Online Appendix to "Where is the Value Added? Trade Liberalization and Production Networks"

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Appendix B. The Caliendo and Parro (2015) model with different trade shares for final and intermediates goods trade

Appendix B.1. Production and Gross Exports

There are N countries indexed by h or n and J sectors indexed by j or k. Consumers derive utility from consumption of final goods from all sectors. Each sectoral final good is a composite of differentiated varieties that are sourced from different countries. We assume that preferences for sectoral composites are Cobb-Douglas and we denote with α_n^j the corresponding constant sectoral expenditure shares. A country's labor force, L_n, is mobile across sectors, but not across borders.

In each sector j a continuum of varieties ω^j is produced with labor $l_n^j[\omega^j]$ and composite intermediate inputs $m_n^{k,j}[\omega^j]$ from other sectors according to the following production function:

$$q_n^j[\omega^j] = z_n^j[\omega^j]^{-\frac{1}{\theta^j}} l_n^j[\omega^j]^{\beta_n^j} \left(\prod_{k=1}^{J} m_n^{k,j}[\omega^j]^{\gamma_n^{k,j}} \right)^{(1-\beta_n^j)}, \tag{B.1}$$

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where $\beta_n^j \in [0,1]$ is the cost share of labor and $(1-\beta_n^j)\gamma_n^{k,j}$ is the cost share of intermediates from source sector k, with $\gamma_n^{k,j} \in [0,1]$ and $\sum_{k=1}^{J} \gamma_n^{k,j} = 1$. $z_n^j[\omega^j]$ denotes the inverse efficiency of variety producer ω^j and $\theta^j > 0$ governs the dispersion of efficiency across varieties in sector j. A lower θ^j implies greater dispersion. All varieties ω^j from sector j are aggregated to a composite intermediate good $q_n^{j_m}$ and a composite final good $q_n^{j_f}$ with the same Dixit-Stiglitz CES technology.

The minimum costs c_n^j of an input bundle for a typical variety producer from sector j in country n depends on the wage rate w_n and the prices of composite intermediate goods $p_n^{k_m}$ according to

$$c_n^j = \Upsilon_n^j \, w_n{}^{\beta_n^j} \left(\prod_{k=1}^{J} \left(p_n^{k_m}\right)^{\gamma_n^{k,j}} \right)^{(1-\beta_n^j)}, \tag{B.2}$$

where Υ_n^j is a constant.

Let $\kappa_{hn}^{j_m}$ denote the trade costs of delivering intermediate good j_m from country h to country n and, likewise, we denote with $\kappa_{hn}^{j_f}$ the trade costs of delivering final goods j_f. We assume that these costs consist of iceberg trade costs $d_{hn}^{j_\nu} \geq 1$ and ad-valorem tariffs $\tau_{hn}^{j_\nu} \geq 0$ such that $\kappa_{hn}^{j_\nu} = (1 + \tau_{hn}^{j_\nu})d_{hn}^{j_\nu}$, where $\nu \in (m, f)$ denotes the use category (final or intermediate). We let trade costs vary between final and intermediate goods from the same sector. Differential trade costs across use categories may reflect differences in preferential treatment of intermediate and final goods with regard to tariffs, but also potential differences in the costs of customization of products to the demand of consumers and intermediate goods purchasing firms. Perfect competition and constant returns to scale imply that firms charge prices equal to unit costs, that is, the price of variety ω^j from country h in country n is given by $p_{hn}^{\nu}[\omega^j] = z_h^j[\omega^j]^{\frac{1}{\theta_j}} c_h^j \kappa_{hn}^{j_\nu}$. Producers search across countries for the lowest-cost supplier of variety ω^j. We assume that productivity levels $z_h^j[\omega^j]$ are independent draws from an exponential distribution with a country-and-sector-specific location parameter λ_h^j. Solving for the distribution of prices and integrating over the sets of goods for which any country is the lowest-cost supplier of intermediate or final goods to country n, we obtain the prices of the composite intermediate and final good in country n as

$$p_n^{j_\nu} = A^j \left(\sum_{h=1}^{N} \lambda_h^j \left(c_h^j \kappa_{hn}^{j_\nu} \right)^{-\theta^j} \right)^{-\frac{1}{\theta^j}} \quad \text{for} \quad \nu \in (m, f), \tag{B.3}$$

where A^j is a constant. Note that $p_n^{j_m}$ and $p_n^{j_f}$ depend on the prices of composites of intermediates from all other sectors via c_h^j. The strength of the correlation is governed by the cross-sectoral intermediate cost shares $\gamma_n^{k,j}$.

Ultimately, the model delivers a gravity equation for both intermediates and final goods. Country n's expenditure share $\pi_{hn}^{j_\nu}$ for source country h's goods in sector j_ν, for $\nu \in (m, f)$, depends on h's price relative to the price index in country n and can be written as

$$\pi_{hn}^{j_\nu} = \frac{\lambda_h^j \left(c_h^j \kappa_{hn}^{j_\nu} \right)^{-\theta^j}}{\sum_{i=1}^{N} \lambda_h^j \left(c_h^j \kappa_{hn}^{j_\nu} \right)^{-\theta^j}} \quad \text{for} \quad \nu \in (m, f). \tag{B.4}$$

This trade share corresponds to the probability that country h is the lowest-cost supplier of a variety in sector j for intermediates or final goods buyers in country n. Eq. (B.4) differs from the standard gravity equation in that unit costs c_h^j depend on the costs of all sectoral intermediate composites and thus also on trade costs of other sectors and between other countries.

Appendix B.2. General Equilibrium

Let Y_n^j denote the gross value of production of varieties in sector j. For each country n and sector j, market clearing requires that Y_n^j be equal to the sum of intermediates and final goods demand from all countries $h = 1, \ldots, N$. Hence, goods market clearing conditions are given by

$$Y_n^j = \sum_{h=1}^{N} \frac{\pi_{nh}^{j_m}}{1 + \tau_{nh}^{j_m}} X_h^{j_m} + \sum_{h=1}^{N} \frac{\pi_{nh}^{j_f}}{1 + \tau_{nh}^{j_f}} X_h^{j_f} \tag{B.5}$$

where

$$X_h^{j_m} = \sum_{k=1}^{J} \frac{\pi_{nh}^{j_m}}{1 + \tau_{nh}^{j_m}} \gamma_h^{j,k} (1 - \beta_h^k) Y_h^k \qquad \text{and} \qquad X_h^{j_f} = \alpha_h^j I_h$$

and national income I_h consists of labor income, tariff rebates R_h, and the (exogenous) trade surplus S_h, that is, $I_h = w_h L_h + R_h - S_h$. $X_h^{j_m}$ and

$X_h^{j_f}$ denote country h's expenditure on intermediate and final goods from sector j, respectively. The first term on the right-hand side of Eq. (B.5) equals demand of all sectors in all countries for intermediates from sector j produced in n. The second term is final goods demand. Tariff rebates are $R_h = \sum_{j=1}^{J} X_h^{j_m}(1 - F_h^{j_m}) + \sum_{j=1}^{J} X_h^{j_f}(1 - F_h^{j_f})$ where $F_h^{j_\nu} = \sum_{n=1}^{N} \frac{\pi_{nh}^{j_\nu}}{1+\tau_{nh}^{j_\nu}}$ for $\nu \in (m, f)$.

The model is closed with an income-equals-expenditure condition for each country n that takes into account trade imbalances. This condition mandates that the value of total imports and domestic demand plus the trade surplus equal the value of total exports plus domestic sales, which is equivalent to the value of national production Y_n:

$$\sum_{j=1}^{J} X_n^{j_m} \sum_{h=1}^{N} \frac{\pi_{hn}^{j_m}}{1+\tau_{hn}^{j_m}} + \sum_{j=1}^{J} X_n^{j_f} \sum_{h=1}^{N} \frac{\pi_{hn}^{j_f}}{1+\tau_{hn}^{j_f}} + S_n = \sum_{j=1}^{J} Y_n^j \equiv Y_n,$$

Appendix B.3. Comparative Statics in General Equilibrium

In this section, we describe how the model can be solved for changes in equilibrium outcomes induced by an exogenous change in the tariff structure, thus paving the way for our counterfactual analysis of China's WTO entry. As suggested by Dekle et al. (2007), instead of solving the model for the new equilibrium, one can solve for equilibrium changes. This approach has the advantage that we do not need data on prices, iceberg trade costs, or productivity levels.

Denote with $\hat{x} \equiv x'/x$ the relative change in any variable x from its initial level x to the counterfactual level x'. The equilibrium change in input costs induced by a change in tariffs is then given by

$$\hat{c}_n^j = \hat{w}_n^{\beta_n^j} \left(\prod_{k=1}^{J} \left(\hat{p}_n^{k_m}\right)^{\gamma_n^{k,j}} \right)^{1-\beta_n^j}. \tag{B.6}$$

The change in the price index is

$$\hat{p}_n^{j_\nu} = \left(\sum_{h=1}^{N} \pi_{hn}^{j_\nu} \left(\hat{\kappa}_{hn}^{j_\nu} \hat{c}_h^j\right)^{-\theta^j} \right)^{-1/\theta^j} \tag{B.7}$$

and bilateral trade shares change according to

$$\hat{\pi}_{hn}^{j_\nu} = \left(\frac{\hat{c}_h^j}{\hat{p}_n^{j_\nu}} \hat{\kappa}_{hn}^{j_\nu}\right)^{-\theta^j} \qquad \text{for} \qquad \nu \in (m, f). \tag{B.8}$$

The counterfactual intermediate goods and final goods expenditure levels in each country and sector are

$$X_n^{j'_m} = \sum_{k=1}^{J} \gamma_n^{j,k} (1 - \beta_n^k) \left(\sum_{h=1}^{N} \frac{\pi_{nh}^{k'_m}}{1 + \tau_{nh}^{k'_m}} X_h^{k'_m} + \sum_{h=1}^{N} \frac{\pi_{nh}^{k'_f}}{1 + \tau_{nh}^{k'_f}} X_h^{k'_f} \right) \tag{B.9}$$

and

$$X_n^{j'_f} = \alpha_n^j I'_n \quad \text{with} \quad I'_n = \hat{w}_n w_n L_n + \sum_{j=1}^{J} X_n^{j'_m} (1 - F_n^{j'_m}) + \sum_{j=1}^{J} X_n^{j'_f} (1 - F_n^{j'_f}) - S_n, \tag{B.10}$$

subject to the trade balance that requires

$$\sum_{j=1}^{J} F_n^{j'_m} X_n^{j'_m} + \sum_{j=1}^{J} F_n^{j'_f} X_n^{j'_f} + S_n = \sum_{j=1}^{J} \sum_{h=1}^{N} \frac{\pi_{nh}^{j'_m}}{1 + \tau_{nh}^{j'_m}} X_h^{j'_m} + \sum_{j=1}^{J} \sum_{h=1}^{N} \frac{\pi_{nh}^{j'_f}}{1 + \tau_{nh}^{j'_f}} X_h^{j'_f}. \tag{B.11}$$

The welfare change is given by the change in real income, which is

$$\widehat{W}_n = \frac{\hat{I}_n}{\Pi_{j=1}^{J} (\hat{p}_n^{j_f})^{\alpha_n^j}}. \tag{B.12}$$

Real income is affected through wages, tariff revenue, and the price index. Due to global production linkages, real wages in all countries are much more directly affected than just through the equilibrium consumer price indices, as is the case in the standard gravity model. Even countries that experienced little or no tariff changes with respect to China can witness an increased demand for their labor if they are an important input supplier either for China or for some other country that experienced significant changes in the tariff structure. Similarly, production linkages imply that other countries' production costs show up directly in a country's own price index. Hence, we expect that the welfare consequences are much more complex than in a standard general equilibrium gravity framework without IO linkages.

Appendix C. Decomposition of Exports into Value Added Components

The total value of a country's exports consists of domestic value added, value added generated in other countries that is re-exported, and some double-counting of those values associated with multiple border crossings by the same piece of value added. The value of the latter is a pure statistical artifact. We use the methodology developed by Koopman et al. (2014) to decompose a country's exports as follows.

$$
\begin{aligned}
\mathbf{1}\cdot\mathbf{e}_i = {} & \underbrace{\boldsymbol{\beta}_i \sum_{n\neq i}^{N} \mathbf{B}_{ii}\mathbf{C}_{in} + \boldsymbol{\beta}_i \sum_{n\neq i}^{N} \mathbf{B}_{in} C_{nn} + \boldsymbol{\beta}_i \sum_{n\neq i}^{N} \sum_{m\neq i,n}^{N} \mathbf{B}_{in}\mathbf{C}_{nm} +}_{i'\text{s VA consumed in } n\neq i \text{ or passed on to } m\neq i,n} \\
& \underbrace{+ \boldsymbol{\beta}_i \sum_{n\neq i}^{N} \mathbf{B}_{in}\mathbf{C}_{ni} + \boldsymbol{\beta}_i \sum_{n\neq i}^{N} \mathbf{B}_{in}\mathbf{A}_{ni}(\mathbf{I}-\mathbf{A}_{ii})^{-1}\mathbf{C}_{ii} +}_{i'\text{s VA returning home}} \\
& \underbrace{+ \sum_{n\neq i}^{N} \sum_{m\neq i}^{N} \boldsymbol{\beta}_m \mathbf{B}_{mi}\mathbf{C}_{in} + \sum_{n\neq i}^{N} \sum_{m\neq i}^{N} \boldsymbol{\beta}_m \mathbf{B}_{mi}\mathbf{A}_{in}(\mathbf{I}-\mathbf{A}_{nn})^{-1}\mathbf{C}_{nn} +}_{\text{Foreign VA in } i\text{'s exports}} \\
& \underbrace{+ \boldsymbol{\beta}_i \sum_{n\neq i}^{N} \mathbf{B}_{in}\mathbf{A}_{ni}(\mathbf{I}-\mathbf{A}_{ii})^{-1}\mathbf{e}_i + \sum_{m\neq i}^{N} \boldsymbol{\beta}_m \mathbf{B}_{mi} \sum_{n\neq i}^{N} \mathbf{A}_{in}(\mathbf{I}-\mathbf{A}_{nn})^{-1}\mathbf{e}_n}_{\text{Pure double counting}} \\
& + TA_i
\end{aligned}
\tag{C.1}
$$

where $\mathbf{1}$ is a unit vector and $\mathbf{e_i}$ is a vector collecting country i's total sectoral exports. TA_i is a residual term collecting all actual and double-counted tariff payments on intermediate imports induced by country i's production of its exports.[1]

The first three terms in Eq. (C.1) make up country i's value added exports

[1] The residual vanishes if we treat the international IO coefficients as valued in consumer prices (that is, including tariffs), as it is commonly done in the extant literature. However, most international IO database, including OECD ICIO and the World-Input-Output Database (WIOD), are valued in producer prices (that is, net of tariffs).

to other countries, that is, value added from country i that is consumed in other countries $n \neq i$. This is identical to the value added flows in Eqs. (6) and (9), when summing over destination countries $n \neq i$. The second line represents value added generated in country i that first leaves the country in the form of intermediate goods but is eventually re-imported (as final or intermediate good) and consumed in i. These flows show up in country i's export statistic but do not constitute value added exports. The third line shows the part of country i's export value that is foreign value added, embodied either in final or in intermediate goods exports. The last line shows value added (originating either in the home country or in the foreign country) that appears several times in i's export statistic. The first three terms in Eq. (C.1) make up country i's value added exports to other countries, that is, value added from country i that is consumed in other countries $n \neq i$. This is identical to the value added flows in Eqs. (6) and (9), when summing over destination countries $n \neq i$. The second line represents value added generated in country i that first leaves the country in the form of intermediate goods but is eventually re-imported (as final or intermediate good) and consumed in i. These flows show up in country i's export statistic but do not constitute value added exports. The third line shows the part of country i's export value that is foreign value added, embodied either in final or in intermediate goods exports. The last line shows value added (originating either in the home country or in the foreign country) that appears several times in i's export statistic.

Appendix D. Model Calibration

The OECD ICIO data are valued in producer prices; we obtain bilateral imports in purchaser prices by applying the add-valorem tariffs to the reverse export flows so that $X_{hn}^{k} = Z_{hn}^{k_\nu}(1 + \tau_{hn}^{k_\nu})$. Trade shares are then computed as $\pi_{hn}^{k_\nu} = \frac{X_{hn}^{k_\nu}}{\sum_{h=1}^{N} X_{hn}^{k_\nu}}$.

Sectoral value added for each country is obtained by subtracting the total costs of intermediate usage from the sector's production value. To that end, we first need to convert sector j's usage of intermediate inputs to purchaser prices by augmenting IO coefficients with ad-valorem tariffs. Value added then results from subtracting the total costs of intermediate usage from the sector's production value, that is,

$$VA_n^j = Y_n^j - \sum_k^J \sum_h^N (1+\tau_{hn}^{k_m}) a_{hn}^{k,j} Y_n^j.$$

The value of production observes $Y_n^j = \sum_h \left(Z_{nh}^{j_f} + Z_{nh}^{j_m} \right) + \Delta Inv_n^j$, i.e., it is given by the sum over exports plus changes in the stock of inventory. Value added shares follow as $\beta_n^j = \frac{VA_n^j}{Y_n^j}$. The cost shares for intermediate inputs can then be computed as $\gamma_n^{k,j} = \frac{\sum_h a_{hn}^{k,j}(1+\tau_{hn}^{k_m})}{1-\beta_n^j}$.

We obtain total sectoral final and intermediate expenditure as $X_n^{k_f} = \sum_h X_{hn}^{k_f}$ and $X_n^{k_m} = \sum_h X_{hn}^{k_m}$. Accounting for inventories, the trade balance condition reads $\sum_k X_n^{k_f} + \sum_k X_n^{k_m} = Y_n + R_n - S_n = VA_n + \sum_k X_n^{k_m} + \sum_k \Delta Inv_n^k + R_n - S_n$, which implies that we obtain income from the income-equals-expenditure condition as

$$I_n = \sum_k X_n^{k_f} = VA_n + R_n - S_n - \Delta Inv_n,$$

where S_n is the aggregate trade surplus $\sum_h Z_{nh}^k - \sum_h Z_{hn}^k$ and $\Delta Inv_n = \sum_k \Delta Inv_n^k$ is the aggregate change in the stock of inventories. Both terms appear as a mere transfer of income in our one-period setting. The trade surplus is valued in producer prices, since tariff income is captured separately in R_n. The share of expenditure on goods from sector k in total final goods consumption is obtained as $\alpha_n^k = \frac{X_n^{k_f}}{I_n}$.

Appendix E. Algorithm for the Equilibrium Changes

The system of equilibrium conditions (B.6)-(B.11) can be solved with a variant of the searching algorithm proposed by Alvarez and Lucas (2007). The logic is similar to the multi-sector IO-variant developed by Caliendo and Parro (2015), but instead of solving a $N \times J$ system of equations for total expenditure at the country-sector-level, we split expenditure into intermediate and final goods expenditure to solve the following $2 \times N \times J$ system of equations:

$$
\begin{aligned}
X_1^{1'_m} &= \sum_{k=1}^{J} \gamma_1^{1,k}(1-\beta_1^k)\left(\sum_{h=1}^{N} \frac{\pi_{1h}^{k'_m}}{1+\tau_{1h}^{k'_m}} X_h^{k'_m} + \sum_{h=1}^{N} \frac{\pi_{1h}^{k'_f}}{1+\tau_{1h}^{k'_f}} X_h^{k'_f} + \Delta Inv_1^k\right)\\
&\vdots\\
X_1^{J'_m} &= ...\\
&\vdots\\
X_N^{J'_m} &= ...\\
X_1^{1'_f} &= \alpha_1^1\left(\hat{w}_1 w_1 L_1 + \sum_{j=1}^{J} X_1^{j'_m}(1-F_1^{j'_m}) + \sum_{j=1}^{J} X_1^{j'_f}(1-F_1^{j'_f}) - S_1 - \Delta Inv_1\right)\\
&\vdots\\
X_N^{J'_f} &= ...
\end{aligned}
$$

which can be written as $\Delta\left[\hat{\mathbf{w}}\right] = \tilde{\mathbf{\Omega}}\tilde{\mathbf{X}}$, where

$$
\tilde{\Delta}\left[\hat{\mathbf{w}}\right] = \begin{pmatrix}
\sum_{k=1}^{J} \gamma_1^{1,k}(1-\beta_1^k)\Delta Inv_1^k\\
\vdots\\
\sum_{k=1}^{J} \gamma_1^{J,k}(1-\beta_1^k)\Delta Inv_1^k\\
\vdots\\
\vdots\\
\sum_{k=1}^{J} \gamma_N^{J,k}(1-\beta_N^k)\Delta Inv_N^k\\
\alpha_1^1\left(\hat{w}_1 w_1 L_1 - S_1 - \Delta Inv_1\right)\\
\vdots\\
\alpha_1^J\left(\hat{w}_1 w_1 L_1 - S_1 - \Delta Inv_1\right)\\
\vdots\\
\vdots\\
\alpha_N^J\left(\hat{w}_1 w_1 L_1 - S_1 - \Delta Inv_1\right)
\end{pmatrix}
\qquad
\tilde{\mathbf{X}} = \begin{pmatrix}
X_1^{1'_m}\\
\vdots\\
X_1^{J'_m}\\
\vdots\\
\vdots\\
X_N^{J'_m}\\
X_1^{1'_f}\\
\vdots\\
X_1^{J'_f}\\
\vdots\\
\vdots\\
X_N^{J'_f}
\end{pmatrix}
$$

$$
\tilde{\mathbf{\Omega}} = \begin{pmatrix} \tilde{H}^m\left[\hat{\mathbf{w}}\right] & \tilde{H}^f\left[\hat{\mathbf{w}}\right]\\ \mathcal{F}^m\left[\hat{\mathbf{w}}\right] & \mathcal{F}^f\left[\hat{\mathbf{w}}\right] \end{pmatrix}. \tag{E.1}
$$

The submatrices of $\tilde{\mathbf{\Omega}}$ are defined analogously to the matrices $\tilde{H}, \mathcal{F}$ in Caliendo and Parro (2015), but using intermediate (final) goods trade shares and tariffs to compute $\tilde{H}^m(\tilde{H}^f)$ and $\mathcal{F}^m(\mathcal{F}^f)$. The second block of elements in $\tilde{\Delta}\left[\hat{\mathbf{w}}\right]$ corresponds to $\Delta\left[\hat{\mathbf{w}}\right]$ in Caliendo and Parro (2015). The first block is given by intermediate demand for the production of inventory, which we account for as described in Appendix D.

The algorithm starts with an initial guess about a vector of wage changes, then computes price and trade share changes and the new expenditure levels based on those wage changes, then evaluates the trade balance condition, and then updates the wage change based on the error in the trade balance.

Appendix F. Supply Networks Involving China

To analyze global production sharing with China, we use the network measures developed in Section 2.3. First, we take the perspective of downstream sectors in China and describe the relative importance of different sources of upstream value added, as measured by Eq. (12). Across downstream sectors in China we find that the (weighted) average share of domestic in total upstream value added processed in China is 90 percent. Among foreign sources, countries nearby China stand out; see column (1) of Table F.1, which is sorted by increasing distance from China. Japan accounts for the largest average foreign share (1.9 percent), South Korea and Taiwan rank fourth and fifth. The last row of Table F.1 shows (for odd columns) the Spearman rank correlation between the strength of a network and the country's distance from China. For China's supply networks, the correlation is -.2. Country size also matters besides proximity, as shown by the sizeable shares accounted for by the United States, RoW, and Germany.

Table F.1: Actual Demand and Supply Networks, Sorted by Distance from China

	Supply networks				Demand networks			
	CHN proc. destination		CHN VA source		CHN proc. destination		CHN VA source	
Country	$sn_{i,CHN}^{2000}$	$\Delta sn_{i,CHN}$	$sn_{CHN,n}^{2000}$	$\Delta sn_{CHN,n}$	$dn_{i,CHN}^{2000}$	$\Delta dn_{i,CHN}$	$dn_{CHN,n}^{2000}$	$\Delta dn_{CHN,n}$
CHN	90.1	-4.4	90.1	-4.4	93.4	-5.2	93.4	-5.2
KOR	0.7	0.4	0.9	1.8	1.9	2.5	0.4	0.4
TWN	0.7	0.2	0.7	1.8	2.7	6.0	0.2	0.1
HKG	0.3	-0.1	1.7	0.9	2.5	1.8	0.2	-0.1
JPN	1.9	0.2	0.3	0.6	0.5	1.3	1.2	-0.0
PHL	0.0	0.1	0.4	0.8	0.7	3.5	0.0	0.0
VNM	0.1	0.0	1.8	4.2	2.3	0.5	0.0	0.1
KHM	0.0	-0.0	2.0	4.2	0.9	0.0	0.0	0.0
THA	0.1	0.1	0.7	1.5	1.3	1.7	0.1	0.1
BRN	0.0	0.0	0.7	0.5	2.0	1.6	0.0	0.0
MYS	0.2	0.1	1.1	2.6	2.4	3.0	0.1	0.1
SGP	0.2	0.1	1.2	1.1	2.1	2.7	0.1	0.0
IND	0.1	0.2	0.2	0.8	0.2	0.7	0.1	0.3
IDN	0.2	0.0	0.6	0.6	1.5	0.5	0.1	0.1
RUS	0.2	0.2	0.2	0.7	1.2	0.3	0.0	0.2
FIN	0.1	-0.0	0.2	0.8	0.9	0.4	0.0	0.0
EST	0.0	0.0	0.3	0.6	0.3	0.1	0.0	0.0
LVA	0.0	0.0	0.1	0.4	0.2	0.0	0.0	0.0
LTU	0.0	-0.0	0.2	0.2	0.2	-0.0	0.0	0.0
SAU	0.2	0.3	0.2	0.5	1.2	3.2	0.0	0.0
TUR	0.0	-0.0	0.1	0.6	0.2	0.0	0.0	0.1
SWE	0.1	-0.0	0.1	0.4	0.6	0.2	0.0	0.0
CYP	0.0	0.0	0.2	0.4	0.1	0.1	0.0	0.0
ISR	0.0	0.0	0.2	0.7	0.4	0.6	0.0	0.0
ROU	0.0	0.0	0.1	0.3	0.2	-0.0	0.0	0.0
POL	0.0	0.0	0.2	0.7	0.1	0.2	0.0	0.1
NOR	0.0	0.0	0.2	0.3	0.4	0.1	0.0	0.0
BGR	0.0	0.0	0.1	0.9	0.2	0.2	0.0	0.0
SVK	0.0	0.0	0.2	0.8	0.2	0.4	0.0	0.0
DNK	0.1	0.0	0.2	0.4	0.5	0.4	0.0	0.0
HUN	0.0	0.0	0.4	0.7	0.2	0.4	0.0	0.0
CZE	0.0	0.0	0.3	1.4	0.2	0.3	0.0	0.1
GRC	0.0	0.0	0.1	0.3	0.1	0.1	0.0	0.0
AUT	0.0	0.0	0.1	0.3	0.3	0.5	0.0	0.0
HRV	0.0	0.0	0.1	0.4	0.1	0.1	0.0	0.0
DEU	0.5	0.3	0.2	0.4	0.4	0.6	0.3	0.3
SVN	0.0	0.0	0.2	0.5	0.1	0.2	0.0	0.0
NLD	0.1	0.0	0.2	0.3	0.2	0.3	0.1	0.0
ISL	0.0	0.0	0.2	0.4	0.2	0.1	0.0	0.0
AUS	0.2	0.3	0.4	0.5	0.8	1.3	0.1	0.1
LUX	0.0	0.0	0.2	0.4	0.3	0.6	0.0	0.0
BEL	0.0	0.0	0.2	0.4	0.3	0.4	0.0	0.0
CHE	0.1	0.0	0.1	0.3	0.4	0.6	0.0	0.0
ITA	0.2	0.1	0.2	0.4	0.2	0.2	0.2	0.2
GBR	0.2	0.0	0.2	0.3	0.2	0.2	0.2	0.2
MLT	0.0	0.0	0.4	0.4	0.3	1.2	0.0	0.0
FRA	0.2	0.1	0.2	0.4	0.2	0.2	0.2	0.2
IRL	0.0	0.1	0.3	0.6	0.3	0.8	0.0	0.0
TUN	0.0	0.0	0.2	0.4	0.1	0.1	0.0	0.0
ESP	0.0	0.1	0.3	0.5	0.1	0.2	0.1	0.2
PRT	0.0	0.0	0.1	0.2	0.1	0.2	0.0	0.0

to be continued

Table F.1: continued

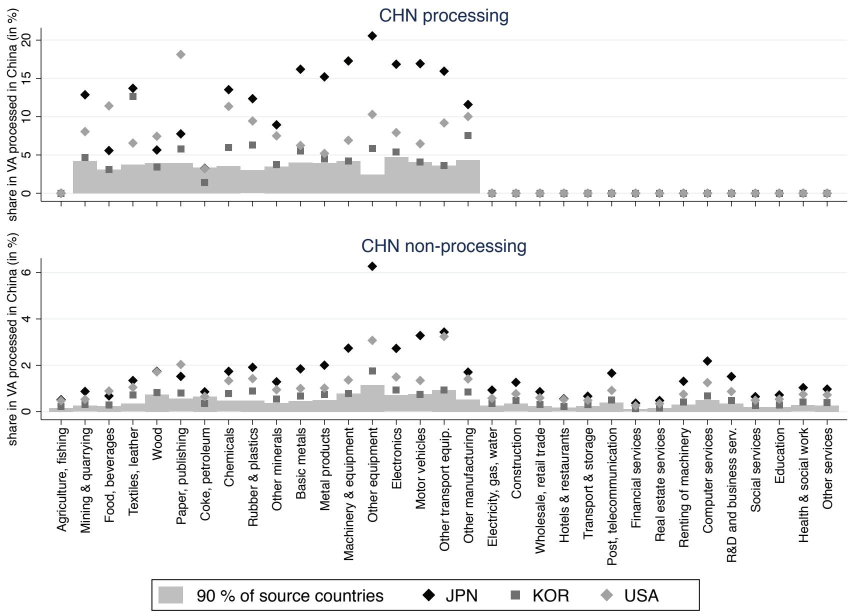
	Supply networks				Demand networks			
	CHN proc. destination		CHN VA source		CHN proc. destination		CHN VA source	
Country	$sn^{2000}_{i,CHN}$	$\Delta sn_{i,CHN}$	$sn^{2000}_{CHN,n}$	$\Delta sn_{CHN,n}$	$dn^{2000}_{i,CHN}$	$\Delta dn_{i,CHN}$	$dn^{2000}_{CHN,n}$	$\Delta dn_{CHN,n}$
... continued								
NZL	0.0	0.0	0.3	0.3	0.7	0.1	0.0	0.0
MAR	0.0	0.0	0.2	0.4	0.1	0.2	0.0	0.0
CAN	0.2	0.0	0.3	0.5	0.3	0.3	0.1	0.1
USA	1.2	0.2	0.2	0.5	0.2	0.2	1.9	0.8
ZAF	0.1	0.1	0.2	0.8	0.6	1.0	0.0	0.1
MEX	0.0	0.0	0.2	0.7	0.1	0.2	0.1	0.2
CRI	0.0	0.0	0.2	0.6	0.2	2.9	0.0	0.0
COL	0.0	0.0	0.1	0.4	0.1	0.3	0.0	0.0
PER	0.0	0.1	0.2	0.6	0.7	3.3	0.0	0.0
BRA	0.1	0.2	0.1	0.4	0.2	0.6	0.0	0.1
CHL	0.1	0.1	0.1	0.7	1.0	2.9	0.0	0.0
ARG	0.0	0.0	0.1	0.5	0.2	0.9	0.0	0.0
ROW	1.2	0.4	0.4	0.9	1.1	0.7	0.4	0.7
	$\rho_{dist,sn}$	$\rho_{sn,\Delta sn}$	$\rho_{dist,sn}$	$\rho_{sn,\Delta sn}$	$\rho_{dist,dn}$	$\rho_{dn,\Delta dn}$	$\rho_{dist,dn}$	$\rho_{dn,\Delta dn}$
rank corr.	-0.2	0.6	-0.5	0.6	-0.6	0.6	-0.2	0.7

Note: The table shows weighted averages across sectors of supply and demand networks as well as changes therein for all countries included in the study as observed in the data and defined in Equations (12) and (13). $sn^{2000}_{CHN,n}$ ($sn^{2000}_{i,CHN}$) denotes the share of Chinese (country i's) value added in total value added processed by country n (China). $dn^{2000}_{CHN,n}$ ($dn^{2000}_{i,CHN}$) denotes the share of China's (country i's) upstream value added that is processed by country n (China). Δ denotes the change in the respective share between 2000 and 2007. ρ denotes Spearman rank correlation coefficients. For the correlation coefficients in even columns China's domestic networks were excluded.

Fig. F.1 shows that there is substantial heterogeneity in the relative importance of foreign-sourced value added across sectors, as well as between China's processing zones and the rest of its economy. The figure displays supply networks for selected foreign countries and all sectors in China, differentiating between processing zones (upper panel) and ordinary production (lower panel). The grey bars capture the range of values of the network measure across all sourcing countries up to the 90th percentile; Japan, Korea, and the United States are shown explicitly. In the processing zones, foreign value added shares are considerably larger. Around 15 (10, 5) percent of all upstream value added entering final goods production in China's processing zones stems from Japan (the United States, South Korea).

As indicated by the aggregate value added content measures discussed in Section 4, firms in the processing zones also experienced completely different trends than the rest of China between 2000 and 2007. Fig. F.2 shows how the

Figure F.1: China's Supply Networks in 2000

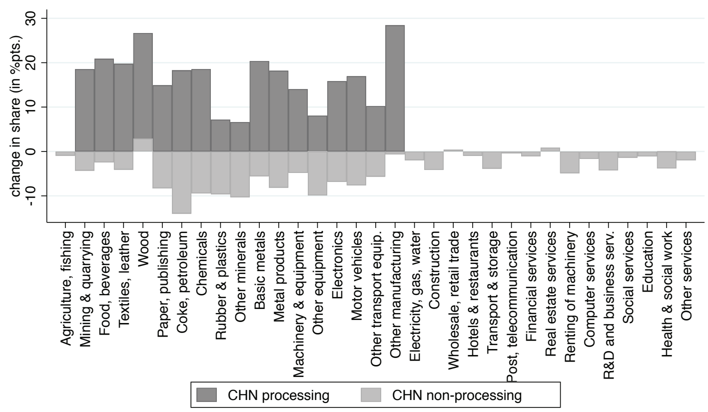


Note: The figure plots the measure of supply networks as given in Eq. (12) for China's sectors producing under the export-processing regime (upper panel) and under the ordinary regime (lower panel). Grey bars indicate the 0-90th percentile range of the distribution of the measure across source countries. Calculations are based on the OECD's ICIO Database.

share of domestic upstream value added in final goods production changed. We find an increase in the importance of domestically sourced value added for all sectors engaged in processing exports, whilst the share of domestic upstream value added in ordinary production went down.

Fig. 2 in the main text shows the corresponding changes in the relative importance of foreign sourced value added, exemplary for the "Electronics" sector, revealing strong correlations between initial network strength and the change therein. These strong correlations, which we also find for other networks shown in Table F.1, are consistent with a non-linear, amplified response of trade in upstream production stages to trade cost changes as put forward by Yi (2003). The difference in the sign of the correlation between processing and ordinary production in China is consistent with the finding of Kee and Tang (2016) that the WTO entry led to a lower relative cost of

Figure F.2: Change in China's Domestic Supply Networks



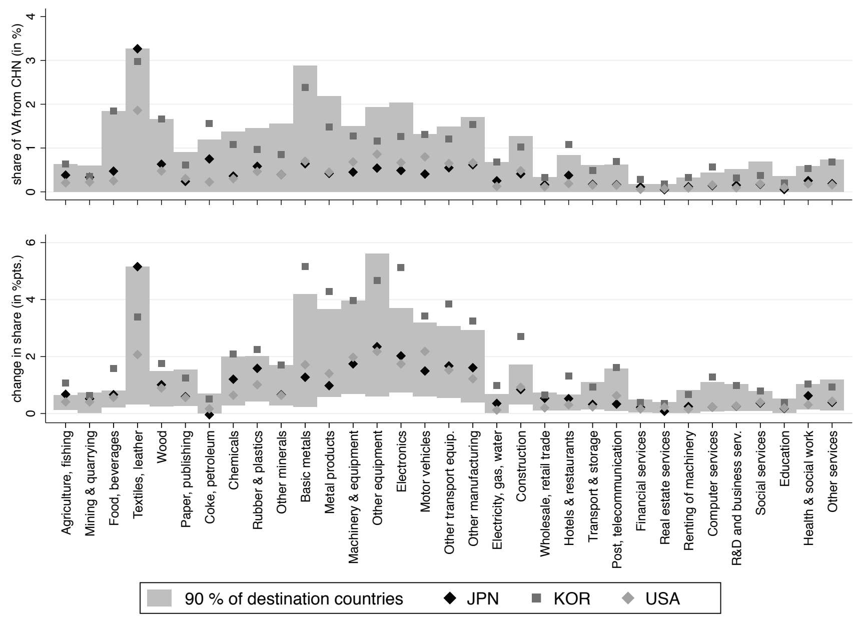
Note: The figure plots changes in domestic supply networks as defined in Eq. (12) of China's segments producing under the export-processing regime (dark gray bars) and under the ordinary regime (light gray bars). Calculations are based on the OECD's ICIO Database.

imported intermediates for non-processing firms and declining relative costs of domestic inputs for the processing firms.[2]

Next, we analyse the relative importance of China as a source of upstream value added from the perspective of downstream sectors in foreign countries. The upper panel of Fig. F.3 shows the initial network measures. Triangles and squares now depict for all downstream sectors in Japan, the United States, and South Korea the share of Chinese upstream value added in total upstream value added processed. The lower panel shows how the share changed between 2000 and 2007. As shown by the gray bars, China gained in importance as a value added source across a wide range of countries. South Korea stands out among the larger economies depicted here, both in terms of initial network strength and the change. Columns (3) and (4) of Table F.1 show that small Asian economies like Vietnam, Cambodia, Hong Kong, and Taiwan on average had the strongest supply networks with China initially and also experienced the strongest increases. We also find, again, that initial network strength is strongly negatively correlated with distance,

[2] We exclude China's domestic networks when computing $\rho_{sn,\Delta sn}$ since the expected correlation has the opposite sign.

Figure F.3: Foreign Supply Networks with China, 2000

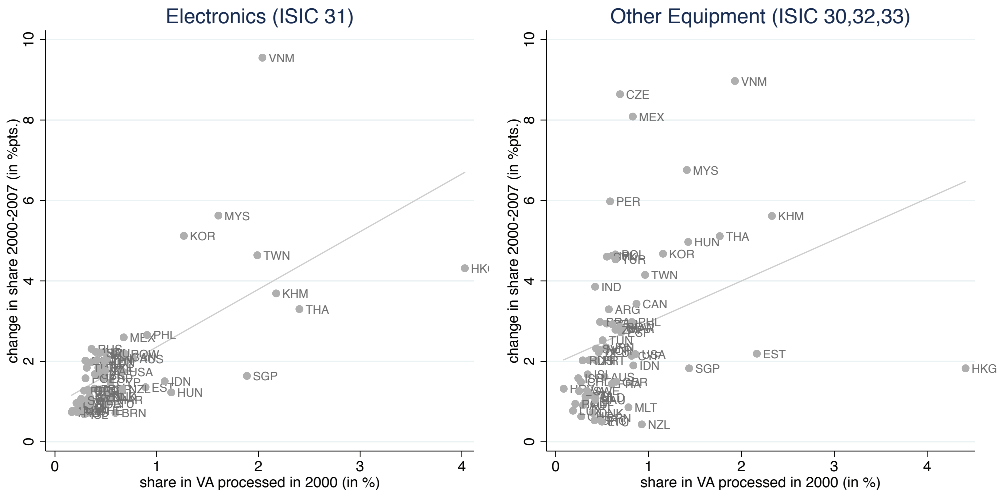


Note: The figure plots supply networks as given in Eq. (12) of downstream sectors in foreign countries with China in 2000 (upper panel) and changes therein between 2000 and 2007 (lower panel). Calculations are based on the OECD's ICIO Database.

and growth in network strength correlates positively with the initial level – underscoring the increasing dominance of regional production networks for international production sharing. Fig. F.4 zooms into the "Electronics" and "Other equipment" sectors (the latter comprising among others manufacturing of computing, telecommunication, medical, and optical equipment) and plots all countries' supply networks with China. The figure highlights both the strength and disproportional growth of regional supply networks.

To summarize, our proposed network measures provide evidence for the dominance of regional over global production networks as put forward by Baldwin and Lopez-Gonzalez (2015). We clearly see the gravitational forces at work. Distance predominantly shapes network structures when considering the relative importance of China as a value added source for producers in foreign countries (or China itself). Country size affects the relative importance of different value added source countries from the point of view

Figure F.4: Change in Foreign Supply Networks with China: Electronics and Other Equipment Sectors



Note: The figure plots changes in supply networks with China as given in Eq. (12) between 2000 and 2007 for the Electronics sector (left panel) and the Other Equipment sector (right panel) in foreign countries against the initial values in 2000. The gray line shows fitted values. Calculations are based on the OECD's ICIO Database.

of China. Consistent with the notion of China's integration into the world economy, we see a decline in the importance of domestic networks – with the exception of China's processing zones. In the non-processing sectors we observe a shift toward more foreign value added in Chinese final goods. China's share in upstream value added entering final goods production went up everywhere. Lastly, we find suggestive evidence for the magnification effect of trade cost changes on upstream trade flows: Networks with countries that had stronger links with China in 2000 also experienced the greatest increase in network strength, fostering regional value chains.

We find very similar features for demand networks involving China. Columns (5,6) and (7,8) of Table F.1 show, respectively, the relative importance of China as a processing location for foreign upstream producers and the importance of different countries as processing location for Chinese value added.

Appendix G. Detailed Estimation Results

Table G.1: Detailed Estimation Results: Goods

Sector	Isic Rev. 3	# Obs	(1) *pta*	(2) *L1.pta*	(3) *L2.pta*	(4) *ccu*	(5) *L1.ccu*	(6) *L2.ccu*	(7) *wto*	(8) *L1.wto*	(9) *L2.wto*	**(10)** ***PTA***	**(11)** ***CCU***	**(12)** ***WTO***
Agriculture, fishing	01-05	14370	0.176***	-0.0168	0.0238	0.00978	0.114*	0.184**	0.331***	0.149*	0.183**	**0.183***	**0.308****	**0.663*****
			(0.0599)	(0.0476)	(0.0630)	(0.155)	(0.0646)	(0.0850)	(0.0602)	(0.0791)	(0.0902)	**(0.0956)**	**(0.154)**	**(0.112)**
Mining & quarrying	10-14	13572	-0.000709	-0.0174	-0.0850	0.341*	0.223	-0.177	0.261**	-0.241**	0.365	**-0.103**	**0.387***	**0.384**
			(0.0672)	(0.0800)	(0.0633)	(0.175)	(0.176)	(0.123)	(0.123)	(0.109)	(0.227)	**(0.0928)**	**(0.202)**	**(0.241)**
Food, beverages	15-16	14541	-0.0282	0.0407*	0.123***	-0.0766	0.184***	0.167***	0.156***	-0.0849***	0.0501	**0.135*****	**0.275*****	**0.121****
			(0.0263)	(0.0218)	(0.0332)	(0.0537)	(0.0303)	(0.0479)	(0.0443)	(0.0317)	(0.0327)	**(0.0506)**	**(0.0561)**	**(0.0497)**
Textiles, leather	17-19	15301	-0.00705	0.0177	-0.170***	0.0927	0.0855*	-0.297***	-0.289***	0.0997*	0.223***	**-0.159****	**-0.119**	**0.0330**
			(0.0438)	(0.0369)	(0.0612)	(0.0716)	(0.0474)	(0.0856)	(0.0639)	(0.0524)	(0.0816)	**(0.0699)**	**(0.0859)**	**(0.0999)**
Wood	20	13982	-0.0107	0.0120	-0.128***	0.106	0.0144	-0.179***	0.129**	-0.0755*	0.0274	**-0.127***	**-0.0579**	**0.0805**
			(0.0395)	(0.0392)	(0.0446)	(0.0674)	(0.0438)	(0.0548)	(0.0594)	(0.0420)	(0.0531)	**(0.0736)**	**(0.0619)**	**(0.0720)**
Paper, publishing	21_22	14499	-0.0376	-0.00278	-0.0832**	0.186***	0.111***	-0.172***	0.00241	0.0477	0.132***	**-0.124****	**0.124****	**0.182*****
			(0.0355)	(0.0311)	(0.0375)	(0.0510)	(0.0374)	(0.0462)	(0.0484)	(0.0478)	(0.0442)	**(0.0522)**	**(0.0563)**	**(0.0524)**
Coke, petroleum	23	14517	-1.441	-4.232**	-0.0227	0.114	-3.649*	0.507	-6.545***	0.817	8.827***	**-5.696***	**-3.028***	**3.100**
			(0.959)	(1.878)	(0.718)	(1.394)	(1.955)	(0.843)	(1.653)	(0.851)	(3.176)	**(3.029)**	**(1.693)**	**(3.359)**
Chemicals	24	15182	0.0344	0.0343	0.0244	0.253***	0.159***	-0.0648*	0.209***	0.0829***	-0.107**	**0.0931*****	**0.347*****	**0.184*****
			(0.0224)	(0.0209)	(0.0177)	(0.0356)	(0.0322)	(0.0345)	(0.0328)	(0.0248)	(0.0439)	**(0.0318)**	**(0.0504)**	**(0.0520)**
Rubber & plastics	25	14758	0.102**	0.106***	0.0307*	0.326***	0.197***	0.0192	0.425***	0.102***	0.00867	**0.239*****	**0.542*****	**0.535*****
			(0.0402)	(0.0296)	(0.0162)	(0.0562)	(0.0324)	(0.0285)	(0.0408)	(0.0297)	(0.0321)	**(0.0453)**	**(0.0550)**	**(0.0582)**
Other minerals	26	14498	0.0497	0.0349	-0.0593*	0.148***	0.121***	-0.169***	-0.144**	-0.0985*	0.137***	**0.0254**	**0.0994****	**-0.106***
			(0.0351)	(0.0290)	(0.0317)	(0.0544)	(0.0321)	(0.0379)	(0.0604)	(0.0544)	(0.0412)	**(0.0502)**	**(0.0460)**	**(0.0630)**
Basic metals	27	14212	0.112**	0.0282	0.0641**	0.312***	0.0891**	0.0628	0.319***	-0.00405	0.167**	**0.204*****	**0.464*****	**0.482*****
			(0.0464)	(0.0336)	(0.0315)	(0.0617)	(0.0447)	(0.0438)	(0.0494)	(0.0573)	(0.0698)	**(0.0641)**	**(0.0659)**	**(0.0800)**
Metal products	28	14793	0.0374	0.0401	-0.137***	0.262***	0.0548	-0.201***	0.0646*	-0.0795***	0.0460	**-0.0593**	**0.116****	**0.0311**
			(0.0315)	(0.0345)	(0.0393)	(0.0471)	(0.0397)	(0.0483)	(0.0379)	(0.0261)	(0.0344)	**(0.0435)**	**(0.0486)**	**(0.0466)**
Machinery & equipment	29	15171	0.113***	0.124***	0.0911***	0.244***	0.139***	0.0685*	0.0146	0.00484	0.00627	**0.328*****	**0.451*****	**0.0258**
			(0.0253)	(0.0240)	(0.0319)	(0.0504)	(0.0349)	(0.0407)	(0.0460)	(0.0347)	(0.0370)	**(0.0550)**	**(0.0548)**	**(0.0497)**
Other equipment	30_32_33	15227	-0.0746	-0.0328	-0.199***	0.232*	-0.0209	-0.309***	-0.0612	-0.112***	0.120	**-0.307*****	**-0.0980**	**-0.0533**
			(0.0624)	(0.0628)	(0.0630)	(0.124)	(0.0718)	(0.0755)	(0.0541)	(0.0406)	(0.0981)	**(0.108)**	**(0.106)**	**(0.104)**
Electronics	31	14830	0.0744*	-0.0924*	-0.185**	0.340***	-0.0892*	-0.242**	0.203***	-0.208***	0.286***	**-0.203**	**0.00900**	**0.282*****
			(0.0447)	(0.0509)	(0.0891)	(0.0997)	(0.0525)	(0.0988)	(0.0618)	(0.0373)	(0.0607)	**(0.142)**	**(0.0859)**	**(0.0718)**
Motor vehicles	34	14058	0.102**	0.224***	-0.00761	0.299***	0.210***	0.114*	0.0641*	0.129***	-0.0669	**0.318*****	**0.623*****	**0.126***
			(0.0490)	(0.0321)	(0.0296)	(0.0661)	(0.0414)	(0.0596)	(0.0366)	(0.0371)	(0.0658)	**(0.0677)**	**(0.0886)**	**(0.0729)**
Other transport equip.	35	14009	-0.177	0.198**	0.0103	-0.146	0.0751	-0.126	0.205**	-0.210***	0.110	**0.0308**	**-0.197**	**0.104**
			(0.115)	(0.0851)	(0.0420)	(0.152)	(0.0991)	(0.0881)	(0.0862)	(0.0656)	(0.113)	**(0.115)**	**(0.153)**	**(0.126)**
Other manufacturing	36_37	15222	0.143**	0.0203	0.0380	0.225***	0.0406	-0.0161	-0.136**	-0.0903**	-0.0734	**0.201*****	**0.249*****	**-0.299*****
			(0.0574)	(0.0391)	(0.0309)	(0.0690)	(0.0527)	(0.0438)	(0.0556)	(0.0420)	(0.0459)	**(0.0644)**	**(0.0685)**	**(0.0635)**

Note: Columns (1)-(9) display coefficient estimates for goods sectors resulting from sector-by-sector Poisson panel estimation using data for 1996, 2001, 2006, and 2011. All estimations include country-pair, importer-time, and exporter-time fixed effects. Each row corresponds to a sectoral estimation. *wto* (*pta*; *ccu*) denotes exponentiated zero-one-indicator for joint membership in the WTO (a preferential trade agreement; a customs union, a common market, or an economic union) - as classified by Baier et al. (2014). $L1$ ($L2$) denotes the first (second) lag. Columns (10)-(12) shows the sum over the contemporaneous and lagged effects. Standard errors (in parentheses) are robust to clusters at the country-pair level. Standard errors for cumulative effects are obtained with the Delta method. *, ** and *** indicate statistical significance at the 10, 5, and 1% level, respectively.

Table G.2: Detailed Estimation Results: Services

Sector	Isic Rev. 3	# Obs	(1) *pta*	(2) *L1.pta*	(3) *L2.pta*	(4) *ccu*	(5) *L1.ccu*	(6) *L2.ccu*	(7) *wto*	(8) *L1.wto*	(9) *L2.wto*	**(10)** *PTA*	**(11)** *CCU*	**(12)** *WTO*
Electricity, gas, water	40_41	9574	0.185*	0.0441	0.0656	0.474***	0.353**	0.245	0.218*	-0.00926	-0.107	**0.295***	**1.071*****	**0.101**
			(0.111)	(0.0751)	(0.0850)	(0.141)	(0.156)	(0.164)	(0.118)	(0.0917)	(0.155)	**(0.173)**	**(0.213)**	**(0.232)**
Construction	45	13880	0.111	0.211***	0.185***	-0.102	0.241***	0.0722	0.511***	-0.286*	-0.105	**0.506*****	**0.211***	**0.120**
			(0.0704)	(0.0528)	(0.0607)	(0.120)	(0.0755)	(0.0966)	(0.162)	(0.166)	(0.130)	**(0.105)**	**(0.123)**	**(0.147)**
Wholesale, retail trade	50_52	15381	0.0221	0.0398**	0.0341**	0.207***	0.0647***	0.00993	0.0652*	-0.0579***	0.0539**	**0.0960*****	**0.281*****	**0.0612**
			(0.0288)	(0.0173)	(0.0164)	(0.0375)	(0.0221)	(0.0254)	(0.0370)	(0.0178)	(0.0266)	**(0.0365)**	**(0.0405)**	**(0.0409)**
Hotels & restaurants	55	15192	0.106**	0.0317	-0.0731*	0.164**	0.114**	-0.0441	0.0274	-0.0935**	0.0728	**0.0645**	**0.234*****	**0.00675**
			(0.0439)	(0.0354)	(0.0374)	(0.0733)	(0.0471)	(0.0598)	(0.0889)	(0.0474)	(0.0466)	**(0.0580)**	**(0.0825)**	**(0.0915)**
Transport & storage	60_63	15382	0.0357	0.0598**	-0.0671**	0.0842	0.0731**	-0.130***	0.286***	-0.200***	-0.0788*	**0.0284**	**0.0277**	**0.00722**
			(0.0385)	(0.0274)	(0.0325)	(0.0517)	(0.0371)	(0.0438)	(0.0596)	(0.0626)	(0.0470)	**(0.0524)**	**(0.0574)**	**(0.0639)**
Post, telecommunication	64	14542	0.0439	0.0359	0.130	0.111	0.135	0.295**	-0.235*	0.215*	0.0389	**0.210**	**0.541*****	**0.0185**
			(0.0791)	(0.0821)	(0.102)	(0.118)	(0.100)	(0.118)	(0.123)	(0.117)	(0.0885)	**(0.137)**	**(0.111)**	**(0.134)**
Financial services	65_67	14058	0.112	-0.0188	-0.0446	-0.0475	0.0180	-0.156	-0.134**	0.290***	-0.130	**0.0481**	**-0.185**	**0.0262**
			(0.0913)	(0.0552)	(0.124)	(0.137)	(0.0884)	(0.150)	(0.0649)	(0.111)	(0.0847)	**(0.148)**	**(0.151)**	**(0.121)**
Real estate services	70	14974	0.148***	-0.00130	-0.0582*	0.388***	0.0343	-0.0892*	0.177*	-0.143**	-0.126**	**0.0882**	**0.333*****	**-0.0924**
			(0.0507)	(0.0449)	(0.0330)	(0.0805)	(0.0550)	(0.0540)	(0.104)	(0.0581)	(0.0598)	**(0.0744)**	**(0.102)**	**(0.115)**
Renting of machinery	71	14408	0.134*	0.0218	0.0126	0.0699	0.513***	0.133	0.115	0.0401	-0.211**	**0.168***	**0.716*****	**-0.0559**
			(0.0777)	(0.0532)	(0.0650)	(0.133)	(0.107)	(0.114)	(0.0862)	(0.0751)	(0.105)	**(0.0999)**	**(0.166)**	**(0.125)**
Computer services	72	13716	0.0305	-0.0672	0.196***	0.346***	-0.0860	0.435***	0.0540	-0.361	0.0894	**0.159**	**0.695*****	**-0.218**
			(0.0710)	(0.0808)	(0.0631)	(0.104)	(0.0939)	(0.0880)	(0.0990)	(0.272)	(0.130)	**(0.111)**	**(0.113)**	**(0.154)**
R&D and business serv.	73_74	14478	0.0134	0.121***	0.0949**	-0.0420	0.227***	0.0475	0.0443	0.182**	-0.125**	**0.230****	**0.232****	**0.102**
			(0.0906)	(0.0470)	(0.0471)	(0.109)	(0.0562)	(0.0563)	(0.0827)	(0.0816)	(0.0630)	**(0.0989)**	**(0.104)**	**(0.0918)**
Social services	75	8770	0.0189	0.217***	0.143***	-0.0948	0.322***	0.0508	0.173**	-0.173**	-0.232***	**0.379*****	**0.278*****	**-0.232****
			(0.0586)	(0.0704)	(0.0211)	(0.0923)	(0.0767)	(0.0383)	(0.0751)	(0.0765)	(0.0757)	**(0.0921)**	**(0.0986)**	**(0.108)**
Education	80	13564	0.0215	0.0983***	0.0939	0.0466	0.121***	0.343***	-0.149	-0.207***	0.0344	**0.214*****	**0.511*****	**-0.322*****
			(0.0332)	(0.0231)	(0.0785)	(0.0942)	(0.0365)	(0.104)	(0.120)	(0.0766)	(0.0829)	**(0.0811)**	**(0.111)**	**(0.112)**
Health & social work	85	13413	-0.0724	0.129*	-0.0157	0.0658	0.307***	0.0696	-0.0892**	-0.0613	-0.00981	**0.0404**	**0.442*****	**-0.160***
			(0.0791)	(0.0697)	(0.0472)	(0.100)	(0.0799)	(0.0546)	(0.0410)	(0.0710)	(0.0775)	**(0.0992)**	**(0.107)**	**(0.0915)**
Other services	90_95	15155	0.203***	0.0685	0.0539	0.379***	0.220***	0.158**	-0.0144	-0.0761	0.0151	**0.325*****	**0.756*****	**-0.0753**
			(0.0507)	(0.0475)	(0.0378)	(0.0767)	(0.0658)	(0.0620)	(0.0858)	(0.0517)	(0.0758)	**(0.0714)**	**(0.0910)**	**(0.113)**

Note: Columns (1)-(9) display coefficient estimates for service sectors resulting from sector-by-sector Poisson panel estimation using data for 1996, 2001, 2006, and 2011. All estimations include country-pair, importer-time, and exporter-time fixed effects. Each row corresponds to a sectoral estimation. *wto* (*pta*; *ccu*) denotes exponentiated zero-one-indicator for joint membership in the WTO (a preferential trade agreement; a customs union, a common market, or an economic union) - as classified by Baier et al. (2014). $L1$ ($L2$) denotes the first (second) lag. Columns (10)-(12) shows the sum over the contemporaneous and lagged effects. Standard errors (in parentheses) are robust to clusters at the country-pair level. Standard errors for cumulative effects are obtained with the Delta method. *, ** and *** indicate statistical significance at the 10, 5, and 1% level, respectively.

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