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Trade and International Economics

Trade in frictional good markets

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Part I

Introduction

Motivation

- Yesterday, I showed stylized facts on the network structure of firm-to-firm trade
- I also talked about modern theories of comparative advantages
- These theories are not well-suited to capture micro-level features of trade data
- Degenerated structure in which a maximum of one firm / technology serves a given market

Motivation

- Today, I will talk about a model of trade under comparative advantages and random search which
  1. Keeps the tractability of Eaton & Kortum's model and
  2. Has rich (static and dynamic) predictions regarding trade networks
- I'll discuss what moments in firm-to-firm trade data can be used to estimate the model
- The material is based on a paper entitled "Frictions and adjustments in firm-to-firm trade" co-authored with F. Fontaine (PSE) and J. Martin (UQAM)

What this paper does / finds

1. Develop a dynamic model of firm-to-firm trade displaying
   - Ricardian comparative advantages (à la Eaton & Kortum, 2002)
   - Random search (à la Eaton, Kortum & Kramarz, 2023)
   - Within and between-match price bargaining (à la Postel-Vinay & Robin, 2002)

$\Rightarrow$ Model reproduces a number of stylized facts, most notably the dynamic of prices within and across F2F relationships

What we do / What we find

1. Develop a dynamic model of firm-to-firm trade
2. Separate comparative advantages from search frictions structurally
   - for 330 sector×country pairs
   - using a simulated maximum likelihood estimator
   - that exploits the mobility of importers along the supplier network

⇒ Search frictions explain 24% of the cross-sectional variance in trade shares

What we do / What we find

1. Develop a dynamic model of firm-to-firm trade displaying
2. Separate comparative advantages from search frictions structurally
3. Use model and estimates to quantify the incidence on foreign importers of relative price shocks
   - Pass-through and switching rates shaped by the interaction of comparative advantages, search frictions and individual characteristics of the firms involved into the transaction
   - More in next lecture

Related literature

- **Firm-to-firm trade and search frictions**: Bernard et al (2019), Miyauchi (2019), Chor and Ma (2020), Demir et al (2021), Eaton et al (2021, 2022, 2023), Lenoir et al (2022), Lu et al (2017), Grossman et al (2022)
  - ⇒ A richer view of firm pricing strategies
- **Pricing in trade**: Bernard et al (2003), Atkeson and Burstein (2008), Drozd and Nosal (2012), de Blas and Russ (2015), Dhyne et al (2019), Fajgelbaum et al (2020), Alviarez et al (2023)
  - ⇒ Dynamics of markups and pass-through rates (within and across relationships)
- **Labor**: Postel-Vinay and Robin (2002), Cahuc et al (2006), Bagger et al (2014)
  - ⇒ Identification strategy from Ridder and van den Berg (2003)
  - ⇒ Use the panel dimension of the data rather than the cross-sectional moments (Bernard & Zi, 2022)

Part II

Data

Data

- Firm-to-firm export data from the French Customs
- Use data over 2002-2006 + pre- and post-sample periods to control for left and right censoring
- Restrict the analysis to the 14 historical members of the EU
- Remove trade intermediaries (Stylized facts robust to keeping them) ▸ Details
- Use unit values as a proxy for prices:

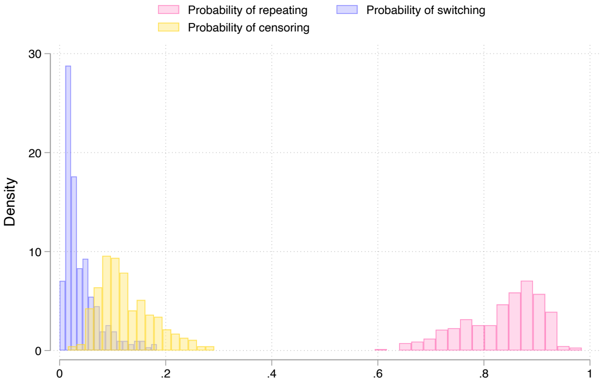
$$p_{sb(i)jt} = \frac{Value_{sb(i)jt}}{Quantity_{sb(i)jt}}$$

Dimensionality of the data

	Transactions (1)	Exporters s (2)	Importers $b(i)$ (3)	$sb(i)j$ Triplets (4)
All	27,442,785	39,751	744,118	5,646,587
Austria	787,990	9,669	20,765	157,550
Belgium	4,501,923	27,786	86,174	927,695
Denmark	577,165	9,478	14,326	116,695
Finland	357,670	6,261	7,718	69,181
Germany	5,731,010	24,683	181,630	1,122,918
Greece	634,143	8,415	14,950	136,556
Ireland	426,605	7,221	9,207	104,659
Italy	3,613,227	20,395	129,124	812,073
Luxembourg	479,248	10,922	8,047	97,417
Netherlands	1,869,157	17,344	46,071	375,632
Portugal	1,165,765	12,625	26,545	259,340
Spain	3,639,465	21,362	104,745	732,013
Sweden	637,453	8,975	15,298	121,086
United Kingdom	3,021,964	19,885	79,518	613,772

Notes: Based on data for 2002-2006, excluding trade intermediaries on the sellers' and buyers' side

Mobility of importers over time



Note: Probabilities computed at the country×sector level, over the population of importers from January 2002. More Back

- Consistent with evidence in Lu et al (2017), Monarch (2022) and Sugita et al (2023)

Part III

Model

A Ricardian model of trade in frictional product markets

- Partial equilibrium model of the many-to-one matching of
  1. Buyers $b(i)$: Produce using a set of intermediate inputs j
  2. Sellers s: Suppliers of one input j, heterogeneous in quality-adjusted costs
- Buyers and sellers from any pair of countries are matched randomly
- Sellers adjust their prices to retain the buyers

The final good producers = buyers

$b(i)$

- Are born unmatched
- Exit at rate μ
- Face a demand x_b for their variety (exogenous)
- Produce with a CES production function involving intermediaries $j \in [1; M_{b(i)}]$

The intermediate good producers = sellers

Sellers of input k

$$s^k_F(c_1)$$
$$\vdots$$
$$s^k_F(c_N)$$

$$s^k_{\bar{F}}(c_1)$$
$$\vdots$$
$$s^k_{\bar{F}}(c_N)$$

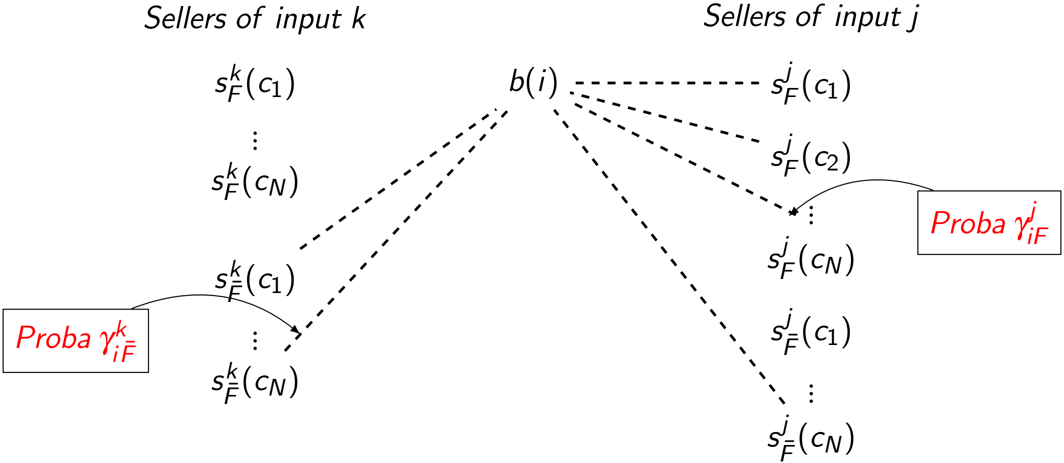
$$b(i)$$

Sellers of input j

$$s^j_F(c_1)$$
$$s^j_F(c_2)$$
$$\vdots$$
$$s^j_F(c_N)$$
$$s^j_{\bar{F}}(c_1)$$
$$\vdots$$
$$s^j_{\bar{F}}(c_N)$$

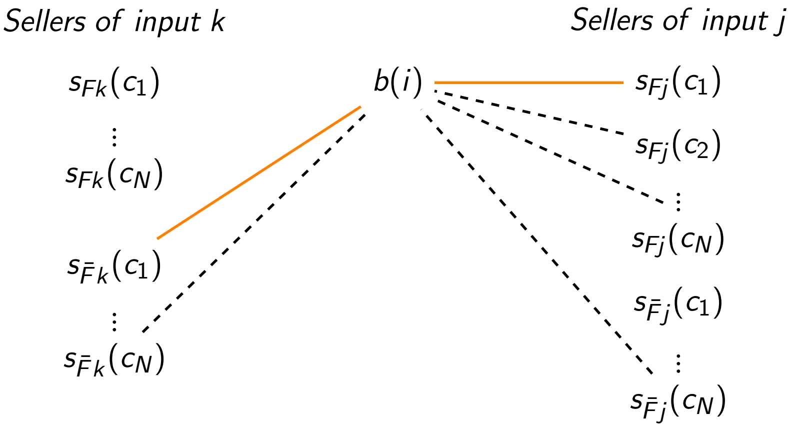
- Are located in any country
- Produce a single input at quality-adjusted cost c

Buyer-seller matching



- Search occurs (simultaneously) on as many separate markets as there are input types
- Buyers are matched with sellers randomly

Seller-buyer matching



- Buyers choose the best sellers among their matches
- They start the relationship whenever the price is below their reservation price

Technology (Eaton & Kortum, 2002)

- Sellers produce under CRS with efficiency e and quality q such that the quality-adjusted cost of serving market i is

$$c^j_{iF}(z) = \frac{\nu^j_F d^j_{iF}}{z}$$

d^j_{iF} the (iceberg) cost and $z \equiv eq$ the quality-adjusted productivity, which is distributed Pareto (shape θ^j)

$\Rightarrow$ Serving costs follow:

$$\begin{aligned} F^j_{iF}(c) &\equiv 1 - F(\nu^j_F d^j_{iF}/c) \\ F^j_{i\bar{F}}(c) &\equiv 1 - F(\nu^j_{\bar{F}} d^j_{i\bar{F}}/c) = \left(\tau^j_{iF\bar{F}}\right)^{\theta^j} F^j_{iF}(c) \end{aligned}$$

where $\tau^j_{iF\bar{F}} \equiv \left(\frac{\nu^j_F d^j_{iF}}{\nu^j_{\bar{F}} d^j_{i\bar{F}}}\right)$ denotes F's relative cost and $F()$ is the Pareto distribution

Buyer-seller matching

- Buyers (B_i) in country i
  - Meet with French (resp. non-French) sellers at rate γ^j_{iF} (resp. $\gamma^j_{i\bar{F}}$)
  - Meet with a seller at rate $\gamma^j_i = \gamma^j_{iF} + \gamma^j_{i\bar{F}}$
- Sellers maintain links up to buyer death (exogeneous rate μ) or buyer switch (endogenous)
- Sellers in a buyer's network Bertrand compete (no collusion)
- Buyers can always recall a previous seller and there is no commitment beyond the current transaction ($\neq$ labor literature)

Price setting

- Take a buyer with n potential sellers, indexed by their quality-adjusted cost

$$c_1 \leq c_2 \leq \ldots \leq c_n$$

- The best supplier (c_1) is able to set the price such that the buyer is indifferent between her and the next best supplier:

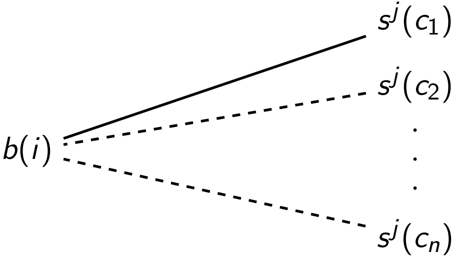
$$p(q_1, c_2) = Min\left\{c_2 q_1; \frac{\eta}{\eta - 1} c_1 q_1\right\}$$

  where q_1 is the quality of her variety and η is the elasticity of demand

- Prices can be renegotiated over time after a shock or when the buyer meets new sellers

Price dynamics

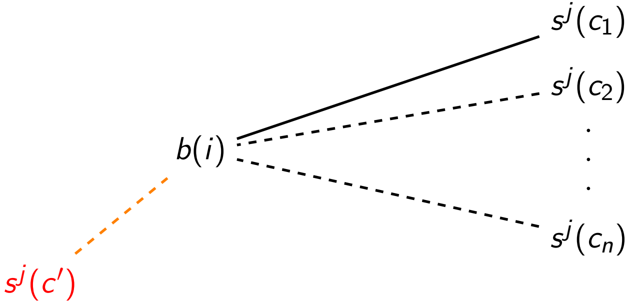
Start from any period t



$$p = Min\left\{c_2 q_1; \frac{\eta}{\eta - 1} c_1 q_1\right\}$$

Price dynamics

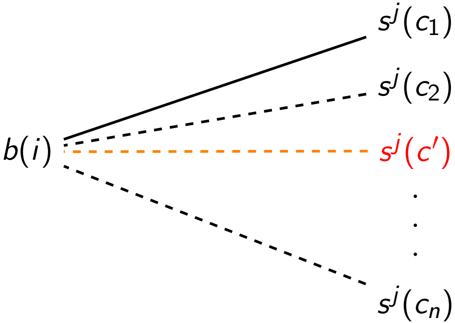
With probability γ_i^j, the buyer meets with a new match c' in $t + dt$



$$p = Min\left\{c_2 q_1; \frac{\eta}{\eta-1} c_1 q_1\right\}$$

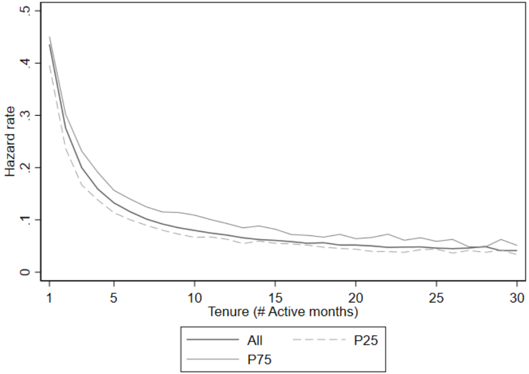
Price dynamics

If $c' > c_2$, nothing changes



$$p = Min\left\{c_2 q_1; \frac{\eta}{\eta-1} c_1 q_1\right\}, \quad \Delta p = 0$$

Dynamics of hazard rates: Data

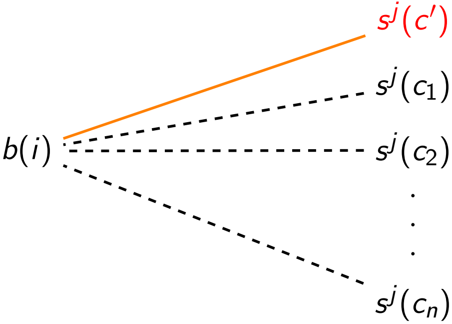


Note: The hazard rate is defined as the probability of the relationship ending, conditional on tenure into the relationship. Back

- See also Eaton, et al (2021) and Monarch and Schmidt-Eisenlohr (2023)

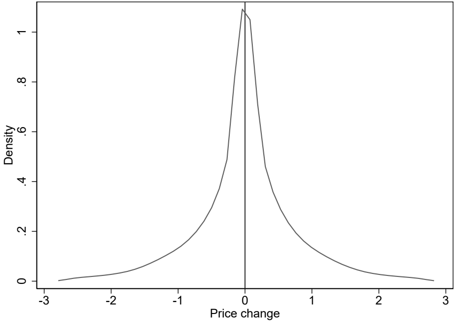
Price dynamics

If $c' \leq c_1$, $b(i)$ switches and the price adjusts (up or down)



$$p = Min\left\{c_1 q'; \frac{\eta}{\eta-1} c' q'\right\}, \quad \Delta p \lesseqgtr 0$$

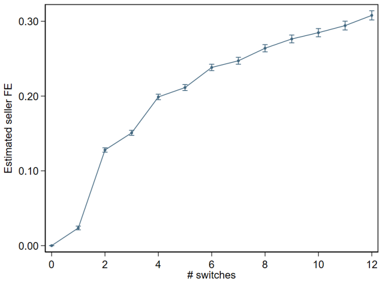
Price dynamics, across matches: Data



Note: Kernel density of price changes, conditional on a switch ($\ln p_{bjst} - \ln p_{bjs_{-1}t-1}$). Vertical line is the empirical median

- See also Monarch (2022)

Buyers switching to **lower quality-adjusted cost suppliers: Data**

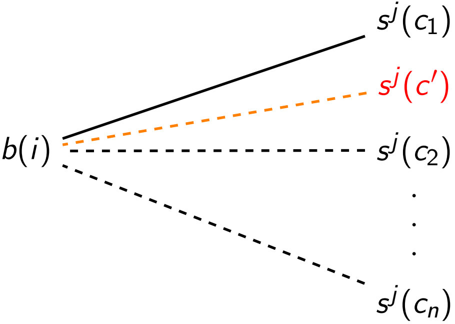


$$\hat{FE}^{b}_{sji} = FE_{bj} + \sum_{l=2}^{K} \alpha_l \mathbb{1}(Partner_{bjs} = l) + \varepsilon_{bjs}$$

where $\hat{FE}^{b}_{sji}$ is the seller's attribute recovered from dynamics of buyers margin, posterior to entry.

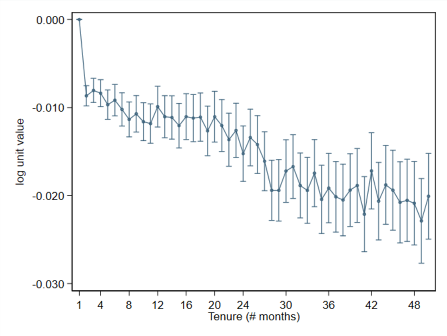
Price dynamics

If $c_2 \geq c' > c_1$, $b(i)$ does not switch but the price is renegotiated down



$$p = Min\left\{c' q_1; \frac{\eta}{\eta - 1} c_1 q_1\right\}, \quad \Delta p \leq 0$$

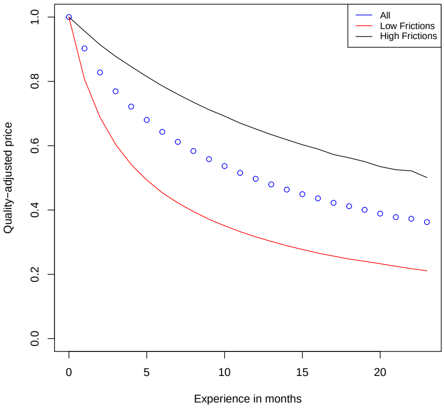
Price dynamics, within a match: Data More



$$\ln p_{bjst} = FE_{bjs} + FE_{ijt} + \sum_{l=2}^{K} \alpha_l \mathbb{1}(Tenure_{bjst} = l) + \varepsilon_{bjst}$$

- See also Monarch and Schmidt-Eisenlohr (2023), Compare with Fitzgerald & Haller (2023)

Price dynamics, within a match: Model



Note: Mean dynamics of quality-adjusted prices, as a function of experience and search frictions.

Steady state equilibrium: Distribution of suppliers

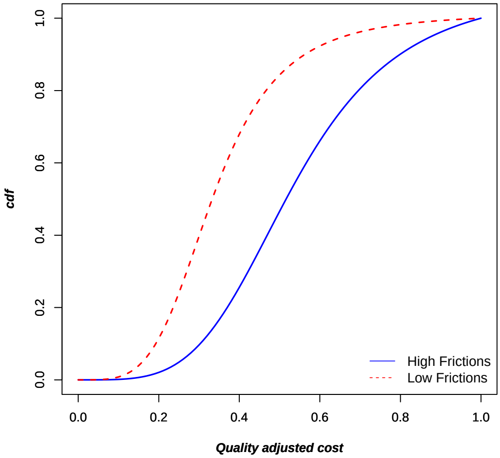
- Distribution $L_i^j(c)$ of costs faced by buyers in i satisfies:

$$\underbrace{B_i(1-u_i^j)\ell_i^j(c)\left(\mu+\gamma_i^j F_i^j(c)\right)}_{\text{outflows}} = \underbrace{B_i(1-u_i^j)\gamma_i^j \bar{L}_i^j(c) f_i^j(c) + B_i u_i^j \gamma_i^j f_i^j(c)}_{\text{inflows}}$$

  with
  - $u_i^j = \frac{\mu}{\gamma_i^j+\mu}$ the share of unmatched buyers
  - $F_i^j(c) = \frac{\gamma_{iF}^j}{\gamma_i^j} F_{iF}^j(c) + \frac{\gamma_{i\bar{F}}^j}{\gamma_i^j} F_{i\bar{F}}^j(c)$ the overall quality-adjusted serving cost distribution
- In equilibrium

$$L_i^j(c) = \frac{\mu+\gamma_i^j}{\mu+\gamma_i^j F_i^j(c)} F_i^j(c)$$

Search frictions distorting the distribution of costs



Steady state equilibrium: Trade shares

- Distribution of costs faced by buyers/final good producers in i conditional on being matched with French sellers ($L_{iF}^j(c)$) satisfies:

$$\underbrace{(1-u_i^j)\pi_{iF}^j \ell_{iF}^j(c)\left(\mu+\gamma_i^j F_i^j(c)\right)}_{\text{outflows}} = \underbrace{u_i^j \gamma_{iF}^j f_{iF}^j(c) + (1-u_i^j)\bar{L}_i^j(c)\gamma_{iF}^j f_{iF}^j(c)}_{\text{inflows}}$$

with

- π_{iF}^j the share of firms matched with French sellers

Steady state equilibrium: Trade shares

- After integrating and simplifying, one gets for $\mu \approx 0$

$$\pi^j_{iF} = \frac{\gamma^j_{iF}/\gamma^j_{i\bar{F}}}{\gamma^j_{iF}/\gamma^j_{i\bar{F}} + \left(\tau^j_{iF\bar{F}}\right)^{\theta^j}}, \quad \ell^j_{iF}(c) = \ell^j_i(c)$$

$\mu \neq 0$

- Share of buyers importing from France increasing in:

1. **Ricardian comparative advantages**, $\left(\tau^j_{iF\bar{F}}\right)^{-\theta^j} = \left(\frac{\nu^j_F d^j_{iF}}{\nu^j_{\bar{F}} d^j_{i\bar{F}}}\right)^{-\theta^j}$
2. **Relative matching frictions**, $\gamma^j_{iF}/\gamma^j_{i\bar{F}}$

Part IV

Estimation

Estimation

- Parameters to be estimated (by market):

$$\left\{ \gamma^j_{iF}, \gamma^j_{i\bar{F}}, \mu, \left(\tau^j_{iF\bar{F}}\right)^{-\theta^j} \right\}$$

- We use the fact that, given the observed trade share π^j_{iF}, $\left(\tau^j_{iF\bar{F}}\right)^{-\theta^j}$ is a function of the matching rates
- Estimation uses a simulated maximum likelihood estimator, together with data on switch frequencies at the buyer level (Jolivet et al, 2006)

Challenges

- We face a number of challenges:
  1. Switches to non-French sellers are not observed $\rightarrow \gamma^{j}_{i\bar{F}}$ is not identified separately from μ
  2. Prices, quantities and production costs are difficult to measure accurately
  3. Switches are observed conditional on a transaction

Practical implementation

- Solution:
  1. Calibrate μ using the long-run empirical hazard rate of relationships here

$$\mathbb{E}\left[\frac{H_i^j(c)e^{H_i^j(c)t}}{e^{H_i^j(c)t}}\right] = \mathbb{E}\left[H_i^j(c)\right] \xrightarrow[t\to\infty]{} \mu_i^j$$

with $H_i^j(c) = \left(\mu_i^j + \gamma_{iF}^j F_{iF}^j(c) + \gamma_{i\bar{F}}^j F_{i\bar{F}}^j(c)\right)$

Practical implementation

- Solution:
  1. Calibrate μ
  2. Use unconditional hazard rates, which only depend on the structural parameters (Ridder and van den Berg, 2003)

$$\int_{c_{inf}}^{c^{sup}} H_i^j(c) dL_{iF}^j(c) = \frac{\gamma_{iF}^j {\tau_{iF}^j}^{-\theta} + \gamma_{i\bar{F}}^j}{\gamma_{iF}^j + \gamma_{i\bar{F}}^j} \int_0^1 \frac{\mu_i^j(\mu_i^j + \gamma_{iF}^j + \gamma_{i\bar{F}}^j)}{\mu_i^j + \gamma_{iF}^j {\tau_{iF}^j}^{-\theta} x + \gamma_{i\bar{F}}^j x} dx$$

    - Does not require data on prices and/or quantities and/or production costs
    - Does not put too much weight on the price bargaining assumption. Identification assumption: Buyers switch if this improves their intertemporal profit

Practical implementation

- Solution:
  1. Calibrate μ_i^j
  2. Use unconditional hazard rates
  3. Assume that transactions are exponentially distributed according to a mixture model with two types of buyers, one buying more frequently (p_i^j, t_{iF}^{j1}), one buying less frequently ($1 - p_i^j$, t_{iF}^{j2})
     - Parameters identified using transaction frequencies

Part V

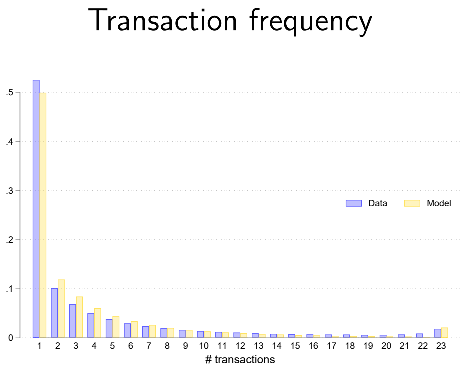
Results

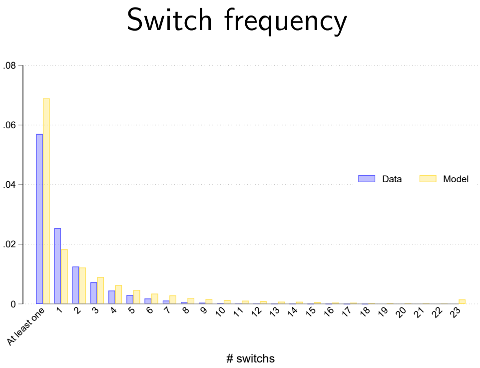
Frictions versus comparative advantages ▸ More

	Dep. Var				
	$\ln \frac{\gamma^j_{iF}}{\gamma^j_{i\bar{F}}}$ (1)	$\ln \left(\tau^j_{iF\bar{F}}\right)^{-\theta}$ (2)	$\ln \frac{\gamma^j_{iF}}{\gamma^j_{i\bar{F}}}$ (3)	$\ln \frac{\gamma^j_{iF}}{\gamma^j_{i\bar{F}}}$ (4)	$\ln \frac{\gamma^j_{iF}}{\gamma^j_{i\bar{F}}}$ (5)
$\ln \frac{\pi^j_{iF}}{1-\pi^j_{iF}}$	0.235^a	0.765^a	0.078	0.193^a	
	(0.061)	(0.061)	(0.059)	(0.068)	
ln distance					$-.765^a$
					(.103)
Obs.	330	330	330	330	330
Adjusted R^2	.040	.321	.205	.160	.307
Country FE	No	No	Yes	No	No
Product FE	No	No	No	Yes	Yes

Eaton, Kortum & Kramarz (2023): Matching frictions explain 50% of the geography of trade (using cross-sectional moments)

Model fit: Targeted Moments





Note: The figures show moments in the data (purple bars) and estimated model (yellow bars). The left panel describes the number of transactions per importer, over the two-year observation period. The right panel shows the probability of at least one switch (first bars) and the probability of exactly one to 23 switches.

Model fit: Non-targeted Moments - Pass-through

	Dependent variable: log p			
	Simulated data			
	(1)	(2)	(3)	(4)
log cost shock	0.382***	0.289***	0.312***	0.356***
	(.000)	(.001)	(.001)	(.001)
- × French market share		1.168***		
		(.007)		
- × Relative meeting rate			0.092***	0.093***
			(.000)	(.000)
- × Experience buyer				-0.020***
				(.000)
FE	*sji*	*sji*	*sji*	*sji*
Obs.	1,980,624	1,980,624	1,980,624	1,980,624
	Actual data			
	(1)	(2)	(3)	(4)
log cost shock	0.081***	0.059***	0.032**	0.074***
	(.010)	(.014)	(.012)	(.023)
- × French market share		0.441**		
		(.192)		
- × Relative meeting rate			0.121***	0.126***
			(.015)	(.015)
- × Experience buyer				-0.030**
				(.012)
FE	*sji*	*sji*	*sji*	*sji*
Obs.	9,082,588	9,082,588	9,082,588	9,082,588

Notes: Robust standard errors in parenthesis. * $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$. Price adjustments are computed on impact in simulated data and on a year-by-year basis in actual data. The cost shock in actual data is measured using the real effective exchange rate of France. Column (4) further controls for the buyer's experience. This control is colinear with the fixed effects in simulated data as the shock is one shot.

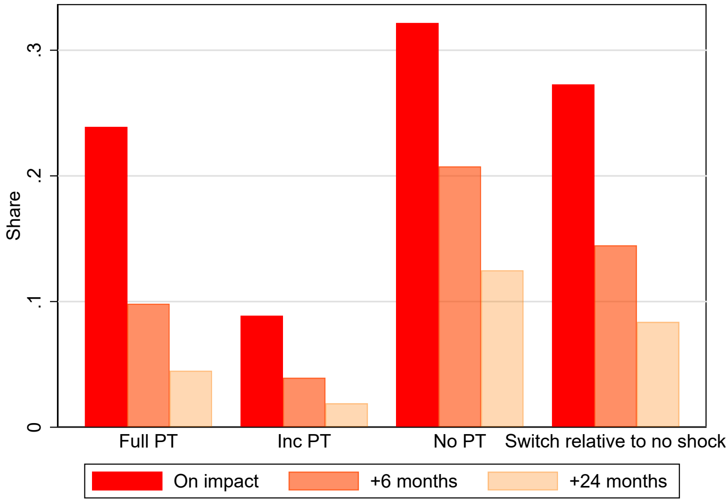
Part VI

Incidence in frictional markets

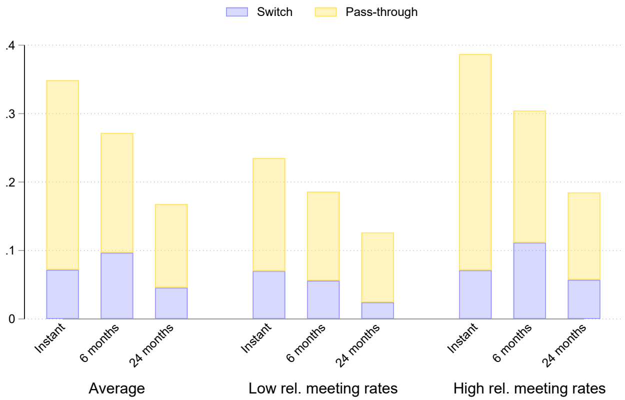
Incidence of relative cost shocks: Model versus data

- This paper: A rich theory of pass-through rates, shaped by strength of market-level competition (search frictions + comparative advantages), and individual characteristics
- Simulate a uniform/unilateral 10% cost shock on all French suppliers
  - Relative price shocks affect switching probabilities and negotiated prices (within and outside of relationships involving French suppliers)
  - Switching and pass-through rates vary with absolute and relative frictions, individual characteristics and their interactions

Switches and Pass-through



Incidence of the shock



- Incidence $\downarrow$ over time, especially in high $\gamma_F/\gamma_{\bar{F}}$ markets
- Incidence 75% higher in high $\gamma_F/\gamma_{\bar{F}}$ markets
- Dynamic mostly driven by young buyers (small network at the time of the shock)

Conclusion

- F2F model with Ricardian forces and search frictions reproduces a number of stylized facts observed in a panel of firm-to-firm trade data
- Estimated search frictions vary heavily across products and sectors, which contributes to heterogeneous trade adjustments.
- The bargaining and switch patterns induced by these frictions generate rich pricing and pass-through dynamics.

Thank you!

The role of wholesalers

- Model relies on the matching of firms with their input providers under frictional product markets
- Intermediaries can help deal with these frictions. But the level of these frictions needs to be estimated in non-intermediated data
- Drop wholesalers and retailers:
  - On the French side based on their sector of activity (40% of French exporters, 15% of the value of exports)
  - On the foreign side based on the number of partners they are simultaneously matched with: In the overall sample, 5% of importers have multiple partners within a month but represent 23% of trade. Drop 1% of importers with the largest number of simultaneous partners (ie all importers with more than 3 partners)
- Remaining sample covers 75% of the total value of trade

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More on the mobility

	Firm-to-firm data	Employer-employee data
Probability		
Repeat	.757	.751
Switching	.067	.124
Censoring	.176	.125

Notes: This table provides statistics on mobility rates computed from the population of importers from January 2002, which we follow until their next transaction of a maximum of 12 months. The probability of a recall is computed on the population of switchers using the history of their match with French firms over the previous two years. Column (2) compares these statistics with mobility rates computed from French employer-employee linked data comparing the job status of employees at the beginning of 2006 and one year later. The probability of a recall is computed based on the history of the switchers' employees between 2002 and 2006. Source: DADS-Panel

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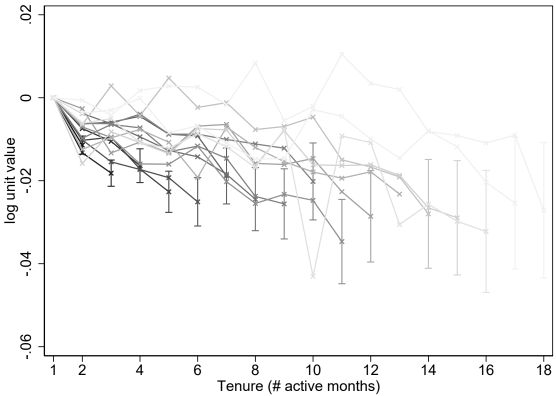
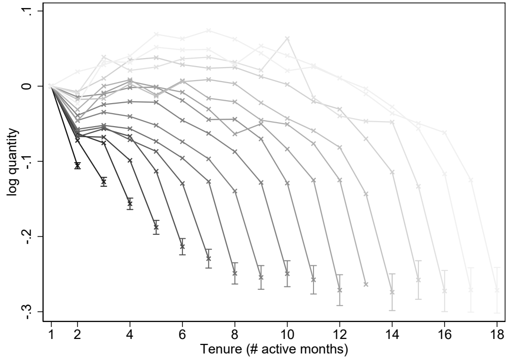
Within a match, prices always **decrease** when $c_2 \geq c' > c_1$ Back



$$\ln p_{bjst} = FE_{bjs} + FE_{ijt} + \sum_{l=2}^{K} \alpha_l \mathbb{1}(Tenure_{bjst} = l) + \varepsilon_{bjst}$$

Dynamics of exported quantities Back

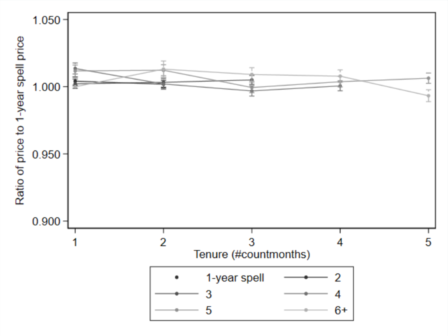


$$\ln q_{bjst} = FE_{bjs} + \sum_{l=2}^{K} \alpha_l \mathbb{1}(Tenure_{bjst} = l) + \varepsilon_{bjst}$$

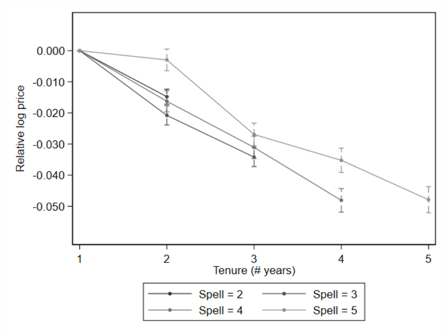
- See also Monarch and Schmidt-Eisenlohr (2023) based on data that are more than 10-year old

Comparison with Fitzgerald et al (2023) Back

Their specification



Ours based on aggregated data



Fitzgerald et al's specification reads

$$\ln p_{ijst} = FE_{sjt} + FE_{ijt} + \beta X_{ijst} + \sum_{d=2}^{T} \delta_{dt} \mathbb{1}(Tenure_{ijst} = d) + \sum_{k=2}^{6} \sum_{d=2}^{t} \gamma_{kdt} \mathbb{1}(Spell_{ijs} = k) \mathbb{1}(Tenure_{ijst} = d) + \varepsilon_{ijst}$$

where i, j, s, t respectively denote a destination, product, exporter and year. X_{ijst} is a set of controls that contains dummies for left and right censoring. Ours is similar except that the FE_{sjt} is replaced by FE_{isj}, ie the identification is over time instead of across destinations.

Price dynamics following a cost shock

Start from $c_1 \leq c_2 \leq ... \leq c_n$ and the associated price

$$p = q_1 c_2$$

The dynamics of prices conditional on a cost shock ε on French sellers:

$$p' = \begin{cases} p \quad \text{if} & s_1 \notin F \quad \text{and} \quad c_2' = c_2 & \text{(no cost PT)} \\ p\dfrac{c_2'}{c_2} \quad \text{if} & s_1 \notin F \quad \text{and} \quad c_2' > c_2 & \text{(more than full cost PT)} \\ p \quad \text{if} & s_1 \in F \quad \text{and} \quad c_2' = c_2 & \text{(no cost PT)} \\ p\varepsilon \quad \text{if} & s_1 \in F \quad \text{and} \quad c_2' = c_2\varepsilon & \text{(full cost PT)} \\ p\dfrac{c_2'}{c_2} \quad \text{if} & s_1 \in F \quad \text{and} \quad c_2' < c_2\varepsilon & \text{(incomplete cost PT)} \\ q_1' c_2' \quad \text{if} & s_1 \in F \quad \text{and} \quad c_1' < c_1\varepsilon & \text{(switch)} \end{cases}$$

Back to the model Back to the results

Trade shares when $\mu \neq 0$

- If $\nu_F d_{iF} < \nu_{\bar{F}} d_{i\bar{F}}$

$$\pi_{iF} = \frac{\gamma_{iF}}{\gamma_{iF} + \gamma_{i\bar{F}}} \times \frac{\mu + \gamma_{iF} + \gamma_{i\bar{F}}}{\mu + \gamma_{iF} + \gamma_{i\bar{F}} \tau_{iF\bar{F}}^{\theta}}$$

- If $\nu_F d_{iF} > \nu_{\bar{F}} d_{i\bar{F}}$

$$\pi_{iF} = \frac{\gamma_{iF}}{\gamma_{iF} + \gamma_{i\bar{F}}} \times \frac{\mu + (\gamma_{iF} + \gamma_{i\bar{F}}) \tau_{iF\bar{F}}^{-\theta}}{\mu + \gamma_{iF} \tau_{iF\bar{F}}^{-\theta} + \gamma_{i\bar{F}}}$$

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Details on the estimation

- Estimation relies on the fact unconditional hazard rates solely depend on the structural parameters
- Example: Overall hazard rate for a buyer matched with a French seller c:

$$H(c) \equiv \mu + \gamma_{iF} F_{iF}(c) + \gamma_{i\bar{F}} F_{i\bar{F}}(c)$$

- Unconditional hazard rate:

$$\int_{c_{inf}}^{c_{sup}} H(c) dL_{iF}(c) = \frac{\gamma_{iF}\tau_{iF\bar{F}}^{-\theta} + \gamma_{i\bar{F}}}{\gamma_{iF} + \gamma_{i\bar{F}}} \int_0^1 \frac{\mu(\mu + \gamma_{iF} + \gamma_{i\bar{F}})}{\mu + \gamma_{iF}\tau_{iF\bar{F}}^{-\theta} x + \gamma_{i\bar{F}} x} dx$$

- True for any type of events in our model

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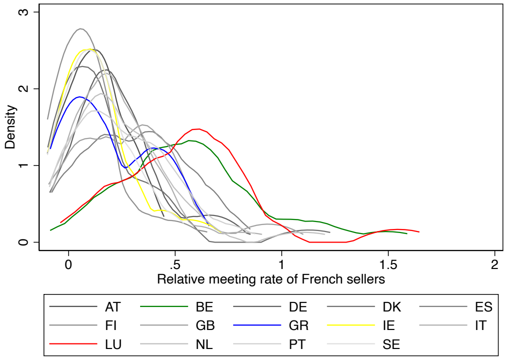
Relative meeting rates, by country



Note: The figure shows the distribution of relative meeting rate of French firms ($\gamma_{iF}/\gamma_{i\bar{F}}$), by country.

Relative meeting rates, by country

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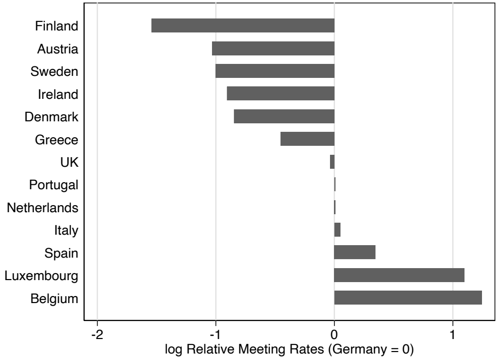

Note: The figure shows the relative meeting rate of French firms ($\gamma_{iF}/\gamma_{i\bar{F}}$), by country. Recovered from a regression of estimated coefficients on sector and country fixed effects. Germany is used as reference

More

Relative meeting rate, by sector

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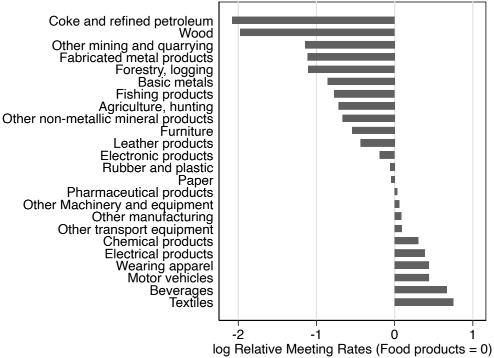

Note: The figure shows the mean value of the relative meeting rate of French firms $(\gamma_{iF}/\gamma_{i\bar{F}})$, by sector. Recovered from a regression of estimated coefficients on sector and country fixed effects. Food products are used as reference

Adjustment margins, High vs Low $\gamma_F / \gamma_{\bar{F}}$ Back