Escaping import competition in China

Appendix

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Contents

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A Positive Results in the Closed Economy

We prove the ordering of exit in Appendix A.1. Appendix A.2 proves the results on productivity and differentiation. It deals with the general cases $c_{iD} \neq c_{iL}$ and with convexity of the set of firms differentiating. Appendix A.3 proves the results for large shocks to competition in a single sector, and Appendix A.4 provides a numerical example with small shocks.

A.1 Exit

Suppose that firms in sector S can be ranked in terms of costs, $c_{iD} < c_{i'D}$ if and only if $c_{iL} < c_{i'L}$. Then, there exists $\bar{c}_S > 0$ such that firms produce if and only if $c_{iL} \leq \bar{c}$.

Proof. Suppose by contradiction that i firm with costs (c_{iL}, c_{iD}) enters and a firm j with $(c_{jL}, c_{jD}) \ll (c_{iL}, c_{iD})$ does not enter. If firm i differentiates its product, then trivially, firm j would make positive profits from entering and differentiating. Let firm j be the highest-cost firm that does not enter and that has some firms with costs higher than it enter. Consider the subgame perfect equilibrium where firm j enters and does not differentiate. If any of the subsequent firms remain in the market, then firm j must make positive profits in this subgame, since other firms have costs higher than j. So, the entry of firm j must induce exit from all subsequent firms. This is a contradiction because firm j's profits in this subgame equilibrium must be strictly higher than firm i's profit and $\pi_i \geq 0$ since firm i enters. ■

A.2 Product Differentiation and Productivity

Fix $\mathbf{c}_{-iL}$ and the ratio of unit costs c_{iD}/c_{iL}. If the set of firm productivity parameters $\phi_i \equiv (c_{iL})^{-1}$ such that firm i differentiates its product is non-empty, then (i) it is a line segment $[\underline{\phi}, \overline{\phi}]$ if differentiation increases unit costs $c_{Di}/c_{Li} \geq 1$, and (ii) it is unbounded if differentiation decreases unit costs $c_{Di}/c_{Li} < 1$. The net gain from product differentiation $\pi_D(c_{iD}) - \pi_L(c_{iL}, \hat{\mathbf{c}}_{-iL})$ strictly increases if elements of $\mathbf{c}_{-iL}$ decrease or if $\mathbf{c}_{-iL}$ is augmented with new elements (competitors).

Proof. We omit the firm's subscript i, and write its costs as $c_{iL} = c_L/\phi$ and $c_{iD} = c_D/\phi$ where ϕ is the firm's productivity. This notation captures all the cases $c_{iL} \lesseqgtr c_{iD}$.

Step 1: Limits of profits. For a less-differentiated firm, $\lim_{\phi\to\infty} s = 1$, $\lim_{\phi\to\infty} \epsilon = \eta$ and $\lim_{\phi\to\infty} P_L = \frac{\eta c_L}{(\eta-1)\phi}$. We use these limits below,

$$\begin{aligned}
\lim_{\phi\to\infty} (\pi_D - \pi_L) &= \lim_{\phi\to\infty} \overline{P}^{\eta-1} \left[\frac{1}{\eta} \left(\frac{\eta c_D}{(\eta-1)\phi} \right)^{1-\eta} - \frac{P_L^{\sigma-\eta}}{\epsilon_L} \left(\frac{\epsilon_L c_L}{(\epsilon_L - 1)\phi} \right)^{1-\sigma} \right] \\
&= \overline{P}^{\eta-1} \left[\frac{1}{\eta} \left(\frac{\eta c_D}{(\eta-1)\phi} \right)^{1-\eta} - \frac{1}{\eta} \left(\frac{\eta c_L}{(\eta-1)\phi} \right)^{1-\eta} \right] \\
&= \overline{P}^{\eta-1} \frac{1}{\eta} \left(\frac{\eta}{(\eta-1)\phi} \right)^{1-\eta} \left[c_D^{1-\eta} - c_L^{1-\eta} \right]
\end{aligned}$$

The term outside the brackets tends to infinity. The term in the square brackets is independent of

ϕ and satisfies

$$\begin{aligned}\left[c_D^{1-\eta} - c_L^{1-\eta}\right] &< 0 \qquad \text{if } c_D > c_L \\ \left[c_D^{1-\eta} - c_L^{1-\eta}\right] &= 0 \qquad \text{if } c_D = c_L \\ \left[c_D^{1-\eta} - c_L^{1-\eta}\right] &> 0 \qquad \text{if } c_D < c_L\end{aligned}$$

This completes the case $c_D < c_L$ for which convexity does not necessarily hold.

Step 2: Convexity when $c_D \geq c_L$.

Step 2.1. Get $\frac{d\pi}{d\phi}$. The profit of a downstream firm is

$$\pi = \max_p \overline{P}^{\eta-1} P_n^{\sigma-\eta} p^{-\sigma}(p - c_n/\phi)$$

Applying the Envelope Theorem, at the optimal price, $\frac{d\pi}{d\phi} = \frac{\partial\pi}{\partial\phi}$

$$\begin{aligned}\frac{\partial\pi}{\partial\phi} &= \overline{P}^{\eta-1} P_n^{\sigma-\eta} p^{-\sigma} \frac{c_n}{\phi^2} \\ &= \frac{\pi}{\phi}\left(\frac{c_n/\phi}{p - c_n/\phi}\right) \\ &= (\epsilon - 1)\frac{\pi}{\phi} \qquad \text{(A.1)}\end{aligned}$$

where the last line uses $p = \left(\frac{\epsilon}{\epsilon-1}\right)\frac{c_n}{\phi}$. For differentiated firms, $\epsilon = \eta$.

Step 2.2. Define $G = \pi_D - \pi_L$ as the gain from differentiation gross of fixed costs. A necessary condition for a maximum of the gross gain from differentiating $G(\phi)$ is

$$G'(\phi) = 0 \quad \Rightarrow \quad (\eta - 1)\pi_D = (\epsilon - 1)\pi_L. \qquad \text{(A.2)}$$

Step 2.3. Let s be the market share of the firm in $\mathcal{L}$ when it does not differentiate its product. Clearly, s is strictly increasing in ϕ. To prove that there a unique s satisfying equation (A.2), we rewrite the condition above as a function of s. Denote the markup of the firm with μ_D if it is differentiated, and μ_L otherwise. Substituting the expression for profit in (A.2), we have:

$$\begin{aligned}\frac{\eta - 1}{\eta} p_D^{1-\eta} &= \frac{\epsilon - 1}{\epsilon} P_L^{1-\eta}\left(\frac{p_L}{P_L}\right)^{1-\sigma} \qquad \text{(A.3)} \\ \frac{(\mu_D c_D/\phi)^{1-\eta}}{\mu_D} &= \frac{P_L^{1-\eta}}{\mu_L} s \\ \equiv \quad \left(\frac{\mu_D c_D}{\mu_L c_L}\frac{\mu_L c_L/\phi}{P_L}\right)^{1-\eta} &= \frac{\mu_D}{\mu_L} s\end{aligned}$$

Using $s^{1/(1-\sigma)} = \mu_L c_L/(\phi P_L)$, we have

$$\begin{aligned} s^{\frac{\eta-1}{\sigma-1}} &= s\left(\frac{\mu_D}{\mu_L}\right)^{\eta}\left(\frac{c_D}{c_L}\right)^{(\eta-1)} \\ \equiv \quad s &= \left(\frac{\mu_L}{\mu_D}\right)^{\eta\frac{\sigma-1}{\sigma-\eta}}\left(\frac{c_L}{c_D}\right)^{(\eta-1)\frac{\sigma-1}{\sigma-\eta}} \end{aligned} \tag{A.4}$$

When $s = 1$, then the right-hand-side is $(c_L/c_D)^{(\eta-1)\frac{\sigma-1}{\sigma-\eta}}$, less than or equal to one since $c_L \leq c_D$. When $s = 0$, then $\mu_L = \sigma/(\sigma-1)$ and the right-hand-side is strictly larger than one. Next, we prove that μ_L is a convex function of s. Then these two limits will be enough to prove that the left- and right-hand-sides of (A.4) cross at most once.

Step 2.4. The pricing rule is

$$\mu_L = \frac{\sigma + (\eta-\sigma)s}{\sigma + (\eta-\sigma)s - 1}$$

We must show that $\frac{\partial^2(\mu_L)^a}{\partial s^2} > 0$ where $a > 1$ is a constant.

$$\frac{\partial(\mu_L)^a}{\partial s} = a\mu_L^{a-1}\frac{\sigma-\eta}{(\sigma + (\eta-\sigma)s - 1)^2}$$

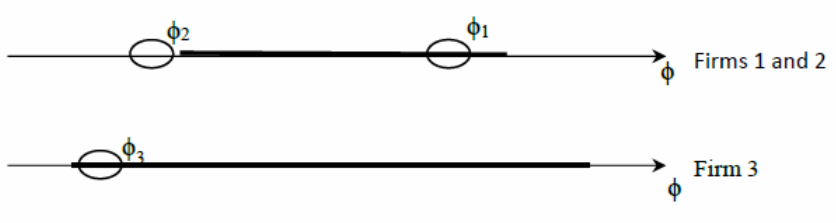
It is a positive constant a times the product of two positive and increasing functions of s, μ_L^{a-1} and $(\sigma + (\eta-\sigma)s - 1)^{-2}$. Hence, $\frac{\partial^2(\mu_L)^a}{\partial s^2} > 0$ as we wanted to prove. ■

Two notes on convexity are in order. First, convexity generally does not hold when $c_L > c_D$. By the arguments in steps 2.3 and 2.4, the gain from differentiation, $\pi_D - \pi_L$ has either zero or two critical points when $c_L > c_D$ satisfying equation (A.4). When there are no critical points, then the set of productivity ϕ for which the firm differentiates its product is convex $(\underline{\phi}, \infty)$. When there are two critical points, the first is local maximum and the second is a local minimum. Convexity holds only if the gain from differentiating is strictly larger than the fixed cost $\pi_D - \pi_L - (f_D - f_L) > 0$ at the second critical point.

Second, even when the ratio of unit costs c_{iL}/c_{iD} is the same for all firms, the set of differentiated firms is not necessarily convex in costs c_{iL} in a given equilibrium because firms face different levels of competition in the less-differentiated nest c_{-iL}. We sketch an example where the equilibrium set of differentiated firms is not necessarily convex in productivity.

When c_{iL}/c_{iD} is the same for all firms, we can write firms' units costs as functions of firm-specific productivity ϕ_i: Let $c_{iL} = c_L/\phi_i$ and $c_iD = c_D/\phi_i$ for all i where c_L and c_D are common parameters. Consider an economy with Foreign competition and three domestic firms with productivity parameters $\phi_1 > \phi_2 > \phi_3$. Let $c_D = c_L$ so that the set of differentiated firms is a bounded interval $(\underline{\phi}, \overline{\phi})$ for any given P_{-iL}. We claim that for some parameter values, it is possible to construct a subgame perfect equilibrium with actions in the equilibrium path {*differentiate, not differentiate, differentiate*}. Suppose that in the subgame where firm 1 does not differentiate, then the two other firms differ-

Figure A.1: Set of productivities ϕ where differentiation is profitable, given $P_{-1L} = P_{-2L} > P_{-3L}$



entiate. Then, the level of competition faced by the three firms in the less-differentiated nest is $P_{LF} = P_{-1L} = P_{-2L} > P_{-3L}$. Then, the set of productivity ϕ that makes differentiation profitable is illustrated in Figure A.1 in bold. The set is larger for firm 3 because $P_{-1L} = P_{-2L} > P_{-3L}$, and so it is possible to judiciously pick productivity levels in the regions indicated with an oval such that the proposed equilibrium holds.

A.3 Markup Responses of Firms of Different Sizes

Consider the effect of a sufficiently large decrease in the cost of foreign varieties on two domestic firms, a and b, originally producing less-differentiated varieties with $c_{aL} < c_{bL}$. If both firms a and b differentiate their products or if both firms remain less-differentiated, the markup of firm b increases relative to firm a, i.e., μ_b/μ_a increases, where μ_i is the markup of firm i.

Proof. The case where both firms differentiate is in the main text. If both firm remain less-differentiated, they decrease their markups. We must prove that the markup response is greater for firm a than for firm b:

$$\left|\frac{d\mu_a}{\mu_a}\right| > \left|\frac{d\mu_b}{\mu_b}\right|$$

where μ_i is the markup of firm i and $d\mu_b$ is the change given the shock.

In setting prices in the less-differentiated nest, firm i best responds to the other firm's prices. Define

$$P_{-iL}^{1-\sigma} = \sum_{i' \in \mathcal{L}, i' \neq i} p_{i'}^{1-\sigma}.$$

The shock decreases the price of firms in $\mathcal{L}$, excluding firm a and b. Since both a and b respond to it, the shock to P_{-aL} and P_{-bL} is different. We first consider each firm's response to an increase in $P_{-iL}^{1-\sigma}$. For ease of notation, we drop the firm's subscript and define $A = P_{-iL}^{1-\sigma}$. Denote the markup with μ and without loss of generality, we set $c_L = 1$.

Step 1: Derive an expression for $\frac{P_L^{1-\sigma}}{\mu}\frac{d\mu}{dA}$ Using the pricing rule, the markup μ of a less-differentiated firm with unit cost c is implicitly defined as a function of A as

$$\Psi(\mu, A) \equiv \frac{\sigma + (\eta - \sigma)\left(\frac{(\mu c)^{1-\sigma}}{(\mu c)^{1-\sigma} + A}\right)}{\sigma + (\eta - \sigma)\left(\frac{(\mu c)^{1-\sigma}}{(\mu c)^{1-\sigma} + A}\right) - 1} - \mu = 0$$

By the Implicit Function Theorem, $\frac{d\mu}{dA} = -\frac{\Psi_A}{\Psi_\mu}$ where Ψ_x refers to derivative of Ψ with respect to x, following standard notation. Taking derivatives,

$$\Psi_A = \frac{(\eta-\sigma)\left(\frac{(\mu c)^{1-\sigma}}{[(\mu c)^{1-\sigma}+A]^2}\right)}{\left[\sigma+(\eta-\sigma)\left(\frac{(\mu c)^{1-\sigma}}{(\mu c)^{1-\sigma}+A}\right)-1\right]^2}$$

$$\Psi_\mu = -1 - \frac{\frac{(\sigma-\eta)(\sigma-1)}{\mu}\left(\frac{A(\mu c)^{1-\sigma}}{[(\mu c)^{1-\sigma}+A]^2}\right)}{\left[\sigma+(\eta-\sigma)\left(\frac{(\mu c)^{1-\sigma}}{(\mu c)^{1-\sigma}+A}\right)-1\right]^2}$$

Since $\eta < \sigma$, $(\Psi_A, \Psi_\mu) \ll 0$ so that $\frac{d\mu}{dA} = -\frac{\Psi_A}{\Psi_\mu} < 0$, confirming that firms decrease markups in response to tighter competition.

$$\frac{d\mu}{dA} = \frac{(\eta-\sigma)\left(\frac{(\mu c)^{1-\sigma}}{[(\mu c)^{1-\sigma}+A]^2}\right)}{\left[\sigma+(\eta-\sigma)\left(\frac{(\mu c)^{1-\sigma}}{(\mu c)^{1-\sigma}+A}\right)-1\right]^2 + \frac{(\sigma-\eta)(\sigma-1)}{\mu}\left(\frac{A(\mu c)^{1-\sigma}}{[(\mu c)^{1-\sigma}+A]^2}\right)}$$

Using the firm's market share $s = (\mu c)^{1-\sigma} / \left[(\mu c)^{1-\sigma} + A\right]$

$$-\frac{P_L^{1-\sigma}}{\mu}\frac{d\mu}{dA} = \frac{(\sigma-\eta)s}{\mu\left[(\sigma-1)-(\sigma-\eta)s\right]^2 + (\sigma-\eta)(\sigma-1)s(1-s)} \tag{A.5}$$

Step 2. We now return to the original shock that decreases the price of the competitors of firms a and b in the less-differentiated nest. Note first that since firm a and b are in the same nest, price index P_L is the same for both firms. Define P_{-abL} as the component of the shock that is common to a and b,

$$P_{-abL}^{1-\sigma} = \sum_{i\in\mathcal{L}, i\neq a,b} p_i^{1-\sigma}.$$

The price index of all firm a's competitors is

$$P_{-aL}^{1-\sigma} = P_{-abL}^{1-\sigma} + (\mu_b c_b)^{1-\sigma} \tag{A.6}$$

Totally differentiating μ_a with respect to $P_{-abL}^{1-\sigma}$, we get:

$$\frac{d\mu_a}{dP_{-abL}^{1-\sigma}} = \frac{\partial\mu_a}{\partial P_{-abL}^{1-\sigma}} + (1-\sigma)\frac{p_b^{1-\sigma}}{\mu_b}\frac{\partial\mu_b}{\partial P_{-abL}^{1-\sigma}}\frac{\partial\mu_a}{\partial p_b^{1-\sigma}} \tag{A.7}$$

The equivalent expression for b is

$$\frac{d\mu_b}{dP_{-abL}^{1-\sigma}} = \frac{\partial \mu_b}{\partial P_{-abL}^{1-\sigma}} + (1-\sigma)\frac{p_a^{1-\sigma}}{\mu_a}\frac{\partial \mu_a}{\partial P_{-abL}^{1-\sigma}}\frac{\partial \mu_b}{\partial p_a^{1-\sigma}} \tag{A.8}$$

Note that the partial derivatives $\frac{\partial \mu}{\partial P_{-abL}^{1-\sigma}}$ and $\frac{\partial \mu}{\partial p_i^{1-\sigma}}$ with respect to the price of any competitor i is given by (A.5) because of the linearity of (A.6). Then, combining (A.7) and (A.8), we then have

$$\frac{P_L^{1-\sigma}}{\mu_a}\frac{d\mu_a}{dP_{-abL}^{1-\sigma}} - \frac{P_L^{1-\sigma}}{\mu_b}\frac{d\mu_b}{dP_{-abL}^{1-\sigma}} = \frac{P_L^{1-\sigma}}{\mu_a}\frac{\partial \mu_a}{\partial P_{-abL}^{1-\sigma}} - \frac{P_L^{1-\sigma}}{\mu_b}\frac{\partial \mu_b}{\partial P_{-abL}^{1-\sigma}} + (1-\sigma)(s_b - s_a)\frac{(P_L^{1-\sigma})^2}{\mu_b \mu_a}\frac{\partial \mu_b}{\partial P_{-abL}^{1-\sigma}}\frac{\partial \mu_a}{\partial P_{-abL}^{1-\sigma}}$$

Substituting (A.5),

$$\begin{aligned}
&\frac{P_L^{1-\sigma}}{\mu_a}\frac{d\mu_a}{dP_{-abL}^{1-\sigma}} - \frac{P_L^{1-\sigma}}{\mu_b}\frac{d\mu_b}{dP_{-abL}^{1-\sigma}} \\
=&\frac{(\eta-\sigma)s_a}{\mu_a\left[(\sigma-1)-(\sigma-\eta)s_a\right]^2 + (\sigma-\eta)(\sigma-1)s_a(1-s_a)} - \\
&\frac{(\eta-\sigma)s_b}{\mu_b\left[(\sigma-1)-(\sigma-\eta)s_b\right]^2 + (\sigma-\eta)(\sigma-1)s_b(1-s_b)} + \\
&\frac{(1-\sigma)(\sigma-\eta)^2 s_a s_b (s_a - s_b)}{\left\{\mu_a\left[(\sigma-1)-(\sigma-\eta)s_a\right]^2 + (\sigma-\eta)(\sigma-1)s_a(1-s_a)\right\}\left\{\mu_b\left[(\sigma-1)(\sigma-\eta)s_b\right]^2 + (\sigma-\eta)(\sigma-1)s_b(1-s_b)\right\}} \\
=&\frac{(\sigma-\eta)\left\{\mu_a\left[(\sigma-1)-(\sigma-\eta)s_a\right]^2 s_b - \mu_b\left[(\sigma-1)-(\sigma-\eta)s_b\right]^2 s_a\right\}}{\left\{\left[(\sigma-1)-(\sigma-\eta)s_a\right]^2 + (\sigma-\eta)(\sigma-1)s_a(1-s_a)\right\}\left\{\left[(\sigma-1)(\sigma-\eta)s_b\right]^2 + (\sigma-\eta)(\sigma-1)s_b(1-s_b)\right\}}
\end{aligned}$$

Since the denominator is positive, we must prove that the numerator is negative so that in absolute value, $\left|\frac{1}{\mu_a}\frac{d\mu_a}{dP_{-abL}^{1-\sigma}}\right| > \left|\frac{1}{\mu_b}\frac{d\mu_b}{dP_{-abL}^{1-\sigma}}\right|$. That is, the following function must be increasing in s:

$$\frac{(\sigma-\eta)s}{\mu[(\sigma-1)-(\sigma-\eta)s]^2}$$

We rewrite this function as a function of the firm's endogenous elasticity of demand:

$$\frac{(\sigma-\eta)s}{\mu[(\sigma-1)-(\sigma-\eta)s]^2} = \frac{\sigma-\epsilon}{\epsilon(\epsilon-1)}$$

which is clearly a decreasing function of ϵ for $\epsilon > 1$ as we wanted to prove. ■

A.4 Example of a Small Shock to Competition

Sector S is in SPE. The unit cost c_{iL} decreases for some firm $i \in S$. All firms adjust their strategies to a new SPE. If the shock is small, we show with an example that it has an ambiguous effect on

Table A.1: Operating profits (before fixed costs) in the numerical example

	Initial			**After decrease in c_1**		
	firm 1	firm 2	firm 3	firm 1	firm 2	firm 3
unit cost $c_{iL} = c_{iD}$	**1.0**	1.1	1.2	**0.9**	1.1	1.2
π_D	0.148	0.122	0.103	0.183	0.122	0.103
π_L						
$\mathcal{L}_S = \{1,2,3\}$	0.092	0.064	0.045	0.126	0.058	0.041
$\mathcal{L}_S = \{1,2\}$	0.107	0.075		0.143	0.067	
$\mathcal{L}_S = \{1,3\}$	0.114		0.058	0.150		0.051
$\mathcal{L}_S = \{2,3\}$		0.088	0.064		0.088	0.064

the discrete actions of other firms in the same sector due to strategic interactions among firms.

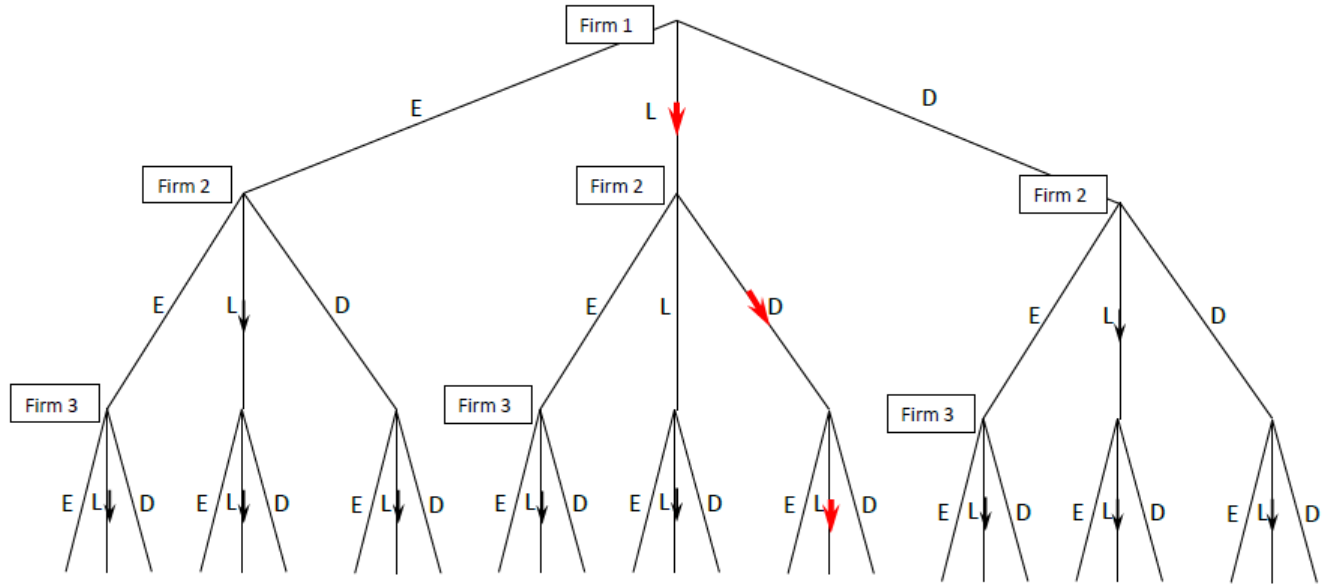
There are three firms with unit costs $c \equiv c_L = c_D = (1, 1.1, 1.2)$. Fixed costs are $f_L = 0.044$ and $f_D = 0.102$, and $\overline{P}^{\sigma-1} y = 1$. Table A.1 reports the operating profits for all strategies, and Figure A.2(a) illustrates the equilibrium strategies. Actions E, L, D correspond to *exit*, *less-differentiation*, *differentiation*, respectively. We chose fixed costs so that firm 3 is close to exit in the subgame following actions (L, L), $\pi_L(c_3, \{c_1, c_2\}) = 0.045 > f_L = 0.044$, and the gain from differentiation is small for firm 2, $\pi_D(c_2) - \pi_L(c_2, \{c_1, c_3\}) = 0.122 - 0.064 = 0.059 > 0.058 = f_D - f_L$. The arrows indicate the full subgame equilibrium strategies, whereas the thick red arrows indicate the actions in the equilibrium path: (L, D, L).

Figure A.2(b) illustrates the effect on the SPE of a decrease in firm 1's cost from $c_1 = 1$ to $c_1 = 0.9$. Now, $\pi_L(c_3, \{c_1, c_2\}) = 0.041 < f_L$. Then, firm 3 exits in the subgame following actions (L, L). The gross gain from product differentiation for firm 2 becomes $\pi_D(c_2) - \pi_L(c_2, \{c_1\}) = 0.055 < f_D - f_L$. Actions in the new equilibrium path are (L, L, E). So, firm 2 switches from differentiation to less-differentiation.

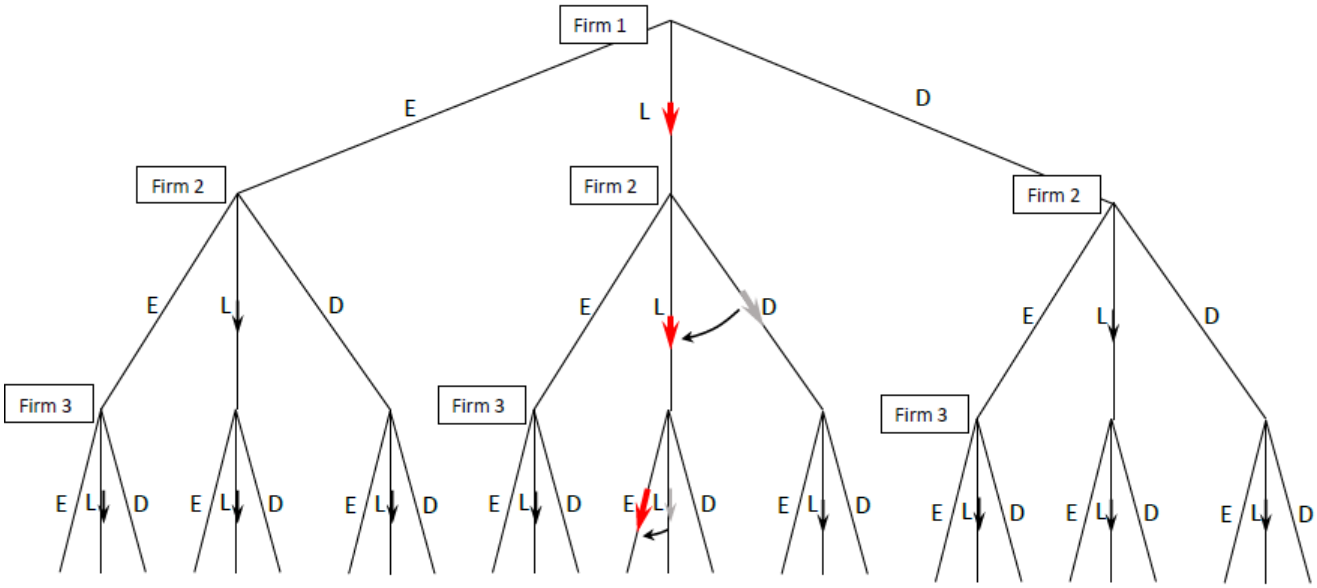
Similar examples exist in which a decrease in firm i's unit cost leads some firms i' to differentiate and yet other firms i'' to switch from exiting to producing a less-differentiated variety. Examples where the shock increases exit and differentiation among other firms $i' \in S$ are easy to generate since the operating profit under less differentiation $\pi_L(c_{i'L}, \mathbf{c}_{-i'L})$ is decreasing in any element of $\mathbf{c}_{-i'L}$, while the profit $\pi_D(c_{iD})$ is unaffected by shocks to a single sector.

B Welfare Results in the Open Economy

For generality, we prove all welfare results in the open economy in the general equilibrium model of Appendix C.1, in which there's no homogeneous sector and the Foreign wage, denoted w^*, is endogenous. Appendix B.1 shows the misallocation of labor. The main text proved results on discrete choices in the closed economy. Appendix B.2 extends these results to the open economy. Since none of the welfare results involved changes in input suppliers, we set $\tilde{c}_{SU} = 1$ without loss of generality and treat the economy as if labor were the unique factor of production.



Initial SPE



SPE after shock (decrease in c_1)

Figure (a) illustrates the SPE when $\overline{P}^{\sigma-1}y = 1$, costs are $c_L = c_D = (1, 1.1, 1.2)$ and fixed costs are $f_L = 0.044$, $f_D = 0.102$. Letters E, L, D indicate actions exit, less-differentiation, and differentiation, respectively. The arrows indicate all equilibrium strategies and the thick arrows indicate the actions in the equilibrium path. Figure (b) illustrates how the subgame perfect equilibrium changes when the c_1 decreases from 1 to 0.9. Firm 2 switches from a differentiated to a less-differentiated product because it knows that firm 3 will exit in the subgame following actions (L,L) by firms 1 and 2.

Figure A.2: Example of the effect of a small decrease in c_1 on the SPE strategies

B.1 Misallocation of Labor

Consider any set of discrete choices with the corresponding profit-maximizing prices and market-clearing quantities. Suppose a planner can reallocate labor but not change discrete choices or the quantities produced by Foreigners. For any two less-differentiated firms, the planner allocates relatively more labor to the more productive firm compared to the market. The planner also allocates more labor to differentiated varieties relative to less-differentiated varieties.

Proof. Fix sector S. The result on two less-differentiated varieties is simple and appears in a footnote in the main text. Given $\mathcal{L}_S$ and $\mathcal{D}_S$, the planner's problem is to choose quantities q_i for Home varieties to maximize

$$\begin{aligned} \max Q_S &= \left[(Q_L)^{\frac{\eta-1}{\eta}} + \sum_{i \in \mathcal{D}_S} q_i^{\frac{\eta-1}{\eta}} + (Q_D^*)^{\frac{\eta-1}{\eta}} \right]^{\frac{\eta}{\eta-1}} \\ \text{subject to} \quad Q_L &= \left(\sum_{i \in \mathcal{L}_S \cap S_H} q_i^{\frac{\sigma-1}{\sigma}} + (Q_L^*)^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}} \\ L &= \sum_{i \in \mathcal{L}_S \cap S_H} (c_{iL} q_i) + \sum_{i \in \mathcal{D}_S \cap S_H} (c_{iD} q_i) \,. \end{aligned} \tag{B.1}$$

where Q_D^* and Q_L^* are the aggregate quantities of Foreign goods, which the planner takes as given.[1] The first order conditions with respect to quantity q_L for a less-differentiated firm and quantity q_D for a differentiated firm are respectively

$$\begin{aligned} q_L &= \lambda^{-\sigma} (c_{iL})^{-\sigma} Q^{\sigma/\eta} (Q_L)^{(\eta-\sigma)/\eta} \\ q_D &= \lambda^{-\eta} (c_{iD})^{-\eta} Q \end{aligned}$$

λ is the Lagrange multiplier for constraint (B.1). Define the aggregate quantities of Home less-differentiated and differentiated goods are respectively,

$$\begin{aligned} Q_{LH} &= \left(\sum_{i \in \mathcal{L}_S \cap S_H} q_i^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}} \\ Q_{DH} &= \left(\sum_{i \in \mathcal{D}_S \cap S_H} q_i^{\frac{\eta-1}{\eta}} \right)^{\frac{\eta}{\eta-1}} \end{aligned}$$

[1] We're more general here than in the main text where $Q_D^* = 0$.

Substituting the first order conditions,

$$\frac{Q_{LH}}{Q_L} = \lambda^{-\sigma}\left(\frac{Q_L}{Q}\right)^{-\sigma/\eta} C_{LH}^{-\sigma} \tag{B.2}$$

$$\frac{Q_{DH}}{Q} = \lambda^{-\eta} C_{DH}^{-\eta} \tag{B.3}$$

$$\text{where} \quad C_{LH} = \left(\sum_{i\in\mathcal{L}\cap S_H} (c_{iL})^{1-\sigma}\right)^{1/(1-\sigma)}$$

$$C_{DH} = \mu_D \left(\sum_{i\in\mathcal{D}\cap S_H} (c_{iD})^{1-\eta}\right)^{1/(1-\eta)}$$

C_{LH} and C_{LH} are the labor requirements for production of aggregate quantities. Rearranging (B.2),

$$\frac{Q_L}{Q}\left(\frac{Q_{LH}}{Q_L}\right)^{\eta/\sigma} = \lambda^{-\eta} C_{LH}^{-\eta}$$

Dividing it by (B.3),

$$\frac{Q_L^W}{Q_D^W}\left(\frac{Q_{LH}^W}{Q_L^W}\right)^{\eta/\sigma} = \left(\frac{C_{LH}}{C_{DH}}\right)^{-\eta} \tag{B.4}$$

where the superscript W indicates the planner's solution. Following the same steps, the equivalent expression for the market (superscript M) is

$$\frac{Q_L^M}{Q_D^M}\left(\frac{Q_{LH}^M}{Q_L^M}\right)^{\eta/\sigma} = \left(\frac{P_{LH}}{P_{DH}}\right)^{-\eta}$$

$$\text{where} \quad P_{LH} = \left(\sum_{i\in\mathcal{L}\cap\mathcal{H}} (c_{iL})^{1-\sigma}\right)^{1/(1-\sigma)}$$

$$P_{DH} = \mu_D \left(\sum_{i\in\mathcal{L}\cap\mathcal{H}} (c_{iD})^{1-\sigma}\right)^{1/(1-\sigma)}$$

Dividing these market quantities by the planner's (B.4), we have

$$\frac{Q_L^M/Q_D^M(Q_{LH}^M/Q_L^M)^{\eta/\sigma}}{Q_L^W/Q_D^W(Q_{LH}^W/Q_L^W)^{\eta/\sigma}} = \left(\frac{P_{LH}/P_{DH}}{C_{LH}/C_{DH}}\right)^{-\eta} \geq 1$$

where the inequality holds strictly if less-differentiated firms have at least one competitor in $\mathcal{L}_S$ so that $\mu_{Li} < \mu_D$ for all $i \in \mathcal{L}_S \cap S_H$. The consumption of Foreign goods Q_L^* and Q_D^* and the total quantity of labor are the same for the market and the planner by construction of the problem. So, the only way for the right-hand side to be greater than 1 is for $Q_L^M/Q_D^M \geq Q_L^W/Q_D^W$ and $Q_{LH}^M/Q_L^M \geq Q_{LH}^W/Q_L^W$. That is, for the market to allocate more labor to the production of less-differentiated goods than to the production of differentiated goods. ■

B.2 Discrete Choices

The proof on the welfare effect of a single variety is unchanged. Only in marginal cost of labor in the economy $C = K/Q$, labor allocated for production is now:

$$K = 1 - \int_0^1 \left(\left| \mathcal{L}_S \cap S_H \right| f_L + \left| \mathcal{D}_S \right| f_D + \left| S_H^* \right| f^* \right) dS$$

For a non-zero mass of firms in the main text, we proved that welfare decreases with the following shock. The economy is in equilibrium. A planner selects a non-zero set of differentiated downstream firms $\mathcal{I}$ and shifts them from differentiation to less-differentiation. Set $\mathcal{I}$ is picked so that the conditions on continuity of costs (except for a finite number of sectors) hold conditional on discrete choices. All other firms cannot change their original discrete choices. All firms then set prices to maximize profits and general equilibrium variables $(\overline{P}, y)$ simultaneously adjust to satisfy the equilibrium conditions on income and price index.

For the open economy of Appendix C.1, we assume that the profit share in the economy decreases in the counterfactual. In the closed economy, the profit share always falls with an increase in the set of less-differentiated firms. But in the open economy the assumption that profits decrease precludes a large shift of labor from the production of exports to the production of differentiated varieties, which defeats the spirit of the counterfactual to forcibly decrease differentiation.

Proof. Suppose not, suppose real income $y/\overline{P}$ increases with the counterfactual. Then, $\overline{P}^{\eta-1}y$ must decrease because y decreases by assumption. If w^* increases, then exports by Home firms in (C.1) increase. To balance trade, Foreign sales in Home must also increase. But this is a contradiction since w^* increases and $\overline{P}^{\eta-1}y$ decreases. Then, w^* decreases. With this condition, the remaining of the proof of the closed economy holds: For any firm i, the gain from differentiation increases, and this increase contradicts the result that the planner values differentiation more then less differentiation than the firm. ■

C Robustness of the Theory

Appendix C.1 presents the model with no homogeneous-good sector and exports from firms in differentiated sectors. Appendix C.2 considers the same setting as Appendix C.1 but with two-symmetric countries. Appendix C.3 introduces free entry. To highlight only the new general equilibrium features of the model, Appendices C.2 and C.3 don't have input suppliers.

Appendix C.4 deals with input suppliers. It changes the timing of the sectoral game to allow for input suppliers to internalize the effect of their prices on prices and sales downstream.

C.1 General Equilibrium and a Small Open Economy

In the main text, sector $S = 0$ produced a homogeneous good with constant returns to scale and no trade costs. This sector pinned down wages in Home relative to Foreign. Here, we take out this

homogeneous sector. We take Home wages as the numeraire and denote Foreign wages with w^*. To balance trade, we allow firms in the differentiated sectors to export.

Production in Foreign takes only labor. The unit cost of firm $i \in S_F$ is $c_{iL} = w^* c^*_{iL}$ and $f^*_L = w^* \bar{f}_L$ where c^*_{iL} and $\bar{f}_L$ are exogenous labor requirements. Since sectors are infinitesimal, for a given w^* the description and solution of the sectoral game in the Home market remain unchanged.

In addition to supplying Home, a downstream Home firm $i \in S_H$ may export to Foreign at a fixed cost f^* and a unit cost $1/\phi_i$. These costs use only labor, not upstream inputs from S_U, to isolate shocks to import competition from shocks to exporting. The firm's sales and gross profits from exporting are

$$\begin{aligned} X^*(\phi_i, w^*) &= (\phi_i w^*)^{\sigma-1} w^* Y^*, \\ \pi^*(\phi_i, w^*) &= \frac{X^*(\phi_i, w^*)}{\sigma} \end{aligned} \tag{C.1}$$

where $Y^* > 0$ is a parameter. The firm exports if and only if $\pi^*(\phi_i, w^*) \geq f^*$ or equivalently

$$\phi_i \geq \left(\frac{\sigma f^*}{w^* Y^*}\right)^{1/(\sigma-1)} \frac{1}{w^*}.$$

For any w^*, we denote the set of firms satisfying this condition with S^*_H.

An equilibrium is a set of firm strategies and a vector $(y, \overline{P}, w^*)$ such that firm strategies are subgame perfect in all sectors and the following three conditions hold:

$$\begin{aligned} \overline{P} &= \left[\int_0^1 [P_L(\mathbf{c}_{LS})]^{1-\eta} + \sum_{i \in \mathcal{D}_S} \left(\frac{\eta c_{iD}}{\eta - 1}\right)^{1-\eta} dS\right]^{1/(1-\eta)} \\ y &= 1 + \int_0^1 \left[\sum_{i \in S^*_H} \pi^*(\phi_i, w^*) + \sum_{i \in \mathcal{D}_S} \pi_D(c_{iD}) + \sum_{i \in \mathcal{L}_S \cap S_H} \pi_L(c_{iL}, \mathbf{c}_{-iL}) + \sum_{i \in \mathcal{L}_{SU}} \pi_U(c_{iU}, \mathbf{c}_{-iU}, Y_{SU})\right] dS \\ \int_0^1 \sum_{i \in S^*_H} X^*(\phi_i, w^*) dS &= \overline{P}^{\eta-1} y \int_0^1 \sum_{i \in \mathcal{L}_S \cap S_F} P_L(\mathbf{c}_{LS})^{\sigma-\eta} \left(\frac{c_{iL} \epsilon_L(c_{iL} \mathbf{c}_{-iL})}{\epsilon_L(c_{iL}, \mathbf{c}_{-iL}) - 1}\right)^{1-\sigma} dS, \end{aligned} \tag{C.2}$$

where the last equation implies balanced trade.

Results Since w^* does not change with shocks to a single sector, those results are unchanged. Large shocks don't change either because large decreases in c^*_{iL} must decrease also $w^* c^*_{iL}$ to balance trade. Hence it has the same effect on domestic firms as the partial equilibrium model. Finally, the welfare results in Appendix B.2 were proven in the general equilibrium model presented here for generality.

C.2 General Equilibrium and Two Symmetric Countries

Set up There are two symmetric countries, each with an inelastic supply of labor, with measure one. Labor is the only input in production. It can move freely across firms within countries, but not across countries. The set of sectors is $[0, 1]$. Each country and sector has a finite and exogenous set of firms. The two countries are symmetric in the sense that the vectors of Home and Foreign labor requirements in sectors [0,0.5) is the same as the vectors of labor requirements in (0.5,1], except that Foreign is switched with Home. We describe the economy from Home's perspective.

We maintain the simplifying assumption that firms can only export their less-differentiated varieties. Denote firm i's per unit labor requirement with $\tilde{c}_{iL}$ if we the firm is less-differentiated and $\tilde{c}_{iD}$ if it is differentiated. Normalizing wages in both countries to one, the per unit cost of a variety in Home is $c_{iL} = \tilde{c}_{iL}$ and $c_{iD} = \tilde{c}_{iD}$. The unit cost of delivering of delivering each unit of their variety in Foreign is $c_{iL} = \tau\tilde{c}_{iL}$ where $\tau > 1$ is an iceberg cost. We maintain the same assumptions that the number of firms is bounded and that the vector of labor requirements is bounded from below, and it is continuous in all but a finite set of sectors where the number of firms in Home or Foreign changes.

Sectoral Game The game in each sector and market (Home and Foreign) has the following timing. (1) In ascending order of unit cost c_{iL} all firms make their discrete choices. Foreign firms decide whether to sell in Home or not. If they export, they pay a fixed cost f^* units of labor. Home firms decide on whether to (i) exit, (ii) produce a less-differentiated variety, or (iii) produce a differentiated variety. (3) All firms, Home and Foreign, simultaneously set prices.

We consider the subgame perfect equilibrium within a sector-market. The equilibrium is also symmetric in that both countries have wage set to one and the same income and price-index pair $(y, \overline{P})$. We write the general equilibrium conditions when all firms in all sectors play the subgame perfect equilibrium. The pricing rule is the same as in the main text. The price p_L, elasticity of demand ϵ_L, market share s_L, sales x, and profit π_L of a firm i, domestic or foreign, with unit cost c_{iL} selling in the less differentiated nest $\mathcal{L}_S$ in Home are

$$
\begin{aligned}
p_L(c_{iL}, \mathbf{c}_{-iL}) &= \frac{\epsilon_L(c_{iL}, \mathbf{c}_{-iL})c_{iL}}{(\epsilon_L(c_{iL}, \mathbf{c}_{-iL}) - 1)} \\
\epsilon_L(c_{iL}, \mathbf{c}_{-iL}) &= \sigma s_L(c_{iL}, \mathbf{c}_{-iL}) + \eta(1 - s_L(c_{iL}, \mathbf{c}_{-iL})) \\
s_L(c_{iL}, \mathbf{c}_{-iL}) &= \left(\frac{p_L(c_{iL}, \mathbf{c}_{-iL})}{P_{LS}}\right)^{1-\sigma} \\
x_L(c_{iL}, \mathbf{c}_{-iL}) &= \overline{P}^{\eta-1} P_{LS}^{\sigma-\eta} [p_L(c_{iL}, \mathbf{c}_{-iL})]^{1-\sigma} y \\
\pi_L(c_{iL}, \mathbf{c}_{-iL}) &= \frac{x_L(c_{iL}, \mathbf{c}_{-iL})}{\epsilon_L(c_{iL}, \mathbf{c}_{-iL})}
\end{aligned}
$$

where P_{LS} is the equilibrium price index of nest $\mathcal{L}_S$, the less-differentiated nest of sector S, and $\mathbf{c}_{-iL}$ is the vector of unit costs of firm i's competitors in nest $\mathcal{L}_S$ in the subgame in which firm i does not differentiate and all other firms play their subgame perfect equilibrium strategies. A Foreign

firm in sector S exports if $\pi_L(\tau\tilde{c}_{iL}, \mathbf{c}_{-iL}) - f^* \geq 0$. Let the set of firms satisfying this condition in sector S be $\mathcal{L}^*_{FS}$. Foreign total exports to Home are

$$\int_0^1 \sum_{i \in \mathcal{L}^*_{FS}} x_L(\tau\tilde{c}_{iL}, \mathbf{c}_{-iL}) dS$$

The discontinuities in set $\mathcal{L}^*_{FS}$ have zero measure since profits are continuous for any set of discrete choices. Then, the integral exists because labor requirements are continuous almost everywhere and bounded away from zero in S.

Denote with $\mathcal{L}_{HS}$ the set of less-differentiated Home firms in sector S so that $\mathcal{L}_S = (\mathcal{L}_{HS} \cup \mathcal{L}^*_{FS})$. The set of differentiated firms $\mathcal{D}_S$ contains only Home firms by assumption. The set of all nests in the definition of the price index is $\mathcal{N} = \{\mathcal{L}_S \cup \mathcal{D}_S\}_{S \in [0,1]}$ and the price index is

$$\overline{P} = \left\{ \int_0^1 \left[[P_L(\mathbf{c}_{LS})]^{1-\eta} + \sum_{i \in \mathcal{D}_S} \left(\frac{\eta c_{iD}}{\eta - 1} \right)^{1-\eta} \right] dS \right\}^{1/(1-\eta)} \tag{C.3}$$

The representative household gets income from labor and profits:

$$y = 1 + \int_0^1 \left[\sum_{i \in \mathcal{L}^*_{FS}} \pi_L(\tau\tilde{c}_{iL}, \mathbf{c}_{-iL}) + \sum_{i \in \mathcal{D}_S} \pi_D(\tilde{c}_{iD}) + \sum_{i \in \mathcal{L}_{HS}} \pi_L(\tilde{c}_{iL}, \mathbf{c}_{-iL}) \right] dS \tag{C.4}$$

The first term, summing over set $\mathcal{L}^*_{FS}$, enters Home household income because, by symmetry, the sum of all profits of Foreign firms selling in Home is the same as the profits of Home firms selling in Foreign. A general equilibrium is a set of strategies and a vector $(y, \overline{P})$ such that the strategies are subgame perfect equilibrium strategies in all sectors and equations (C.3) and (C.4) hold.

Trade shocks. The symmetric two-country model separates foreign production from trade costs explicitly. A decrease in f^* and τ decreases c_{iL} for Foreign firms, in S_F, relative to Home firms. This occurs always in the sector-specific shocks and in the large shocks to a non-zero mass of firms. So, the only distinction between the model in the main text and in Appendix C.1 above is that we cannot guarantee that a large enough shock will tighten competition in the less-differentiated nest for all affected domestic firms. This issue clearly exists also in the other set ups if we had explicitly separated production from trade costs.

Welfare. The welfare results remain unchanged. They pertain to the allocation of labor to variable costs and fixed costs (discrete choices) in the domestic market only. The general equilibrium effect on Foreign wages relative to Home wages in Appendix B.2 hold whether Foreign is large (here) or small (as in Appendix C.1 above).

C.3 Free Entry

We add a free-entry condition to the general equilibrium model. A large mass of entrepreneurs may pay a fixed cost of f_E units of labor to enter the market. Upon entry, a firm is assigned its own variety, a sector, and a productivity. This condition adds an equilibrium mass of firms M and a corresponding condition that expected profits must equal f_E:

$$Mf_E = y - 1 \tag{C.5}$$

where equilibrium income y is in (C.2) for the small open economy and in (C.4) for the model with two symmetric countries.

Since entry is not directed toward specific sectors, shocks to a single sector don't affect entry. Consider the shock that decreases the cost of a non-zero mass of firms in set of sectors $\mathcal{S}$. The mass of firms decreases, but profits in the less differentiated nests of sectors $S \in \mathcal{S}$ still decrease because they decrease relative to sectors not affected and to exporting activities that are not affected by the shock. So, a sufficiently large shock increases differentiation and exit in the affected sectors as in the main text.

The welfare effect of moving a non-zero mass of firms from differentiation to non-differentiation was done without adjustments to discrete choices, and so the exercise presumes no entry or exit of firms. If we relax this assumption, the decrease in y must be offset by a decrease in the mass of firms in (C.5). Our welfare results already imply that entry in the market equilibrium doesn't generally coincide with the planner's optimal variety—there are typically too many inefficient less-differentiated varieties and too few differentiated ones. So, it's not clear whether the exit of new firms improves welfare or not.

There are, however, a few practical difficulties with free entry. First is in the interpretation of existing firms' responses to decreases in foreign prices. Free entry must not completely reshuffle firms assigning new productivity parameters and eliminating the concept of an existing firm. One way around this issue is to introduce dynamics and allow firms to choose to exit and subject them to random exit shocks. Then in any period and given any shock, expected profits must be less than or equal to wf_E, with equality if entry is positive. Second is that for any measure of entrants, the productivity distributions must be defined so that the assumptions on continuity across sectors in the general equilibrium model hold. These extensions are beyond the scope of the paper.

C.4 Timing and Markup of Input Suppliers

The model in the main text assumes that all firms in a sector set prices simultaneously. The elasticity of demand faced by an input supplier in $\mathcal{L}_{SU}$ is

$$\epsilon_U = \sigma_U(1 - s) + \eta_U s(1 - s_{SU}), \tag{C.6}$$

where

$$s_{SU} = \left(\frac{p_{SU}}{\tilde{c}_{SU}}\right)^{1-\eta_U},$$
$$s = \left(\frac{p}{p_{SU}}\right)^{1-\sigma_U}.$$

If $ss_{SU} \approx 1$ then $\epsilon_U \approx 0$ and the supplier's problem doesn't have a solution. This issue arises because even a very large input supplier doesn't internalize his effect on the price and sales of downstream domestic firms.

This Appendix modifies the timing of the sectoral game to eliminate this issue. After discrete choices are all made, input suppliers in $\mathcal{L}_{SU}$ set prices first and then other firms set prices simultaneously.

A supplier with cost c solves

$$\max_p \tilde{Y}_{SU} P_L^{\sigma-\eta} (\tilde{c}_{SU})^{\eta_U-\sigma} (p_{SU})^{\sigma_U-\eta_U} p^{-\sigma_U} (p-c) \tag{C.7}$$

where

$$\tilde{Y}_{SU} = \overline{P}^{\eta-1} y \left(\sum_{i \in \mathcal{L}_S \cap S_H} \mu_i^{-\sigma} \phi_i^{\sigma-1} \right)$$

and μ_i is the equilibrium markup of downstream firm i. The supplier internalizes the effect of his price on P_L, $\tilde{c}_{SU}$, and p_{SU} but we assume for simplicity that he takes as given downstream markups μ_i and hence the term $\tilde{Y}_{SU}$ (more below).

In (C.7), the optimal markup over marginal cost is $\epsilon_U/(\epsilon_U - 1)$ where

$$\epsilon_U = \sigma_U(1-s) + \eta_U s(1-s_{SU}) + ss_{SU}\left[\sigma(1-s_{SH}) + \eta s_{SH}\right], \tag{C.8}$$
$$s_{SH} = \left(\frac{\sum_{i \in S_H \cap \mathcal{L}_S} p_i^{1-\sigma}}{P_L(\mathbf{c}_{SL})}\right)^{1/(1-\sigma)}$$

is the market share of Home firms in nest $\mathcal{L}_S$. Comparing (C.6) to (C.8), the added term arises because a large input supplier now internalizes his effect on sales downstream by Home varieties in $S_H \cap \mathcal{L}_S$. These varieties have an elasticity of substitution σ with respect to Foreign varieties in $S_F \cap \mathcal{L}_S$ and an elasticity η with respect to varieties in other sectors (or differentiated varieties). Since all elasticities, σ_U, η_U, σ, η, are greater than one, ϵ_U in (C.8) is also greater than one and the input supplier's problem has an interior solution for prices.

The main result regarding markups of input suppliers is that these markups increase with a decrease in trade costs downstream. The added term in (C.8) weakens this result because the shock decreases the market share s_{SH} of less-differentiated Home firms. Still, this opposing effect is multiplied by ss_{SU} which is the share of the input supplier in *all* the costs of domestic downstream firms. In practice, this share is small because costs include labor, capital and inputs from other

sectors. So, the result is unlikely to be overturned.

Above, we made the simplifying assumption above that input suppliers don't internalize the effect of their prices on markups downstream (in $\tilde{Y}_{SU}$). Since markups decrease with costs, the added effect of (C.8) would be even smaller (in absolute value) without this simplifying assumption.

D Additional Empirical Results

This Appendix presents additional empirical results. Appendix D.1 details the construction of control variables and reports their coefficients. Appendix D.2 studies other firm outcomes, and Appendix D.3 conducts robustness checks.

D.1 Control Variables

Sector-time controls include input tariffs and the share of state ownership of the sector of the firm at time t in addition to three measures of exposure to foreign ownership following Javorcik (2004). Horizontal_FDI$_{jt}$ is a weighted average of foreign equity participation in each firm in sector j at time t, where the weights are the firm's share in sectoral output. Downstream_FDI$_{jt}$ is a measure of foreign participation in the sectors that are supplied by sector j, i.e., in sectors downstream from j. Upstream_FDI$_{jt}$ is a measure of foreign participation in sectors upstream from j. Firm-time controls include three zero-one dummy variables indicating whether the firm received subsidies (index_subsidies), whether the firm received a tax holiday (index_tax), and whether the firm paid below median interest rates on loans (index_interest).

We refer to input tariffs as upstream tariffs because they are symmetric to our downstream tariffs. Following the literature, they are a weighted average of output tariffs:

$$\text{upstream\_tariff}_{jt} = \sum_{m \neq j} \alpha_{jm} \ \text{output\_tariff}_{mt}$$

where α_{jm} is the share of sector m in all of sector j's inputs, from the 2002 Chinese Input-Output Table. These weights don't add up to one because inputs include labor and capital.

An example illustrates our three measures of tariffs. A firm that produces car engines is impacted by Chinese entry into the WTO if the tariffs on the pistons that go into engines decrease (upstream tariffs), if the tariffs on car engines decrease (output tariff) increasing import competition, or if tariffs on cars decrease (downstream tariffs) and change the type of car Chinese producers make.

The main text reports only the coefficients of interest, on output and downstream tariffs. The coefficients on control variables are in Appendix Tables D.1 through D.6. Tables D.1, D.2, and D.3 refer to the basic regressions with the three measures of tariffs as the coefficients of interest. Tables D.4, D.5, and D.6 refer to the regressions where the dependent variable output_tariff is substituted with the interaction between output_tariff and indicator variables of whether the firm is in each of the four quartiles of firm sales.

Table D.1: Basic Regressions of Productivity on Tariffs

Dependent variable: TFP measured à la Olley-Pakes (OP) or OLS with fixed effects (FE)

	All Enterprises Excluding SOEs and Multinationals				Only Non-Exporters	
measure of TFP ⟶	OP	FE	OP	FE	OP	FE
	OLS	OLS	IV	IV	IV	IV
	(1)	(2)	(3)	(4)	(5)	(6)
output_tariff	-0.0304***	-0.0322***	-0.0505***	-0.0477***	-0.0617***	-0.0580***
	(0.0027)	(0.0028)	(0.0169)	(0.0184)	(0.0158)	(0.0170)
downstream_tariff	-0.0179**	-0.0194**	-0.178***	-0.173***	-0.421***	-0.444***
	(0.0070)	(0.0079)	(0.0627)	(0.0641)	(0.0650)	(0.0672)
upsrteam_tariff	-0.132***	-0.141***	-0.369***	-0.483***	-0.227**	-0.323***
	(0.0118)	(0.0130)	(0.0975)	(0.1020)	(0.0907)	(0.0938)
index_subsidy	0.0106***	0.0128***	0.0100***	0.0120***	0.00745***	0.00875***
	(0.0012)	(0.0012)	(0.0012)	(0.0012)	(0.0015)	(0.0015)
index_tax	0.0216***	0.0220***	0.0213***	0.0217***	0.0210***	0.0215***
	(0.0009)	(0.0009)	(0.0009)	(0.0010)	(0.0010)	(0.0010)
index_interest	-0.0121***	-0.0133***	-0.0119***	-0.0132***	-0.0133***	-0.0144***
	(0.0009)	(0.0009)	(0.0009)	(0.0009)	(0.0010)	(0.0010)
exportshare_sector	0.121***	0.166***	0.398***	0.488***	0.479***	0.578***
	(0.0352)	(0.0357)	(0.0513)	(0.0539)	(0.0582)	(0.0615)
State_share	0.000537	0.0012	0.000136	0.000733	0.00176	0.00279
	(0.0037)	(0.0037)	(0.0037)	(0.0037)	(0.0042)	(0.0043)
Horizontal FDI	0.145***	0.204***	0.135***	0.187***	0.224***	0.286***
	(0.0394)	(0.0420)	(0.0412)	(0.0439)	(0.0487)	(0.0513)
Downstream FDI	1.184***	1.108***	1.718***	1.652***	2.281***	2.262***
	(0.1940)	(0.2060)	(0.2760)	(0.2890)	(0.2960)	(0.3120)
Upstream FDI	0.0926	0.1	0.156**	0.185**	0.042	0.0726
	(0.0724)	(0.0736)	(0.0752)	(0.0764)	(0.0786)	(0.0795)
Observations	1,037,738	1,037,738	1,037,738	1,037,738	826,072	826,072
F statistic, log(output tariff) = log(downstream tariff)	3.1	2.6	4.3	4.0	31.8	34.3
First Stage F, output tariff	-	-	277.6	277.6	349.8	349.8
First Stage F, downstream tariff	-	-	630.1	630.1	524.1	524.1
First Stage F, upstream tariff	-	-	142.8	142.8	161.8	161.8

Standard errors are clustered by firm and initial sector. Tariffs and TFP are in logs. All specifications include fixed effects for the firm, time, and two-digit sector. All specifications also include a dummy variable equal to 1 if the firm changes a four digit sector. IV estimates use initial 1998 tariffs and initial tariffs interacted with a WTO dummy as instruments. *** indicates $p < 0.01$, ** $p < 0.05$, and * indicates $p < 0.1$.

Table D.2: Introduction of New Goods

dependent variable →	All enterprises, excluding SOEs and Multinationals				Only Non-Exporters	
	new product share	new product share	0-1 dummy for introducing a new product	0-1 dummy for introducing a new product	new product share	0-1 dummy for introducing a new product
	OLS	IV	OLS	IV	IV	IV
	(1)	(2)	(3)	(4)	(5)	(6)
output_tariff	-0.000356	-0.0157**	-0.000687	-0.0405**	-0.00976**	-0.0279***
	(0.0012)	(0.0068)	(0.0029)	(0.0168)	(0.0045)	(0.0102)
downstream_tariff	-0.00372	-0.0272	0.00777	-0.0533	-0.0313**	-0.0423
	(0.0024)	(0.0184)	(0.0078)	(0.0399)	(0.0147)	(0.0266)
upsrteam_tariff	0.00251	0.033	-0.0016	0.103*	0.0404**	0.0893**
	(0.0037)	(0.0274)	(0.0092)	(0.0622)	(0.0186)	(0.0382)
index_subsidy	0.00631***	0.00635***	0.0170***	0.0171***	0.00449***	0.0116***
	(0.0008)	(0.0008)	(0.0016)	(0.0016)	(0.0008)	(0.0014)
index_tax	-0.000694*	-0.000663*	-0.00213**	-0.00204**	-0.000451	-0.00145**
	(0.0004)	(0.0004)	(0.0009)	(0.0009)	(0.0004)	(0.0007)
index_interest	-0.00183***	-0.00177***	-0.00617***	-0.00600***	-0.000943**	-0.00347***
	(0.0004)	(0.0004)	(0.0010)	(0.0010)	(0.0004)	(0.0008)
exportshare_sector	-0.0128	0.00461	-0.00328	0.0322	-0.00341	-0.0189
	(0.010)	(0.013)	(0.025)	(0.029)	(0.011)	(0.023)
State_share	0.000525	0.000416	0.00616*	0.00597	0.000107	0.00287
	(0.0020)	(0.0020)	(0.0037)	(0.0037)	(0.0021)	(0.0036)
Horizontal FDI	0.0314***	0.0229*	0.0249	-0.00632	0.0227**	0.0237
	(0.011)	(0.014)	(0.027)	(0.034)	(0.011)	(0.023)
Downstream FDI	-0.00932	0.0266	-0.0532	0.0261	0.0454	0.0152
	(0.024)	(0.039)	(0.058)	(0.086)	(0.033)	(0.060)
Upstream FDI	-0.00705	-0.0285**	-0.0175	-0.0706***	-0.0272***	-0.0540***
	(0.006)	(0.011)	(0.013)	(0.025)	(0.009)	(0.018)
Observations	1,037,738	1,037,738	1,037,738	1,037,738	826,072	826,072
F statistic, log(output tariff) = log(downstream tariff)	1.7	0.5	1.1	0.1	2.6	0.4
First Stage F, output tariff	-	340.7	-	340.7	447.8	447.8
First Stage F, downstream tariff	-	631.1	-	631.1	469.4	469.4
First Stage F, upstream tariff	-	192.6	-	192.6	220.3	220.3

Standard errors are clustered by firm and initial sector. All specifications include firm fixed effects and time effects. Instruments in the IV specifications for log of output tariff, downstream tariff, and upstream tariff include the WTO dummy interacted with the initial tariff. *** indicates $p < 0.01$, ** $p < 0.05$, and * indicates $p < 0.1$.

Table D.3: Movements to Sectors with Higher Skilled Worker Share Based on 2004 survey

Dependent variable: Ranking of sector according to skill intensity

	All Enterprises, Excluding SOEs and Multinationals		Only Non-Exporters	
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
output_tariff	-17.82***	-26.20***	-18.80***	-19.27***
	(1.00)	(3.81)	(0.89)	(3.14)
downstream_tariff	6.914***	-33.44***	5.907***	-31.39***
	(1.34)	(7.40)	(1.31)	(7.49)
upsrteam_tariff	34.04***	108.5***	36.85***	93.35***
	(2.79)	(14.39)	(2.75)	(13.07)
index_subsidy	0.630***	0.703***	0.843***	0.877***
	(0.16)	(0.18)	(0.19)	(0.20)
index_tax	0.134	0.153	0.216**	0.173*
	(0.09)	(0.10)	(0.10)	(0.10)
index_interest	-0.390***	-0.338***	-0.431***	-0.428***
	(0.110)	(0.115)	(0.123)	(0.127)
exportshare_sector	-194.7***	-185.5***	-209.2***	-202.1***
	(8.64)	(7.80)	(7.81)	(7.98)
State_share	-0.194	-0.0456	-0.423	-0.207
	(0.420)	(0.424)	(0.467)	(0.468)
Horizontal FDI	68.07***	44.12***	73.68***	55.40***
	(7.60)	(9.77)	(7.54)	(9.29)
Downstream FDI	539.2***	592.5***	549.8***	593.3***
	(23.83)	(27.49)	(26.15)	(29.35)
Upstream FDI	-33.38***	-46.95***	-43.23***	-51.02***
	(5.58)	(6.24)	(5.89)	(6.51)
Observations	1,037,738	1,037,738	826,072	826,072
F statistic log(output tariff) = log(downstream tariff)	216	1	228	3
First Stage F, output tariff	-	341	-	448
First Stage F, downstream tariff	-	631	-	469
First Stage F, upstream tariff	-	193	-	220

Sectors with a higher rank (number) are more skill intensive. Standard errors are clustered by firm and initial sector. All regressions include firm fixed effects and time fixed effects.

Table D.4: Regressions of Productivity on Tariffs Interacted with Lagged Quartile of Sales

Dependent variable: TFP measured à la Olley-Pakes (OP) or OLS with fixed effects (FE)

	All Enterprises Excluding SOEs and Multinationals				Only Non-Exporters	
	OP OLS	FE OLS	OP IV	FE IV	OP IV	FE IV
	(1)	(2)	(3)	(4)	(5)	(6)
output_tariff*q1	-0.0337***	-0.0344***	-0.0334**	-0.0276	-0.0435***	-0.0365**
	(0.00341)	(0.00350)	(0.0169)	(0.0175)	(0.0167)	(0.0172)
output_tariff*q2	-0.0302***	-0.0312***	-0.0277	-0.0249	-0.0396**	-0.0353*
	(0.00313)	(0.00322)	(0.0179)	(0.0189)	(0.0173)	(0.0181)
output_tariff*q3	-0.0261***	-0.0273***	-0.00859	-0.00510	-0.0180	-0.0132
	(0.00314)	(0.00324)	(0.0190)	(0.0198)	(0.0189)	(0.0196)
output_tariff*q4 (largest)	-0.0240***	-0.0253***	-0.0129	-0.0118	-0.0259	-0.0233
	(0.00327)	(0.00340)	(0.0168)	(0.0178)	(0.0173)	(0.0182)
downstream_tariff	-0.0112*	-0.0117	-0.153**	-0.156**	-0.388***	-0.404***
	(0.00639)	(0.00719)	(0.0643)	(0.0645)	(0.0714)	(0.0732)
upsrteam_tariff	-0.137***	-0.146***	-0.445***	-0.521***	-0.322***	-0.389***
	(0.0124)	(0.0133)	(0.0988)	(0.101)	(0.0965)	(0.0984)
index_subsidy	0.00466***	0.00617***	0.00401***	0.00540***	0.00206	0.00288*
	(0.00129)	(0.00130)	(0.00130)	(0.00132)	(0.00170)	(0.00171)
index_tax	0.0188***	0.0192***	0.0186***	0.0189***	0.0180***	0.0185***
	(0.000989)	(0.000995)	(0.00100)	(0.00101)	(0.00105)	(0.00106)
index_interest	-0.00623***	-0.00718***	-0.00624***	-0.00720***	-0.00684***	-0.00773***
	(0.000960)	(0.000967)	(0.000972)	(0.000981)	(0.00112)	(0.00114)
Export_share	0.190***	0.223***	0.450***	0.513***	0.567***	0.632***
	(0.0343)	(0.0354)	(0.0545)	(0.0569)	(0.0601)	(0.0635)
State_share	-0.00327	-0.00319	-0.00325	-0.00313	-0.000174	0.000417
	(0.00440)	(0.00435)	(0.00443)	(0.00439)	(0.00490)	(0.00486)
Horizontal FDI	0.192***	0.239***	0.177***	0.218***	0.282***	0.333***
	(0.0424)	(0.0447)	(0.0457)	(0.0480)	(0.0541)	(0.0563)
Downstream FDI	0.812***	0.706***	1.599***	1.543***	2.215***	2.171***
	(0.197)	(0.204)	(0.321)	(0.329)	(0.354)	(0.367)
Upstream FDI	0.0527	0.0560	0.190**	0.213**	0.0287	0.0504
	(0.0816)	(0.0824)	(0.0901)	(0.0911)	(0.0927)	(0.0937)
q1	-0.0804***	-0.0909***	-0.0560**	-0.0756***	-0.0613**	-0.0801**
	(0.00729)	(0.00766)	(0.0275)	(0.0279)	(0.0308)	(0.0313)
q2	-0.0660***	-0.0738***	-0.0465**	-0.0573**	-0.0479*	-0.0584**
	(0.00626)	(0.00657)	(0.0236)	(0.0238)	(0.0267)	(0.0269)
q3	-0.0435***	-0.0482***	-0.0587**	-0.0684**	-0.0645**	-0.0732**
	(0.00509)	(0.00524)	(0.0269)	(0.0271)	(0.0314)	(0.0316)
Observations	701,765	701,765	701,765	701,765	548,283	548,283

output_tariff*q# indicates output tariffs interacted with a dummy for whether sales is in the first, second, third or fourth quartile of sales in the lagged year. Standard errors are clustered by firm and initial sector. Tariffs and TFP are in logs. All specifications include fixed effects for the firm, time, and two-digit sector. All specifications also include a dummy variable equal to 1 if the firm changes a four digit sector. IV estimates use initial 1998 tariffs and initial tariffs interacted with a WTO dummy as instruments. *** indicates $p < 0.01$, ** $p < 0.05$, and * indicates $p < 0.1$.

Table D.5: Introduction of New Goods on Tariffs Interacted with Lagged Quartile of Sales

dependent variable →	All Enterprises excluding SOE's and multinationals				Only Non-Exporting Enterprises	
	new product share	0-1 dummy for introducing a new product	new product share	0-1 dummy for introducing a new product	new product share	0-1 dummy for introducing a new product
	OLS	OLS	IV	IV	IV	IV
	(1)	(2)	(3)	(4)	(6)	(5)
output_tariff*q1	0.000531	-0.00138	-0.0152**	-0.0513***	-0.0123**	-0.0327***
	(0.00144)	(0.00348)	(0.00746)	(0.0184)	(0.00582)	(0.0124)
output_tariff*q2	0.000509	0.000862	-0.0169**	-0.0337*	-0.0117**	-0.0252**
	(0.00142)	(0.00328)	(0.00747)	(0.0177)	(0.00575)	(0.0120)
output_tariff*q3	0.000192	0.00117	-0.0148*	-0.0293	-0.00981	-0.0168
	(0.00153)	(0.00343)	(0.00786)	(0.0191)	(0.00612)	(0.0134)
output_tariff*q4 (largest)	-0.000867	-0.00185	-0.0189**	-0.0264	-0.0131**	-0.0290**
	(0.00179)	(0.00377)	(0.00834)	(0.0194)	(0.00628)	(0.0135)
downstream_tariff	-0.00253	0.0142	-0.0381*	-0.0742	-0.0500***	-0.0725**
	(0.00238)	(0.00909)	(0.0224)	(0.0497)	(0.0177)	(0.0351)
upsrteam_tariff	0.00138	-0.00309	0.0440	0.137*	0.0469**	0.113**
	(0.00403)	(0.0103)	(0.0313)	(0.0710)	(0.0231)	(0.0472)
index_subsidy	0.00544***	0.0138***	0.00547***	0.0140***	0.00417***	0.0100***
	(0.000851)	(0.00171)	(0.000845)	(0.00170)	(0.000885)	(0.00163)
index_tax	-0.000130	-0.00176	-9.29e-05	-0.00166	0.000277	-0.000624
	(0.000424)	(0.00108)	(0.000429)	(0.00109)	(0.000421)	(0.000861)
index_interest	-0.00249***	-0.00776***	-0.00242***	-0.00763***	-0.00135***	-0.00462***
	(0.000514)	(0.00126)	(0.000512)	(0.00126)	(0.000496)	(0.000970)
Export_share	-0.0112	-0.0153	0.0107	0.0223	0.00664	-0.0147
	(0.00984)	(0.0262)	(0.0143)	(0.0337)	(0.0129)	(0.0277)
State_share	-0.00205	0.00188	-0.00207	0.00185	-0.00335	-0.00108
	(0.00247)	(0.00471)	(0.00247)	(0.00473)	(0.00255)	(0.00473)
Horizontal FDI	0.0173	0.0158	0.00538	-0.0249	0.0164	0.0125
	(0.0113)	(0.0310)	(0.0150)	(0.0392)	(0.0123)	(0.0261)
Downstream FDI	-0.0245	-0.0637	0.0334	0.0637	0.0722*	0.0682
	(0.0277)	(0.0695)	(0.0498)	(0.111)	(0.0401)	(0.0789)
Upstream FDI	-0.00302	-0.0118	-0.0283**	-0.0606**	-0.0309***	-0.0550**
	(0.00727)	(0.0151)	(0.0127)	(0.0281)	(0.0110)	(0.0221)
q1	-0.00757*	-0.0104	-0.0129	0.0480*	-0.00451	-0.00260
	(0.00400)	(0.00893)	(0.0123)	(0.0270)	(0.0115)	(0.0239)
q2	-0.00851**	-0.0186**	-0.00984	0.00450	-0.00623	-0.0196
	(0.00375)	(0.00789)	(0.0112)	(0.0247)	(0.0113)	(0.0222)
q3	-0.00704**	-0.0187***	-0.0139	-0.00515	-0.00938	-0.0350
	(0.00337)	(0.00648)	(0.0127)	(0.0284)	(0.0125)	(0.0258)
Observations	701,765	701,765	701,765	701,765	548,283	548,283

output_tariff*q# indicates output tariffs interacted with a dummy for whether sales is in the first, second, third or fourth quartile of sales in the lagged year. Standard errors are clustered by firm and initial sector. All specifications include firm fixed effects and time effects. Instruments in the IV specifications for log of output tariff, downstream tariff, and upstream tariff include the WTO dummy interacted with the initial tariff. *** indicates $p < 0.01$, ** $p < 0.05$, and * indicates $p < 0.1$.

Table D.6: Sectoral skill intensity and tariffs interacted with lagged quartiles of firm sales

Dependent variable: Ranking of sector according to skill intensity

	All Enterprises Excluding SOEs and Multinationals		Only Non-Exporters	
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
output_tariff*q1	-17.70***	-21.31***	-18.51***	-15.49***
	(1.067)	(3.914)	(1.012)	(3.441)
output_tariff*q2	-17.62***	-19.51***	-18.32***	-13.33***
	(1.070)	(3.662)	(1.015)	(3.283)
output_tariff*q3	-17.41***	-20.63***	-18.07***	-15.17***
	(1.079)	(3.835)	(1.011)	(3.446)
output_tariff*q4 (largest)	-16.95***	-23.32***	-17.89***	-17.71***
	(1.105)	(3.890)	(1.078)	(3.499)
downstream_tariff	5.040***	-40.18***	4.296***	-42.09***
	(1.297)	(8.168)	(1.250)	(8.872)
upsrteam_tariff	33.69***	110.0***	35.25***	94.50***
	(3.102)	(14.99)	(3.153)	(14.23)
index_subsidy	0.557***	0.575***	0.721***	0.694***
	(0.186)	(0.199)	(0.226)	(0.239)
index_tax	0.120	0.136	0.202*	0.142
	(0.106)	(0.112)	(0.120)	(0.125)
index_interest	-0.327***	-0.276**	-0.341**	-0.347**
	(0.126)	(0.132)	(0.144)	(0.149)
exportshare_sector	-189.8***	-181.7***	-206.3***	-198.1***
	(9.236)	(8.140)	(8.927)	(9.022)
State_share	-0.147	0.287	-0.311	0.104
	(0.526)	(0.529)	(0.594)	(0.600)
Horizontal FDI	65.14***	40.52***	71.19***	52.45***
	(8.281)	(10.34)	(8.537)	(10.07)
Downstream FDI	541.6***	606.0***	549.6***	611.8***
	(26.71)	(30.71)	(29.73)	(34.02)
Upstream FDI	-33.28***	-42.72***	-42.68***	-49.50***
	(6.264)	(7.028)	(6.869)	(7.850)
q1	2.157	-4.534	2.022	-4.695
	(1.333)	(4.008)	(1.467)	(4.343)
q2	1.803	-8.723**	1.407	-9.660**
	(1.149)	(3.859)	(1.287)	(4.194)
q3	0.944	-6.313	0.540	-5.658
	(0.911)	(3.935)	(1.033)	(4.189)
Observations	701,765	701,765	548,283	548,283

output_tariff*q# indicates output tariffs interacted with a dummy for whether sales is in the first, second, third or fourth quartile of sales in the lagged year. Sectors with a higher rank (number) are more skill intensive. Standard errors are clustered by firm and initial sector. All regressions include firm fixed effects and time fixed effects.

Table D.7: Cross-sectional relation between revenue and TFP
Dependent variable is log TFP, measured à la Olley-Pakes (OP) or OLS with fixed effects (FE)

	OP	FE	OP	FE
	(1)	(2)	(3)	(4)
log revenue	0.191***	0.204***	0.188***	0.197***
	(0.0074)	(0.0062)	(0.0077)	(0.0061)
Time Fixed Effects	Yes	Yes	Yes	Yes
Sector Fixed Effects	No	No	Yes	Yes
Observations	1,012,444	1,012,444	1,012,444	1,012,444
R-squared	0.279	0.319	0.453	0.455
Number of firm ID's	327,924	327,924	327,924	327,924

Robust standard errors in parenthesis. *** indicates p-values less than 1%.

D.2 Other Firm Outcomes

We study various firm outcomes. In Table D.8 is the main regression specification with an exit dummy as the dependent variable. The IV results are consistent with the prediction of the model that import-competing firms and their input suppliers are more likely to exit when tariffs fall. In Table D.9, the dependent variable is a dummy for whether the firm switches sectors. To the extent that product differentiation may be accompanied by sectoral switches, the model predicts the coefficient on output tariffs should be negative. The coefficient is negative, though statistically significant only in our preferred specification, the IV with only non-exporters.

Table D.10 repeats the main regression specification with revenue as the dependent variable. In all IV specifications, the coefficient on tariff is positive and statistically significant. Tariff cuts are thus associated with decreases in sales, especially among non-exporting firms. This result is consistent with most international trade models. The results for OLS specifications is more mixed, many of the coefficients are negative and statistically insignificant.

Table D.7 regresses TFP on revenue with time and sector fixed effects. The coefficient is around 0.20, and it is statistically significant in all specifications, confirming the well-known positive relationship between revenue and TFP in our data. In the model, this increasing relation holds within sectors among less-differentiated firms.

Table D.8: Determinants of Exit

	All enterprises OLS (1)	Non-Exporters OLS (2)	All enterprises IV (3)	Non-Exporters IV (4)
output_tariff	-0.00153	-0.00257	-0.0640**	-0.0930***
	(0.00249)	(0.00295)	(0.0249)	(0.0229)
downstream_tariff	-0.00412	-0.00311	-0.290***	-0.370***
	(0.00357)	(0.00402)	(0.0700)	(0.0788)
upsrteam_tariff	0.00826	0.0186**	0.290***	0.332***
	(0.00724)	(0.00825)	(0.107)	(0.103)
index_subsidy	-0.0208***	-0.0193***	-0.0207***	-0.0192***
	(0.00129)	(0.00164)	(0.00130)	(0.00165)
index_tax	-0.00440***	-0.00533***	-0.00439***	-0.00569***
	(0.000871)	(0.000976)	(0.000890)	(0.00101)
index_interest	0.0103***	0.00956***	0.0105***	0.00988***
	(0.00104)	(0.00116)	(0.00106)	(0.00119)
exportshare_sector	0.0243	0.00351	0.189***	0.233***
	(0.0160)	(0.0195)	(0.0484)	(0.0547)
State_share	0.00368	0.000947	0.00376	0.000775
	(0.00466)	(0.00533)	(0.00470)	(0.00540)
Horizontal FDI	-0.0618***	-0.0739***	-0.147***	-0.142***
	(0.0206)	(0.0236)	(0.0434)	(0.0411)
Downstream FDI	0.0772	0.0704	0.596***	0.629***
	(0.0487)	(0.0577)	(0.143)	(0.159)
Upstream FDI	-0.00591	0.00403	-0.127***	-0.196***
	(0.0106)	(0.0132)	(0.0349)	(0.0405)
Observations	987,022	785,271	987,022	785,271

Notes: Standard errors are clustered by firm and initial sector. Linear probability where the dependent variable is a zero-one dummy variable for whether or not the establishment exits. All specifications include firm and time effects. *** indicates $p < 0.01$, ** $p < 0.05$, and * indicates $p < 0.1$.

Table D.9: Linear Probability Model of Whether or Not Establishment Switched Sector

	All enterprises OLS (1)	Non-Exporters OLS (2)	All enterprises IV (3)	Non-Exporters IV (4)
output_tariff	-0.00137	-0.000845	-0.0158	-0.0323**
	(0.00149)	(0.00143)	(0.0165)	(0.0150)
downstream_tariff	-0.0108***	-0.0111***	0.0235	0.0277
	(0.00279)	(0.00253)	(0.0381)	(0.0380)
upsrteam_tariff	-0.0132***	-0.0159***	0.0938	0.124*
	(0.00275)	(0.00258)	(0.0736)	(0.0694)
index_subsidy	0.00989***	0.00974***	0.00441***	0.00557***
	(0.000958)	(0.00108)	(0.00108)	(0.00128)
index_tax	-0.00104*	-0.000778	-0.000452	-0.000512
	(0.000584)	(0.000609)	(0.000671)	(0.000737)
index_interest	-0.00330***	-0.00249***	-0.00249***	-0.00194**
	(0.000622)	(0.000630)	(0.000829)	(0.000958)
exportshare_sector	0.00919	0.0169**	-0.192***	-0.176***
	(0.00656)	(0.00669)	(0.0498)	(0.0518)
State_share	-0.0103***	-0.00731***	-0.00131	-0.000320
	(0.00164)	(0.00179)	(0.00288)	(0.00330)
Horizontal FDI	-0.00344	0.00207	-0.103**	-0.167***
	(0.00976)	(0.00915)	(0.0524)	(0.0517)
Downstream FDI	0.157***	0.158***	0.357**	0.362**
	(0.0263)	(0.0246)	(0.174)	(0.172)
Upstream FDI	0.0131	0.0125	0.0720*	0.0997**
	(0.00801)	(0.00781)	(0.0404)	(0.0402)
Observations	987,022	785,271	987,022	785,271

Dependent variable is a zero-one dummy variable for whether or not the enterprise changed sector. *** indicates $p < 0.01$, ** $p < 0.05$, and * indicates $p < 0.1$.

Table D.10: Basic Regressions of Revenue on Tariffs

The dependent variable is log of revenue

	All enterprises		Non-Exporters Only		All enterprises		Non-Exporters Only	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
output_tariff	-0.0258***	0.0523	-0.0309***	0.0526	-0.0171**	0.0471	-0.0243***	0.0619
	(0.0076)	(0.0461)	(0.0078)	(0.0439)	(0.0081)	(0.0501)	(0.0088)	(0.0477)
downstream_tariff	0.0334**	0.522***	0.00361	0.375***	0.0711***	1.094***	0.0326	0.730***
	(0.0168)	(0.1270)	(0.0176)	(0.1380)	(0.0218)	(0.1960)	(0.0243)	(0.2180)
upsrteam_tariff	0.0175	-0.175	0.017	-0.272	-0.0999***	-0.743***	-0.115***	-0.636**
	(0.0240)	(0.1760)	(0.0241)	(0.1750)	(0.0381)	(0.2690)	(0.0418)	(0.2650)
index_subsidy	0.0990***	0.0994***	0.0856***	0.0855***	0.0951***	0.0956***	0.0819***	0.0821***
	(0.0034)	(0.0034)	(0.0039)	(0.0039)	(0.0034)	(0.0034)	(0.0039)	(0.0039)
index_tax	0.0680***	0.0681***	0.0705***	0.0708***	0.0676***	0.0681***	0.0698***	0.0705***
	(0.0023)	(0.0023)	(0.0026)	(0.0026)	(0.0023)	(0.0023)	(0.0025)	(0.0025)
index_interest	-0.101***	-0.101***	-0.111***	-0.111***	-0.0977***	-0.0980***	-0.107***	-0.107***
	(0.0027)	(0.0027)	(0.0030)	(0.0030)	(0.0027)	(0.0027)	(0.0029)	(0.0030)
exportshare_sector	0.00344	-0.361***	-0.143**	-0.374***	0.441***	-0.188	-0.145	-0.481***
	(0.067)	(0.085)	(0.061)	(0.096)	(0.114)	(0.148)	(0.142)	(0.170)
State_share	0.0466***	0.0470***	0.0440***	0.0440***	0.0481***	0.0474***	0.0458***	0.0455***
	(0.0089)	(0.0089)	(0.0099)	(0.0099)	(0.0088)	(0.0089)	(0.0099)	(0.0099)
Horizontal FDI	-0.0486	-0.0112	-0.0000323	0.057	-0.125	-0.273**	-0.0543	-0.151
	(0.067)	(0.096)	(0.075)	(0.099)	(0.112)	(0.135)	(0.124)	(0.144)
Downstream FDI	0.920***	-0.125	1.007***	0.416	0.51	-2.661***	0.155	-1.814**
	(0.160)	(0.296)	(0.176)	(0.301)	(0.493)	(0.791)	(0.536)	(0.868)
Upstream FDI	0.240***	0.442***	0.229***	0.426***	0.716***	0.546***	0.550***	0.524***
	(0.036)	(0.068)	(0.041)	(0.079)	(0.106)	(0.144)	(0.118)	(0.140)
sector fixed effect	no	no	no	no	yes	yes	yes	yes
Observations	1,037,738	1,037,738	826,072	826,072	1,037,738	1,037,738	826,072	826,072

Standard errors are clustered. Tariffs and revenue are in logs. All specifications include fixed effects for the firm and time. IV estimates use initial 1998 tariffs and initial tariffs interacted with a WTO dummy as instruments. *** indicates $p < 0.01$, ** $p < 0.05$, and * indicates $p < 0.1$.

D.3 Robustness of Empirical Results

Main Specification We first check the robustness of the main regression specification:

$$y_{it} = \beta_1 \ln \text{Output Tariff}_{j(i,t)t} + \beta_2 \ln \text{Downstream Tariff}_{j(i,t)t} + \gamma_1 X_{j(i,t)t} + \gamma_2 X_{i,t} + \alpha_i + \alpha_t + \varepsilon$$

Tables D.11, D.12 and D.13 show the coefficient on output and downstream tariffs β_1, β_2 for each robustness check. The dependent variable is revenue TFP measured à la Olley Pakes in Table D.11, the two measures of introduction of new goods in Table D.12, and the ranking of sector skill intensity in Table D.13. All specifications include time and firm fixed effects and control variables described in Appendix D.1. When the dependent variable is TFP, we also include sector fixed effects and a dummy for when the firm switches sectors.

Exercise 1 includes all multinationals and state-owned enterprises (SOE's) excluded from the main specification. In exercises 2 and 3, we drop one tariff measure from the regression at a time to check if collinearity drives the results.

To address selection, exercise 4 keeps only a balanced panel of establishments that survived all ten years of our data. In exercise 5, we follow Wooldridge (2002) and construct a Heckman-type correction in the context of a panel dataset with firm fixed effects and attrition. In each period, we estimate a selection equation using a probit approach and calculating lambda, the inverse Mills ratio, for each parent i. Once a series of lambdas has been estimated for each year and parent, the estimating equations are augmented by these lambdas. We use the establishment's profitability in the previous period as the determinant of survival that does not appear in the estimating equation.

In October 2000, the United States Congress permanently granted Normal Trade Relations (NTR) to China. Until then, China faced a threat of an increase in tariffs by the USA to non-NTR rates. Sectors are differentially exposed to tariff uncertainty from the USA because the gap between NTR and non-NTR tariffs varies across sectors. We follow Pierce and Schott (2016, 2019) in measuring the sector exposure with a variable that takes the value of the sectoral non-NTR tariffs until 2000 and NTR tariffs after 2001. Exercise 6 adds this variable as a control.

Exercise 7 drops textiles and apparel sectors from the data, and exercise 8 drops computer and computer peripherals. For the TFP regressions, exercise 9 includes tariffs in the first stage of the TFP estimate, and exercise 10 measures TFP following Caves, Fraser, and Ackerberg (2015).

Quartiles of Sales We repeat the robustness checks above in the specification in which the independent variable output tariffs is substituted with an interaction term of output tariffs with a dummy for each quartile of sales in year $t-1$, plus each of the four dummy variables. We do not repeat the balanced-panel regressions because only 6,600 firms survive in all years of our sample and these firms are not well represented in the lower quartiles of sales.

Table D.11: Robustness checks on TFP measured à la Olley-Pakes (except line 9)

	all establishments excluding SOEs and multinationals			non-exporters	
	coefficient (std. err)		number of	coeff. (std. err)	number of
	OLS	IV	observations	IV	observations
Baseline specification (main text)					
output tariffs	**-0.0304*** **	**-0.0505*** **	1,037,738	**-0.0617*** **	826,072
	(0.0027)	(0.0169)		(0.0158)	
downstream tariffs	**-0.0179** **	**-0.178*** **		**-0.421*** **	
	(0.0070)	(0.0627)		(0.0650)	
1. including SOE's and multinationals					
output tariffs	-0.0271***	-0.0123	1,495,411	-0.0294**	1,047,907
	(0.00228)	(0.0168)		(0.0142)	
downstream tariffs	-0.0266***	-0.0798		-0.376***	
	(0.00637)	(0.0565)		(0.0630)	
2. drop downstream tariffs					
output tariffs	-0.0301***	-0.0722***	1,037,738	-0.0876***	826,072
	(0.00266)	(0.0202)		(0.0173)	
3. drop ouput tariffs					
downsream tariffs	-0.0204***	-0.104	1,037,738	-0.325***	826,072
	(0.00693)	(0.0659)		(0.0709)	
4. balanced panel					
output tariffs	-0.0536***	-0.0561***	65,809	-0.0659***	47,128
	(0.0070)	(0.0073)		(0.0224)	
downstream tariffs	-0.0616***	-0.0678***		-0.648***	
	(0.0164)	(0.0179)		(0.1320)	
5. Include Mills ratio					
output tariffs	-0.0326***	-0.0272*	850,582	-0.0386***	671,237
	(0.0027)	(0.0162)		(0.0032)	
downstream tariffs	-0.131***	-0.189**		-0.167***	
	(0.0171)	(0.0851)		(0.0206)	
6. Include USA Trade Policy					
output tariffs	-0.0306***	-0.0557***	1,020,447	-0.0590***	811,239
	(0.00269)	(0.0182)		(0.0171)	
downstream tariffs	-0.0184***	-0.197***		-0.422***	
	(0.00710)	(0.0652)		(0.0674)	

Robustness checks on TFP measured à la Olley-Pakes (continued from previous page)

	all establishments excluding SOEs and multinationals			non-exporters	
	coefficient (std. err)		number of	coeff. (std. err)	number of
	OLS	IV	observations	IV	observations
Baseline specification (main text)					
output tariffs	**-0.0304*** **	**-0.0505*** **	1,037,738	**-0.0617*** **	826,072
	(0.0027)	(0.0169)		(0.0158)	
downstream tariffs	**-0.0179** **	**-0.178*** **		**-0.421*** **	
	(0.0070)	(0.0627)		(0.0650)	
7. Excluding textiles and apparel					
output tariffs	-0.0322***	-0.0727***	849,870	-0.103***	706,931
	(0.00273)	(0.0192)		(0.0179)	
downstream tariffs	-0.00880	-0.509***		-0.752***	
	(0.00754)	(0.0834)		(0.0960)	
8. Excluding computers and peripherals					
output tariffs	-0.0307***	-0.0504***	1,037,243	-0.0616***	825,647
	(0.00268)	(0.0169)		(0.0158)	
downstream tariffs	-0.0183***	-0.179***		-0.421***	
	(0.00698)	(0.0626)		(0.0648)	
9. Including tariffs in estimating TFP					
output tariffs	-0.0323***	-0.0491***	1,004,678	-0.0586***	797,937
	(0.00280)	(0.0174)		(0.0163)	
downstream tariffs	-0.0149**	-0.150**		-0.416***	
	(0.00735)	(0.0657)		(0.0680)	
10. TFP estimated à la Ackerberg, Caves, Frazer (2015)					
output tariffs	-0.0619***	-0.120**	1,036,517	-0.169***	825,221
	(0.0057)	(0.0549)		(0.0513)	
downstream tariffs	-0.0421	-0.568***		-1.252***	
	(0.0284)	(0.1280)		(0.1310)	

Table D.12: Robustness checks on the introduction of new goods

Dependent variable is the share of new goods in sales

	all establishments excluding SOEs and multinationals			non-exporters	
	coefficient (std. err)		number of	coeff. (std. err)	number of
	OLS	IV	observations	IV	observations
Baseline specification (main text)					
output tariffs	**-0.000356**	**-0.0157****	1,037,738	**-0.00976****	826,072
	(0.0012)	(0.0068)		(0.0045)	
downstream tariffs	**-0.00372**	**-0.0272**		**-0.0313****	
	(0.0024)	(0.0184)		(0.0147)	
1. including SOE's and multinationals					
output tariffs	0.00141	-0.0122	1,495,411	-0.00703*	1,047,907
	(0.000968)	(0.00845)		(0.00395)	
downstream tariffs	-0.00252	-0.0208		-0.0198	
	(0.00199)	(0.0170)		(0.0123)	
2. drop downstream tariffs					
output tariffs	-0.000277	-0.0186**	1,037,738	-0.0110**	826,072
	(0.00120)	(0.00794)		(0.00471)	
3. drop ouput tariffs					
downstream tariffs	-0.00369	-0.00861	1,037,738	-0.0200	826,072
	(0.00235)	(0.0160)		(0.0132)	
4. balanced panel					
output tariffs	-0.000430	-0.0192	65,809	-0.0110	47,128
	(0.00343)	(0.0138)		(0.00869)	
downstream tariffs	-0.00590	-0.0585		-0.0639**	
	(0.00671)	(0.0383)		(0.0321)	
5. Include Mills ratio					
output tariffs	0.000606	-0.0129**	850,582	-0.0100**	671,237
	(0.00118)	(0.00625)		(0.00428)	
downstream tariffs	-0.00436*	-0.0313*		-0.0363**	
	(0.00265)	(0.0184)		(0.0157)	
6. Include USA trade policy					
output tariffs	-0.00149	-0.0119	1,020,447	-0.00669	811,239
	(0.00120)	(0.00742)		(0.00484)	
downstream tariffs	-0.00320	-0.0187		-0.0221	
	(0.00236)	(0.0196)		(0.0150)	
7. Excluding textiles and apparel					
output tariffs	-0.000361	-0.0169**	849,870	-0.00999**	706,931
	(0.00124)	(0.00750)		(0.00479)	
downstream tariffs	0.00150	-0.0256		-0.0292	
	(0.00271)	(0.0216)		(0.0204)	
8. Excluding computers and peripherals					
output tariffs	-0.000474	-0.0157**	1,037,243	-0.00978**	825,647
	(0.00121)	(0.00678)		(0.00445)	
downstream tariffs	-0.00359	-0.0273		-0.0315**	
	(0.00237)	(0.0185)		(0.0148)	

Robustness checks on the introduction of new goods (continued from previous page)

Dependent variable is a 0-1 dummy of whether the firm introduced a new product in the year

	all establishments excluding SOEs and multinationals			non-exporters	
	coefficient (std. err)		number of	coeff. (std. err)	number of
	OLS	IV	observations	IV	observations
Baseline specification (main text)					
output tariffs	**-0.000687**	**-0.0405****	1,037,738	**-0.0279*****	826,072
	(0.0029)	(0.0168)		(0.0102)	
downstream tariffs	**0.00777**	**-0.0533**		**-0.0423**	
	(0.0078)	(0.0399)		(0.0266)	
1. including SOE's and multinationals					
output tariffs	0.00134	-0.0446***	1,495,411	-0.0195**	1,047,907
	(0.00207)	(0.0172)		(0.00838)	
downstream tariffs	0.00548	-0.0584*		-0.0130	
	(0.00598)	(0.0347)		(0.0236)	
2. drop downstream tariffs					
output tariffs	-0.000852	-0.0461**	1,037,738	-0.0295***	826,072
	(0.00290)	(0.0188)		(0.0106)	
3. drop ouput tariffs					
downstream tariffs	0.00782	-0.00547	1,037,738	-0.0100	826,072
	(0.00778)	(0.0362)		(0.0232)	
4. balanced panel					
output tariffs	0.00317	-0.0650**	65,809	-0.0409**	47,128
	(0.00713)	(0.0272)		(0.0186)	
downstream tariffs	0.00926	-0.152*		-0.132**	
	(0.0152)	(0.0827)		(0.0651)	
5. Include Mills ratio					
output tariffs	0.00140	-0.0292*	850,582	-0.0282***	671,237
	(0.00328)	(0.0159)		(0.00943)	
downstream tariffs	-0.00116	-0.0819**		-0.0577**	
	(0.00565)	(0.0404)		(0.0279)	
6. Include USA trade policy					
output tariffs	-0.00203	-0.0365**	1,020,447	-0.0253**	811,239
	(0.00296)	(0.0184)		(0.0110)	
downstream tariffs	0.00837	-0.0447		-0.0287	
	(0.00795)	(0.0421)		(0.0267)	
7. Excluding textiles and apparel					
output tariffs	-0.000124	-0.0412**	849,870	-0.0269**	706,931
	(0.00298)	(0.0184)		(0.0109)	
downstream tariffs	0.0257**	-0.0236		-0.0234	
	(0.0103)	(0.0490)		(0.0354)	
8. Excluding computers and peripherals					
output tariffs	-0.000784	-0.0405**	1,037,243	-0.0279***	825,647
	(0.00292)	(0.0168)		(0.0102)	
downstream tariffs	0.00806	-0.0534		-0.0425	
	(0.00783)	(0.0399)		(0.0266)	

Table D.13: Robustness checks on switches to skill-intensive sectors

Dependent variable is the ranking of skill intensity of the sector

	all establishments excluding SOEs and multinationals			non-exporters	
	coefficient (std. err)		number of	coeff. (std. err)	number of
	OLS	IV	observations	IV	observations
Baseline specification (main text)					
output tariffs	**-17.82*** **	**-26.20*** **	1,037,738	**-19.27*** **	826,072
	(1.00)	(3.81)		(3.14)	
downstream tariffs	**6.914*** **	**-33.44*** **		**-31.39*** **	
	(1.34)	(7.40)		(7.49)	
1. including SOE's and multinationals					
output tariffs	-15.83***	-40.10***	1,495,411	-18.70***	1,047,907
	(0.970)	(4.997)		(2.743)	
downstream tariffs	8.834***	-49.73***		-28.79***	
	(1.419)	(7.862)		(6.143)	
2. drop downstream tariffs					
output tariffs	-17.96***	-29.69***	1,037,738	-20.47***	826,072
	(0.996)	(4.287)		(3.278)	
3. drop output tariffs					
downstream tariffs	8.260***	-2.523	1,037,738	-9.073	826,072
	(1.452)	(5.669)		(5.908)	
4. balanced panel					
output tariffs	-14.49***	-23.15***	65,809	-16.50***	47,128
	(1.957)	(4.897)		(4.469)	
downstream tariffs	8.957**	-26.93**		-27.21**	
	(3.850)	(11.89)		(13.43)	
5. Include Mills ratio					
output tariffs	-17.73***	-26.09***	850,582	-19.10***	671,237
	(1.053)	(3.760)		(3.097)	
downstream tariffs	12.66***	-34.74***		-30.03***	
	(2.536)	(7.978)		(7.946)	
6. Include USA trade policy					
output tariffs	-16.08***	-21.34***	1,020,447	-14.58***	811,239
	(1.018)	(4.259)		(3.549)	
downstream tariffs	7.682***	-25.13***		-25.55***	
	(1.349)	(8.265)		(7.975)	
7. Excluding textiles and apparel					
output tariffs	-17.87***	-29.36***	849,870	-21.73***	706,931
	(1.027)	(4.141)		(3.349)	
downstream tariffs	-3.432**	-22.97**		-27.43***	
	(1.418)	(9.341)		(9.872)	
7. Excluding computers and peripherals					
output tariffs	-17.86***	-26.19***	1,037,243	-19.25***	825,647
	(1.004)	(3.822)		(3.150)	
downstream tariffs	6.777***	-33.48***		-31.43***	
	(1.348)	(7.409)		(7.510)	

Table D.14: Robustness of TFP regressions on quartiles of sales interacted with tariffs

Dependent variable: Revenue TFP á la Olley-Pakes

1. Basic regression including SOE's and multinationals			
	All establishments		Non-exporters
	OLS	IV	IV
output_tariff*q1	-0.0272***	0.0165	-0.00254
	(0.00292)	(0.0174)	(0.0156)
output_tariff*q2	-0.0258***	-0.00187	-0.0169
	(0.00263)	(0.0173)	(0.0151)
output_tariff*q3	-0.0234***	0.0166	-0.00280
	(0.00256)	(0.0171)	(0.0153)
output_tariff*q4 (largest)	-0.0202***	0.0156	-0.00673
	(0.00260)	(0.0165)	(0.0152)
p-value H_0 : tariff*q1 = tariff*q4	0.0045	0.91	0.69
number of observations	1,054,525	1,054,525	713,687
2. Dropping control downstream tariffs			
	All establishments excluding SOEs and multinationals		Non-exporters
	OLS	IV	IV
output_tariff*q1	-0.0334***	-0.0511***	-0.0669***
	(0.00340)	(0.0197)	(0.0182)
output_tariff*q2	-0.0300***	-0.0447**	-0.0603***
	(0.00313)	(0.0206)	(0.0186)
output_tariff*q3	-0.0259***	-0.0234	-0.0343*
	(0.00313)	(0.0213)	(0.0197)
output_tariff*q4 (largest)	-0.0238***	-0.0276	-0.0399**
	(0.00326)	(0.0194)	(0.0182)
p-value H_0 : tariff*q1 = tariff*q4	0.0011	0.044	0.0409
number of observations	701,765	701,765	548,283
3. Dropping textiles and apparel			
	All establishments excluding SOEs and multinationals		Non-exporters
	OLS	IV	IV
output_tariff*q1	-0.0354***	-0.0340*	-0.0625***
	(0.00358)	(0.0183)	(0.0185)
output_tariff*q2	-0.0314***	-0.0336*	-0.0645***
	(0.00326)	(0.0196)	(0.0194)
output_tariff*q3	-0.0265***	-0.0347*	-0.0637***
	(0.00327)	(0.0206)	(0.0206)
output_tariff*q4 (largest)	-0.0250***	-0.0428**	-0.0760***
	(0.00338)	(0.0188)	(0.0198)
p-value H_0 : tariff*q1 = tariff*q4	0.0009	0.46	0.347
number of observations	574,845	574,845	470,520

Robustness of TFP regressions on quartiles of sales interacted with tariffs (cont.)

Dependent variable: Revenue TFP á la Olley-Pakes

4. Dropping computers and peripherals	All establishments excluding SOEs and multinationals		Non-exporters
	OLS	IV	IV
output_tariff*q1	-0.0338***	-0.0331*	-0.0432***
	(0.00342)	(0.0169)	(0.0167)
output_tariff*q2	-0.0304***	-0.0270	-0.0397**
	(0.00314)	(0.0179)	(0.0175)
output_tariff*q3	-0.0263***	-0.00876	-0.0178
	(0.00315)	(0.0190)	(0.0187)
output_tariff*q4 (largest)	-0.0242***	-0.0131	-0.0258
	(0.00328)	(0.0168)	(0.0174)
p-value H_0 : tariff*q1 = tariff*q4	0.0012	0.0898	0.1979
number of observations	701,523	701,523	548,074

5. Include policy variables in the first stage of TFP estimation	All establishments excluding SOEs and multinationals		Non-exporters
	OLS	IV	IV
output_tariff*q1	-0.0337***	-0.0318*	-0.0389**
	(0.00349)	(0.0173)	(0.0170)
output_tariff*q2	-0.0309***	-0.0241	-0.0334*
	(0.00324)	(0.0183)	(0.0176)
output_tariff*q3	-0.0271***	-0.00737	-0.0147
	(0.00323)	(0.0189)	(0.0188)
output_tariff*q4 (largest)	-0.0262***	-0.0123	-0.0238
	(0.00340)	(0.0172)	(0.0177)
p-value H_0 : tariff*q1 = tariff*q4	0.013	0.1096	0.2776
number of observations	680,432	680,432	530,411

6. TFP measured à la Ackerberg, Caves, Frazer (2015)	All establishments excluding SOEs and multinationals		Non-exporters
	OLS	IV	IV
output_tariff*q1	-0.0538***	-0.0633	-0.107**
	(0.00742)	(0.0554)	(0.0520)
output_tariff*q2	-0.0518***	-0.108**	-0.143***
	(0.00673)	(0.0523)	(0.0472)
output_tariff*q3	-0.0493***	-0.0913	-0.139***
	(0.00669)	(0.0582)	(0.0518)
output_tariff*q4 (largest)	-0.0498***	-0.0604	-0.110**
	(0.00727)	(0.0533)	(0.0526)
p-value H_0 : tariff*q1 = tariff*q4	0.6176	0.907	0.909
number of observations	700,756	700,756	547,596

Table D.15: Robustness of regressions of new goods on quartiles of sales interacted with tariffs

Dependent variable: share of new products in sales

1. Include SOE's and multinationals	All establishments		Non-exporters
	OLS	IV	IV
output_tariff*q1	0.00154	-0.0177**	-0.0136***
	(0.00117)	(0.00843)	(0.00500)
output_tariff*q2	0.00143	-0.0144*	-0.00957*
	(0.00115)	(0.00850)	(0.00498)
output_tariff*q3	0.00148	-0.00896	-0.00322
	(0.00118)	(0.00863)	(0.00497)
output_tariff*q4 (largest)	0.00165	-0.0105	-0.00643
	(0.00137)	(0.00906)	(0.00552)
test q1 = q4, pvalue	0.928	0.042	0.0732
number of observations	1,054,525	1,054,525	713,687
2. Drop control downstream tariffs	All excluding SOEs and multinationals		Non-exporters
	OLS	IV	IV
output_tariff*q1	0.000604	-0.0187**	-0.0141**
	(0.00144)	(0.00864)	(0.00614)
output_tariff*q2	0.000575	-0.0209**	-0.0136**
	(0.00141)	(0.00865)	(0.00604)
output_tariff*q3	0.000228	-0.0181**	-0.0111*
	(0.00153)	(0.00893)	(0.00630)
output_tariff*q4 (largest)	-0.000806	-0.0220**	-0.0139**
	(0.00179)	(0.00936)	(0.00640)
test q1 = q4, pvalue	0.3923	0.5213	0.9583
number of observations	701,765	701,765	548,283
3. Dropping textiles and apparel	All excluding SOEs and multinationals		Non-exporters
	OLS	IV	IV
output_tariff*q1	0.000583	-0.0135*	-0.00996
	(0.00150)	(0.00794)	(0.00606)
output_tariff*q2	2.59e-05	-0.0156*	-0.0122**
	(0.00149)	(0.00814)	(0.00609)
output_tariff*q3	-0.000232	-0.0170**	-0.0120*
	(0.00162)	(0.00853)	(0.00646)
output_tariff*q4 (largest)	-0.000461	-0.0209**	-0.0147**
	(0.00185)	(0.00922)	(0.00672)
test q1 = q4, pvalue	0.5483	0.1748	0.3702
number of observations	574,845	574,845	470,520
4. Dropping computers and peripherals	All excluding SOEs and multinationals		Non-exporters
	OLS	IV	IV
output_tariff*q1	0.000517	-0.0151**	-0.0124**
	(0.00144)	(0.00746)	(0.00583)
output_tariff*q2	0.000489	-0.0169**	-0.0116**
	(0.00141)	(0.00747)	(0.00575)
output_tariff*q3	7.99e-05	-0.0150*	-0.0100
	(0.00153)	(0.00786)	(0.00612)
output_tariff*q4 (largest)	-0.00103	-0.0193**	-0.0134**
	(0.00179)	(0.00835)	(0.00629)
test q1 = q4, pvalue	0.3493	0.4232	0.8416
number of observations	701,523	701,523	548,074

Robustness of regressions of new goods on quartiles of sales interacted with tariffs (cont)

Dependent variable: 0-1 dummy of whether the firm introduced a new product in the year

1. Include SOE's and multinationals	All establishments		Non-exporters
	OLS	IV	IV
output_tariff*q1	-0.00145	-0.0708***	-0.0371***
	(0.00244)	(0.0179)	(0.0103)
output_tariff*q2	2.15e-05	-0.0589***	-0.0269***
	(0.00238)	(0.0179)	(0.0104)
output_tariff*q3	0.00187	-0.0356*	-0.00422
	(0.00236)	(0.0183)	(0.0109)
output_tariff*q4 (largest)	0.00215	-0.0281	-0.0137
	(0.00269)	(0.0189)	(0.0115)
test q1 = q4, pvalue	0.1808	0.0000	0.0034
number of observations	1,054,525	1,054,525	713,687
2. Drop control downstream tariffs	All excluding SOEs and multinationals		Non-exporters
	OLS	IV	IV
output_tariff*q1	-0.00159	-0.0581***	-0.0354***
	(0.00346)	(0.0203)	(0.0130)
output_tariff*q2	0.000597	-0.0414**	-0.0279**
	(0.00328)	(0.0196)	(0.0126)
output_tariff*q3	0.000798	-0.0357*	-0.0187
	(0.00343)	(0.0208)	(0.0138)
output_tariff*q4 (largest)	-0.00224	-0.0325	-0.0301**
	(0.00375)	(0.0211)	(0.0137)
test q1 = q4, pvalue	0.8587	0.0243	0.6099
number of observations	701,765	701,765	548,283
3. Dropping textiles and apparel	All excluding SOEs and multinationals		Non-exporters
	OLS	IV	IV
output_tariff*q1	-0.000524	-0.0445**	-0.0246*
	(0.00356)	(0.0195)	(0.0129)
output_tariff*q2	0.000224	-0.0261	-0.0229*
	(0.00345)	(0.0189)	(0.0127)
output_tariff*q3	0.00102	-0.0303	-0.0189
	(0.00357)	(0.0205)	(0.0141)
output_tariff*q4 (largest)	0.000472	-0.0356*	-0.0339**
	(0.00384)	(0.0210)	(0.0145)
test q1 = q4, pvalue	0.7915	0.4551	0.3871
number of observations	574,845	574,845	470,520
4. Dropping computers and peripherals	All excluding SOEs and multinationals		Non-exporters
	OLS	IV	IV
output_tariff*q1	-0.00135	-0.0513***	-0.0331***
	(0.00347)	(0.0184)	(0.0124)
output_tariff*q2	0.000840	-0.0338*	-0.0249**
	(0.00329)	(0.0177)	(0.0120)
output_tariff*q3	0.00107	-0.0294	-0.0171
	(0.00344)	(0.0191)	(0.0134)
output_tariff*q4 (largest)	-0.00195	-0.0268	-0.0295**
	(0.00378)	(0.0194)	(0.0135)
test q1 = q4, pvalue	0.8704	0.0329	0.7286
number of observations	701,523	701,523	548,074

Table D.16: Robustness of regressions of sectoral skill intensity on quartiles of sales interacted with tariffs

Dependent variable: Ranking of sectors according to skill intensity (Higher ranking corresponds to higher skill intensity.)

1. Include SOE's and multinationals	All establishments		Non-exporters
	OLS	IV	IV
output_tariff*q1	-15.54***	-34.83***	-14.01***
	(0.991)	(4.924)	(2.951)
output_tariff*q2	-15.40***	-33.49***	-13.05***
	(1.013)	(4.764)	(2.809)
output_tariff*q3	-15.23***	-34.20***	-15.16***
	(1.019)	(4.744)	(2.825)
output_tariff*q4 (largest)	-14.79***	-35.00***	-16.24***
	(1.035)	(4.839)	(3.002)
test q1 = q4, pvalue	0.1163	0.9008	0.1235
number of observations	1,054,525	1,054,525	713,687
2. Drop control downstream tariffs	All excluding SOEs and multinationals		Non-exporters
	OLS	IV	IV
output_tariff*q1	-17.80***	-25.11***	-17.00***
	(1.064)	(4.363)	(3.607)
output_tariff*q2	-17.73***	-23.59***	-14.98***
	(1.066)	(4.111)	(3.444)
output_tariff*q3	-17.52***	-24.03***	-16.14***
	(1.074)	(4.211)	(3.537)
output_tariff*q4 (largest)	-17.09***	-26.62***	-18.33***
	(1.099)	(4.262)	(3.562)
test q1 = q4, pvalue	0.2143	0.3736	0.4742
number of observations	701,765	701,765	548,283
3. Dropping textiles and apparel	All excluding SOEs and multinationals		Non-exporters
	OLS	IV	IV
output_tariff*q1	-17.98***	-23.81***	-17.42***
	(1.100)	(4.148)	(3.594)
output_tariff*q2	-17.73***	-23.38***	-16.20***
	(1.100)	(3.998)	(3.513)
output_tariff*q3	-17.38***	-23.31***	-17.16***
	(1.110)	(4.109)	(3.638)
output_tariff*q4 (largest)	-16.54***	-26.88***	-20.06***
	(1.138)	(4.227)	(3.775)
test q1 = q4, pvalue	0.0259	0.0906	0.1752
number of observations	574,845	574,845	470,520
4. Dropping computers and peripherals	All excluding SOEs and multinationals		Non-exporters
	OLS	IV	IV
output_tariff*q1	-17.75***	-21.34***	-15.51***
	(1.070)	(3.919)	(3.448)
output_tariff*q2	-17.66***	-19.57***	-13.39***
	(1.073)	(3.670)	(3.290)
output_tariff*q3	-17.42***	-20.57***	-15.07***
	(1.082)	(3.838)	(3.452)
output_tariff*q4 (largest)	-16.98***	-23.34***	-17.67***
	(1.108)	(3.901)	(3.510)
test q1 = q4, pvalue	0.1765	0.2521	0.2626
number of observations	701,523	701,523	548,074