Export Selection, Labour Market Frictions, and Firm Dynamics

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- On average, exporter firms are **larger**, **more productive**, **pay greater wages**, and can be **drivers of real income gains** in the economy.
- Since export status is persistent, what prompts firms to become exporters?
  → Melitz (2003): "exposure to trade induces **only the more productive** firms to export".
- But is that enough? Is exporting simply driven by a productivity cut-off rule?
- **Labour market frictions** can be relevant to better understand that discrete choice:
  → Adjustment costs may prevent firms from fully reaping the benefits of a positive TFP shock.
  → Lumpy adjustments can be even more expensive when labour supply is positively sloped.
  → Persistence of export participation may actually mirror these labour market frictions.

1. Are labour market frictions quantitatively relevant to explain firms' export status?

Theory framework

→ Perfectly competitive, frictionless labour market.

→ Two testable predictions on export dynamics.

Data

→ Portuguese manufacturing firms, 2012-2022.

→ Estimation of exporting policy function.

2. What happens to export participation when a reform slashes labour adjustment costs?

Structural estimation GE model

→ Endogenous labour demand and export participation of *ex-post* heterogeneous firms.

→ Counterfactual: reverse the flexibility added by the reform.

Exporter dynamics of heterogeneous firms.

[Roberts & Tybout (1997), Melitz (2003), Bernard et al. (2003), Burstein & Melitz (2003), Alessandria & Choi (2007), Das et al. (2007), Impullitti et al. (2013), Alessandria & Choi (2014), Rho and Rodrigue (2016), Ruhl & Willis (2017), Alessandria et al. (2021)]

→ Export participation as a function of labour market frictions.

→ Those frictions can act as costs which prevent entry and raise the persistence of export status.

Labour market frictions and international trade.

[Kamburov (2009), Helpman & Itskhoki (2010), Cosar et al. (2016), Dix-Carneiro (2014), Cooper et al. (2018), Caliendo et al. (2019), Fajgelbaum (2020), Jha et al. (2023), Garin & Silvério (2024), Cooper et al. (2025), Gurkova et al. (2026)]

→ What are the international trade effects of a labour market reform?

→ Changes in labour market regulations go beyond their impact on workers' job finding rates.

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How relevant are labour market frictions for export dynamics?

Consider an economy which is the stripped down version of Melitz (2003):

- Firms have a revenue function w/ curvature α, and which is shifted by **idiosyncratic shocks**.
- Every period they make two decisions: *i)* **employment**, *ii)* and whether or not to **export**.
- The labour market is **perfectly competitive** and **frictionless**: w_t = Marginal revenue of labour$_{ft}$.
- Exporters' **revenue grows** by a factor of $\varphi > 1$, but they **pay a fixed cost** and a **sunk entry cost**.

The framework is useful to study how labour market frictions are pivotal to explain export decisions.

1. What happens to the average revenue of labour across export status?
2. Do firms sort into export markets based on TFP?

Formal problem

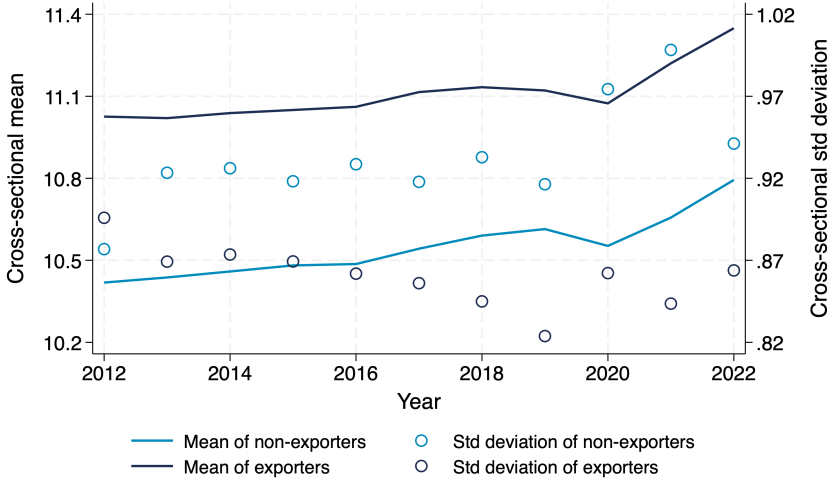
What happens to the average revenue of labour across export status?

- **Absence of labour market frictions** implies a closed form solution for optimal labour demand.
- The **average revenue of labour (ARL)** can also be solved analytically:

$$\text{ARL of non-exporters} \;=\; \text{ARL of exporters} = \frac{w_t}{\alpha}$$

- ARL should be **independent of export status**, and its **distribution should be degenerate** in t.
- This result holds as long as **labour adjustment costs are missing**, and **wages are taken as given**.

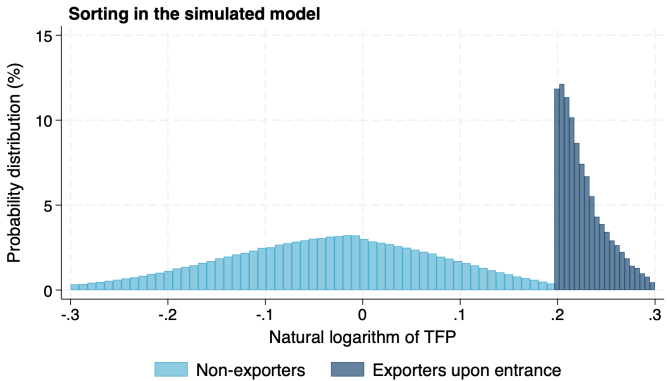
What happens to the average revenue of labour across export status?



Dispersion ARL | W/ fixed effects

Do firms sort into export markets based on TFP?

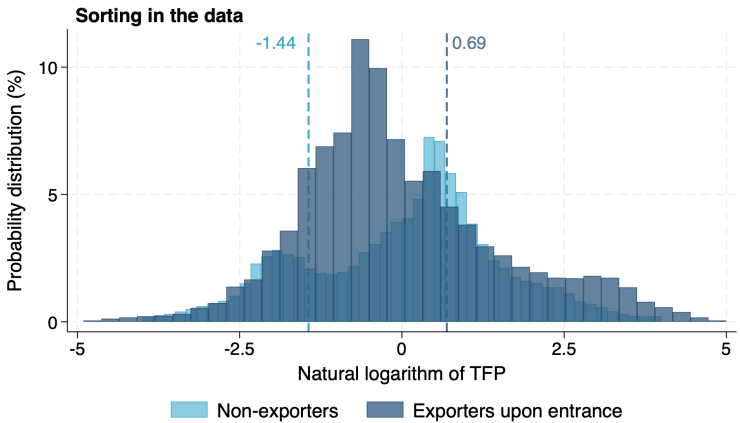
- Let the **simulated model** replicate key exporting-related moments of Portuguese firms.
- **Perfect TFP sorting**: the least productive firm accessing export markets has a **higher TFP level** than the most productive firm which stays out.



All exporters

Do firms sort into export markets based on TFP?

- **TFP can be retrieved** w/ production function estimation techniques [more on this later].
- On average, new exporters are more productive, but the distributions are surely not disjoint.



- A simple model of export dynamics under a perfectly competitive and frictionless labour market predicts...
  - → A **degenerate distribution of ARL**, independent of export status.
  - → **Perfect TFP sorting** upon access to export markets.
- But **none of these predictions are corroborated by the data**.
- The **importance of factor adjustments** is immediately visible in the data and the model.

	Employment growth (%)	Real wage growth (%)	Investment rate (%)
All firms	1.27	2.63	22.32
Exporters	2.61	2.69	25.03
Exporters upon entrance	5.15	3.63	28.36

A more complete policy function for export status

- According to the framework in Melitz (2003): $x_{ft} \equiv g(\mathcal{Z}_{ft})$.
- But the ability to **carry out costly labour adjustments** is pivotal to explain features of the data: $x_{ft} \equiv g(\mathcal{Z}_{ft}, n_{ft-1})$.
- The existence of labour market frictions can also explain the **large persistence of export status**: $x_{ft} \equiv g(\mathcal{Z}_{ft}, n_{ft-1}, x_{ft-1})$.

		Period $t+1$		
		Non-exporter	Exporter	Exit
Period t	Non-exporters	78.9	12.0	9.2
	Exporters	10.1	85.4	4.5

- Say firm f produces product p in period t w/ the following technology:

$$\log(Y_{fpt}) = \log(\mathcal{Z}_{ft}) + \log\left(F_p(k_{fpt}, n_{fpt}, m_{fpt}; \boldsymbol{\alpha})\right) + \log(\epsilon_{fpt})$$

- While **technology is product-specific**, Hicks-neutral **productivity is firm-specific**.

- Unbiased estimates of $\boldsymbol{\alpha}$ recover the productivity level, $z_{ft} \equiv \log(\mathcal{Z}_{ft})$. Problems to overcome:

  → **Endogeneity bias**: unobserved productivity is correlated w/ contemporaneous input choices.

  → Multi-product firms **do not record the allocation of inputs** across their various products.

  → Firms rely on input of different quality, whose **prices are also unobserved**.

- Productivity is retrieved via Ackerberg et al. (2015) and De Loecker et al. (2016):
  1. Clean output of measurement error, $\log(\hat{Y}_{fpt}) \equiv \log(Y_{fpt}) - \log(\epsilon_{fpt})$
  2. Estimate $\boldsymbol{\alpha}$ through GMM-IV using the **set of single-product firms**.
     - → Input price bias: *observed* output prices proxy for *unobserved* input prices.
     - → Sample correction: probability of remaining single-product depends on the productivity forecast.
     - → Control function approach: materials is a frictionless and flexible input, and strictly increasing in TFP.
  3. Solve the constrained systems of equations which recovers TFP and input allocations of **multi-product firms**.
     - → The product-specific expenditure on any input is a share ρ_{fpt} of the total firm-level expenditure on that input.
- This method retrieves **log TFP** at the firm level, z_{ft}, and its **exogenous innovations**.
- Define also **log TFPR** at the firm level: $a_{ft} \equiv z_{ft} + p_{ft}$, w/ **exogenous innovations** ξ_{ft}.

$$x_{ft} = \delta_1 \cdot x_{ft-1} + \delta_2 \cdot \log(n_{ft-1}) + \delta_3 \cdot \xi_{ft} + \Delta' \Lambda_{ft} + \upsilon_{ft}$$

	Export status, x_{ft}			
	(1)	(2)	(3)	(4)
Lagged export status, δ_1	0.64***		0.63***	0.64***
	(0.03)		(0.03)	(0.03)
Log lagged employees, δ_2		0.08***	0.03***	0.03***
		(0.01)	(0.00)	(0.00)
Log profitability innovation, δ_3				0.02***
				(0.00)
Controls	Yes	Yes	Yes	Yes
R^2	0.82	0.72	0.83	0.84
Observations	143 886	143 886	143 886	143 886

- **Profitability innovations** embed shocks to technical efficiency, and domestic and foreign demand.
- If **TFP and foreign demand shocks are singled out**, those profitability innovations will just **reflect domestic demand** circumstances.
- **Identification**: country c's total import demand of product p is taken exogenously by firm f.

$$\mathcal{F}_{ft} = \sum_{c} \sum_{p} s_{fpct-1} \cdot \log(M_{pct})$$

  → A shift from BACI database: country c's purchases of product p in the world market, M_{pct}.

  → A share from customs data: exposure of f to demand swings of product p in country c, s_{fpct-1}

A more complete policy function for export status — TFP and demand shocks

	Export status, x_{it}		
	(1)	(2)	(3)
Lagged export status, γ_1	0.64***	0.64***	0.64***
	(0.03)	(0.03)	(0.03)
Log lagged employees, γ_2	0.03***	0.03***	0.03***
	(0.00)	(0.00)	(0.00)
Log productivity innovation, γ_3	0.02***	0.02***	0.02***
	(0.00)	(0.00)	(0.00)
Foreign demand shock, γ_4		0.01***	0.01***
		(0.00)	(0.00)
Log domestic demand innovation, γ_5			0.01
			(0.00)
Controls	Yes	Yes	Yes
R^2	0.84	0.84	0.84
Observations	143 886	143 886	143 886

A more complete policy function for export status —Taking stock

- A one std deviation profitability shock $\uparrow$ the probability of exporting by 7 pp.
  - $\rightarrow$ The effect comes mostly from exogenous changes to TFP.
- Export participation is positively and significantly associated w/ lagged employment.
  - $\rightarrow$ The inability to undertake costly labour adjustments may prevent firms from accessing export markets.
- Past export status is **the main predictor** of current export participation, and soaks up a large share of the effect of lagged employment.
  - $\rightarrow$ Do labour market frictions explain the large persistence of export status?
  - $\rightarrow$ What happens to export participation when a reform slashes labour adjustment costs?

GE Model

- B/w 2011-2013, a reform effectively **slashed labour adjustment costs** for Portuguese firms.
  - → If the reform had not taken place, what would have happened to export participation?
  - → Can changes in labour market frictions alter the persistence of export status?
- An **estimated GE model** is useful to design counterfactuals and to disentangle effects exerted on persistence of export status.
- **Framework of the model** draws essentially from Berger et al. (2022) and Cooper et al. (2025):
  - → Heterogeneous (incumbent) firms endogenously choose labour demand and export status.
  - → Both decisions are dynamic in nature: $C(n_{-1}, n)$ and $\chi(x_{-1}, x)$.
  - → Inverse labour supply curve from representative HH problem: $\omega(n_{ft}; \boldsymbol{w}_t, \boldsymbol{n}_t) = \boldsymbol{w}_t \cdot (n_{ft}/\boldsymbol{n}_t)^{1/\psi}$

- Firms observe their state vector and instantly decide to **remain as incumbents** or to **exit**.
  - → They draw a productivity shock, domestic and foreign demand shocks: $\mu \equiv (z, \theta, \theta^*)$.
  - → Stock of workers carried from the previous period is relevant for adjustment costs, n_{-1}.
  - → Inherited export status determines if sunk entry costs have already been borne, x_{-1}.

- Labour demand and export status are two **dynamic choices set endogenously**:

$$V^i(\mu, n_{-1}, x_{-1}; \boldsymbol{w}, \boldsymbol{n}) = \max_{n \geq 0,\, x=\{0,1\}} \left\{ R(\mu, n, x) - \omega(n; \boldsymbol{w}, \boldsymbol{n}) \cdot n - C(n_{-1}, n) - \chi(x_{-1}, x) - c \right.$$
$$\left. + \beta \int_{\mu'} V(\mu', n, x; \boldsymbol{w'}, \boldsymbol{n'}) \cdot dG(\mu' | \mu) \right\}$$

Revenue function

Conclusion

- **Labour market frictions are essential** to explain export dynamics found in the data.
  - → The distribution of ARL is not degenerate nor independent of export status.
  - → There is no perfect TFP sorting upon entrance in export markets.
- This is corroborated by an **estimated policy function** for export participation.
  - → Export status is positively and significantly associated w/ lagged employment.
  - → But past export status soaks up a large part of that effect.
- How did a **labour market reform** impact export participation and the persistence of export status?
  - → To be answered w/ a GE model of endogenous labour demand and export participation.

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Appendix: A toy model for export decisions under a fully flexible labour market

- State vector: firms know their TFP level $\mathcal{Z} \in \mathbb{R}_+$, and their export status last period $x = \{0, 1\}$.
- Every period firms decide if they want to be **exporters** (discrete choice):

$$\mathcal{V}(\mathcal{Z}, x) = \max\Big\{ \underbrace{\mathcal{D}(\mathcal{Z})}_{\text{Non-exporters}} , \underbrace{\mathcal{F}(\mathcal{Z}, x)}_{\text{Exporters}} \Big\}$$

- Non-exporter set their workforce in a **perfectly competitive** and **frictionless labour market**:

$$\mathcal{D}(\mathcal{Z}) = \max_{n \geq 0} \left\{ \mathcal{Z} \cdot n^{\alpha} - w \cdot n + \beta \int_{\mathcal{Z}'} \mathcal{V}(\mathcal{Z}', 0) \cdot \mathrm{d}G(\mathcal{Z}' | \mathcal{Z}) \right\}$$

- Revenue of exporters **grows exogenously**, but they also pay a **fixed cost** and a **sunk entry cost**.

$$\mathcal{F}(\mathcal{Z}, x) = \max_{n \geq 0} \left\{ \varphi\, \mathcal{Z} \cdot n^{\alpha} - w \cdot n - c - \chi \cdot \{x = 0\} + \beta \int_{\mathcal{Z}'} \mathcal{V}(\mathcal{Z}', 1) \cdot \mathrm{d}G(\mathcal{Z}' | \mathcal{Z}) \right\}$$

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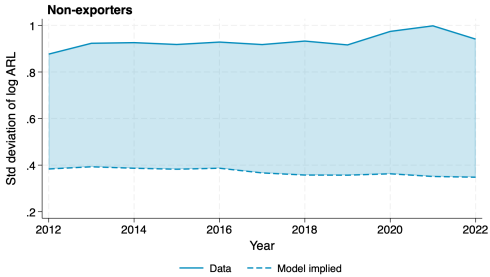
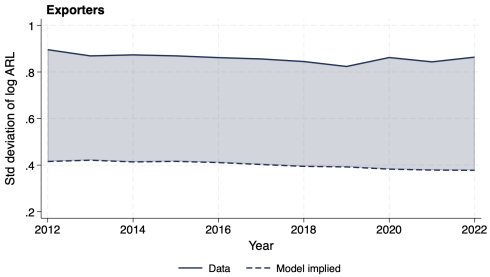
Appendix: Cross-sectional variance of the average revenue of labour

- Conditional on export status, the cross-sectional dispersion of **log ARL** should match that of **log real wages**.
- The observed **dispersion of log ARL is greater** than what would be implied by a model of perfectly competitive and frictionless labour market.





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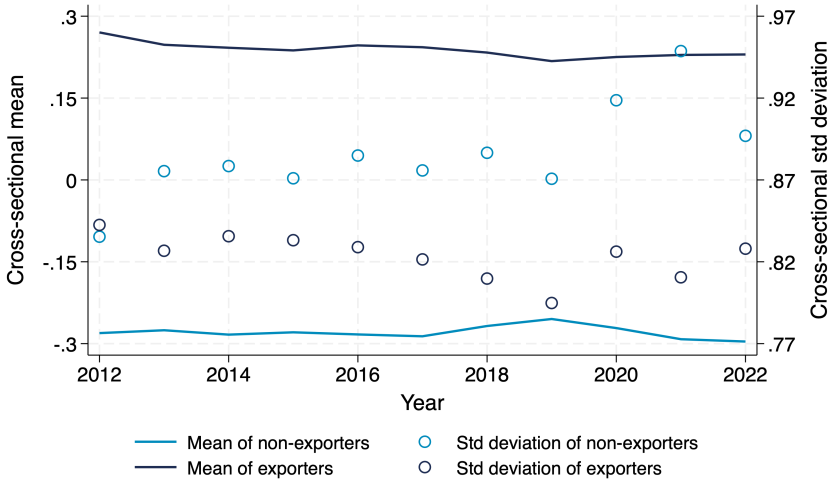
Appendix: Distribution of ARL once sector-year FEs are removed



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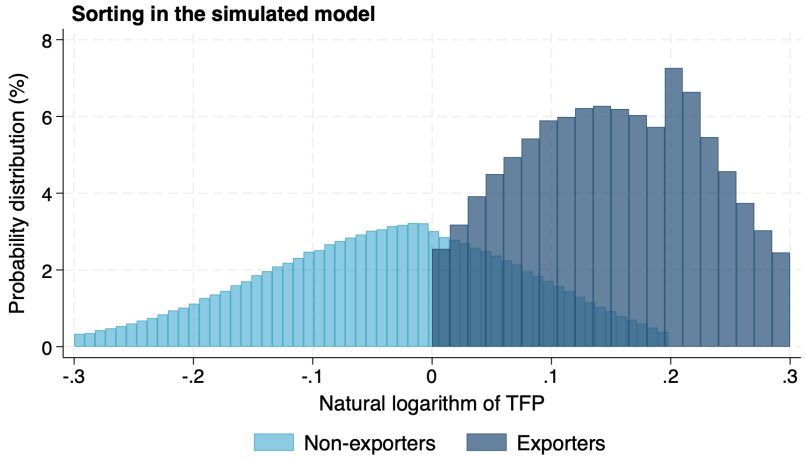
Appendix: Do firms sort into export markets?

- Some firms can remain exporters w/ low TFP levels to avoid repaying a **sunk entry cost**.



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Appendix: The revenue function of firms

- For given n and x, firms must decide the **share of output to assign to each market**, subject to a **resource constraint**.

- **Price elasticities** and **demand shocks** define the optimal revenue, $R(\mu, n, x)$.

$$R(\mu, n, x) = \max_{y \geq 0,\, y^* \geq 0} \left\{ y \cdot \left(\frac{\theta}{y}\right)^{1/\varepsilon} + y^* \cdot \left(\frac{\theta^*}{y^*}\right)^{1/\varepsilon^*} \cdot \{x = 1\} \right\},$$

$$\text{subject to } y + y^* \cdot \{x = 1\} \leq z \cdot n^{\alpha}$$

- For an exporter firm there is an **interior solution** given by:

$$z \cdot n^{\alpha} - y = \left(\frac{\theta^{1/\varepsilon}}{\theta^{*\,1/\varepsilon^*}} \cdot \frac{1 - 1/\varepsilon}{1 - 1/\varepsilon^*} \right)^{-\varepsilon^*} y^{\varepsilon^*/\varepsilon}$$

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