Appendix B. Robustness tests

Table B.1
Number of hours.

	(1)	(2)	(3)	(4)
	Part-time hours		Full-time hours	
Banned export share x Post 2014	-112.657***	-81.330**	-760.604**	-364.107
	(42.458)	(39.657)	(332.419)	(308.019)
Banned export share x Post 2016		-80.719		-1021.639*
		(56.313)		(560.785)
Constant	18.992***	18.944***	210.729***	210.126***
	(3.793)	(3.784)	(29.558)	(29.733)
R^2	0.674	0.681	0.949	0.952
N	151	151	151	151

Notes: This table shows the effect of the Russian ban on the hours worked by employees in Lithuanian food manufacturing firms over 2011-2017. For each *treated* firm that exported any banned products to Russia in 2013, we assign one *control* firm that is a food exporter, and is closest in size (as measured by total sales). The dependent variable is then the difference in the number of either part-time hours (Columns 1-2) or full-time hours (Columns 3-4) between the treated and control firms. All specifications include match- and year-fixed effects. ***, **, and * refer to the statistical significance at 1%, 5%, and 10%, respectively.

Table B.2
Dummy treatment.

	(1)	(2)	(3)	(4)
	Part-time employees		Full-time employees	
High banned export share x Post 2014	-19.415***	-17.423***	-58.332**	-10.816
	(6.726)	(6.261)	(27.378)	(23.298)
High banned export share x Post 2016		-5.756		-137.309**
		(8.490)		(54.037)
Constant	24.327***	24.311***	141.528***	141.149***
	(4.643)	(4.645)	(16.963)	(17.083)
R^2	0.742	0.743	0.952	0.957
N	151	151	151	151

Notes: This table shows the effect of the Russian ban on the number of employees in Lithuanian food manufacturing firms over 2011-2017. For each *treated* firm that exported any banned products to Russia in 2013, we assign one *control* firm that is a food exporter, and is closest in size (as measured by total sales). The dependent variable is then the difference in the number of either part-time employees (Columns 1-2) or full-time employees (Columns 3-4) between the treated and control firms. Instead of a continuous variable as in Table 3, $High\,banned\,export\,share$ is defined as a dummy equal to one if the $Banned\,export\,share$ is larger than 3%. All specifications include match- and year-fixed effects. ***, **, and * refer to the statistical significance at 1%, 5%, and 10%, respectively.

Table B.3
Four control firms for each treated firm.

	(1)	(2)	(3)	(4)
	Part-time employees		Full-time employees	
Banned export share x Post 2014	-147.486***	-114.990**	-396.773**	-81.593
	(49.980)	(49.311)	(175.955)	(167.078)
Banned export share x Post 2016		-78.096		-757.459***
		(50.818)		(281.392)
Constant	21.910***	21.854***	70.794***	70.244***
	(4.347)	(4.346)	(15.613)	(15.642)
R^2	0.739	0.744	0.939	0.944
N	157	157	157	157

Notes: This table shows the effect of the Russian ban on the number of employees in Lithuanian food manufacturing firms over 2011-2017. For each *treated* firm that exported any banned products to Russia in 2013, we assign four *control* firms that are food exporter and are closest in size (as measured by total sales). The dependent variable is then the difference in the number of either part-time employees (Columns 1-2) or full-time employees (Columns 3-4) between the treated and control firms. All specifications include match- and year-fixed effects. ***, **, and * refer to the statistical significance at 1%, 5%, and 10%, respectively.

Table B.4
Entropy balancing.

	(1)	(2)	(3)	(4)
	Part-time employees		Full-time employees	
Banned export share x Post 2014	-146.909***	-125.123**	-384.578**	-128.022
	(50.223)	(48.105)	(177.502)	(159.867)
Banned export share x Post 2016		-56.133		-661.058**
		(52.725)		(314.478)
Constant	24.411***	24.378***	141.696***	141.306***
	(4.478)	(4.474)	(16.923)	(17.150)
R^2	0.755	0.757	0.953	0.956
N	151	151	151	151

Notes: This table shows the effect of the Russian ban on the number of employees in Lithuanian food manufacturing firms over 2011-2017. For each *treated* firm that exported any banned products to Russia in 2013, we assign one *control* firm that is a food exporter and is closest in size (as measured by total sales). The dependent variable is then the difference in the number of either part-time employees (Columns 1-2) or full-time employees (Columns 3-4) between the treated and control firms. The first-differences observations are reweighted by balancing the first two moments of distributions of firm sales across the treated and control group in 2012. All specifications include match- and year-fixed effects. ***, **, and * refer to the statistical significance at 1%, 5%, and 10%, respectively.

Table B.5
Propensity score matching.

	(1)	(2)	(3)	(4)
	Part-time employees		Full-time employees	
Banned export share x Post 2014	-97.367**	-80.392*	53.687	352.928
	(41.103)	(40.822)	(259.022)	(249.252)
Banned export share x Post 2016		-107.457		-1894.211***
		(75.836)		(497.288)
Constant	21.534***	21.488***	123.219***	122.405***
	(4.213)	(4.251)	(24.427)	(23.876)
R^2	0.759	0.762	0.959	0.964
N	136	136	136	136

Notes: This table shows the effect of the Russian ban on the number of employees in Lithuanian food manufacturing firms over 2011-2017. For each *treated* firm that exported any banned products to Russia in 2013, we assign one *control* firm that is a food exporter and is closest in terms of propensity score, estimated based on sales in 2013, gross profit margin in 2013, and total exports in 2013. The dependent variable is then the difference in the number of either part-time employees (Columns 1-2) or full-time employees (Columns 3-4) between the treated and control firms. All specifications include match- and year-fixed effects. ***, **, and * refer to the statistical significance at 1%, 5%, and 10%, respectively.

Table B.6
Matching without replacement.

	(1)	(2)	(3)	(4)
	Part-time employees		Full-time employees	
Banned export share x Post 2014	-131.739***	-106.893**	-784.731***	-374.865**
	(48.875)	(47.099)	(206.920)	(183.002)
Banned export share x Post 2016		-63.698		-1050.801***
		(54.748)		(314.289)
Constant	20.920***	20.882***	71.740***	71.105***
	(4.143)	(4.141)	(22.863)	(22.689)
R^2	0.822	0.824	0.955	0.960
N	150	150	150	150

Notes: This table shows the effect of the Russian ban on the number of employees in Lithuanian food manufacturing firms over 2011-2017. For each *treated* firm that exported any banned products to Russia in 2013, we assign one *control* firm that is a food exporter and is closest in terms of in size (as measured by total sales). We match without replacement, picking the closest size matches as a priority. The dependent variable is then the difference in the number of either part-time employees (Columns 1-2) or full-time employees (Columns 3-4) between the treated and control firms. All specifications include match- and year-fixed effects. ***, **, and * refer to the statistical significance at 1%, 5%, and 10%, respectively.

Table B.7
Control group only exporters to Russia but only non-banned products.

	(1)	(2)	(3)	(4)
	Part-time employees		Full-time employees	
Banned export share x Post 2014	-141.070***	-119.876**	-453.575**	-209.698
	(50.460)	(48.461)	(184.888)	(167.125)
Banned export share x Post 2016		-57.096		-657.001**
		(52.446)		(323.490)
Constant	25.290***	25.251***	189.319***	188.877***
	(4.445)	(4.451)	(17.615)	(17.802)
R^2	0.760	0.763	0.941	0.944
N	147	147	147	147

Notes: This table shows the effect of the Russian ban on the number of employees in Lithuanian food manufacturing firms over 2011-2017. For each *treated* firm that exported any banned products to Russia in 2013, we assign one *control* firm that is a food exporter and is closest in terms of in size (as measured by total sales). We only consider control firm candidates among firms that export to Russia but export only those products that were not banned by Russian sanctions. The dependent variable is then the difference in the number of either part-time employees (Columns 1-2) or full-time employees (Columns 3-4) between the treated and control firms. All specifications include match- and year-fixed effects. ***, **, and * refer to the statistical significance at 1%, 5%, and 10%, respectively.

Table B.8
Control group only exporters outside of Russia but banned products.

	(1)	(2)	(3)	(4)
	Part-time employees		Full-time employees	
Banned export share x Post 2014	-127.845**	-103.264**	-729.323***	-392.096*
	(49.986)	(48.931)	(238.171)	(224.804)
Banned export share x Post 2016		-59.143		-811.389**
		(51.133)		(352.099)
Constant	18.920***	18.880***	17.958	17.404
	(4.600)	(4.603)	(24.741)	(24.995)
R^2	0.761	0.763	0.935	0.939
N	153	153	153	153

Notes: This table shows the effect of the Russian ban on the number of employees in Lithuanian food manufacturing firms over 2011-2017. For each *treated* firm that exported any banned products to Russia in 2013, we assign one *control* firm that is a food exporter and is closest in terms of in size (as measured by total sales). We only consider control firm candidates among firms that export to outside Russia but export those products that were banned by Russian sanctions. The dependent variable is then the difference in the number of either part-time employees (Columns 1-2) or full-time employees (Columns 3-4) between the treated and control firms. All specifications include match- and year-fixed effects. ***, **, and * refer to the statistical significance at 1%, 5%, and 10%, respectively.

Table B.9
Control group only exporters outside of Russia and non-banned products.

	(1)	(2)	(3)	(4)
	Part-time employees		Full-time employees	
Banned export share x Post 2014	-116.780**	-84.619*	-285.004**	-71.600
	(47.555)	(44.564)	(136.023)	(104.392)
Banned export share x Post 2016		-85.914*		-570.085**
		(50.317)		(253.234)
Constant	25.501***	25.439***	110.078***	109.663***
	(4.273)	(4.256)	(12.528)	(12.662)
R^2	0.784	0.789	0.975	0.977
N	153	153	153	153

Notes: This table shows the effect of the Russian ban on the number of employees in Lithuanian food manufacturing firms over 2011-2017. For each *treated* firm that exported any banned products to Russia in 2013, we assign one *control* firm that is a food exporter and is closest in terms of in size (as measured by total sales). We only consider control firm candidates among firms that export to outside Russia and export only those products that were not banned by Russian sanctions. The dependent variable is then the difference in the number of either part-time employees (Columns 1-2) or full-time employees (Columns 3-4) between the treated and control firms. All specifications include match- and year-fixed effects. ***, **, and * refer to the statistical significance at 1%, 5%, and 10%, respectively.

Table B.10
Surviving firms.

	(1)	(2)	(3)	(4)
	Part-time employees		Full-time employees	
Banned export share x Post 2014	-152.426***	-131.323***	-386.130**	-117.405
	(50.846)	(48.748)	(182.749)	(165.680)
Banned export share x Post 2016		-52.413		-667.427**
		(52.868)		(315.623)
Constant	23.841***	23.816***	149.633***	149.312***
	(4.766)	(4.773)	(18.222)	(18.454)
R^2	0.756	0.758	0.953	0.956
N	141	141	141	141

Notes: This table shows the effect of the Russian ban on the number of employees in Lithuanian food manufacturing firms over 2011-2017. For each *treated* firm that exported any banned products to Russia in 2013, we assign one *control* firm that is a food exporter, and is closest in size (as measured by total sales). The dependent variable is then the difference in the number of either part-time employees (Columns 1-2) or full-time employees (Columns 3-4) between the treated and control firms. In this analysis, we condition on the firm surviving until 2017. All specifications include match- and year-fixed effects. ***, **, and * refer to the statistical significance at 1%, 5%, and 10%, respectively.

Appendix E. Conceptual framework

The objective of this section is to set out a theoretical framework at a more conceptual level, leaving more technical details for the Appendix F. The theory helps us interpret empirical results as well as elucidate assumptions, channels, and implications consistent with the empirical findings.

E.1. Preferences and technology

The real consumption index (Q_t) is defined as follows:

$$Q_t = \left[\int_{j \in J} q_t(j)^{\frac{\sigma-1}{\sigma}} \, dj \right]^{\frac{\sigma}{\sigma-1}}, \qquad \sigma > 1, \tag{E.1}$$

where j indexes varieties; J is the set of all varieties; $q_t(j)$ denotes consumption of variety j; and σ governs the elasticity of substitution between varieties. The dual price index for the differentiated sector (P_t) is given by:

$$P_t = \left[\int_{j \in J} p_t(j)^{1-\sigma} \, dj \right]^{\frac{1}{1-\sigma}}. \tag{E.2}$$

Then it follows that the domestic demand for variety j is:

$$q_t(j) = \left(\frac{p_t(j)}{P_t} \right)^{-\sigma} Q_t = \left(\frac{A_t}{p_t(j)} \right)^{\sigma}, \tag{E.3}$$

where $A_t \equiv Q_t^{\frac{1}{\sigma}} P_t$ is a demand-shifter, similarly to Helpman et al. (2010). Refer below to the Appendix F.1 for a more detailed derivation.

A firm takes consumers' choices as given. Given the specification of the demand, the equilibrium revenues of a firm are:

$$r_t(j) \equiv p_t(j) q_t(j) = A_t q_t(j)^{\frac{\sigma-1}{\sigma}} = p_t(j)^{1-\sigma} A_t^{\sigma}. \tag{E.4}$$

The production function is given by:

$$q_t(j) = \left(K_t^{\psi}(j) \left(L_t^F(j) \right)^{1-\psi} \right)^{\phi} \left(L_t^P(j) \right)^{1-\phi}, \tag{E.5}$$

where the functional form is assumed to be identical across all firms producing varieties $j \in J$; ϕ, ψ denote distribution (share) parameters. As is standard, $q_t(j)$ denotes quantity, $K_t(j)$ capital, $L_t^F(j)$ full-time employment and $L_t^P(j)$ part-time employment. A simplifying assumption of the unitary elasticity of substitution across inputs helps us clarify key channels and arrive at the closed-form solutions.

E.2. Openness

Building on the above economic structure of preferences and technology, we move to the firm's choice to trade. Based on equation (E.3), the domestic quantity satisfies $q_t(j) = \left(\frac{A_t}{p_t(j)} \right)^{\sigma}$ and it follows that a foreign consumer faces a price $\tau(j) p_t(j)$, whereas a domestic producer has to produce $\tau(j) > 1$ units for $\left(\frac{A_t^{\star}}{\tau(j) p_t(j)} \right)^{\sigma}$ quantity to arrive to the foreign market:

$$q_t^x(j) = \tau(j) \left(\frac{A_t^{\star}}{\tau(j) p_t(j)} \right)^{\sigma},$$

where $A_t^{\star}$ is the foreign demand shifter, $A_t^{\star} \equiv Q_t^{\star \frac{1}{\sigma}} P_t^{\star}$.

This expression yields $\left(\frac{q_t^x(j)}{q_t^d(j)} \right)^{\frac{1}{\sigma}} = \tau_t^{\frac{1-\sigma}{\sigma}}(j) \left(\frac{A_t^{\star}}{A_t} \right)$. And, lastly, we can express total quantity as:

$$q_t(j) \equiv q_t^d(j) + \mathbb{I}_t^x(j) q_t^x(j) = q_t^d(j) + \mathbb{I}_t^x(j) \left[\tau_t^{\frac{1-\sigma}{\sigma}}(j) \left(\frac{A_t^{\star}}{A_t} \right) \right]^{\sigma} q_t^d(j) = \left[1 + \mathbb{I}_t^x(j) \left(\tau_t^{\frac{1-\sigma}{\sigma}}(j) \left(\frac{A_t^{\star}}{A_t} \right) \right)^{\sigma} \right] \left(\frac{A_t}{p_t(j)} \right)^{\sigma} = \Upsilon_t(j) \left(\frac{A_t}{p_t(j)} \right)^{\sigma},$$

and the total revenues of a firm as follows:

$$r_t(j) \equiv p_t(j) q_t(j) = \left[1 + \mathbb{I}_t^x(j) \tau_t^{1-\sigma}(j) \left(\frac{A_t^{\star}}{A_t} \right)^{\sigma} \right]^{\frac{1}{\sigma}} A_t q_t^{\frac{\sigma-1}{\sigma}}(j) = \Upsilon_t^{\frac{1}{\sigma}}(j) A_t q_t^{\frac{\sigma-1}{\sigma}}(j). \tag{E.6}$$

The variable $\Upsilon_t(j) - 1$ denotes the market access by a firm, and captures the share of exports over domestic revenue:

$$\Upsilon_t(j) \equiv 1 + \mathbb{I}_t^x(j)\,\tau_t^{1-\sigma}(j)\left(\frac{A_t^\star}{A_t}\right)^\sigma \geq 1, \tag{E.7}$$

where $\mathbb{I}_t^x(j)$ is an indicator variable equal to one (zero) if firm j chooses to serve a foreign market. It is straightforward to extend this setting to more than two foreign countries[33] but it suffices to consider two trade partners.

In our case, we refer to them as Russia (RU) and the rest of the world (RW):

$$\Upsilon_t(j) \equiv 1 + \tau_{RU,t}^{1-\sigma}(j)\left(\frac{A_{RU,t}^\star}{A_t}\right)^\sigma + s_{RW,t}^x(j)\,\tau_{RW,t}^{1-\sigma}(j)\left(\frac{A_{RW,t}^\star}{A_t}\right)^\sigma \geq 1. \tag{E.8}$$

We consider only those firms that are exporters to Russia, so there is no indicator function (in other words, we consider firms *conditional* on exporting to Russia). The rest of the world is captured by the share function, $s_{RW,t}^x(j)$, an extensive margin of trade. Unlike a binary choice ($\mathbb{I}_t^x(j)$), and to provide as close and transparent connection as possible to the data, $s_{RW,t}^x(j)$ captures the coverage of all remaining world markets under a trade costs symmetry assumption.[34] We denote a share of export revenues (an intensive margin) as:

$$\mathcal{S}_t^{RU}(j) = \frac{\Upsilon_t(j)-1}{\Upsilon_t(j)} - \frac{s_{RW,t}^x(j)\tau_{RW,t}^{1-\sigma}(j)\left(\frac{A_{RW,t}^\star}{A_t}\right)^\sigma}{\Upsilon_t(j)}$$

and

$$\mathcal{S}_t^{RW}(j) = \frac{r_t^{RW}(j)}{r_t^d(j)+r_t^{RU}(j)+r_t^{RW}(j)} = \frac{\Upsilon_t(j)-1}{\Upsilon_t(j)} - \frac{\tau_{RU,t}^{1-\sigma}(j)\left(\frac{A_{RU,t}^\star}{A_t}\right)^\sigma}{\Upsilon_t(j)}. \tag{E.9}$$

In a standard two-country setting, export revenue share collapses to $\mathcal{S}_t(j) = \frac{\Upsilon_t(j)-1}{\Upsilon_t(j)}$. For full details regarding the derivation of quantity, prices and revenues in this three-country setting, please refer to the Appendix F.2 below.

E.3. Optimal choices

Given the structure outlined above, we summarize firm's optimal choices. Recall that since the focus of our empirical analysis is on the exporters to Russia, we only consider those firms that have been trading with Russia. As in the data, these firms have a choice to increase exporting to the rest of the world. The per-period profit of a firm is then:

$$\begin{aligned}\pi_t(j) = \Bigg\{ & \left[1 + \tau_{RU,t}^{1-\sigma}(j)\left(\frac{A_{RU,t}^\star}{A_t}\right)^\sigma + s_{RW,t}^x(j)\,\tau_{RW,t}^{1-\sigma}(j)\left(\frac{A_{RW,t}^\star}{A_t}\right)^\sigma\right]^{\frac{1}{\sigma}} \times \\ & A_t\left(\left(\psi K_t^\gamma(j) + (1-\psi)\left(L_t^F(j)\right)^\gamma\right)^{\frac{\phi}{\gamma}}\left(L_t^P(j)\right)^{1-\phi}\right)^{\frac{\sigma-1}{\sigma}} \\ & - w_t^F L_t^F(j) - w_t^P L_t^P(j) - I_t(j) - \Phi^L\left(L_t^F(j), H_t^F(j)\right) - s_{RW,t}^x(j)\,f_x \Bigg\},\end{aligned} \tag{E.10}$$

where Φ^L stands for a full-time labor adjustment costs function. The other notation is standard: $I_t(j)$ stands for the firm j investment, $H_t^F(j)$ denotes a change in full-time labor stock, and $\Phi^L\left(L_t^F(j), H_t^F(j)\right)$ takes full-time labor adjustment costs into account. We will assume that hiring and firing costs per each full-time employee, h and f, respectively, are constant across all firms.

A firm engages in a dynamic planning and optimizes by taking into account a constant discount rate ρ:

$$\max_{\substack{L_{t+1}^F(j),\, H_t^F(j),\, L_t^P(j),\\ K_{t+1}(j),\, I_t(j),\, s_{RW,t}^x(j)}} \mathbb{E}_t \sum_{s=t}^{+\infty} \rho^s \pi_s(j) =$$

$$\max_{\substack{L_{t+1}^F(j),\, H_t^F(j),\, L_t^P(j),\\ K_{t+1}(j),\, I_t(j),\, s_{RW,t}^x(j)}} \mathbb{E}_t \sum_{s=t}^{+\infty} \rho^s \Bigg\{ \left[1 + \tau_{RU,s}^{1-\sigma}(j)\left(\frac{A_{RU,s}^\star}{A_s}\right)^\sigma + s_{RW,s}^x(j)\,\tau_{RW,s}^{1-\sigma}(j)\left(\frac{A_{RW,s}^\star}{A_s}\right)^\sigma\right]^{\frac{1}{\sigma}}$$

[33] If each firm reaches a set of foreign markets, we can generalize: $\Upsilon_t(j) \equiv 1 + \sum_\ell \mathbb{I}_{\ell t}^x(j)\,\tau_{\ell t}^{1-\sigma}(j)\left(\frac{A_{\ell t}^\star}{A_t}\right)^\sigma \geq 1$, where $\ell = 1, \ldots, \mathcal{L}$.

[34] One can think of the (normalized) sum as: $\sum_{\ell=1}^{\mathcal{L}} \mathbb{I}_{\ell,t}^x(j)\,\tau_{RW,t}^{1-\sigma}(j)\left(\frac{A_{RW,t}^\star}{A_t}\right)^\sigma = \tau_{RW,t}^{1-\sigma}(j)\left(\frac{A_{RW,t}^\star}{A_t}\right)^\sigma \sum_\ell \mathbb{I}_{\ell,t}^x(j)$, where symmetry across foreign markets was assumed. In such a case, $\mathcal{L} \times s_{RW,t}^x(j) = \sum_\ell \mathbb{I}_{\ell,t}^x(j)$, and we can thus normalize $\mathcal{L} = 1$.

$$\times A_s\left(\left(\psi K_s^{\gamma}(j)+(1-\psi)\left(L_s^F(j)\right)^{\gamma}\right)^{\frac{\phi}{\gamma}}\left(L_s^P(j)\right)^{1-\phi}\right)^{\frac{\sigma-1}{\sigma}} \tag{E.11}$$

$$\left.-w_s^F L_s^F(j)-w_s^P L_s^P(j)-I_s(j)-\Phi^L\left(L_s^F(j),H_s^F(j)\right)-s_{RW,s}^x(j)f_x\right\},$$

subject to the following constraints:

$$I_t(j)=K_{t+1}(j)-(1-\delta)K_t(j), \tag{E.12}$$

$$L_{t+1}^F(j)=L_t^F(j)+H_t^F(j), \tag{E.13}$$

$$\Phi^L\left(L_t^F(j),H_t^F(j)\right)=hH_t^F(j)\mathbb{1}_{\triangle L_t^F(j)>0}-fH_t^F(j)\mathbb{1}_{\triangle L_t^F(j)<0}. \tag{E.14}$$

The firm's optimal choices, ignoring variety-specific notation, can be summarized as follows:

$$\begin{aligned}
\mu_t &= \rho\left(\Upsilon_{t+1}^{\frac{1}{\sigma}}A_{t+1}\left(\tfrac{\sigma-1}{\sigma}\right)q_{t+1}^{\frac{\sigma-1}{\sigma}}(1-\psi)\phi\left(L_{t+1}^F\right)^{\gamma-1}\left(\Phi_{t+1}^{\gamma}\right)^{-1}-w_{t+1}^F+\mu_{t+1}\right),\\
\mu_t &= h\mathbb{1}_{H_t^F>0}-f\mathbb{1}_{H_t^F<0},\\
w_t^P &= \Upsilon_t^{\frac{1}{\sigma}}A_t\left(\tfrac{\sigma-1}{\sigma}\right)q_t^{-\frac{1}{\sigma}}\frac{\partial q_t}{\partial L_t^P},\\
\tfrac{1-\rho+\delta\rho}{\rho} &= \Upsilon_{t+1}^{\frac{1}{\sigma}}A_{t+1}\left(\tfrac{\sigma-1}{\sigma}\right)q_{t+1}^{-\frac{1}{\sigma}}\frac{\partial q_{t+1}}{\partial K_{t+1}},\\
q_t^{\frac{1}{\sigma}} &= \frac{\tau_{RW,t}A_t\left(A_{RW,t}^{\star}\right)^{\frac{\sigma}{1-\sigma}}}{\sigma^{\frac{1}{1-\sigma}}f_x^{\frac{1}{1-\sigma}}}\Upsilon_t^{\frac{1}{\sigma}}\left(s_{RW,t}^x;\tau_{RU,t},\tau_{RW,t}\right).
\end{aligned} \tag{E.15}$$

As usual, capital takes time to be installed and become productive and depreciates at a rate δ (see equation (E.12)). Otherwise, we abstract from the adjustment costs of investment, thus marginal (revenue) product of capital refers to marginal product of capital and additional revenue, both evaluated next period and discounted, as well as depreciation rate.

E.4. Full-time labor adjustment

As covered in the main text, we introduce a concept of a large shock, which necessitates costly adjustment margins by a firm. Recall that we consider a state space reduction into two discrete states – good and bad. Let the transition probability of moving between good and bad states be p, whereas with probability $1-p$ that the state remains the same in the next period. In the good state change case, a firm hires new full-time staff whereas in the case when a bad state happens – it lays off current full-time employees. Given the full-time labor adjustment cost function in the equation (E.14), the full-time labor shadow value varies in the interval $h\geq\mu_t(j)\geq-f$, with the equality constraint binding when hiring or firing occurs. Whenever a firm hits an action interval, then $\mu_t(j)$ is equal to $-f$ under the adverse shock and h under a favorable shock.

Using the first-order conditions for the full-time labor, summarized by the first two equations of the shadow value $\mu_t(j)$ in Section E.3, we get:

$$-f=\rho\left(\Upsilon_{t+1}^{\frac{1}{\sigma}}(j)A_{t+1}\left(\frac{\sigma-1}{\sigma}\right)\underline{q}_{t+1}^{-\frac{1}{\sigma}}(j)\frac{\partial \underline{q}_{t+1}(j)}{\partial L_{t+1}^F(j)}-w_{t+1}^F-(1-p)f+ph\right), \tag{E.16}$$

where $\underline{q}_{t+1}(j)\equiv q\left(L_{t+1}^{F-}(j),L_{t+1}^P(j)\right)$ denotes *reduced* employment levels (thereby implying a negative $H_t^F(j)$). This means that firing is optimal rather than waiting. That coincides with our definition of a large shock, i.e., a situation when the trade disruption is so large that paying firing costs is preferred.[35] In a good state:

$$h=\rho\left(\Upsilon_{t+1}^{\frac{1}{\sigma}}(j)A_{t+1}\left(\frac{\sigma-1}{\sigma}\right)\bar{q}_{t+1}^{-\frac{1}{\sigma}}(j)\frac{\partial \bar{q}_{t+1}(j)}{\partial L_{t+1}^F(j)}-w_{t+1}^F-pf+(1-p)h\right), \tag{E.17}$$

where $\bar{q}_{t+1}(j)\equiv q\left(L_{t+1}^{F+}(j),L_{t+1}^P(j)\right)$ denotes *increased* employment levels (implying positive $H_t^F(j)$). Manipulating these two expressions and simplifying by the normalization of hiring costs to $h=0$, we end up with:

$$\left(L_{t+1}^{F-}(j)\right)^{(1-\psi)\phi\frac{\sigma-1}{\sigma}-1}=\Psi_{t+1}\tau_{RW,t+1}^{\frac{\sigma-1}{\sigma}}(j)K_{t+1}(j)^{-\psi\phi\frac{\sigma-1}{\sigma}}\left(L_{t+1}^P(j)\right)^{-(1-\phi)\frac{\sigma-1}{\sigma}-\frac{1}{\sigma}}, \tag{E.18}$$

where Ψ_{t+1} is a time-varying term, exogenous from the perspective of a firm (see Appendix F.4.3 below for the precise expression and derivation).[36]

---

[35] Technically, when μ_t drops below $-f$, an optimizing firm must fire full-time workers and do so until $\mu_t\geq-f$ is restored. That is why we only consider marginal values with equality.

[36] The term is given by $\Psi_{t+1}\equiv\frac{\left(-\frac{1}{\rho}f+(1-p(j))f+w_{t+1}^F\right)(\sigma-1)^{\frac{1}{\sigma}}f_x^{\frac{1}{\sigma}}}{A_{RW,t+1}^{\star}\left(\frac{\sigma-1}{\sigma}\right)\left(\frac{w^P}{1-\phi}\right)^{\frac{1}{\sigma}}(1-\psi)\phi}$.

Appendix F. Detailed derivations

F.1. Demand derivation

$$\max\left[\int_{j\in J} q_t(j)^{\frac{\sigma-1}{\sigma}}\,dj\right]^{\frac{\sigma}{\sigma-1}},\ s.t. \int_{j\in J} p_t(j)\,q_t(j)=E_t=P_tQ_t.$$

The first order conditions (FOCs), after setting a Lagrangian, are

$$\frac{\sigma}{\sigma-1}\left[\int_{j\in J} q_t(j)^{\frac{\sigma-1}{\sigma}}\,dj\right]^{\frac{\sigma}{\sigma-1}-1}\frac{\sigma-1}{\sigma}q_t(j)^{\frac{\sigma-1}{\sigma}-1}-\lambda p_t(j)=0$$

$$Q_t^{\frac{1}{\sigma}}q_t(j)^{-\frac{1}{\sigma}}-\lambda p_t(j)=0$$

$$Q_t^{\frac{1}{\sigma}}q_t(j')^{-\frac{1}{\sigma}}-\lambda p_t(j')=0$$

So, $\begin{matrix} Q_t^{\frac{1}{\sigma}}q_t(j)^{-\frac{1}{\sigma}}=\lambda p_t(j)\\ Q_t^{\frac{1}{\sigma}}q_t(j')^{-\frac{1}{\sigma}}=\lambda p_t(j')\end{matrix}$ or $q_t(j)^{-\frac{1}{\sigma}}=\frac{p_t(j)}{p_t(j')}q_t(j')^{-\frac{1}{\sigma}}$. It follows that

$$\int_{j\in J} q_t(j)^{-\frac{1}{\sigma}}p_t(j')\,q_t(j')^{\frac{1}{\sigma}}q_t(j)\,dj=p_t(j')\,q_t(j')^{\frac{1}{\sigma}}\int_{j\in J} q_t(j)^{\frac{\sigma-1}{\sigma}}\,dj=p_t(j')\,q_t(j')^{\frac{1}{\sigma}}Q_t^{\frac{\sigma-1}{\sigma}}=P_tQ_t$$

and $q_t(j)^{\frac{1}{\sigma}}=p_t(j)^{-1}P_tQ_t^{\frac{1}{\sigma}}$ or $q_t(j)=p_t(j)^{-\sigma}P_t^{\sigma}Q_t$. An inverse demand function follows immediately:

$$p_t(j)=A_t\left(q_t(j)\right)^{-\frac{1}{\sigma}}.$$

F.2. Extension to multiple countries

For the two foreign countries, the additivity is useful when it comes to expressing a total quantity for an exporter as:

$$q_t(j)\equiv q_t^d(j)+q_t^{RU}(j)+q_t^{RW}(j)=\left(p_t(j)\right)^{-\sigma}A_t^{\sigma}\left[1+\left(\frac{A^{\star}_{RU,t}}{A_t}\right)^{\sigma}\tau^{1-\sigma}_{RU,t}(j)+s^x_{RW,t}(j)\left(\frac{A^{\star}_{RW,t}}{A_t}\right)^{\sigma}\tau^{1-\sigma}_{RW,t}(j)\right]$$

and inverse demand:

$$p_t(j)=\left(q_t(j)\right)^{-\frac{1}{\sigma}}A_t\left(1+\left(\frac{A^{\star}_{RU,t}}{A_t}\right)^{\sigma}\tau^{1-\sigma}_{RU,t}(j)+s^x_{RW,t}(j)\left(\frac{A^{\star}_{RW,t}}{A_t}\right)^{\sigma}\tau^{1-\sigma}_{RW,t}(j)\right)^{\frac{1}{\sigma}}=\left(q_t(j)\right)^{-\frac{1}{\sigma}}A_t\Upsilon_t(j)^{\frac{1}{\sigma}},$$

thereby yielding

$$\begin{aligned}
r_t(j)&\equiv p_t(j)q_t^d(j)+p_t(j)q_t^{RU}(j)+p_t(j)q_t^{RW}(j)=p_t(j)q_t^d(j)\left[1+\frac{q_t^{RU}(j)}{q_t^d(j)}+\frac{q_t^{RW}(j)}{q_t^d(j)}\right]\\
&=\left(p_t(j)\right)^{1-\sigma}A_t^{\sigma}\left[1+\left(\frac{A^{\star}_{RU,t}}{A_t}\right)^{\sigma}\tau^{1-\sigma}_{RU,t}(j)+s^x_{RW,t}(j)\left(\frac{A^{\star}_{RW,t}}{A_t}\right)^{\sigma}\tau^{1-\sigma}_{RW,t}(j)\right]\\
&=\left(q_t(j)\right)^{\frac{\sigma-1}{\sigma}}A_t\left[1+\left(\frac{A^{\star}_{RU,t}}{A_t}\right)^{\sigma}\tau^{1-\sigma}_{RU,t}(j)+s^x_{RW,t}(j)\left(\frac{A^{\star}_{RW,t}}{A_t}\right)^{\sigma}\tau^{1-\sigma}_{RW,t}(j)\right]^{\frac{1}{\sigma}}.
\end{aligned}$$

We will denote a share of export revenues (an intensive margin) as

$$\begin{aligned}
S_t^{RU}(j)&=\frac{r_t^{RU}(j)}{r_t^d(j)+r_t^{RU}(j)+r_t^{RW}(j)}=\frac{\tau_{RU,t}(j)\left(\frac{A^{\star}_{RU,t}}{\tau_{RU,t}(j)}\right)^{\sigma}p_t^{1-\sigma}(j)}{\left(q_t(j)\right)^{\frac{\sigma-1}{\sigma}}A_t\left[1+\left(\frac{A^{\star}_{RU,t}}{A_t}\right)^{\sigma}\tau^{1-\sigma}_{RU,t}(j)+s^x_{RW,t}(j)\left(\frac{A^{\star}_{RW,t}}{A_t}\right)^{\sigma}\tau^{1-\sigma}_{RW,t}(j)\right]^{\frac{1}{\sigma}}}=\frac{\tau_{RU,t}(j)\left(\frac{A^{\star}_{RU,t}}{\tau_{RU,t}(j)}\right)^{\sigma}\left(q_t(j)\right)^{-\frac{1-\sigma}{\sigma}}A_t^{1-\sigma}\Upsilon_t(j)^{\frac{1-\sigma}{\sigma}}}{\left(q_t(j)\right)^{\frac{\sigma-1}{\sigma}}A_t\Upsilon_t(j)^{\frac{1}{\sigma}}}\\
&=\frac{\tau_{RU,t}(j)\left(\frac{A^{\star}_{RU,t}}{\tau_{RU,t}(j)}\right)^{\sigma}A_t^{-\sigma}}{\Upsilon_t(j)}=\frac{\Upsilon_t(j)-1-s^x_{RW,t}(j)\tau^{1-\sigma}_{RW,t}(j)\left(\frac{A^{\star}_{RW,t}}{A_t}\right)^{\sigma}}{\Upsilon_t(j)}=\frac{\Upsilon_t(j)-1}{\Upsilon_t(j)}-\frac{s^x_{RW,t}(j)\tau^{1-\sigma}_{RW,t}(j)\left(\frac{A^{\star}_{RW,t}}{A_t}\right)^{\sigma}}{\Upsilon_t(j)}
\end{aligned}$$

and

$$\mathcal{S}_t^{RW}(j) = \frac{r_t^{RW}(j)}{r_t^{d}(j)+r_t^{RU}(j)+r_t^{RW}(j)} = \frac{s_{RW,t}^{x}(j)\tau_{RW,t}(j)\left(\frac{A_{RW,t}^{\star}}{\tau_{RW,t}(j)}\right)^{\sigma} p_t^{1-\sigma}(j)}{\left(q_t(j)\right)^{\frac{\sigma-1}{\sigma}} A_t\left[1+\left(\frac{A_{RU,t}^{\star}}{A_t}\right)^{\sigma}\tau_{RU,t}^{1-\sigma}(j)+s_{RW,t}^{x}(j)\left(\frac{A_{RW,t}^{\star}}{A_t}\right)^{\sigma}\tau_{RW,t}^{1-\sigma}(j)\right]^{\frac{1}{\sigma}}} = \frac{s_{RW,t}^{x}(j)\tau_{RW,t}(j)\left(\frac{A_{RW,t}^{\star}}{\tau_{RW,t}(j)}\right)^{\sigma}\left(q_t(j)\right)^{-\frac{1-\sigma}{\sigma}} A_t^{1-\sigma}\Upsilon_t(j)^{\frac{1-\sigma}{\sigma}}}{\left(q_t(j)\right)^{\frac{\sigma-1}{\sigma}} A_t\Upsilon_t(j)^{\frac{1}{\sigma}}}$$

$$= \frac{s_{RW,t}^{x}(j)\tau_{RW,t}(j)\left(\frac{A_{RW,t}^{\star}}{\tau_{RW,t}(j)}\right)^{\sigma} A_t^{-\sigma}}{\Upsilon_t(j)} = \frac{\Upsilon_t(j)-1-\tau_{RU,t}^{1-\sigma}(j)\left(\frac{A_{RU,t}^{\star}}{A_t}\right)^{\sigma}}{\Upsilon_t(j)} = \frac{\Upsilon_t(j)-1}{\Upsilon_t(j)} - \frac{\tau_{RU,t}^{1-\sigma}(j)\left(\frac{A_{RU,t}^{\star}}{A_t}\right)^{\sigma}}{\Upsilon_t(j)}.$$

It is clear that when $\tau_{RU,t}(j)\to\infty$, $\mathcal{S}_t^{RU}(j)\to 0$ and $\mathcal{S}_t^{RW}(j)\to\frac{\Upsilon_t(j)-1}{\Upsilon_t(j)}$, thereby replicating a two-country world, as in Helpman et al. (2010) (see their footnote 15).

F.3. Optimal choices

Setting up a Lagrangian in a perfect foresight environment with firm symmetry (to save on notation for each firm j, we abstract from variety/firm-specific notation from now on) yields:

$$\mathcal{L} = \sum_{s=t}^{+\infty}\rho^s\Bigg\{\left[1+\tau_{RU,s}^{1-\sigma}\left(\frac{A_{RU,s}^{\star}}{A_s}\right)^{\sigma}+s_{RW,s}^{x}\tau_{RW,s}^{1-\sigma}\left(\frac{A_{RW,s}^{\star}}{A_s}\right)^{\sigma}\right]^{\frac{1}{\sigma}}\times A_s\left(\left(\psi K_s^{\gamma}+(1-\psi)\left(L_s^{F}\right)^{\gamma}\right)^{\frac{\phi}{\gamma}}\left(L_s^{P}\right)^{1-\phi}\right)^{\frac{\sigma-1}{\sigma}}$$

$$-w_s^F L_s^F - w_s^P L_s^P - I_s - hH_s^F\mathbb{1}_{\triangle L_s^F>0} + fH_s^F\mathbb{1}_{\triangle L_s^F<0} - s_{RW,s}^{x}f_x + \mathsf{q}_s\left(I_s+(1-\delta)K_s-K_{s+1}\right)+\mu_s\left(H_s^F+L_s^F-L_{s+1}^F\right)\Bigg\}.$$

The optimality conditions read as follows:

$$\frac{\partial\mathcal{L}}{\partial L_{t+1}^F} = 0 \Rightarrow -\rho^{t+1}w_{t+1}^F - \rho^t\mu_t + \rho^{t+1}\mu_{t+1} + \rho^{t+1}\Upsilon_{t+1}^{\frac{1}{\sigma}}A_{t+1}\left(\frac{\sigma-1}{\sigma}\right)q_{t+1}^{-\frac{1}{\sigma}}\frac{\partial q_{t+1}}{\partial L_{t+1}^F}$$

$$\mu_t = \rho\left(\Upsilon_{t+1}^{\frac{1}{\sigma}}A_{t+1}\left(\frac{\sigma-1}{\sigma}\right)q_{t+1}^{-\frac{1}{\sigma}}\frac{\partial q_{t+1}}{\partial L_{t+1}^F} - w_{t+1}^F + \mu_{t+1}\right) \tag{F.1}$$

$$\mu_t = \rho\left(\Upsilon_{t+1}^{\frac{1}{\sigma}}A_{t+1}\left(\frac{\sigma-1}{\sigma}\right)q_{t+1}^{\frac{\sigma-1}{\sigma}}(1-\psi)\phi\left(L_{t+1}^F\right)^{\gamma-1}\left(\psi K_{t+1}^{\gamma}+(1-\psi)\left(L_{t+1}^F\right)^{\gamma}\right)^{-1} - w_{t+1}^F + \mu_{t+1}\right) \tag{F.2}$$

$$\mu_t = \rho\left(\Upsilon_{t+1}^{\frac{1}{\sigma}}A_{t+1}\left(\frac{\sigma-1}{\sigma}\right)q_{t+1}^{\frac{\sigma-1}{\sigma}}(1-\psi)\phi\left(L_{t+1}^F\right)^{\gamma-1}\left(\Phi_{t+1}^{\gamma}\right)^{-1} - w_{t+1}^F + \mu_{t+1}\right) \tag{F.3}$$

$$\frac{\partial\mathcal{L}}{\partial H_t^F} = 0 \Rightarrow h\mathbb{1}_{H_t^F>0} - f\mathbb{1}_{H_t^F<0} = \mu_t, \tag{F.4}$$

$$\frac{\partial\mathcal{L}}{\partial L_t^P} = 0 \Rightarrow w_t^P = \Upsilon_t^{\frac{1}{\sigma}}A_t\left(\frac{\sigma-1}{\sigma}\right)q_t^{-\frac{1}{\sigma}}\frac{\partial q_t}{\partial L_t^P}, \tag{F.5}$$

$$\frac{\partial\mathcal{L}}{\partial K_{t+1}} = 0 \Rightarrow \mathsf{q}_{t+1}(1-\delta)\rho^{t+1} - \rho^t\mathsf{q}_t + \rho^{t+1}\Upsilon_{t+1}^{\frac{1}{\sigma}}A_{t+1}\left(\frac{\sigma-1}{\sigma}\right)q_{t+1}^{-\frac{1}{\sigma}}\frac{\partial q_{t+1}}{\partial K_{t+1}} = 0, \tag{F.6}$$

$$\frac{1}{\rho}\mathsf{q}_t = \Upsilon_{t+1}^{\frac{1}{\sigma}}A_{t+1}\left(\frac{\sigma-1}{\sigma}\right)q_{t+1}^{-\frac{1}{\sigma}}\frac{\partial q_{t+1}}{\partial K_{t+1}} + \mathsf{q}_{t+1}(1-\delta), \tag{F.7}$$

$$\frac{\partial\mathcal{L}}{\partial s_{RW,t}^x} = 0 \Rightarrow \frac{1}{\sigma}\left[1+\tau_{RU,t}^{1-\sigma}\left(\frac{A_{RU,t}^{\star}}{A_t}\right)^{\sigma}+s_{RW,t}^{x}\tau_{RW,t}^{1-\sigma}\left(\frac{A_{RW,t}^{\star}}{A_t}\right)^{\sigma}\right]^{\frac{1-\sigma}{\sigma}}\tau_{RW,t}^{1-\sigma}\left(\frac{A_{RW,t}^{\star}}{A_t}\right)^{\sigma}A_t q_t^{\frac{\sigma-1}{\sigma}} = f_x, \tag{F.8}$$

$$\sigma^{-\frac{1}{\sigma-1}}\Upsilon_t^{-\frac{1}{\sigma}}\left(s_{RW,t}^{x};\tau_{RU,t},\tau_{RW,t}\right)\tau_{RW,t}^{-1}\left(\frac{A_{RW,t}^{\star}}{A_t}\right)^{\frac{\sigma}{\sigma-1}}A_t^{\frac{1}{\sigma-1}}q_t^{\frac{1}{\sigma}} = f_x^{\frac{1}{\sigma-1}} \tag{F.9}$$

$$q_t^{\frac{1}{\sigma}} = \frac{\tau_{RW,t}A_t\left(A_{RW,t}^{\star}\right)^{\frac{\sigma}{1-\sigma}}}{\sigma^{\frac{1}{1-\sigma}}f_x^{\frac{1}{1-\sigma}}}\Upsilon_t^{\frac{1}{\sigma}}\left(s_{RW,t}^{x};\tau_{RU,t},\tau_{RW,t}\right), \tag{F.10}$$

$$\frac{\partial\mathcal{L}}{\partial I_t} = 0 \Rightarrow \mathsf{q}_t = 1, \tag{F.11}$$

$$\frac{1-\rho+\delta\rho}{\rho} = \Upsilon_{t+1}^{\frac{1}{\sigma}}A_{t+1}\left(\frac{\sigma-1}{\sigma}\right)q_{t+1}^{-\frac{1}{\sigma}}\frac{\partial q_{t+1}}{\partial K_{t+1}} \tag{F.12}$$

$$= \Upsilon_{t+1}^{\frac{1}{\sigma}}A_{t+1}\left(\frac{\sigma-1}{\sigma}\right)q_{t+1}^{\frac{\sigma-1}{\sigma}}\phi\psi K_{t+1}^{\gamma-1}\left(\psi K_{t+1}^{\gamma}+(1-\psi)\left(L_{t+1}^F\right)^{\gamma}\right)^{-1} \tag{F.13}$$

$$
= \Upsilon_{t+1} (\sigma - 1) \tau_{RW,t+1}^{\sigma-1} \left(\frac{A_{t+1}}{A_{RW,t+1}^{\star}} \right)^{\sigma} f_x \phi \psi K_{t+1}^{\gamma-1} \left(\Phi_{t+1}^{\gamma} \right)^{-1} = \frac{1 - \rho + \delta\rho}{\rho}. \tag{F.14}
$$

Notice that output can be split into flexible and non-flexible parts, $q_t = \Phi_t^{\phi} \left(L_t^P \right)^{1-\phi}$, where the non-flexible part of production is summarized by $\Phi_t^{\gamma} \equiv \left(\psi K_t^{\gamma} + (1-\psi) \left(L_t^F \right)^{\gamma} \right)$. In the main text, we consider a special case when γ approaches zero, the elasticity of substitution becomes unitary, and the production function becomes (3) (see also (E.5)).

Note that next period's capital requires adjusting investment in the current period, whereas full-time labor entails hiring and firing costs on top of temporal rigidities (a firm cannot hire or fire full-time employees contemporaneously).

F.4. Implications

F.4.1. Intensive margin of trade

We can use the trade share choice (F.10) in combination with the part-time employment expression (F.5) to pin down the relationship between openness and firm adjustment in the face of a shock. From (F.10), we have:

$$
q_t = \frac{\tau_{RW,t}^{\sigma} A_t^{\sigma} \left(A_{RW,t}^{\star} \right)^{\frac{\sigma}{1-\sigma}\sigma}}{\sigma^{\frac{\sigma}{1-\sigma}} f_x^{\frac{\sigma}{1-\sigma}}} \Upsilon_t,
$$

and equating to (F.5), we obtain

$$
\Upsilon_t^{\frac{1}{1-\sigma}\frac{\sigma-1}{\sigma}} A_t^{\frac{\sigma}{1-\sigma}\frac{\sigma-1}{\sigma}} \left(\frac{\sigma-1}{\sigma} \right)^{\frac{\sigma}{1-\sigma}\frac{\sigma-1}{\sigma}} \left(\frac{w^P L_t^P}{1-\phi} \right)^{\frac{\sigma}{\sigma-1}\frac{\sigma-1}{\sigma}} = \frac{\tau_{RW,t}^{\sigma\frac{\sigma-1}{\sigma}} A_t^{\sigma\frac{\sigma-1}{\sigma}} \left(A_{RW,t}^{\star} \right)^{\frac{\sigma}{1-\sigma}\sigma\frac{\sigma-1}{\sigma}}}{\sigma^{\frac{\sigma}{1-\sigma}\frac{\sigma-1}{\sigma}} f_x^{\frac{\sigma}{1-\sigma}\frac{\sigma-1}{\sigma}}} \Upsilon_t^{\frac{\sigma-1}{\sigma}}.
$$

We can therefore express intensive margin as:

$$
\Upsilon_t = \left(\frac{w^P L_t^P}{1-\phi} \right) (\sigma - 1)^{-1} \tau_{RW,t}^{1-\sigma} \left(\frac{A_{RW,t}^{\star}}{A_t} \right)^{\sigma} f_x^{-1}.
$$

It is clearly determined by the part-time labor, which acts as a choice variable in the face of an exogenous shock to trade to Russia. To see the full effect, notice that

$$
\frac{\partial \Upsilon_t}{\partial L_t^P} = \left(\frac{w^P}{1-\phi} \right) (\sigma - 1)^{-1} \tau_{RW,t}^{1-\sigma} \left(\frac{A_{RW,t}^{\star}}{A_t} \right)^{\sigma} f_x^{-1}
$$

and

$$
\frac{\partial \Upsilon_t}{\partial \tau_{RU,t}} = (1 - \sigma) \tau_{RU,t}^{-\sigma} \left(\frac{A_{RU,t}^{\star}}{A_t} \right)^{\sigma} < 0,
$$

thereby yielding

$$
\frac{\frac{\partial \Upsilon_t}{\partial \tau_{RU,t}}}{\frac{\partial \Upsilon_t}{\partial L_t^P}} = \frac{\partial L_t^P}{\partial \tau_{RU,t}} = \frac{(\sigma - 1)(1 - \sigma) \tau_{RU,t}^{-\sigma} f_x}{\left(\frac{w^P}{1-\phi} \right) \tau_{RW,t}^{1-\sigma}} \left(\frac{A_{RU,t}^{\star}}{A_{RW,t}^{\star}} \right)^{\sigma} < 0,
$$

as reported in the main text.

F.4.2. Revenue share

Making use of the revenue share function, we get:

$$
S_t^{RW} = \frac{r_t^{RW}}{r_t^d + r_t^{RU} + r_t^{RW}} = \frac{\Upsilon_t - 1}{\Upsilon_t} - \frac{\tau_{RU,t}^{1-\sigma} \left(\frac{A_{RU,t}^{\star}}{A_t} \right)^{\sigma}}{\Upsilon_t}.
$$

It then follows that

$$
\frac{\partial S_t^{RW}}{\partial \tau_{RU,t}} = \frac{\frac{\partial \Upsilon_t}{\partial \tau_{RU,t}} \Upsilon_t - \frac{\partial \Upsilon_t}{\partial \tau_{RU,t}} (\Upsilon_t - 1)}{(\Upsilon_t)^2} - \left[\frac{(1-\sigma) \tau_{RU,t}^{-\sigma} \left(\frac{A_{RU,t}^{\star}}{A_t} \right)^{\sigma} \Upsilon_t - \frac{\partial \Upsilon_t}{\partial \tau_{RU,t}} \tau_{RU,t}^{1-\sigma} \left(\frac{A_{RU,t}^{\star}}{A_t} \right)^{\sigma}}{(\Upsilon_t)^2} \right] = \frac{\frac{\partial \Upsilon_t}{\partial \tau_{RU,t}}}{(\Upsilon_t)^2} - \left[\frac{(1-\sigma) \tau_{RU,t}^{-\sigma} \Upsilon_t - \frac{\partial \Upsilon_t}{\partial \tau_{RU,t}} \tau_{RU,t}^{1-\sigma}}{(\Upsilon_t)^2} \right] \left(\frac{A_{RU,t}^{\star}}{A_t} \right)^{\sigma}
$$

$$
= \frac{1}{(\Upsilon_t)^2} \left[\frac{\partial \Upsilon_t}{\partial \tau_{RU,t}} - (1 - \sigma) \tau_{RU,t}^{-\sigma} \Upsilon_t \left(\frac{A_{RU,t}^{\star}}{A_t} \right)^{\sigma} + \frac{\partial \Upsilon_t}{\partial \tau_{RU,t}} \tau_{RU,t}^{1-\sigma} \left(\frac{A_{RU,t}^{\star}}{A_t} \right)^{\sigma} \right]
$$

$$
= \frac{1}{(\Upsilon_t)^2} \frac{\partial \Upsilon_t}{\partial \tau_{RU,t}} \left[1 - (1 - \sigma) \tau_{RU,t}^{-\sigma} \Upsilon_t \left(\frac{A_{RU,t}^{\star}}{A_t} \right)^{\sigma} \left(\frac{\partial \Upsilon_t}{\partial \tau_{RU,t}} \right)^{-1} + \tau_{RU,t}^{1-\sigma} \left(\frac{A_{RU,t}^{\star}}{A_t} \right)^{\sigma} \right].
$$

Recall that

$$\frac{\partial \Upsilon_t}{\partial \tau_{RU,t}} = (1-\sigma)\,\tau_{RU,t}^{-\sigma} \left(\frac{A^{\star}_{RU,t}}{A_t} \right)^{\sigma},$$

therefore,

$$\frac{\partial S_t^{RW}}{\partial \tau_{RU,t}} = \frac{1}{\left(\Upsilon_t\right)^2} \frac{\partial \Upsilon_t}{\partial \tau_{RU,t}} \left[1 - \Upsilon_t + \tau_{RU,t}^{1-\sigma} \left(\frac{A^{\star}_{RU,t}}{A_t} \right)^{\sigma} \right].$$

From the definition of the revenue share:

$$-S_t^{RW}\Upsilon_t = 1 - \Upsilon_t + \tau_{RU,t}^{1-\sigma} \left(\frac{A^{\star}_{RU,t}}{A_t} \right)^{\sigma},$$

we obtain

$$\frac{\partial S_t^{RW}}{\partial \tau_{RU,t}} = -\frac{S_t^{RW}}{\Upsilon_t} \frac{\partial \Upsilon_t}{\partial \tau_{RU,t}}$$

or

$$\frac{\partial S_t^{RW}}{\partial \tau_{RU,t}} \frac{\tau_{RU,t}}{S_t^{RW}} = -\frac{\partial \Upsilon_t}{\partial \tau_{RU,t}} \frac{\tau_{RU,t}}{\Upsilon_t},$$

just as stated in Proposition 2.

For completeness, note that the openness margin can be expressed as:

$$\frac{\partial \Upsilon_t}{\partial \tau_{RU,t}} \frac{\tau_{RU,t}}{\Upsilon_t} = \frac{(1-\sigma)\tau_{RU,t}^{1-\sigma}\left(\frac{A^{\star}_{RU,t}}{A_t}\right)^{\sigma}}{\Upsilon_t} = \frac{(1-\sigma)\tau_{RU,t}^{1-\sigma}\left(\frac{A^{\star}_{RU,t}}{A_t}\right)^{\sigma}}{\left(\frac{w^P L_t^P}{1-\phi}\right)(\sigma-1)^{-1}\tau_{RW,t}^{1-\sigma}\left(\frac{A^{\star}_{RW,t}}{A_t}\right)^{\sigma} f_x^{-1}} = -\frac{(\sigma-1)^2}{\left(\frac{w^P L_t^P}{1-\phi}\right)} \left(\frac{\tau_{RU,t}}{\tau_{RW,t}}\right)^{1-\sigma} \left(\frac{A^{\star}_{RU,t}}{A^{\star}_{RW,t}}\right)^{\sigma} f_x.$$

Making use of

$$\frac{\partial L_t^P}{\partial \tau_{RU,t}} \frac{\tau_{RU,t}}{L_t^P} = \frac{(\sigma-1)(1-\sigma)}{\left(\frac{w^P L_t^P}{1-\phi}\right)} \left(\frac{\tau_{RU,t}}{\tau_{RW,t}}\right)^{1-\sigma} \left(\frac{A^{\star}_{RU,t}}{A^{\star}_{RW,t}}\right)^{\sigma} f_x,$$

we obtain

$$\frac{\partial \Upsilon_t}{\partial \tau_{RU,t}} \frac{\tau_{RU,t}}{\Upsilon_t} = -\frac{(\sigma-1)^2}{\left(\frac{w^P L_t^P}{1-\phi}\right)} \left(\frac{\tau_{RU,t}}{\tau_{RW,t}}\right)^{1-\sigma} \left(\frac{A^{\star}_{RU,t}}{A^{\star}_{RW,t}}\right)^{\sigma} f_x = \frac{\partial L_t^P}{\partial \tau_{RU,t}} \frac{\tau_{RU,t}}{L_t^P}.$$

Therefore, this analysis justifies the use of part-time employment as a proxy for the trade shock hit by the firm.

F.4.3. Large shock and full-time labor adjustment

To shed light on key drivers of full-time labor layoffs, we focus on a closed-form solution for the production function (E.5), as reported in the main text (see equation (3)). The following expression for the next period's (lower) level of full-time labor emerges:

$$\left(L_{t+1}^{F-}\right)^{(1-\psi)\phi\frac{\sigma-1}{\sigma}-1} = \frac{\left(-\frac{1}{\rho}f + (1-p)f + w_{t+1}^F\right)(\sigma-1)^{\frac{1}{\sigma}} f_x^{\frac{1}{\sigma}} \tau_{RW,t+1}^{\frac{\sigma-1}{\sigma}}}{A^{\star}_{RW,t+1}\left(\frac{\sigma-1}{\sigma}\right)\left(L_{t+1}^P\right)^{(1-\phi)\frac{\sigma-1}{\sigma}+\frac{1}{\sigma}} \left(\frac{w^P}{1-\phi}\right)^{\frac{1}{\sigma}} K_{t+1}^{\psi\phi\frac{\sigma-1}{\sigma}} (1-\psi)\phi}.$$

To derive this result, we combine equations (**??**) and (F.4) and obtain:

$$-f = \rho\left(\Upsilon_{t+1}^{\frac{1}{\sigma}} A_{t+1} \left(\frac{\sigma-1}{\sigma}\right) \underline{q}_{t+1}^{-\frac{1}{\sigma}} \frac{\partial \underline{q}_{t+1}}{\partial L_{t+1}^F} - w_{t+1}^F - (1-p)f + ph \right), \tag{F.15}$$

where $\underline{q}_{t+1} \equiv q\left(L_{t+1}^{F-}, L_{t+1}^P\right)$ denotes *reduced* employment levels (thereby implying a negative H_t^F). This means that firing is optimal rather than waiting. That coincides with our definition of a large shock, i.e., a situation when the trade disruption is so large that paying firing costs is preferred.[37] In a good state:

[37] Technically, when μ_t drops below $-f$, an optimizing firm must fire full-time workers and do so until $\mu_t \geq -f$ is restored. That is why we only consider marginal values with equality.

$$h=\rho\left(\Upsilon_{t+1}^{\frac{1}{\sigma}}A_{t+1}\left(\frac{\sigma-1}{\sigma}\right)\bar{q}_{t+1}^{-\frac{1}{\sigma}}\frac{\partial\bar{q}_{t+1}}{\partial L_{t+1}^{F}}-w_{t+1}^{F}-pf+(1-p)h\right), \tag{F.16}$$

where $\bar{q}_{t+1}\equiv q\left(L_{t+1}^{F+},L_{t+1}^{P}\right)$ denotes *increased* employment levels (implying positive H_t^F). These two equations deliver the following result:

$$-\frac{1}{\rho}f+(1-p)f+w_{t+1}^{F}-ph=\Upsilon_{t+1}^{\frac{1}{\sigma}}A_{t+1}\left(\frac{\sigma-1}{\sigma}\right)\underline{q}_{t+1}^{-\frac{1}{\sigma}}\frac{\partial \underline{q}_{t+1}}{\partial L_{t+1}^{F}}$$

$$\frac{1}{\rho}h-(1-p)h+w_{t+1}^{F}+pf=\Upsilon_{t+1}^{\frac{1}{\sigma}}A_{t+1}\left(\frac{\sigma-1}{\sigma}\right)\bar{q}_{t+1}^{-\frac{1}{\sigma}}\frac{\partial\bar{q}_{t+1}}{\partial L_{t+1}^{F}}.$$

Since we are dealing with a negative shock, we normalize $h=0$ to simplify expressions (we are not concern with costly hiring decisions). We can summarize the new level of full-time employment under the large sanctions shock as follows:

$$-\frac{1}{\rho}f+(1-p)f+w_{t+1}^{F}=\Upsilon_{t+1}^{\frac{1}{\sigma}}A_{t+1}\left(\frac{\sigma-1}{\sigma}\right)\underline{q}_{t+1}^{\frac{\sigma-1}{\sigma}}(1-\psi)\phi\left(L_{t+1}^{F-}\right)^{\gamma-1}\Phi_{t+1}^{-\gamma}$$

$$w_{t+1}^{F}+pf=\Upsilon_{t+1}^{\frac{1}{\sigma}}A_{t+1}\left(\frac{\sigma-1}{\sigma}\right)\bar{q}_{t+1}^{\frac{\sigma-1}{\sigma}}(1-\psi)\phi\left(L_{t+1}^{F+}\right)^{\gamma-1}\Phi_{t+1}^{\gamma}.$$

or

$$-\frac{1}{\rho}f+(1-p)f+w_{t+1}^{F}=\Upsilon_{t+1}^{\frac{1}{\sigma}}A_{t+1}\left(\frac{\sigma-1}{\sigma}\right)\Phi_{t+1}^{\phi\frac{\sigma-1}{\sigma}}\left(L_{t+1}^{P}\right)^{(1-\phi)\frac{\sigma-1}{\sigma}}(1-\psi)\phi\left(L_{t+1}^{F-}\right)^{\gamma-1}\Phi_{t+1}^{-\gamma}$$

$$w_{t+1}^{F}+pf=\Upsilon_{t+1}^{\frac{1}{\sigma}}A_{t+1}\left(\frac{\sigma-1}{\sigma}\right)\bar{q}_{t+1}^{\frac{\sigma-1}{\sigma}}(1-\psi)\phi\left(L_{t+1}^{F+}\right)^{\gamma-1}\Phi_{t+1}^{\gamma}.$$

To follow the steps, we collect required elements:

$$q_t=\left(K_t^{\psi}\left(L_t^F\right)^{1-\psi}\right)^{\phi}\left(L_t^P\right)^{1-\phi}$$

$$\frac{\partial \underline{q}_{t+1}}{\partial L_{t+1}^{F}}=(1-\psi)\phi K_{t+1}^{\psi\phi}\left(L_{t+1}^{F-}\right)^{(1-\psi)\phi-1}\left(L_{t+1}^{P}\right)^{1-\phi}$$

$$\underline{q}_{t+1}^{-\frac{1}{\sigma}}=K_{t+1}^{-\frac{\phi}{\sigma}\psi}\left(L_{t+1}^{F-}\right)^{-\frac{\phi}{\sigma}(1-\psi)}\left(L_{t+1}^{P}\right)^{-\frac{(1-\phi)}{\sigma}}$$

Hence,

$$-\frac{1}{\rho}f+(1-p)f+w_{t+1}^{F}=(1-\psi)\phi\Upsilon_{t+1}^{\frac{1}{\sigma}}A_{t+1}\left(\frac{\sigma-1}{\sigma}\right)K_{t+1}^{\psi\phi-\frac{\phi}{\sigma}\psi}\left(L_{t+1}^{F-}\right)^{((1-\psi)\phi-1)-\frac{\phi}{\sigma}(1-\psi)}\left(L_{t+1}^{P}\right)^{(1-\phi)-\frac{(1-\phi)}{\sigma}}$$

$$=(1-\psi)\phi\Upsilon_{t+1}^{\frac{1}{\sigma}}A_{t+1}\left(\frac{\sigma-1}{\sigma}\right)K_{t+1}^{\psi\phi\left(\frac{\sigma-1}{\sigma}\right)}\left(L_{t+1}^{F-}\right)^{(1-\psi)\phi\left(\frac{\sigma-1}{\sigma}\right)-1}\left(L_{t+1}^{P}\right)^{(1-\phi)\left(\frac{\sigma-1}{\sigma}\right)}$$

The above expression allows us re-expressing:

$$\left(L_{t+1}^{F-}\right)^{(1-\psi)\phi\left(\frac{\sigma-1}{\sigma}\right)-1}=\frac{-\frac{1}{\rho}f+(1-p)f+w_{t+1}^{F}}{(1-\psi)\phi\Upsilon_{t+1}^{\frac{1}{\sigma}}A_{t+1}\left(\frac{\sigma-1}{\sigma}\right)K_{t+1}^{\psi\phi\left(\frac{\sigma-1}{\sigma}\right)}\left(L_{t+1}^{P}\right)^{(1-\phi)\left(\frac{\sigma-1}{\sigma}\right)}}.$$

To get rid of the openness variable, we make use of

$$\Upsilon_{t+1}^{\frac{1}{\sigma}}=\left(\frac{w^P L_{t+1}^P}{1-\phi}\right)^{\frac{1}{\sigma}}(\sigma-1)^{-\frac{1}{\sigma}}\tau_{RW,t+1}^{\frac{1-\sigma}{\sigma}}\frac{A_{RW,t+1}^{\star}}{A_{t+1}}f_x^{-\frac{1}{\sigma}},$$

which leads to

$$\left(L_{t+1}^{F-}\right)^{(1-\psi)\phi\left(\frac{\sigma-1}{\sigma}\right)-1}=\frac{\left(-\frac{1}{\rho}f+(1-p)f+w_{t+1}^{F}\right)(\sigma-1)^{\frac{1}{\sigma}}f_x^{\frac{1}{\sigma}}}{(1-\psi)\phi\left(\frac{w^P}{1-\phi}\right)^{\frac{1}{\sigma}}\tau_{RW,t+1}^{\frac{1-\sigma}{\sigma}}A_{RW,t+1}^{\star}\left(\frac{\sigma-1}{\sigma}\right)K_{t+1}^{\psi\phi\left(\frac{\sigma-1}{\sigma}\right)}\left(L_{t+1}^{P}\right)^{(1-\phi)\left(\frac{\sigma-1}{\sigma}\right)+\frac{1}{\sigma}}}.$$

A closed-form solution for the production function (E.5), therefore, follows:

$$\left(L_{t+1}^{F-}\right)^{(1-\psi)\phi\frac{\sigma-1}{\sigma}-1}=\Psi_{t+1}\tau_{RW,t+1}^{\frac{\sigma-1}{\sigma}}K_{t+1}^{-\psi\phi\frac{\sigma-1}{\sigma}}\left(L_{t+1}^{P}\right)^{-(1-\phi)\frac{\sigma-1}{\sigma}-\frac{1}{\sigma}}, \tag{F.17}$$

where we used $q_t=\left(K_t^{\psi}\left(L_t^F\right)^{1-\psi}\right)^{\phi}\left(L_t^P\right)^{1-\phi}$, and denoted by $\Psi_{t+1}\equiv\frac{\left(-\frac{1}{\rho}f+(1-p)f+w_{t+1}^{F}\right)(\sigma-1)^{\frac{1}{\sigma}}f_x^{\frac{1}{\sigma}}}{A_{RW,t+1}^{\star}\left(\frac{\sigma-1}{\sigma}\right)\left(\frac{w^P}{1-\phi}\right)^{\frac{1}{\sigma}}(1-\psi)\phi}$ a time-varying term, exogenous from the perspective of a firm. This is an expression just as reported in the main text's equation (9).

Before learning how full-time employment adjusts, we have to first solve for the capital choice. From the first-order conditions, (F.14), and under the production function (E.5), we obtain:

$$K_{t+1} = \left(\frac{w^P}{1-\phi}\right)(\sigma-1)^{-1} f_x^{-1} \frac{\rho f_x \phi\psi(\sigma-1)}{1-\rho+\delta\rho} L_{t+1}^P, \tag{F.18}$$

yielding

$$I_t = \left(\frac{w^P}{1-\phi}\right)\frac{\rho}{1-\rho}\phi\psi \bigtriangleup L_{t+1}^P, \tag{F.19}$$

where, for exposition purposes, we assume depreciation to be equal to zero. This result is what we report in the main text equations (10) and (11).

F.4.4. Investment

Our starting position is the capital equation

$$K_{t+1} = \Upsilon_{t+1}\tau_{RW,t+1}^{\sigma-1}\left(\frac{A_{t+1}}{A_{RW,t+1}^{\star}}\right)^{\sigma}\frac{\rho f_x \phi\psi(\sigma-1)}{1-\rho+\delta\rho}.$$

Making use of

$$\Upsilon_{t+1} = \left(\frac{w^P L_{t+1}^P}{1-\phi}\right)(\sigma-1)^{-1}\tau_{RW,t+1}^{1-\sigma}\left(\frac{A_{RW,t+1}^{\star}}{A_{t+1}}\right)^{\sigma} f_x^{-1},$$

we find that

$$K_{t+1} = \left(\frac{w^P}{1-\phi}\right)(\sigma-1)^{-1} f_x^{-1}\frac{\rho f_x\phi\psi(\sigma-1)}{1-\rho+\delta\rho}L_{t+1}^P.$$

It therefore follows that

$$\bigtriangleup K_{t+1} = I_t = \left(\frac{w^P}{1-\phi}\right)\frac{\rho}{1-\rho}\phi\psi \bigtriangleup L_{t+1}^P,$$

when $\delta = 0$.

F.4.5. Full-time labor and capital

We can re-express labor adjustment (F.17) in terms of the flexible adjustment margin, part-time employment, and exogenous (from the perspective of a firm) variables:

$$\left(L_{t+1}^{F-}\right)^{(1-\psi)\phi\left(\frac{\sigma-1}{\sigma}\right)-1} = \widetilde{\Psi}_t\tau_{RW,t+1}^{\frac{\sigma-1}{\sigma}}\left(L_{t+1}^P\right)^{-\frac{1}{\sigma}([1-\phi+\psi\phi](\sigma-1)+1)},$$

where $\widetilde{\Psi}_t$ is a mix of aggregate and exogenous terms. In fact, it is equal to:

$$\widetilde{\Psi}_t \equiv \Psi_t\left(\left(\frac{w^P}{1-\phi}\right)(\sigma-1)^{-1} f_x^{-1}\frac{\rho f_x\phi\psi(\sigma-1)}{1-\rho+\delta\rho}\right)^{-\psi\phi\frac{\sigma-1}{\sigma}}.$$

We combine an expression for $\left(L_{t+1}^{F-}\right)^{(1-\psi)\phi\left(\frac{\sigma-1}{\sigma}\right)-1}$ with K_{t+1} above:

$$\begin{aligned}
\left(L_{t+1}^{F-}\right)^{(1-\psi)\phi\left(\frac{\sigma-1}{\sigma}\right)-1} &= \frac{\left(-\frac{1}{\rho}f+(1-p)f+w_{t+1}^F\right)(\sigma-1)^{\frac{1}{\sigma}} f_x^{\frac{1}{\sigma}}}{(1-\psi)\phi\left(\frac{w^P}{1-\phi}\right)^{\frac{1}{\sigma}}\tau_{RW,t+1}^{\frac{1-\sigma}{\sigma}}A_{RW,t+1}^{\star}\left(\frac{\sigma-1}{\sigma}\right)K_{t+1}^{\psi\phi\left(\frac{\sigma-1}{\sigma}\right)}\left(L_{t+1}^P\right)^{(1-\phi)\left(\frac{\sigma-1}{\sigma}\right)+\frac{1}{\sigma}}} = \Psi_{t+1}\tau_{RW,t+1}^{\frac{\sigma-1}{\sigma}}K_{t+1}^{-\psi\phi\frac{\sigma-1}{\sigma}}\left(L_{t+1}^P\right)^{-(1-\phi)\frac{\sigma-1}{\sigma}-\frac{1}{\sigma}} \\
&= \Psi_{t+1}\tau_{RW,t+1}^{\frac{\sigma-1}{\sigma}}\left(\left(\frac{w^P}{1-\phi}\right)(\sigma-1)^{-1} f_x^{-1}\frac{\rho f_x\phi\psi(\sigma-1)}{1-\rho+\delta\rho}L_{t+1}^P\right)^{-\psi\phi\frac{\sigma-1}{\sigma}}\left(L_{t+1}^P\right)^{-(1-\phi)\frac{\sigma-1}{\sigma}-\frac{1}{\sigma}} \\
&= \Psi_{t+1}\left(\left(\frac{w^P}{1-\phi}\right)(\sigma-1)^{-1} f_x^{-1}\frac{\rho f_x\phi\psi(\sigma-1)}{1-\rho+\delta\rho}\right)^{-\psi\phi\frac{\sigma-1}{\sigma}}\tau_{RW,t+1}^{\frac{\sigma-1}{\sigma}}\left(L_{t+1}^P\right)^{-\psi\phi\frac{\sigma-1}{\sigma}-(1-\phi)\frac{\sigma-1}{\sigma}-\frac{1}{\sigma}} \\
&= \widetilde{\Psi}_t\tau_{RW,t+1}^{\frac{\sigma-1}{\sigma}}\left(L_{t+1}^P\right)^{-\frac{1}{\sigma}(\psi\phi(\sigma-1)+(1-\phi)(\sigma-1)+1)} = \widetilde{\Psi}_t\tau_{RW,t+1}^{\frac{\sigma-1}{\sigma}}\left(L_{t+1}^P\right)^{-\frac{1}{\sigma}([1-\phi+\psi\phi](\sigma-1)+1)}.
\end{aligned}$$