} + \theta\frac{x'(q)}{q} - \theta\frac{x}{q^2}}{1 - exp(-\frac{rx}{q})} - \frac{\frac{r}{q}exp(-\frac{rx}{q})\left[\theta\frac{x}{q} + \frac{f}{q} + \frac{m}{q}\right]x'(q)}{\left[1 - exp(-\frac{rx}{q})\right]^2} + \frac{\left(\frac{rx}{q^2}\right)exp(-\frac{rx}{q})\left[\theta\frac{x}{q} + \frac{f}{q} + \frac{m}{q}\right]}{\left[1 - exp(-\frac{rx}{q})\right]^2}.$$

Re-arranging this expression, we obtain

$$AC'(q) = \frac{-\frac{f+m}{q^2}}{1 - exp(-\frac{rx}{q})} + \frac{1}{q}x'(q)\left\{\frac{\theta}{1 - exp(-\frac{rx}{q})} - \frac{\frac{r}{q}exp(-\frac{rx}{q})\left[\theta x + f + m\right]}{\left[1 - exp(-\frac{rx}{q})\right]^2}\right\}$$
$$- \frac{x}{q^2}\left\{\frac{\theta}{1 - exp(-\frac{rx}{q})} - \frac{\frac{r}{q}exp(-\frac{rx}{q})\left[\theta x + f + m\right]}{\left[1 - exp(-\frac{rx}{q})\right]^2}\right\}.$$

Note that the two terms in brackets are the first-order condition of the cost function with respect to x, which is equal to zero (this is the "Envelope condition")! This is key: because in the average cost function x and q almost always appear as x/q, we can re-arrange terms to not only cancel the expression containing $x'(q)$, but also the term involving x/q^2. Thus, we get

$$AC'(q) = \frac{-\frac{f+m}{q^2}}{1 - exp(-\frac{rx}{q})}. \tag{A.3}$$

This clearly shows that average cost curves are decreasing.

Japanese System The proof proceeds in the same way as before. Average costs under the "Japanese" system are

$$AC(q) = \frac{\theta \frac{x}{q} exp(\frac{(r+\rho)x}{q}) + \frac{f}{q}}{1 - exp(-\frac{rx}{q})}.$$

The first derivative with respect to q is (ignoring the derivative with respect to x here, which we know must be zero)

$$AC'(q) = \frac{-\frac{f}{q^2} - \theta \frac{x}{q^2} exp(\frac{(r+\rho)x}{q}) - \theta(r+\rho)\frac{x^2}{q^3} exp(\frac{(r+\rho)x}{q})}{1 - exp(-\frac{rx}{q})} + \frac{\left(\frac{rx}{q^2}\right) exp(-\frac{rx}{q}) \left[\theta \frac{x}{q} exp(\frac{(r+\rho)x}{q}) + \frac{f}{q}\right]}{\left[1 - exp(-\frac{rx}{q})\right]^2}.$$

Re-arranging yields

$$AC'(q) = \frac{-\frac{f}{q^2}}{1 - exp(-\frac{rx}{q})} - \frac{x}{q^2} \left\{ \frac{\theta exp(\frac{(r+\rho)x}{q}) \left[1 + (r+\rho)\frac{x}{q}\right]}{1 - exp(-\frac{rx}{q})} - \frac{\frac{r}{q} exp(-\frac{rx}{q}) \left[\theta x exp(\frac{(r+\rho)x}{q}) + f\right]}{\left[1 - exp(-\frac{rx}{q})\right]^2} \right\}.$$

Similar to before, the term in curly brackets is the first-order condition with respect to x and is equal to zero. Therefore, we have

$$AC'(q) = \frac{-\frac{f}{q^2}}{1 - exp(-\frac{rx}{q})}. \tag{A.4}$$

This function must be convex because the function under the American system was convex for all m, and thus also for $m = 0$.

Part 2: Average cost curves are convex and converge to a finite limit. See Supplemental Appendix K.2, available on the authors' websites.

B Data Refinement and Summary Statistics

B.1 Data Refinement

We use version c201601 of the LFTTD data, which we refine as follows. First, we drop all transactions that are warehouse entries. Second, we remove all transactions that do not include a valid importer identifier, an HS code, a value, a quantity, or a valid transaction date. We also drop observations with invalid exporter identifiers, e.g., those that do not begin with a letter (identifiers should start with the country ISO code). Third, we exclude from our analysis all related-party transactions.[59] We choose a conservative approach and exclude all relationships in which the two parties ever report being related, as well as all observations for which the related-party identifier is missing. Fourth, we use the concordance developed by Pierce and Schott (2012) to create time-consistent HS10 codes so that purchases of goods can be tracked over time. Fifth, we deflate transaction values using the quarterly GDP deflator of the Bureau of Economic Analysis, so that all values are in 2009 real dollars.[60] Sixth, since shipments of the same product between the same buyer and seller spread over multiple containers are recorded as separate transactions, we aggregate the dataset to the weekly level. We perform this aggregation to ensure that each observation in our data reflects a genuinely new transaction rather than being part of a larger shipment. Finally, to remove unit value outliers, we follow Hallak and Schott (2011) in dropping observations where the unit value is below the 1st or above the 99th percentile within HS10 by country by mode of transportation by quarter cells.

B.2 Baseline Sample

Our baseline sample restricts our cleaned data to importer (m) by HS10 product (h) by country (c) by mode of transportation (z) $mhcz$ quadruples with at least five transactions. Table A.1 provides some details for our sample period 1992-2016. The importers in our sample purchased 5.68 trillion dollars worth of goods at arm's length, the majority of which arrived by water (vessel). These imports span 360 thousand unique US importers and just over 5 million unique foreign exporters. The penultimate row shows that our sample contains almost 3 million $mhcz$ quadruples. The final row of the table reports the number of "buyer-seller relationships" associated with these bins, i.e., the number of $mxhcz$ quintuples, where x denotes the exporter. There are nearly 22 million of these relationships within the 3 million buyer quadruples, or an average of about 7 sellers per $mhcz$ cell.

We compare our baseline sample to an alternative arm's-length sample that does not restrict to buyer quadruples with at least five transactions. Since we cannot

[59]The Census Bureau defines parties as related if either party owns, controls or holds voting power equivalent to 6 percent of the outstanding voting stock or shares of the other organization.

[60]https://fred.stlouisfed.org/series/GDPDEF

compute some variables such as weeks between shipments (WBS_{mhcz}) for quadruples that trade only a single time, we focus for consistency on the arm's-length sample consisting of quadruples with two or more transactions. Table A.2 compares the two samples. The first row shows that the baseline sample accounts for slightly more than 80 percent of the broader sample of arm's-length trade by quadruples with at least two transactions. The next row shows that the broader sample contains almost twice as many importers, suggesting that most of the additional importers in the broader sample do not have substantial imports. The third row presents the number of unique exporters and the fourth row shows the number of unique importer (m) by HS10 product (h) by country (c) by mode of transportation (z) $mhcz$ quadruples. The latter rises more than twofold in the broader sample. The last row presents the number of unique quintuples. These do not increase nearly as much in percentage terms as the number of quadruples, as most of the quadruples unique to the broader sample have only few suppliers.

Table A.3 compares the $mhcz$ quadruples in the two samples. The first row shows that the average value traded by a quadruple in the broader sample is only about half of the trade value in the baseline sample. Rows two to four show that quadruples in the broader sample are shorter-lived, contain fewer shipments, and source from fewer suppliers on average. However, the average value per shipment is relatively similar to the baseline sample (row 5). Shipments in the broader sample are significantly more spaced out over time (row 6). The last two rows show that the average importer-exporter relationship length associated with a quadruple in the broader sample is shorter than in the baseline sample and that quadruples in the broader sample have a higher ratio of suppliers to shipments. The latter fact suggests that many of the additional quadruples not in the baseline sample conduct their few transactions with different suppliers.

Table A.1: US Import Transaction Summary Statistics

Total Imports ($\$Bill$)	5,680
Vessel Imports ($\$Bill$)	4,030
Air Imports ($\$Bill$)	988
Unique Importers (m)	360,000
Unique Exporters (x)	5,037,000
Unique Importer-Product-Country-Mode Quadruples ($mhcz$)	2,966,000
Unique Exporter-Importer-Product-Country-Mode Relationship Quintuples ($mxchz$)	21,700,000

Source: LFTTD and authors' calculations. Table summarizes US arm's-length imports from 1992 to 2016. Observations are restricted to quadruples with at least five transactions. Import values are in billions of real 2009 dollars. Vessel imports refer to imports arriving over water. The final four rows of the table provide counts of unique importers, exporters, buyer quadruples, i.e., US importer by HS product by origin country by mode of transport cells, and buyer-seller relationships, i.e., US importer by foreign exporter by HS product by origin country by mode of transport cells. Observation counts are rounded to the nearest thousand per US Census Bureau disclosure guidelines.

Table A.2: US Import Transaction Summary Statistics

	Baseline $t \geq 5$	Sample $t \geq 2$
Total Imports ($\$Bill$)	5,680	6,990
Unique Importers (m)	360,000	637,000
Unique Exporters (x)	5,037,000	6,531,000
Unique Importer-Product-Country-Mode Quadruples ($mhcz$)	2,966,000	7,615,000
Unigue Exporter-Importer-Product-Country-Mode Quintuples ($mxchz$)	21,700,000	30,600,000

Source: LFTTD and authors' calculations. Table summarizes US arm's-length imports from 1992 to 2016. Observations are based on the cleaned data described in Appendix B. The first column restricts to our baseline sample of quadruples with at least five transactions ($t \geq 5$), analogous to Table A.1. The final column restricts to the broader sample of quadruples with two or more transactions ($t \geq 2$). Import values are in billions of real 2009 dollars. The final four rows of the table provide counts of unique importers, exporters, buyer quadruples, i.e., US importer by HS product by origin country by mode of transport cells, and buyer-seller relationships, i.e., US importer by foreign exporter by HS product by origin country by mode of transport cells. Observation counts are rounded to the nearest thousand per US Census Bureau disclosure guidelines.

Table A.3: Attributes of $mhcz$ Quadruples

	Baseline Sample $t \geq 5$		Broader Sample $t \geq 2$	
	Mean	*Standard Deviation*	*Mean*	*Standard Deviation*
Total Value Traded ($)	1,914,000	36,300,000	918,400	24,100,000
Length Between Buyer's First and Last Shipment (Weeks)	304.3	266	187.9	229.8
Total Shipments	38.6	157.9	17.8	100.4
Number of Sellers (x)	7.3	25.5	4.0	16.2
Value per Shipment (VPS), ($)	35,910	386,100	38,090	470,500
Weeks Between Shipments (WBS)	23.5	28.5	44.5	79.8
Average Relationship Length in Weeks ($length$)	180.8	154.7	147.2	156.7
Ratio of Sellers to Shipments (SPS)	0.334	0.241	0.512	0.306

Source: LFTTD and authors' calculations. Table reports the mean and standard deviation across importer (m) by country (c) by ten-digit Harmonized System category (h) by mode of transport (z) quadruples during our 1992 to 2016 sample period. Observations are based on the cleaned data described in Appendix B. Import values are in real 2009 dollars. The first two columns restrict to our baseline sample of quadruples with at least five transactions, analogous to Table 1. The final two columns restrict to the broader sample of quadruples with two or more transactions. Observation counts are rounded to the nearest thousand per US Census Bureau disclosure guidelines.

B.3 Additional Statistics on Sellers per Shipment

Table A.4 provides information on the average number of sellers per shipment (SPS_{mhcz}) by ten-digit HS code, analogous to Table 2 in the main text. For columns (3) and (4), we define J dummies J^k_{mhcz} that take a value of one if SPS_{mhcz} falls in the first quartile of its distribution within country-mode bins in the first time period ($k = cz$) to retain variation across products. We find that J sourcing is most prevalent for transportation equipment, machinery, plastics, and optical products.

Table A.4: "Japanese" Relationships by HS Category

	Mean SPS		$J^{cz}_{mhcz} = 1$ Share of Import Value	
	(1)	(2)	(3)	(4)
Product code (HS chapter)	1995-2000	2002-2007	1995-2000	2002-2007
Transportation (86-89)	0.107	0.081	0.783	0.880
Machinery (84-85)	0.130	0.133	0.754	0.763
Plastics (39-40)	0.130	0.096	0.727	0.820
Optical products (90-92)	0.137	0.127	0.726	0.768
Footwear (64-67)	0.142	0.117	0.750	0.827
Other products (93-99)	*0.151*	*0.124*	*0.697*	*0.808*
Metals (72-83)	0.154	0.128	0.600	0.737
Food (16-24)	0.155	0.120	0.601	0.747
Chemicals (28-38)	0.156	0.121	0.600	0.736
Stones & Jewelry (68-71)	0.159	0.141	0.658	0.674
Animal products & vegetables (01-15)	0.166	0.132	0.511	0.608
Minerals (25-27)	0.182	0.203	0.570	0.500
Leather and wood products (41-49)	0.188	0.153	0.556	0.688
Textiles (50-63)	0.224	0.177	0.463	0.604

Source: LFTTD and authors' calculations. The first two columns report the weighted average sellers per shipment (SPS_{mhcz}) across buyer quadruples with at least five transactions by HS category and period, where import values are used as weights. Numbers in parentheses refer to the Harmonized System chapter of the product. The second two columns report the share of the value of US imports accounted for by quadruples with SPS_{mhcz} in the first quartile of the distribution of SPS_{mhcz} within country-mode in the first period. Rows of the table are sorted by column (1).

We run a series of regressions of SPS_{mhcz} separately on importer, product, country, importer industry, and mode of transportation fixed effects, and examine the R-squared from these regressions to study how much of the variation is explained.[61] We find that importer, product, industry, country, and mode fixed effects individually explain 35%, 12%, 10%, 8%, and 7% of the variation in SPS_{mhcz}, respectively. The large heterogeneity in SPS_{mhcz} across importers is consistent with different firms choosing different procurement strategies.

[61] For industry, we use 6-digit NAICS fixed effects. We define the importer's main industry in each year as the one with the largest share of employment, and then take the modal main industry across the years in which the quadruple is active.

C Construction of the Variables

As discussed in the main text, we collapse all transactions of the same importer (m) - product (h) - country (c) - mode of transportation (z) quadruple in the same week into one. Therefore, a "transaction" (i) refers to a week in which the quadruple imports. Table A.5 provides a summary of how we construct the variables in Section 3. Table A.6 describes the variables used in Section 4.

Table A.5: Classification Regressions

	Formula	Description
Quantity per Shipment (QPS_{mhcz})	$\frac{\sum_i Quantity_{mhczi}}{Ntrans_{mhcz}}$	$Quantity_{mhczi}$ is the quantity imported by quadruple $mhcz$ at transaction i and $Ntrans_{mhcz}$ is the total number of transactions by the quadruple in 1992-2016.
Value per Shipment (VPS_{mhcz})	$\frac{\sum_i Value_{mhczi}}{Ntrans_{mhcz}}$	$Value_{mhczi}$ is the value imported by quadruple $mhcz$ at transaction i and $Ntrans_{mhcz}$ is the total number of transactions by the quadruple in 1992-2016.
Weeks between Shipments (WBS_{mhcz})	$\frac{end_{mhcz}-beg_{mhcz}}{Ntrans_{mhcz}-1}$	end_{mhcz} is the number of the week of the last transaction of the quadruple and beg_{mhcz} is the number of the week of the first transaction of the quadruple (see definition below). The denominator represents the number of time periods between subsequent transactions of the quadruple, which is one less than the number of transactions. Since we require at least five transactions in our baseline, the expression is finite.
Unit Value (UV_{mhcz})	$\frac{1}{Ntrans_{mhcz}} \sum_i \frac{Value_{mhczi}}{Quantity_{mhczi}}$	$Value_{mhczi}$ is the value imported by quadruple $mhcz$ at transaction i, $Quantity_{mhczi}$ is the corresponding quantity.
Quantity per Week (QPW_{mhcz})	$\frac{\sum_i Quantity_{mhczi}}{end_{mhcz}-beg_{mhcz}}$	In contrast to QPS_{mhcz}, this variable does not divide by the number of transactions but by the "flow" of imports in an average week. We note that since we require at least five transactions in our baseline, the beginning and end week are never the same and therefore the expression is finite.
First week (beg_{mhcz}) Last week (end_{mhcz})	$min\{Week_{mhczi}\}$ $max\{Week_{mhczi}\}$	$Week_{mhczi}$ is the week number of the transaction, relative to the first week of 1960. Thus, for example the first week of 2016 has week number 2912.
Avg. relationship length ($length_{mhcz}$)	$\frac{\sum_x length_{mx}}{Sellers_{mhcz}}$	$length_{mx} = max\{Week_{mxi}\} - min\{Week_{mxi}\}$. $Week_{mxi}$ is the week number of a transaction i of the buyer-seller pair mx in any good or mode of transportation, relative to the first week of 1960. $Sellers_{mhcz}$ is the number of exporters (x) with which the quadruple ($mhcz$) has an $mxhcz$ quintuple relationship.

Table A.6: PNTR Regressions

	Formula	Description
Quantity per Shipment (QPS_{mxhczt})	$\frac{\sum_i Quantity_{mxhczti}}{Ntrans_{mxhczt}}$	$Quantity_{mxhczti}$ is the quantity imported by quintuple $mxhcz$ in period t (either 1995-2000 or 2002-2007) at transaction i and $Ntrans_{mxhczt}$ is the total number of transactions by the quintuple in period t.
Weeks between Shipments (WBS_{mxhczt})	$\frac{end_{mxhczt}-beg_{mxhczt}}{Ntrans_{mxhczt}-1}$	end_{mxhczt} is the number of the week of the last transaction of the quintuple in period t (either 1995-2000 or 2002-2007) and beg_{mxhczt} is the number of the week of the first transaction of the quintuple. The week number is relative to the first week of 1960. Thus, for example the first week of 2016 has week number 2912. The denominator represents the number of time periods between subsequent transactions of the quintuple, which is one less than the number of transactions. If $Ntrans_{mxhczt} = 1$, the average time gap cannot be computed. The PNTR regressions therefore require for each quintuple at least two transactions in each period t.
Unit Value (UV_{mxhczt})	$\frac{1}{Ntrans_{mxhczt}} \sum_i \frac{Value_{mxhczti}}{Quantity_{mxhczti}}$	$Value_{mxhczti}$ is the value imported by quintuple $mxhczt$ at transaction i in period t, and $Quantity_{mxhczti}$ is the corresponding quantity.
Quantity per Week (QPW_{mxhczt})	$\frac{\sum_i Quantity_{mxhczti}}{end_{mxhczt}-beg_{mxhczt}}$	In contrast to QPS_{mxhczt}, this variable does not divide by the number of transactions but by the "flow" of imports in an average week. As described above for WBS_{mxhczt}, we require for each quintuple at least two transactions in each period t so that this variable can be computed.

D Additional A vs J Classification Regressions

Thicker Relationships: One concern with our baseline regressions in Section 3.2 might be that SPS_{mhcz} is mismeasured because we did not observe a sufficient number of transactions. In Table A.7, we show that our results are robust to restricting the regression to quadruples with at least 10 transactions, rather than 5 as in the baseline.

More Aggregated Suppliers per Shipment: Another concern with SPS might be that buyers obtain shipments across multiple modes of transportation, and therefore procurement systems – and hence SPS – should be defined at the mhc or even mh level. In Tables A.8 and A.9 we show that our results are robust to defining SPS at these higher levels of aggregation (i.e., SPS_{mhc} or SPS_{mh}), where we keep all other variables at the $mhcz$ level of the baseline.

Median of Dependent Variables: The baseline regressions in Section 3.2 contain the total number of shipments both in the denominator of the dependent variables QPS_{mhcz} and WBS_{mhcz} and in the denominator of the right-hand side variable SPS_{mhcz}, raising concerns about a mechanical correlation between these terms. We therefore re-run specification (7) using the median quantity shipped, $MedQPS_{mhcz}$ and the median weeks between shipments $MedWBS_{mhcz}$ as right-hand side variables. We also run a regression using the median unit value, $MedUV_{mhcz}$ as right-hand side variable. Results in Table A.10 are very similar to the baseline.

Different Modes of Transportation: Results in Table A.11 show that results hold separately for vessel vs. air shipments.

Differentiated Products Versus Commodities: We examine whether buyers are more likely to use J procurement for differentiated goods. If differentiated products have higher inspection costs, then by Proposition 2.1 buyers are more likely to use J procurement for them. As a result, differentiated goods should exhibit smaller shipment size, greater frequency, and higher unit import values, as well as greater relationship duration and lower SPS. We examine these features of the model in the following $mhcz$-level OLS specification,

$$\overline{Y}_{mhcz} = \beta_0 + \beta_1 Diff_h + \beta_2 \ln(VPW_{mhcz}) + \beta_3 beg_{mhcz} + \beta_4 end_{mhcz} + \lambda_{cz} + \epsilon_{mhcz}.$$

We consider four dependent variables: weeks between shipments (WBS_{mhcz}), average relationship length ($length_{mhcz}$), sellers per shipment (SPS_{mhcz}), and transaction value per shipment VPS_{mhcz}. We use VPS_{mhcz} as a measure of average transaction size and do not include quantity or unit value since the regression compares shipping systems across products, which are recorded in different units.[62] On the right-hand side, $Diff_h$ is a dummy variable indicating that product h is either differentiated or has a reference price, as opposed to being a commodity, according to the commonly-cited product categorization scheme proposed by Rauch (1999). Because the right-hand-side variable of interest varies only at the product level, we are unable to include product fixed effects, so comparisons are made within country-mode bins by including fixed effects at that level (λ_{cz}). Since we cannot standardize quantities to be consistent across products, we control for potential scale effects using value per week (VPW_{mhcz}).

Results, reported in Table A.12, confirm that differentiated products are more J: they are shipped with fewer weeks between shipments, the average transaction size is smaller, and the average relationship length is longer. Moreover, as buyer quadruples encompassing differentiated goods tend to have lower sellers per shipment.

A vs J Within Sellers: We next examine whether buyer quadruples' sellers per

[62] For example, we cannot really compare the price of one barrel of oil to the price of one shoe.

shipment, SPS_{mhcz}, predicts theory-consistent procurement patterns *within* each of their exporter relationships. In principle, a buyer quadruple could appear J in aggregate even if it were not with respect to each of its sellers. For example, a buyer quadruple might obtain frequent shipments from a few sellers, thus appearing to be J , but shipments within each seller might be dispersed if the buyer alternates among them. We use the following *mxhcz*-level OLS regression,

$$Y_{mxhcz} = \beta_0 + \beta_1 SPS_{mhcz} + \beta_2 \ln(QPW_{mxhcz}) + \beta_3 beg_{mxhcz} + \beta_4 end_{mxhcz} + \lambda_{xhcz} + \epsilon_{mxhcz}.$$

In this specification, Y_{mxhcz} represents procurement attributes at the buyer-seller relationship quintuple (*mxhcz*) level, and the right-hand-side variables are defined at this level as well, with the exception of SPS_{mhcz} which continues to be at the *mhcz* level.[63] We also include exporter by product by country by mode fixed effects (λ_{xhcz}) to compare buyer procurement patterns within sellers who may be heterogeneous in a number of attributes, including production costs. Results, reported in Table A.13, are similar to those in Section 3.2, providing further support for Proposition 2.3, as well as the use of SPS_{mhcz}.

Average Firm Attributes: In regression (8), we use the firm-level attribute in the year of the firm's first import transaction. In Table A.14 we instead compute for each buyer quadruple an average of the firm attribute across all years in which the quadruple is active, and then average across quadruples. The results are similar to the baseline.

Additional Robustness: In Supplemental Appendix L, available on the authors' websites, we perform two additional analyses. First, we construct an alternative relationship duration variable using the duration of *mxhcz* quintuples. If firms treat relationships with the same supplier across different products or modes of transportation as different relationships, this definition would be appropriate. The results are similar. Second, we show that adding importer fixed effects to specification (7) increases R-squared modestly while the estimated coefficients are similar to before.

[63] Thus, a different number of shipments is used in the denominator of the dependent variable QPS_{mxhcz} and the independent variable SPS_{mhcz}, alleviating concerns about a mechanical correlation between the two in this regression.

Table A.7: A vs J Classification Regression With At Least 10 Transactions

Dep. var.	$\log(QPS_{mhcz})$	$\log(WBS_{mhcz})$	$\log(UV_{mhcz})$	$\log(length_{mhcz})$
$\log(SPS_{mhcz})$	0.359***	0.370***	−0.064***	−0.504***
	0.015	0.016	0.020	0.013
$\log(QPW_{mhcz})$	0.700***	−0.306***	−0.273***	−0.134***
	0.014	0.014	0.019	0.005
Observations	1,645,000	1,645,000	1,645,000	1,645,000
R-squared	0.950	0.659	0.855	0.488
Fixed effects	hcz	hcz	hcz	hcz
Controls	beg, end	beg, end	beg, end	beg, end

Source: LFTTD and authors' calculations. Table reports the results of regressing noted attribute of importer by product by country by mode of transport ($mhcz$) bins on sellers per shipment (SPS_{mhcz}) and total quantity shipped per week (QPW_{mhcz}). All regressions include hcz fixed effects, control for the beginning and end week of the quadruple, and exclude quadruples with less than 10 shipments. Standard errors, adjusted for clustering by country (c) and product (h) are reported below coefficient estimates. ***, **, and * represent statistical significance at the 1, 5 and 10 percent levels.

Table A.8: A vs J Classification Regression With SPS at mhc Level

Dep. var.	$\log(QPS_{mhcz})$	$\log(WBS_{mhcz})$	$\log(UV_{mhcz})$	$\log(length_{mhcz})$
$\log(SPS_{mhc})$	0.346***	0.376***	−0.083***	−0.578***
	0.014	0.015	0.018	0.013
$\log(QPW_{mhcz})$	0.687***	−0.322***	−0.279***	−0.147***
	0.015	0.015	0.020	0.005
Observations	2,966,000	2,966,000	2,966,000	2,966,000
R-squared	0.944	0.654	0.844	0.442
Fixed effects	hcz	hcz	hcz	hcz
Controls	beg, end	beg, end	beg, end	beg, end

Source: LFTTD and authors' calculations. Table reports the results of regressing noted attribute of importer by product by country by mode of transport ($mhcz$) bins on sellers per shipment defined for broader mhc bins (SPS_{mhc}) and total quantity shipped per week (QPW_{mhcz}). All regressions include hcz fixed effects, control for the beginning and end week of the quadruple, and exclude quadruples with less than five shipments. Standard errors, adjusted for clustering by country (c) and product (h) are reported below coefficient estimates. ***, **, and * represent statistical significance at the 1, 5 and 10 percent levels.

Table A.9: A vs J Classification Regression With SPS at mh Level

Dep. var.	$\log(QPS_{mhcz})$	$\log(WBS_{mhcz})$	$\log(UV_{mhcz})$	$\log(Length_{mhcz})$
$\log(SPS_{mh})$	0.285***	0.311***	−0.063***	−0.483***
	0.019	0.020	0.021	0.009
$\log(QPW_{mhcz})$	0.668***	−0.343***	−0.274***	−0.115***
	0.014	0.014	0.020	0.006
Observations	2,966,000	2,966,000	2,966,000	2,966,000
R-squared	0.940	0.631	0.844	0.379
Fixed effects	hcz	hcz	hcz	hcz
Controls	beg, end	beg, end	beg, end	beg, end

Source: LFTTD and authors' calculations. Table reports the results of regressing noted attribute of importer by product by country by mode of transport ($mhcz$) bins on sellers per shipment defined for broader mh bins (SPS_{mh}) and total quantity shipped per week (QPW_{mhcz}). All regressions include hcz fixed effects, control for the beginning and end week of the quadruple, and exclude quadruples with less than five shipments. Standard errors, adjusted for clustering by country (c) and product (h) are reported below coefficient estimates. ***, **, and * represent statistical significance at the 1, 5 and 10 percent levels.

Table A.10: A vs J Classification Regression With Median Variables

	(1)	(2)	(3)
Dep. var.	$\log(MedQPS_{mhcz})$	$\log(MedWBS_{mhcz})$	$\log(MedUV_{mhcz})$
$\log(SPS_{mh})$	0.317***	0.384***	−0.229***
	0.028	0.017	0.023
$\log(QPW_{mhcz})$	0.656***	−0.301***	−0.358***
	0.012	0.014	0.029
Observations	2,926,000	2,926,000	2,926,000
R-squared	0.913	0.540	0.857
Fixed effects	*hcz*	*hcz*	*hcz*
Controls	beg, end	beg, end	beg, end

Source: LFTTD and authors' calculations. Table reports the results of regressing noted median attribute of importer by product by country by mode of transport (*mhcz*) bins on sellers per shipment defined for *mhcz* bins (SPS_{mhcz}) and total quantity shipped per week (QPW_{mhcz}). $MedQPS_{mhcz}$, $MedWBS_{mhcz}$, and $MedUV_{mhcz}$ are median quantity per shipment, median weeks between shipment, and median unit value. All regressions include product by country by mode of transport (*hcz*) fixed effects, control for the beginning and end week of the quadruple, and exclude quadruples with less than five shipments. Standard errors, adjusted for clustering by country (c) and product (h) are reported below coefficient estimates. ***, **, and * represent statistical significance at the 1, 5 and 10 percent levels.

Table A.11: A vs J Classification Regression Across Mode of Transport

	(1)	(2)	(3)	(4)
Dep. var.	$\log(QPS_{mhcz})$	$\log(WBS_{mhcz})$	$\log(UV_{mhcz})$	$\log(length_{mhcz})$
	Vessel			
$\log(SPS_{mhcz})$	0.419***	0.451***	-0.172***	-0.570***
	0.015	0.015	0.013	0.018
$\log(QPW_{mhcz})$	0.661***	-0.347***	-0.263***	-0.177***
	0.011	0.011	0.018	0.008
Observations	1,506,000	1,506,000	1,506,000	1,506,000
R-squared	0.924	0.686	0.829	0.434
	Air			
$\log(SPS_{mhcz})$	0.410***	0.443***	-0.058**	-0.609***
	0.022	0.022	0.025	0.018
$\log(QPW_{mhcz})$	0.737***	-0.272***	-0.300***	-0.106***
	0.015	0.015	0.023	0.005
Observations	1,029,000	1,029,000	1,029,000	1,029,000
R-squared	0.933	0.635	0.764	0.416

Source: LFTTD and authors' calculations. Table reports the results of regressing noted attribute of importer by product by country by mode of transport (*mhcz*) bins on bins' sellers per shipment (SPS_{mhcz}) and total quantity shipped per week (QPW_{mhcz}). QPS_{mhcz}, WBS_{mhcz}, P_{mhcz}, and $length_{mhcz}$ are average quantity per shipment, average weeks between shipment, average unit value (i.e. value divided by quantity), and average relationship length. All regressions include product by country by mode of transport (*hcz*) fixed effects, control for the beginning and end week of the quadruple, and exclude quadruples with less than five shipments. Standard errors, adjusted for clustering by country (c) and product (h), are reported below coefficient estimates. ***, **, and * represent statistical significance at the 1, 5 and 10 percent levels.

Table A.12: A vs J Classification Regression for Differentiated Goods

	(1)	(2)	(3)	(4)
Dep. var.	$\log(WBS_{mhcz})$	$\log(VPS_{mhcz})$	$\log(length_{mhcz})$	$\log(SPS_{mhcz})$
$Diff_h$	-0.234***	-0.225***	0.073**	-0.082***
	0.026	0.025	0.028	0.025
$\log(VPW_{mhcz})$	-0.464***	0.557***	-0.045***	-0.203***
	0.002	0.002	0.001	0.001
Observations	$2,589,000$	$2,589,000$	$2,589,000$	$2,589,000$
R-squared	0.611	0.730	0.193	0.278
Fixed effects	cz	cz	cz	cz
Controls	beg, end	beg, end	beg, end	beg, end

Source: LFTTD and authors' calculations. Table reports the results of regressing noted attribute of US importer by product by country by mode of transport ($mhcz$) bins on a dummy for whether the bin's product code is differentiated or reference priced according to the liberal classification by Rauch, 1999 and on value shipped per week (VPW_{mhcz}). WBS_{mhcz}, VPS_{mhcz}, $length_{mhcz}$, and SPS_{mhcz} are average weeks between shipment, average value per shipment, average relationship length, and sellers per shipment. All regressions include country by mode of transport (cz) fixed effects, control for the beginning and end week of the quadruple, and exclude quadruples with less than five shipments. Standard errors, adjusted for clustering by country and product, are reported below coefficient estimates. ***, **, and * represent statistical significance at the 1, 5 and 10 percent levels.

Table A.13: A vs J Classification Regression Across $mxhcz$ Quintuples

	(1)	(2)	(3)	(4)
Dep. var.	$\log(QPS_{mxhcz})$	$\ln(WBS_{mxhcz})$	$\ln(UV_{mxhcz})$	$\ln(length_{mxhcz})$
$\ln(SPS_{mhcz})$	0.100***	0.696***	−0.062***	−0.302***
	0.015	0.041	0.006	0.011
$\ln(QPW_{mxhcz})$	0.511***	−0.171***	−0.130***	−0.241***
	0.010	0.009	0.011	0.008
Observations	$4,783,000$	$4,783,000$	$4,783,000$	$4,783,000$
R-squared	0.966	0.621	0.953	0.786
Fixed effects	$xhcz$	$xhcz$	$xhcz$	$xhcz$
Controls	beg, end	beg, end	beg, end	beg, end

Source: LFTTD and authors' calculations. Table reports the results of regressing noted attribute of US importer by foreign exporter by product by country by mode of transport ($mxhcz$) bins on bins' sellers per shipment (SPS_{mhcz}) and total quantity shipped per week (QPW_{mxhcz}). WBS_{mhcz}, VPS_{mhcz}, $length_{mhcz}$, and SPS_{mhcz} are average weeks between shipment, average value per shipment, average relationship length, and sellers per shipment. All regressions include exporter by product by country by mode of transport ($xhcz$) fixed effects, control for the beginning and end week of the quintuple, and exclude buyer quadruples with less than five shipments. Standard errors, adjusted for clustering by country (c) and product (h) bins are reported below coefficient estimates. ***, **, and * represent statistical significance at the 1, 5 and 10 percent levels.

Table A.14: SPS_m and Firm Characteristics

	(1)	(2)	(3)	(4)
Dep. var.	$\log(sales_m)$	$\log(pay_m)$	$\log(wage_m)$	$(inv/sales)_m$
$\log(SPS_m)$	-0.255^{***}	-0.313^{***}	-0.066^{***}	0.016^{***}
	0.005	0.006	0.002	0.001
Observations	184,000	184,000	184,000	48,500
R-squared	0.012	0.014	0.004	0.007

Source: LFTTD and authors' calculations. Table reports the results of regressing importer characteristics averaged across all years in which the importer is active on sellers per shipment (SPS_{mhcz}) averaged across all quadruples involving the importer. All regressions exclude quadruples with less than five shipments. ($sales_m$), (pay_m), ($wage_m$), and (($inv/sales)_m$) are total sales, total payroll, average wage (i.e., payroll divided by number of employees), and total inventory at the beginning of the year divided by total sales, respectively. Robust standard errors are reported below coefficient estimates. ***, **, and * represent statistical significance at the 1, 5 and 10 percent levels.

E Additional DID Regressions

Alternate Time Periods: We show that our baseline DID results also hold if we use a different post-PNTR period from 2004 to 2009. Table A.15 presents the results from the continuing relationship PNTR regression (9), and Table A.16 shows the results for the regression with only new relationships. All results retain their expected sign and remain significant. Table A.17 presents the results from the within-importer regression, equation (10), both at the $mhcz$ level and at the hcz level. On average, we find that the results from the main text become stronger for this later post-period, possibly because the shift of systems takes time.

No Quantity Control: One concern with our analysis could be that by conditioning on quantity we do not take into account that PNTR also affects the quantity traded, which could in turn affect the procurement system. We therefore run the baseline PNTR regression (9) without quantity control, QPW_{mxhczt}. Results in Table A.18 show that we still find a decline in the quantity per shipment and an increase in the unit value. The effect on weeks between shipments is qualitatively consistent with the theory, though not significant at conventional levels.

All Relationships: We re-run our relationship-level PNTR regression (9) using both continuing and new relationships simultaneously for all buyer quadruples and sellers that appear in both, where we use importer-product-country-mode of transportation ($mhcz$) fixed effects, exporter (x) fixed effects, and period (t) fixed effects. Our results in Table A.19 indicate that PNTR leads to a decline in the quantity per shipment and the number of weeks between shipments, and an increase in the unit value for this set of relationships, consistent with a shift to J procurement.

mhcz Quadruple Level: In the main text we show that PNTR changed the shipping patterns (quantity per shipment, weeks between shipments, and unit value) at the $mxhcz$ level. In Supplemental Appendix N, we show that the shift from A to J procurement also altered shipping patterns at the $mhcz$ quadruple level.

Table A.15: Within $mxhcz$ Quintuple PNTR DID Regression: 2004-2009 vs 1995-2000

	(1)	(2)	(3)
Dep. var.	$\ln(QPS_{mxhczt})$	$\ln(WBS_{mxhczt})$	$\ln(UV_{mxhczt})$
$Post_t * China_c * NTRGap_h$	-0.199***	-0.163***	0.149***
	0.017	0.021	0.031
$ln(QPW_{mxhczt})$	0.403***	-0.606***	-0.133***
	0.009	0.008	0.014
Observations	221,000	221,000	221,000
R-squared	0.980	0.883	0.982
Fixed effects	$mxhcz, t$	$mxhcz, t$	$mxhcz, t$
Controls	Yes	Yes	Yes

Source: LFTTD and authors' calculations. Table reports the results of regressing noted attribute of US importer by exporter by product by country by mode of transport ($mxhcz$) bins on the difference-in-differences term of interest and quantity shipped per week. Pre-and post periods are 1995 to 2000 and 2004 to 2009. (QPS_{mxhczt}), (WBS_{mxhczt}), and (UV_{mxhczt}) are average quantity per shipment, average weeks between shipments, and average unit value (i.e. value divided by quantity) in period t. All regressions include $mxhcz$ and period t fixed effects, control for the beginning and end week of the quintuple as well as all variables needed to identify the DID term of interest. Standard errors, adjusted for clustering by country (c) and product (h), are reported below coefficient estimates. ***, **, and * represent statistical significance at the 1, 5 and 10 percent levels.

Table A.16: New $mxhcz$ Quintuple PNTR DID Regression: 2004-2009 vs 1995-2000

	(1)	(2)	(3)
Dep. var.	$\ln(QPS_{mxhczt})$	$\ln(WBS_{mxhczt})$	$\ln(UV_{mxhczt})$
$Post_t * China_c * NTRGap_h$	-0.087**	-0.067*	0.075*
	0.036	0.035	0.045
$\ln(QPW_{mxhczt})$	0.414***	-0.590***	-0.127***
	0.012	0.011	0.017
Observations	3,158,000	3,158,000	3,158,000
R-squared	0.968	0.845	0.973
Fixed effects	$mhcz, x, t$	$mhcz, x, t$	$mhcz, x, t$
Controls	Yes	Yes	Yes

Source: LFTTD and authors' calculations. Table reports the results of regressing noted attribute of US importer by exporter by product by country by mode of transport ($mxhcz$) bins on the difference-in-differences term of interest and quantity shipped per week. Pre-and post periods are 1995 to 2000 and 2004 to 2009. (QPS_{mxhczt}), (WBS_{mxhczt}), and (UV_{mxhczt}) are average quantity per shipment, average weeks between shipments, and average unit value (i.e. value divided by quantity) in period t. All regressions include $mxhcz$ and period t fixed effects, control for the beginning and end week of the quintuple as well as all variables needed to identify the DID term of interest. Standard errors, adjusted for clustering by country (c) and product (h), are reported below coefficient estimates. ***, **, and * represent statistical significance at the 1, 5 and 10 percent levels.

Table A.17: Within-Importer PNTR Regression: 2004-2009 vs 1995-2000

	(1)	(2)	(3)	(4)
Dep. var.	$\ln(SPS_{mhczt})$	$1\{J^{hcz}_{mhczt} = 1\}$	$\ln(SPS_{hczt})$	J^{hcz}_{hczt}
$Post_t * China_c * NTRGap_h$	-0.076**	0.076**	-0.027**	0.042
	0.037	0.029	0.011	0.027
$ln(QPW_{mhczt})$	-0.186***	0.125***	-0.059***	0.031***
	0.005	0.005	0.002	0.004
Observations	556,000	225,000	355,000	28,000
R-squared	0.757	0.660	0.687	0.550
Fixed effects	$mhcz, t$	$mhcz, t$	hcz, t	hcz, t
Controls	Yes	Yes	Yes	Yes

Source: LFTTD and authors' calculations. First two columns report the results of regressing noted attribute of US importer by product by country by mode of transport ($mhcz$) bins on the difference-in-differences term of interest and quantity shipped per week. Second two columns are analogous but at the hcz level of aggregation. Pre- and post-PNTR periods are 1995 to 2000 and 2004 to 2009. All regressions include period t fixed effects, and control for the beginning and end week of the quadruple as well as all variables needed to identify the DID term of interest. Regressions in columns two and four are restricted to quadruples with at least five transactions in both periods. Standard errors, adjusted for clustering by country (c) and product (h), are reported below coefficient estimates. ***, **, and * represent statistical significance at the 1, 5 and 10 percent levels.

Table A.18: Baseline Within $mxhcz$ Quintuple PNTR DID Regression Without Quantity: 2002-2007 vs 1995-2000

	(1)	(2)	(3)
Dep. var.	$\ln(QPS_{mxhczt})$	$\ln(WBS_{mxhczt})$	$\ln(UV_{mxhczt})$
$Post_t * China_c * NTRGap_h$	-0.2753***	-0.0339	0.1186***
	0.0076	0.0318	0.0191
Observations	439,000	439,000	439,000
R-squared	0.97	0.69	0.98
Fixed effects	$mxhcz, t$	$mxhcz, t$	$mxhcz, t$
Controls	Yes	Yes	Yes

Source: LFTTD and authors' calculations. Table reports the results of regressing noted attribute of US importer by exporter by product by country by mode of transport ($mxhcz$) bins on the difference-in-differences term of interest and quantity shipped per week. Pre-and post periods are 1995 to 2000 and 2002 to 2007. (QPS_{mxhczt}), (WBS_{mxhczt}), and (UV_{mxhczt}) are average quantity per shipment, average weeks between shipment, and average unit value (i.e. value divided by quantity) in period t. All regressions include $mxhcz$ and period t fixed effects, control for the beginning and end week of the quadruple as well as all variables needed to identify the DID term of interest. Standard errors, adjusted for clustering by country (c) and product (h), are reported below coefficient estimates. ***, **, and * represent statistical significance at the 1, 5 and 10 percent levels.

Table A.19: Within $mxhcz$ Quintuple PNTR DID Regression Using All Relationships: 2002-2007 vs 1995-2000

	(1)	(2)	(3)
Dep. var.	$\ln(QPS_{mxhczt})$	$\ln(WBS_{mxhczt})$	$\ln(UV_{mxhczt})$
$Post_t * China_c * NTRGap_h$	-0.131***	-0.115**	0.078***
	0.012	0.012	0.027
$ln(QPW_{mxhczt})$	0.407***	-0.597***	-0.130***
	0.013	0.012	0.018
Observations	4,023,000	4,023,000	4,023,000
R-squared	0.966	0.838	0.971
Fixed effects	$mhcz, x, t$	$mhcz, x, t$	$mhcz, x, t$
Controls	Yes	Yes	Yes

Source: LFTTD and authors' calculations. Table reports the results of regressing noted attribute of US importer by exporter by product by country by mode of transport ($mxhcz$) bins on the difference-in-differences term of interest and quantity shipped per week. Pre-and post periods are 1995 to 2000 and 2002 to 2007. (QPS_{mxhczt}), (WBS_{mxhczt}), and (UV_{mxhczt}) are average quantity per shipment, average weeks between shipment, and average unit value (i.e. value divided by quantity) in period t. All regressions include $mhcz$, exporter x, and period t fixed effects, and control for the beginning and end week of the quadruple as well as all variables needed to identify the DID term of interest. Standard errors, adjusted for clustering by country (c) and product (h), are reported below coefficient estimates. ***, **, and * represent statistical significance at the 1, 5 and 10 percent levels.

F Market Clearing Conditions

Goods market clearing implies that production equals consumption for each ω:

$$\sum_n \sum_i \sum_s I_{ni,s}(\omega) x^*_{ni,s}(\omega) = \sum_n \sum_i \sum_s I_{ni,s}(\omega) \int_0^{x^*_{ni,s}(\omega)/q_n(\omega)} q_n(\omega) dt \quad \forall \omega, \tag{A.5}$$

where $I_{ni,s}(\omega)$ is an indicator function that is equal to one if the buyer in country n procures product ω from country i under system s, and zero otherwise.

The market for the homogeneous good clears as well,

$$\sum_n Z_n = \sum_n a_n L_n^O. \tag{A.6}$$

Finally, labor market clearing in each country requires that

$$\begin{aligned} L_n = & \sum_i \sum_s \int_0^1 I_{in,s}(\omega) \frac{\bar{\theta}}{\Upsilon_n(\omega)} q_i(\omega) d\omega + f_n \sum_i \sum_s \int_0^1 I_{in,s}(\omega) \frac{q_i(\omega)}{x^*_{in,s}(\omega)} d\omega \\ & + \sum_i \int_0^1 I_{ni,A}(\omega) m(\omega) \frac{q_n(\omega)}{x^*_{ni,s}(\omega)} d\omega + L_n^O \quad \forall n \in N, \end{aligned} \tag{A.7}$$

where the left-hand side is total labor supply in country n, and on the right-hand side we have labor used in manufacturing production, labor used for fixed costs, labor used for inspections, and the homogeneous "outside" good labor, respectively. Since the fixed costs and the inspection costs are paid for each shipment, we scale these costs by the number of shipments per period.

G Equilibrium Solution Algorithm

We discretize the product space to $\Omega = 5,000$ products, and follow the steps in Table A.20. Our algorithm first computes the average cost curves and shipment sizes on a grid of inspection costs, productivities, trade war arrival rates, and quantities. We then guess a price index and total income for each country, trace out the demand curves, find the intersection of supply and demand, and iterate to convergence. We compute the average cost curves outside of the iteration algorithm since the numerical solution of the buyer's problem is quite time consuming. While in principle it would be possible to solve the buyer's problem within each iteration for each $ni\omega$ tuple, using linear interpolation on a grid during the iteration process is much faster.

Table A.20: Equilibrium Solution Algorithm

Step	Description
1	Initiate the model by drawing an inspection cost $m(\omega)$ for each product ω and country n from $G_n(m)$ and by drawing a productivity $\Upsilon_n(\omega)$ from $F_n(\Upsilon)$. Also set the trade war arrival rates ρ_{ni} for each country pair.
2	Define a four-dimensional grid with $(K_1 \times K_2 \times K_3 \times Q)$ grid points, where $K_1 = 70$, $K_2 = 60$, $K_3 = 60$, and $Q = 70$. Let $\mathbf{k} \equiv (k_1, k_2, k_3, q_k)$ denote a given grid point. Solve numerically for the average costs $AC(\mathbf{k})$ at each grid point under each system, using equation (4), i.e. $AC_A(\mathbf{k}) = \min_x \left(\frac{r}{q_k}\right) \frac{k_1 + k_2 x}{\left[1 - e^{-rx/q_k}\right]}$ and $AC_J(\mathbf{k}) = \min_x \left(\frac{r}{q_k}\right) \frac{k_1 + e^{(r+k_3)x/q_k} k_2 x}{\left[1 - e^{-rx/q_k}\right]}$. We denote by $x_A(\mathbf{k})$ and $x_J(\mathbf{k})$ the cost-minimizing shipment sizes under each system at grid point $\mathbf{k}$.
3	Map the draw $(m(\omega), \Upsilon_i(\omega), \rho_{ni})$ of each origin country (i)-destination country (n)-product (ω) triplet to an estimated average cost for each q_k using linear interpolation on the grid of average costs computed in Step 2, where under the A system we use $k_1 = f_i w_i + m(\omega) w_n$, $k_2 = \frac{\bar{\theta}}{\Upsilon_i(\omega)} w_i$ and under the J system we use $k_1 = f_i w_i$, $k_2 = \frac{\bar{\theta}}{\Upsilon_i(\omega)} w_i$, and $k_3 = \rho_{ni}$. Similarly, obtain the shipment sizes, $x^*_{ni,s}$, from linear interpolation on the grid of shipment sizes computed in Step 2.
4	Determine the cost minimizing system and origin country at each quantity q_k for each destination-product market $n\omega$, using equation (12). This traces out the average cost curve $AC_{n\omega}(q_k)$ of each market.
5	Begin iteration $t = 0$. Guess an initial manufacturing price index in each destination country, $P_n(t)$, and an initial total income, $W_n(t)$.

Step	Description
5.a	Compute each destination-product market $n\omega$'s demand curve, using utility maximization, by computing for each q_k the price $p_n(\omega; q_k, t) = \left(\frac{\alpha W_n(t)}{q_k}\right)^{\frac{1}{\sigma}} P_n(t)^{\frac{\sigma-1}{\sigma}}$.
5.b	Find the intersection between supply and demand curve in each market, using linear interpolation between grid points, to obtain the equilibrium $(p_n^*(\omega), q_n^*(\omega))$. If there are several intersections, find the last intersection at which the demand curve intersects the supply curve from above. Using the equilibrium prices in each market, compute a new price index, $P_n(t+1)$.
5.c	Determine the labor used for production, fixed costs, and inspection costs. Use the labor market clearing condition (A.7) to determine labor used for the homogeneous good sector L_n^O . Verify that this labor is non-negative.
5.d	Compute the total income in each country, $W_n(t+1)$, which is equal to labor income $w_n L_n$ plus profits under the "Japanese" system, see equation (13). Return to Step 5.a with $\{P_n(t+1), W_n(t+1)\}$ and iterate to convergence.

H Parameters and Empirical Moments

Table A.21 provides more detail on how we set the calibrated parameters in Table 9. Table A.22 contains more detail on how we construct the moments for the estimation.

Table A.21: Calibrated Parameters

Parameter	Description
Interest rate (r)	As in Caliendo et al. (2019)
Elasticity of substitution (σ)	We follow Antràs et al. (2017). They find a median markup of 35 percent across establishments. This estimate implies an elasticity of substitution of $\sigma = 3.85$.
Consumption share of manufactured goods (α)	We construct this parameter based on estimates by Duarte (2020), who uses detailed data on household consumption expenditure from the International Comparisons Programs (ICP) to compute consumption expenditures and relative prices of manufactured goods and services in many countries. She computes a real share of manufactured goods consumption in all consumption expenditures of $45\% - 50\%$ for high-income countries such as the United States (Table 4).
Dispersion of productivities (ζ)	We set this parameter based on Eaton and Kortum (2002), who estimate it from a gravity equation that relates bilateral trade flows to the characteristics of the trading partners and the distance between them.
Productivity (a_n)	We exploit that $a_n = w_n$ and set productivity based on average wages. We estimate wages as two thirds times GDP divided by the size of the labor force (i.e., GDP per worker) from the World Bank World Development Indicators (WDI) in 2016. For each country we obtain GDP in current USD (series NY.GDP.MKTP.CD) and the total size of the labor force (series SL.TLF.TOTL.IN). For RoW, we take an average across the US' top-ten trading partners (listed in Table 2) using US imports from each country in 2016 as weight. US is normalized to 1.

Parameter	Description
Labor force (L_n)	We obtain the size of the labor force from the World Development Indicators (WDI) in 2016 (series SL.TLF.TOTL.IN). For RoW, we sum the labor force of the top ten US trading partners in the period 1992-2016. The United States is normalized to 1.
Rate of trade wars US -China ($\rho_{US,CN}$)	We take all J buyer-seller ($mxhcz$) quintuples in our data, identified as those where the associated $mhcz$ quadruple is in the first quartile of the within-country-product-mode (hcz) SPS distribution in the entire dataset. We compute for these the probability that a relationship separates after τ quarters, separately for China and RoW $$S_{c\tau} = \frac{\sum_{mxhzt} \mathbb{I}^T(\tau_{mxhczt} = \tau)}{\sum_{mxhzt} \mathbb{I}(\tau_{mxhczt} = \tau)}$$ where $\mathbb{I}(\tau_{mxhczt} = \tau)$ is equal to one if quintuple $mxhcz$ is at age $\tau_{mxhczt} = \tau$ quarters in quarter t, and $\mathbb{I}^T(\tau_{mxhczt} = \tau)$ is equal to one for all such quintuples that additionally trade for the last time in quarter t. We then fit the exponential decay function $e^{-\psi_{US,i} t}$ to the estimated separation probabilities to minimize the squared deviation for i =China and i =RoW. Since many quintuples trade only once, we fit this function from quarter two onwards, $\tau = 2, ..., 100$. We obtain $\psi_{US,RoW} = 0.0873$ and $\psi_{US,CN} = 0.1137$ yielding a difference of $\rho_{US,CN} = 0.0264$.

Table A.22: Construction of Empirical Moments

Moment	Description
Share of Chinese imports in domestic manufacturing sales	We target the US import penetration from China in 2016, computed as $$IP_{CN} = \frac{\text{Imports}_{CN}}{\text{Domestic output} + \text{Total imports} - \text{Total exports}},$$ where Imports_{CN} are US imports from China from https://www.census.gov/foreign-trade/balance/c5700.html, Domestic output denotes gross output in the manufacturing sector from https://www.bea.gov/itable/gdp-by-industry, and Total imports and Total exports are US imports and exports of goods from https://www.census.gov/foreign-trade/balance/country.xlsx
Share of rest of world imports in domestic manufacturing sales	We target the US import penetration from the rest of the world in 2016, computed as: $$IP_{RoW} = \frac{\text{Imports}_{RoW}}{\text{Domestic output} + \text{Total imports} - \text{Total exports}}$$ where Imports_{RoW} are US imports from all countries except China from https://www.census.gov/foreign-trade/balance/country.xlsx.
Standard deviation of $\hat{\epsilon}$	We take the residuals from (14) and retain only those that have $\overline{WBS}_{mhcz}$ in the fourth quartile of the WBS distribution, i.e., those most likely associated with A sourcing, separately for imports from China and from the rest of the world. We collapse the residuals to the HS10 level to remove variation in shipping frequency within the same product that is unrelated to inspection costs and then take the standard deviation of the resulting product-level average residuals.

I Additional Estimation Details and Robustness

I.1 Baseline Estimation

The objective is to find a parameter vector ϕ^* that solves

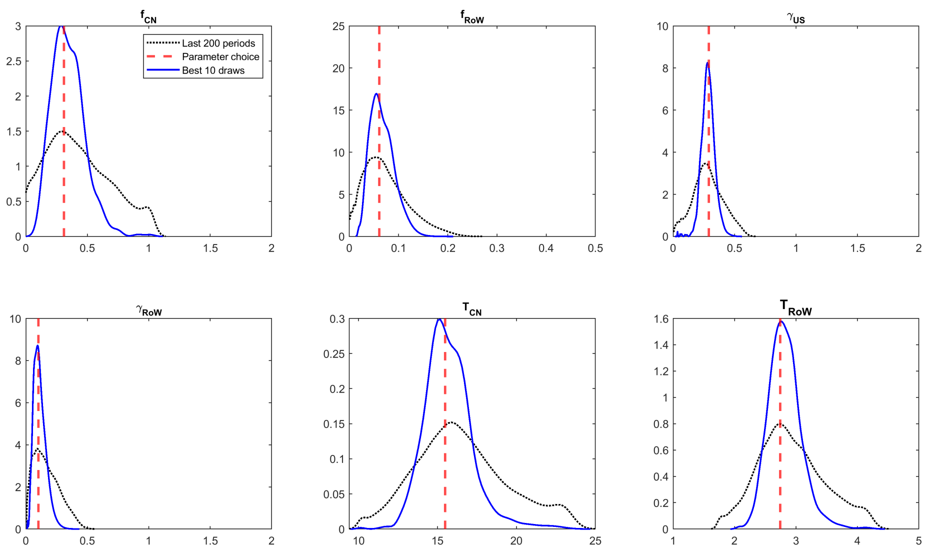
$$\arg\min_{\phi \in \mathbb{F}} \sum_x T(\mathcal{M}_x(\phi), \hat{\mathcal{M}}_x) \tag{A.8}$$

where $T(\cdot)$ is the percentage difference between the model, $(\mathcal{M}_x(\phi))$, and data, $(\hat{\mathcal{M}}_x)$, moments, and $\mathbb{F}$ is the set of admissible parameter vectors, which is bounded to be strictly positive and finite. In the choice of the function $T((\mathcal{M}_x(\phi), (\hat{\mathcal{M}}_x))$ we follow Lise et al. (2016) and minimize the sum of the percentage deviations between model-generated and empirical moments.

The minimization algorithm that we use to solve the problem combines the approaches of Lise et al. (2016) and Engbom and Moser (2022), adapted to our needs. We simulate, using Markov Chain Monte Carlo for classical estimators as introduced in Chernozhukov and Hong (2003), 100 strings of length 1,000 (+ 200 initial scratch periods used only to calculate posterior variances) starting from 100 different guesses for the vector of parameters ϕ_0. In the first run, we choose the initial guesses to span a large space of possible parameter vectors. In updating the parameter vector along the MCMC simulation, we pick the variance of the shocks to target an average rejection rate of 0.7, as suggested by Gelman et al. (2013). The average parameter values across the 20 strings with the lowest values of the objective function provide a first estimate of the vector of parameters. We then repeat the same MCMC procedure, but we start each of our 100 strings from these parameter estimates.

Figure A.1 illustrates our approach. The black dotted line shows the density function of the parameter values associated with the last 200 iterations of our 100 strings. We pick the optimal parameters (red dashed lines) following Engbom and Moser (2022) as the average across the 100 best outcomes across all the draws. These correspond to the estimates reported in Table 10. For comparison, the blue density function shows the density of the 10 best outcomes of each string, computed across all strings. This density provides an alternative way to select the best parameter values. All the densities are single-peaked, which suggests that the model is, at least locally, identified. Moreover, our chosen parameter values are generally very close to the peak of the densities.

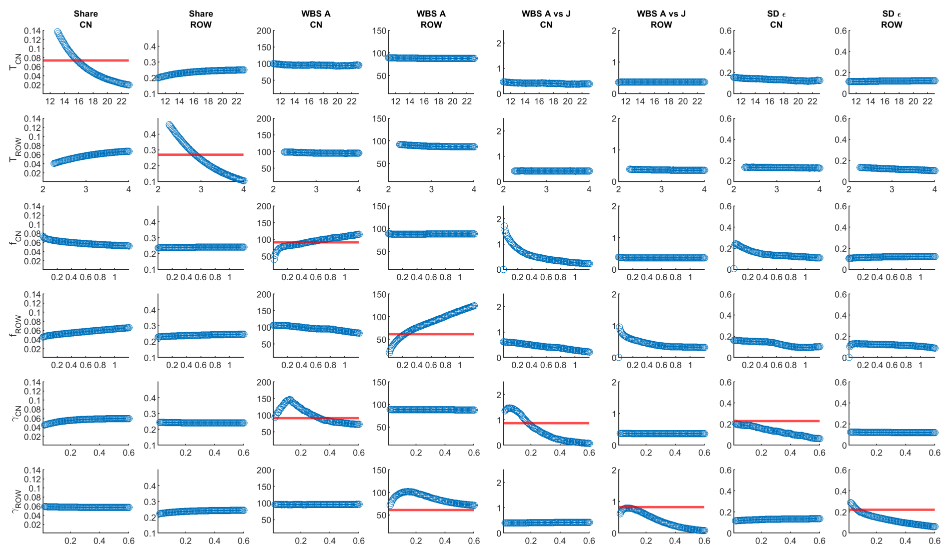
Figure A.1: Estimation Outcomes



Source: Author's calculations, based on the estimation procedure described. Each panel shows the estimated parameter values for the parameter indicated in the title, under the assumption of a Pareto distribution for inspection costs. The black dotted line shows the density function of the parameter values associated with the last 200 iterations of our 100 strings. The red dashed line shows the average parameter values across the 100 best outcomes from all the draws. The blue density functions shows the density of the 10 best outcomes of each string, computed across all strings.

Figure A.2 provides more detail on how each parameter is identified. We start from the optimal parameter values (red dashed lines in the previous figure) and vary each of the six parameters one-by-one on a grid of 100 values. For each parameter combination we solve the model 100 times, re-drawing the random productivity and inspection costs, and compute the average value of each moment. The panels in Figure A.2 plot the different values of each parameter (rows) against the values of the eight moments (columns). The main moments identifying the parameters are along the diagonal. The red horizontal line represents the value of the moment in the data, and hence identifies the parameter value that would lead the model to perfectly match this moment. While the relationships between the first four parameters and their main identifying moments are monotonic, for the last two parameters (the dispersion of inspection costs, γ_n) the relationships with some of the targeted moments are hump-shaped. Thus, there could be multiple values for each of these parameters that match a given moment equally well. We therefore target two sets of moments for these parameters (in the last four columns). This strategy yields a unique value for these parameters that minimizes the objective function.

Figure A.2: Identification of Parameters



Source: Author's calculations, based on the estimation procedure described. Each panel plots different values of the parameter indicated on the row against the moment indicated on the column, keeping all other parameters fixed at their optimal value. The blue dots show the averaged moment value across 100 runs with the given parameter choice, where the averaging is needed since the inspection cost and productivity draws differ across runs. The red horizontal lines represent the value of the moment in the data. We add these only for the main panels used to identify a given parameter in the data.

We perform an additional identification exercise in Supplemental Appendix O.1 where we vary all six parameters jointly, rather than individually. We find similar relationships as in Figure A.2. Overall, these exercises highlight that our parameters of interest are well-identified from the moments we target.

I.2 Fréchet Distribution of Inspection Costs

We re-estimate the model using a Fréchet distribution instead of a Pareto distribution for the inspection costs, $G_n(m) = e^{-m^{-\gamma_n}}$, where γ_n needs to be estimated. The parameters set outside of the model are set as before.

Table A.23 presents the estimated parameter values and the values of the targeted moments in this estimation. The moments are reasonably well-matched, though less well than with the Pareto distribution.

Table A.24 shows selected moments from our equilibrium. Compared to the equilibrium with a Pareto distribution, the estimated share of J relationships is significantly higher for both China and for the rest of the world, with more than half of imports estimated to be under the J system. This higher share of J relationships results from the higher dispersion of inspection costs in this estimation, which generates more high inspection cost draws, leading J sourcing to be cheaper than A sourcing for more products.

We present the densities of the best parameter estimates analogously to Figure A.1 in Supplemental Appendix O.2 on the authors' websites.

Table A.23: Estimated Parameters and Targeted Moments

	(1)	(2)	(3)	(4)	(5)
	Parameter	Estimated Value	Moment that Primarily Identifies the Parameter	Moment in Data	Moment in Model
(1)	Productivity China (T_{CN})	15.973	Share of Chinese imports in domestic sales	0.074	0.049
(2)	Productivity RoW (T_{RoW})	2.769	Share of RoW imports in domestic sales	0.270	0.273
(3)	Fixed costs, China (f_{CN})	0.613	$\exp(\hat{\beta}_0 + \hat{\beta}_1 + \hat{\beta}_3\overline{beg} + \hat{\beta}_4\overline{end})$ from (14) for CN	91.00	105.49
(4)	Fixed costs, RoW (f_{RoW})	0.092	$\exp(\hat{\beta}_0 + \hat{\beta}_1 + \hat{\beta}_3\overline{beg} + \hat{\beta}_4\overline{end})$ from (14) for RoW	60.90	66.35
(5)	Dispersion of inspection	0.068	$\hat{\beta}_1$ from (14) for China	0.871	1.411
(6)	costs, China (γ_{CN})		Sd of $\hat{\epsilon}$ from (14) for China	0.227	0.187
(7)	Dispersion of inspection	0.056	$\hat{\beta}_1$ from (14) for RoW	0.822	0.726
(8)	costs, RoW (γ_{RoW})		Sd of $\hat{\epsilon}$ from (14) for RoW	0.219	0.238
(9)	Total objective $T(\cdot)$				0.580

Source: LFTTD and authors' calculations. Column (1) lists the parameters estimated for the model. Column (2) contains the estimated parameter values. Column (3) reports the moment targeted to identify the parameter. Column (4) presents the value of the moment in the data, and Column (5) presents the value of the moment computed in our simulated model.

Table A.24: Equilibrium Statistics with Fréchet Distribution

(1)	Share of consumption from China (%)	4.9%
(2)	- of which, J	56.7%
(3)	Share of consumption from ROW (%)	27.3%
(4)	- of which, J	67.6%
(5)	Share of consumption from United States (%)	67.8%
(6)	Avg. inspection costs	0.2%
(7)	Avg. fixed costs (imports)	6.8%

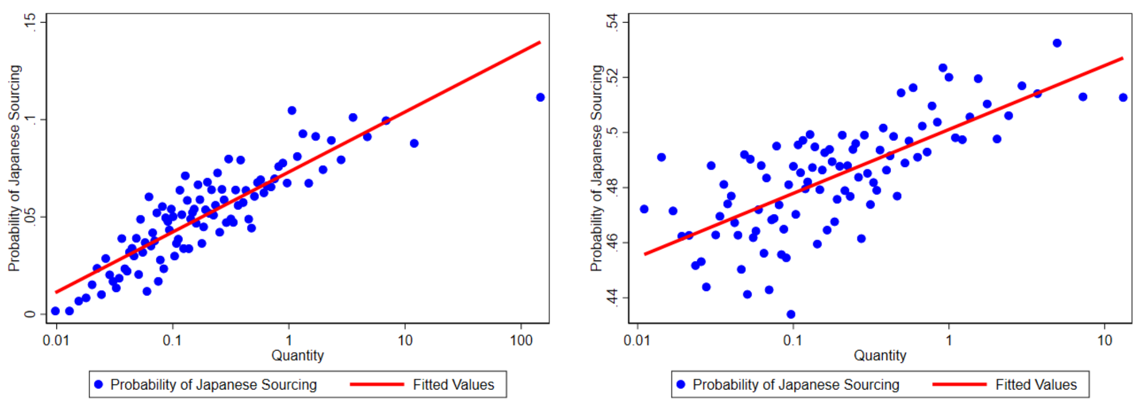
Table shows various statistics of the equilibrium under the assumption of a Fréchet distribution for inspection costs. Rows 1-5 show the share of US manufacturing sales, $P_{US}Q_{US}$, that is from China, from the rest of the world, and from the US, respectively, and the share of these manufacturing sales that is sourced under the J system. Row 6 presents the average inspection costs as a share of the import value, computed over all imports, including under the J system. Row 7 shows the average fixed costs as a share of the import value.

J Additional Quantitative Results

We plot in Figure A.3 the average share of J importers against the average quantity imported for each percentile of the quantity distribution of imports, for China and RoW.[64] The figure shows that larger importers are more likely to use the J system, as in the data. Intuitively, a higher seller productivity raises imports under both systems by reducing variable costs. Under the J system, a higher seller productivity additionally lowers the incentive premium, which makes J sourcing relatively more attractive for high-productivity imports.

Figure A.3: Quantity Imported vs Share of J Importers

(a) China (b) Rest of the World



Notes: The figure shows for each percentile of the distribution of US imports the average quantity imported against the average share of importers using the J system. The left panel presents the results for imports from China, the right panel is for imports from the rest of the world.

[64]We drop outliers below the 1st and above the 99th percentile of the distribution.