Adjusting to Economic Sanctions

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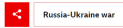
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Biden signs sanctions bills targeting Russia and Belarus

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The Event We Investigate

- ▶ Russia-Ukraine conflict in 2014 led to political tensions between Russia and EU
  - ▶ EU financial sanctions on certain individuals in Russia
  - ▶ Response measures by Russia to ban of imports of agricultural, food product and certain raw materials (meats, dairy products, fruits, vegetables, etc.) from the EU, the US and some other countries in August 2014
  - ▶ Initially announced for one year but then extended annually

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  - ▶ Initially announced for one year but then extended annually
- ▶ Lithuania (part of EU) - small open economy:
  - ▶ Exports make 80% of its GDP
  - ▶ Russia has been one of the main trade partners for Lithuania's agricultural and food product exports
  - ▶ 20% of Lithuania's exports were directed to Russia
  - ▶ 18% of them were banned product exports
  - ▶ Food manufacturing sector affected most

Focus of Our Study

- Firm responses to a strong negative demand shock - adjustments along a number of dimensions
    - How and when do such adjustments interact and reinforce each other?
    - Is the heterogeneity of the adjustments limited to non-uniform adjustment costs and expectations of the demand shock permanence?
    - Are the changes limited to cost/input adjustments? How do firms switch to revenue adjustments?

Related Literature

- ▶ Firm adjustments to trade shocks, mostly partial equilibrium:
  - ▶ Labor margin adjustments (Hogan and Ragan (1995), Mouelhi (2007), Fabiani et al. (2015), Asquith et al. (2019), Tanaka et al. (2019), Egger et al. (2020)); general equilibrium effects (Dix-Carneiro and Kovak 2019, Dix-Carneiro 2014, Caliendo et al. 2019, Dix-Carneiro et al. 2018)
  - ▶ Trade adjustments (Kee and Krishna (2008), Bernard et al. (2009) or Morales et al. (2019))
  - ▶ Multiple adjustment margins (Bernard et al. (2006), Eslava et al. (2010), Bertola et al. (2012), Casacuberta and Gandelman (2012))
- ▶ Effects of trade bans, or severe trade restrictions:
  - ▶ US-China trade war (Selmi et al. 2020, Fusacchia 2020, Hanson 2020, Fajgelbaum et al. 2022)
  - ▶ Russia-EU trade sanctions (Crozet and Hinz 2016, 2020, Klomp 2020, Crozet et al. 2021)

Additions to the Literature

- Trade shocks are likely to be correlated with other economic adjustments or expectations; our paper presents a cleanly identified demand shock (sudden, unanticipated and abrupt) when the trade stops completely, holding other economics factors constant

- Quite a bit is known about firm adjustments to trade liberalizations but: Liberalizations $= -$ Sanctions?

- Something is known about trade restrictions that affect firm adjustments on the intensive margin but how do firms adjust alongside several dimensions; how do they choose the adjustment margins and their sequence?

Main Results

- We build an internally consistent conceptual framework to explain the empirical findings and derive new predictions:
    - Part-time labor, as the most flexible margin, adjusts first
    - Firms also revert to more active export redirection, if the shock is large
    - A larger and persistent shock leads to full-time labor and capital changes
    - Part-time labor adjustment also serves as characteristic of shock severity for the firm, capturing unobservable parameters

EMPIRICAL EVIDENCE

Exports to Russia of Banned Products

▶ Banned product exports by the food manufacturing sector
firms to Russia went virtually to zero:
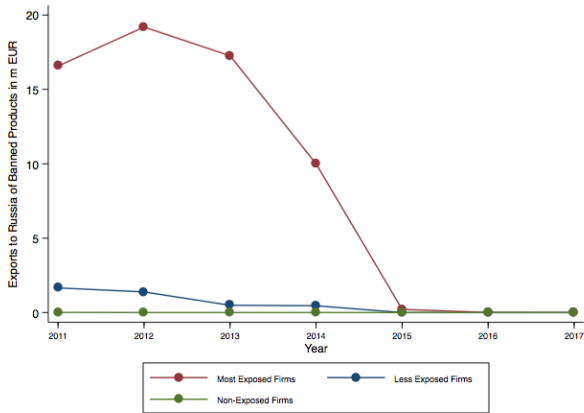
Total Exports to Russia

▶ Sanctions also completely cut food manufacturing sector's total exports to Russia:

Total Revenues

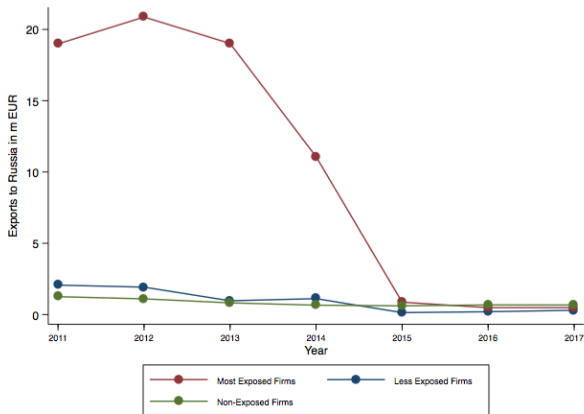▶ That resulted in a drop in total revenues of food manufacturing firms (even if with a minor rebound later):
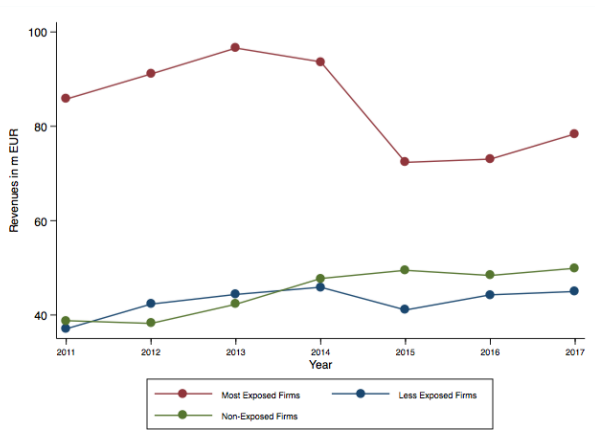
Empirical Strategy

- ▶ Dataset - all firms in the economy:
    - ▶ Disaggregated balance sheet data
    - ▶ Detailed trade data by partner country, 8-digit HS product level
- ▶ Treated firms:
    - ▶ Food manufacturing firms that had banned product exports to Russia in 2013
- ▶ Control firms (for each treated firm):
    - ▶ Food manufacturer that is also an exporter
    - ▶ Firm, closest in size (total sales in 2013) to the treated firm
- ▶ Essentially, a triple-difference estimate of the import ban effects on treated firms in 2014-2017:
    - ▶ as compared to 2011-2013
    - ▶ as compared to the respective changes in control firms
    - ▶ as compared to the respective changes in changes in corresponding firms with a smaller *Banned export share*

Main Specification

- Reduced form difference-in-differences estimation:

$$\Delta Y_{i,t} = \beta_1 \times \text{Banned export share}_i \times \text{Post}2014_t + \gamma_i + \tau_t + \epsilon_{i,t}$$

  - $\Delta Y_{i,t}$: difference in the adjustment margin $Y_{i,t}$ (part-time employees, full-time employees, investment, exports to other markets but Russia), where the difference is taken between the values of treated and the control groups
  - $\text{Banned export share}_i$: % of firm i's exports of the banned products to Russia in 2013 over its total sales in 2013
  - $\text{Post}2014_t$: dummy equal to 1 in the years 2014-2017 and equal to 0 in years 2011-2013
  - γ_i and τ_t: firm- and year-fixed effects

Part-time Employees

	(1)	(2)
Banned export share × Post 2014	-146.909***	-125.123**
	(50.223)	(48.105)
Banned export share × Post 2016		-56.133
		(52.725)
Constant	24.411***	24.378***
	(4.478)	(4.474)
R^2	0.755	0.757
N	151	151

▶ Average exposed firm with 6.69% *Banned export share*
  reduced part-time employees by ~10 (compared to the change
  in control firms), a 67% drop over the pre-period sample mean

Exports Outside of Russia

	(1)	(2)
Banned export share × Post 2014	46.042**	19.626
	(20.687)	(24.308)
Banned export share × Post 2016		54.657*
		(30.436)
Constant	-9.581***	-9.566***
	(1.799)	(1.807)
R^2	0.889	0.892
N	165	165

► Dollar value export adjustments to other countries than Russia.

Investment

	(1)	(2)
Banned export share × Post 2014	-24.459**	-26.798*
	(11.235)	(13.657)
Banned export share × Post 2016		6.103
		(14.727)
Constant	-0.926	-1.274
	(1.609)	(1.772)
R^2	0.596	0.597
N	126	126

▶ A drop in investment for the food manufacturers

Full-time Employees

	(1)	(2)
Banned export share x Post 2014	-384.578**	-128.022
	(177.502)	(159.867)
Banned export share x Post 2016		-661.058**
		(314.478)
Constant	141.696***	141.306***
	(16.923)	(17.150)
R^2	0.953	0.956
N	151	151

► Average exposed firm with 6.69% *Banned export share* reduced full-time employees by ~26 (compared to the change in control firms), a 6.8% drop over the sample mean

CONCEPTUAL FRAMEWORK

Assumptions

▶ CES demand structure + Cobb-Douglas production function over part-time employment, capital and full-time labor

▶ We adopt a simplified version of Helpman et al. (2010), where a firm exports its varieties in addition to selling on a domestic market

▶ Our point of deviation includes firm-specific variable trade costs, e.g., reflecting efficiency in transporting goods, accessing customs, managing distribution network

▶ Another extension is a possibility to export to Russia as well as to the rest of the world, rather than one foreign country

Firm's Problem

▶ In a perfect foresight environment, a firm is *forward-looking* and its profit maximization problem cannot be split into static sub-problems due to *adjustment costs*

▶ A firm faces different adjustment margins
  ▶ Part-time employees can be changed most quickly
  ▶ Reflecting institutional setup, a firm is required to pay a severance payment when firing full-time labor, ending up in non-convex adjustment costs
  ▶ Capital depreciates and investment takes time, implying that next period's capital requires adjusting investment in the current period

▶ The demand shock is modelled as a sharp increase in variable trade cost with Russia

Testable Implication I

Proposition

An exogenous increase in trade costs with Russia induces layoffs of part-time employees. This effect is larger the larger fixed exporting costs and the lower variable exporting costs (and thus the larger export basket) to Russia had been before a shock.

Remark

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

Testable Implication II

Proposition

The larger is the relative trade shock, the larger is the adjustment in the revenue share of the rest of the world.

Remark

Elasticity of the revenue share of the rest of the world, after an increase in variable trade costs with Russia, is given by:

$$\frac{\partial \mathcal{S}_t^{RW}(j)}{\partial \tau_{RU,t}(j)} \frac{\tau_{RU,t}(j)}{\mathcal{S}_t^{RW}(j)} = -\frac{\partial Y_t(j) \tau_{RU,t}(j)}{\partial \tau_{RU,t}(j) Y_t(j)} > 0,$$

since $\frac{\partial Y_t(j)}{\partial \tau_{RU,t}(j)} < 0$

Testable Implication III

Proposition

A forward-looking firm reduces investment proportionally to a forthcoming drop in part-time employment.

Remark

Firm's capital adjustment is expressed as:

$$\triangle K_{t+1} = I_t = \left(\frac{w^P}{1-\phi} \right) \frac{\rho}{1-\rho} \phi \psi \triangle L^P_{t+1} \ \ (\delta = 0)$$

Testable Implication IV

Proposition

The layoffs of full-time labor are more likely, the higher are variable firm's costs to trade with the rest of the world and the smaller is the stock of part-time employment.

Remark

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

Since:

$(1-\psi)\phi\frac{\sigma-1}{\sigma} - 1 < 0$, $\frac{\sigma-1}{\sigma} > 0$, and $-\frac{1}{\sigma}\left([1-\phi+\psi\phi](\sigma-1)+1\right) < 0$, the layoffs of full-time labor are more likely, i.e. a decrease in $L_{t+1}^{F-}(j)$, the higher are variable firm's costs to trade with the rest of the world and the smaller is part-time employment

Taking Stock

- ▶ Larger shock makes firms reduce temporary workers quicker
- ▶ Larger trade shock forces a larger increase in the trade share with the rest of the world
- ▶ Due to forward-looking behavior investment is reduced straight-away (front-loading future costs)
- ▶ Non-convexity in full-time labor produces a delayed reaction (once the shock turns out to be severe and persistent or if the persistence of the bad shock has been unforeseen)

Taking Stock

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- ▶ Non-convexity in full-time labor produces a delayed reaction (once the shock turns out to be severe and persistent or if the persistence of the bad shock has been unforeseen)
- ▶ Adjustments start on the margin with no adjustment costs – part-time labor and continue onto less flexible and more costly adjustment margins

Role of Part-time Labor

▶ Heterogeneity of firm adjustments due to various unobservable characteristics hard to estimate empirically: variable exporting costs, time preference, expected probability of the shock persistence, and various adjustment costs

▶ Yet, it can be captured by how strongly the firm adjusts on its flexible adjustment margin – change in the part-time labor

Role of Part-time Labor

- Heterogeneity of firm adjustments due to various unobservable characteristics hard to estimate empirically: variable exporting costs, time preference, expected probability of the shock persistence, and various adjustment costs

- Yet, it can be captured by how strongly the firm adjusts on its flexible adjustment margin – change in the part-time labor

- Empirically: additional interaction of the change in part-time employees over 2014-2015 to our dynamic specification:

$$\Delta Y_{i,t} = \beta_1 \times \textit{Banned export share}_i \times \textit{Post}2014_t +$$
$$\beta_2 \times \textit{Banned export share}_i \times \textit{Post}2016_t +$$
$$\beta_2 \times \textit{Banned export share}_i \times \Delta \textit{Parttimechange} \times \textit{Post}2016_t +$$
$$\gamma_i + \tau_t + \epsilon_{i,t}$$

Role of Part-time Labor – Result

	(1)	(2)
	ΔFT_empl.	ΔInv.
Banned exp. share × Post 2014	-128.022	-26.798*
	(154.568)	(13.679)
Banned export share × Post 2016	-484.914*	7.230
	(271.284)	(15.670)
ΔPart-time × Post 2016	-0.896	-0.097
	(1.379)	(0.077)
Banned exp. share × ΔPart-time × Post 2016	22.104***	0.744*
	(7.738)	(0.408)
Constant	142.967***	-1.056
	(15.420)	(1.839)
R^2	0.963	0.603
N	149	125

Role of Trade Diversion

▶ Can the firms do something else when faced with the shock?

▶ We test for the firms' ability to adjust towards finding new export markets

▶ Empirically: additional interaction of the change in dollar value of exports outside of Russia between 2013 and 2014 to our dynamic specification:

$$\Delta Y_{i,t} = \beta_1 \times \textit{Banned export share}_i \times \textit{Post}2014_t +$$
$$\beta_2 \times \textit{Banned export share}_i \times \textit{Post}2016_t +$$
$$\beta_2 \times \textit{Banned export share}_i \times \Delta \textit{NonRu export change}_i \times$$
$$\textit{Post}2016_t + \gamma_i + \tau_t + \epsilon_{i,t}$$

Role of Trade Diversion – Result

	(1)
	Full-time empl.
Banned exp. share × Post 2014	-128.022
	(163.557)
Banned export share × Post 2016	-546.798**
	(261.905)
Δ NonRu exports (2013-2014) × Post 2016	-0.951
	(1.053)
Banned exp. share × Δ NonRu exports (2013-2014) × Post 2016	25.454*
	(13.311)
Constant	142.975***
	(16.655)
R^2	0.958
N	149

Takeaways and Conclusions, I

- A major sector of a small open economy lost its main export market for reasons unrelated to economic conditions

- We apply reduced form difference-in-differences strategy to quantify the adjustment margins: part-time and full-time labor, investment, new export markets

- We then build an internally consistent conceptual framework to explain the empirical findings and derive new predictions:
  - Part-time labor, as the most flexible margin, adjusts first
  - Firms also revert to more active export redirection, if the shock is large
  - A larger and persistent shock leads to full-time labor and capital changes

Takeaways and Conclusions, II

▶ Part-time labor adjustment also serves as characteristic of shock severity for the firm, capturing unobservable parameters

Takeaways and Conclusions, II

- Part-time labor adjustment also serves as characteristic of shock severity for the firm, capturing unobservable parameters
- Economic policies of more flexible labor market or international trade support schemes could help ameliorate the shock effects:
    - Part-time labor as a shock absorber requires smooth and fast reallocation across fired labor, effective and accessible training policies, and labor market regulation admitting different types of work contracts
    - Subsidizing wage costs would reduce the shadow cost of labor and thus could prevent the lay-offs
    - Trade deregulation and the infrastructure to direct more products to existing and new foreign markets can help absorb trade shocks

THANK YOU