

Relationship stickiness and economic uncertainty

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Motivation

- Firm-to-firm networks characterized by “sticky relationships”
 - Costs associated with changing supplier...
... in product markets displaying relationship-specific investments, customization costs, informational and/or contractual frictions
⇒ coined as: “relationship-specificity”, “input-specificity”, “locked-in effect”
- Such stickiness matters in uncertain business environments
 - Dixit & Pindyck (1994): Uncertainty affects investment behaviors through the option value of waiting
 - Impact should be especially pronounced in product markets displaying large relationship-specific sunk costs

What we do

Empirically assess

- the impact of uncertainty shocks on trade ...
- ... in more or less sticky product markets

① Construct a novel measure of “Relationship stickiness”

- Duration of firm-to-firm relationships as an ex-post measure of stickiness
- \neq Existing measures (more aggregated, focus on 1 dimension of stickiness)

② Measure the extent to which more stickiness in business relationships is associated with a larger impact of uncertainty

- Exploit cross-country measures of policy uncertainty
- Look at new trade relationships, but also their death and the value of transactions

What we find

- RS measure correlates with measures of upstreamness, complexity, intra-firm trade, and is stable over time / across countries
- Uncertainty reduces the creation of new business relationships \Rightarrow this is magnified for more sticky products
- The impact of uncertainty is persistent: no evidence of delay / no trade diversion

Related literature

- **Relationship-specific investment in trade**

Countries' specialization and comparative advantages [Levchenko (2007) & Nunn (2007)]

Organization of production and vertical integration [Acemoglu et al. (2009)]

Global value chains [Antras & Chor (2013)]

Trade policy [Antras & Staiger (2012)]

Propagation of shocks in networks [Barrot & Sauvagnat (2016)]

⇒ Contribution on the measurement (See also Monarch, 2014)

- **Uncertainty and economic growth**

Impact of uncertainty shocks on patenting and productivity [Bloom and van Reenen (2002)], the response of investment to demand shocks [Bloom et al (2007)], aggregate output and employment [Bloom (2009)]

Impact on the growth and volatility of trade [Handley and Limao (2015, 2017), Graziano et al (2018), Novy and Taylor (2019)]

⇒ Impact of stickiness in firm-to-firm trade

Data

- French Customs data reporting the value of exports to EU countries per transaction from 1993 to 2017
- For each transaction we know the (French) seller, the 8-digit (CN) product, the EU buyer, the month and year
- Aggregate data by seller, buyer, product, month and year
- Concorde the CN8 data across years to avoid nomenclature-driven censoring
- Estimate relationship stickiness using durations of F-2-F relationships over 1996-2006 (robustness based on 2011-2017)
- Study the impact of uncertainty using data up to 2017

Description

Table: French monthly exports, 1996-2006

	# transac.	# sellers	# buyers	# sellers × products	# buyers × products	# buyer × seller × products
	(1)	(2)	(3)	(4)	(5)	(6)
EU15	101,085,679	109,456	1,743,157	1,331,702	14,348,859	19,504,028
Belgium	20,093,986	75,611	220,839	644,380	2,567,705	3,680,980
Germany	19,591,647	61,949	380,942	500,587	2,690,140	3,609,025
Italy	12,766,637	52,825	302,048	386,961	2,185,160	2,835,711
Spain	12,696,214	54,079	259,753	424,676	1,973,209	2,537,203
UK	10,592,077	49,920	173,118	364,629	1,368,087	1,971,993
Netherlands	6,313,236	45,401	110,954	274,736	815,679	1,145,419
Portugal	4,940,157	34,244	77,370	242,825	785,200	1,048,799
Luxemburg	3,161,404	32,178	25,376	204,952	420,501	579,303
Austria	2,392,499	23,368	44,254	133,799	349,275	448,760
Greece	2,040,793	20,829	36,768	142,327	314,962	433,051
Sweden	2,029,067	20,934	36,153	119,912	270,737	358,207
Denmark	1,993,252	23,877	34,368	130,478	264,146	366,991
Ireland	1,391,572	18,062	23,445	95,108	205,661	297,275
Finland	1,083,138	14,499	17,769	78,293	138,397	191,311

Data structure

- **Bipartite graph structure**
- **Many-to-one relationships**
 - Most sellers(-product) interact with more than one buyer within a month
68% of sellers export each of their products to more than one buyer per month on average (conditional on exporting)
 - Buyers tend to import a product from a single French seller
About 95% of the buyers import a 8-digit product, at a given date, from a single French seller
- **Heterogeneity in the frequency of transactions**
 - Drop buyers observed once
44% of buyer-product pairs but less than 2% of the value

Duration of French-EU buyers relationships

Table: Descriptive statistics on the duration of F-2-F relationships

	Mean	Median	P25	P75
Mean duration	18	10	3	25
Frequency of transactions	0.332	0.222	0.095	0.500
Proba Recall	0.013	0.000	0.000	0.000

Table: Duration and the size of trade flows

	(1)	(2)	(3)
	Log of duration		
Log of mean exports	.041*** (.000)	.070*** (.000)	.237*** (.001)
Observations	6,904,758	6,904,585	3,331,224
R ²	0.003	0.151	0.242
Within R ²	0.003	0.007	0.057
Fixed effects		Product	Product × buyer

Notes: Duration in months. Computed for each F-2-F relationship observed over 1996-2006

Conceptual framework

- A buyer purchases an input from a single supplier
- A buyer receives an offer with probability λ every period (search frictions)
- An offer is a quality-adjusted price P drawn from a distribution

$$H_P(p) = \mathbb{P}(P \leq p)$$

- Given its outside option p , the buyer decides to switch whenever $P < \frac{p}{\gamma}$ where $\gamma > 1$ (switching costs)

⇒ Expected duration, conditional on p writes:

$$\mathbb{E}[\mathcal{T}|p] = \frac{1}{\lambda H_P(p/\gamma)}$$

i.e. conditional on the quality of a match, products that display larger switching costs and/or more search frictions involve longer relationships

Parametric assumptions

- ① Iso-elastic demand function with elasticity σ
- ② Price distribution is inverse-Pareto with shape k

⇒ Expected duration, conditional on sales r writes:

$$\mathbb{E}[\mathcal{T}|r] = \eta \left(\frac{r}{r_{min}} \right)^{\frac{k}{\sigma-1}}$$

with $\eta \equiv \frac{\gamma^k}{\lambda}$ a measure of **relationship stickiness**

Estimated equation

⇒ Expected duration, conditional on a sales quantile:

$$\mathbb{E}[\mathcal{T} \mid R \in R_q] = \mathbb{E} \left[\eta \left(\frac{R}{r_{min}} \right)^{\frac{k}{\sigma-1}} \mid R \in R_q \right]$$

where $R_q := [r_{q-1}, r_q] \equiv \left\{ r \mid \bar{H}_R^{-1} \left(\frac{q-1}{Q} \right) \leq r \leq \bar{H}_R^{-1} \left(\frac{q}{Q} \right) \right\}$

and q varies between 1 and $Q - 1$ when Q is the number of cut points

- Under Pareto distribution, this simplifies into:

$$\mathbb{E}[\mathcal{T} \mid R \in R_q] = \eta \log \left[\frac{\mathbb{P}(R \geq r_{q-1})}{\mathbb{P}(R \geq r_q)} \right]$$

which can be estimated by OLS

Implementation

To back out η , run the following regression

$$\ln Dur_{qpc} = FE_p + \alpha \log \log \left[\frac{\mathbb{P}(R \geq r_{q-1})}{\mathbb{P}(R \geq r_q)} \right] + \epsilon_{qpc}$$

- Dur_{qpc} is the mean duration of trade relationships in size-bin q , for product p in destination c (bottom and top 1 percentile excluded)
- ⇒ Recover the distribution of *relative* measures of relationship stickiness ($FE_p = \log \eta_p$)

Most and least sticky products

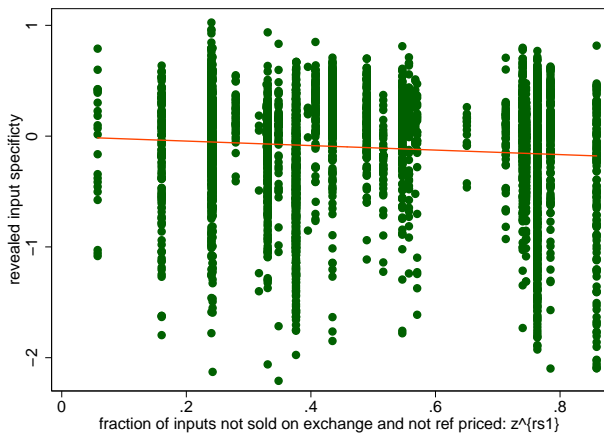
- Bottom 10
 - final good products that are usually produced in large quantities and sold in anonymous markets (e.g. Men's suits)
 - some non-differentiated primary goods (Ferro-alloys or Raw Sild)
 - number of capital goods such as machines used in the textile industry
- Top 10
 - mostly industrial (specialty) chemical, pharmaceutical and mineral products

Correlation with other measures

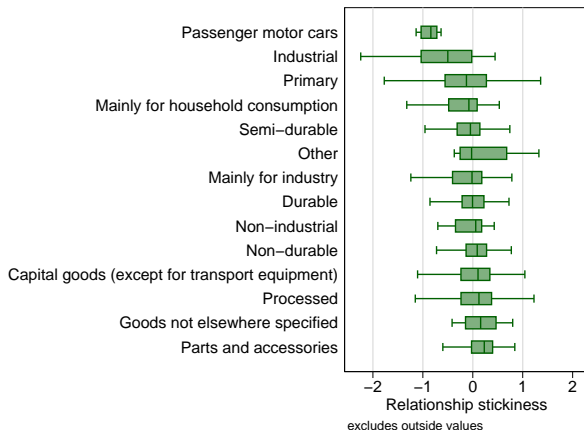
Measure	Corr(η, \cdot)	OLS η
$\mathbf{1}_{differentiated}$ (Rauch)	.04**	-.01
Share of not homogen. products (Nunn)	.06***	.05
Upstreamness (Antras et al.)	.16***	.16***
Elasticity of subs. (Imbs & Mejean)	-.10***	-.28***
Product complexity (Hausman & Hidalgo)	.25***	.10***
Observations		3,863
R^2	-	.12

Correlations are consistent with expectations but variance is substantially larger than in Rauch (1999) and Nunn (2007)

RS and Nunn' classification



RS and the BEC



Other sanity checks

- Estimated stickiness positively correlated with share of intra-trade in US trade
 - ⇒ Consistent with models of vertical integration, eg Antras (2003), and Antras & Helpman (2004)
- Distance elasticity recovered from a gravity equation is larger in high RS markets
 - ⇒ Consistent with model by Head & Ries (2008) (monitoring costs in distant, sticky markets)
- Impact of good institutions on exports in high RS markets
 - ⇒ Consistent with Nunn (2007) (Quality of contract enforcement as a source of comparative advantages in markets with high relationship-specific investments)

Uncertainty and the formation of trade relationships

- Bloom (2009) and subsequent lit.: Impact of uncertainty on the economic activity, through the decision to hire/invest/enter a market
 - ⇒ Trade: Pierce & Schott'16, Handley & Limao'16, Novy & Taylor'14
- Hypothesis:
 - Impact of uncertainty on the probability to form a new trade relationship...
 - Impact stronger for trade involving specific inputs
 - Additional impact on the number of trade relationships ending
- Baseline specification:

$$\# \text{ new relations}_{pct} = \alpha \text{Uncert}_{ct} + \beta \text{RS}_p + \gamma \text{RS}_p \times \text{Uncert}_{ct} + \epsilon_{pct}$$

Uncertainty and the formation of trade relationships (ii)

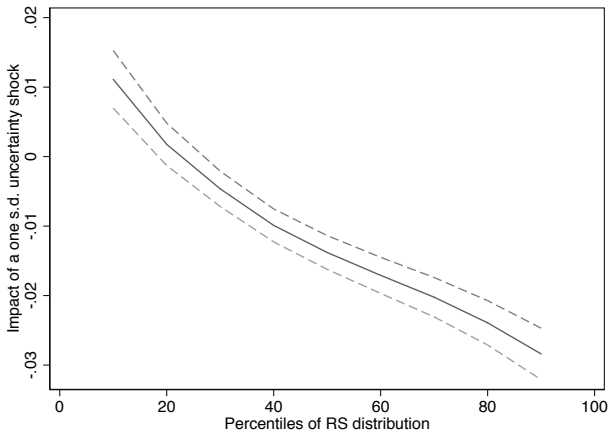
- LHS variable:
 - New interaction btw a French seller and a foreign buyer
 - Focus on years 2001-2010
 - Define a new relationship as the first transaction of a seller-buyer pair that have never interacted since 1995
- RHS variable: Uncertainty episodes
 - ⇒ Ahir, Bloom & Furceri (2019) “World Uncertainty Index”: Quarterly data for 12 EU countries, Frequency counts of “uncertainty” in the EIU reports
- Econometric strategy:
 - Poisson regression and linear probability model
 - Use different sets of FE to account for country trends and seasonality

Uncertainty, stickiness, and new relationships

<i>Dep. var:</i>	(1)	(2)	(3)	(4)	(5)
	# new trade relationships				
<i>Uncertainty shock dummy</i>		-0.01*** (0.001)	-0.09*** (0.004)		-0.00 (0.001)
- × <i>RS index</i>	-0.03*** (0.002)	-0.02*** (0.002)	-0.12*** (0.009)		-0.01*** (0.002)
<i>Uncertainty index</i>				-0.03*** (0.002)	
- × <i>RS index</i>				-0.07*** (0.005)	
<i>Observations</i>	3,622,645	3,622,645	3,622,645	3,622,645	1,703,160
<i>R-squared</i>	0.676	0.718		0.718	0.714
<i>Method</i>	LPM	LPM	Poisson	LPM	LPM
<i>Period</i>	2000-2010	2000-2010	2000-2010	2000-2010	2011-2016
<i>Fixed Effects</i>					
<i>Product × quarter</i>	✓		✓		
<i>Product × period</i>		✓		✓	✓
<i>Country</i>		✓	✓	✓	✓
<i>Country × period</i>	✓				

Uncertainty, stickiness, and new relationships

Figure: Impact of a one s.e. shock on uncertainty, along the distribution of RS



Notes: Based on results in Column (7) of previous table

Uncertainty, stickiness, and new relationships: mechanisms

- Temporary or permanent impact?
 - Examine the persistence of the results
 - Include lags of uncertainty and interaction btw lags and RS
 - ⇒ **persistent** negative impact vanishes after 3 quarters
- Trade destruction or trade diversion?
 - Examine the impact of trade uncertainty in third countries on new relationships
 - Include the level of uncertainty in other countries and its interaction with RS
 - ⇒ **trade destruction**: if anything, uncertainty in third countries reduces new relationships

Uncertainty and trade: Other margins of adjustment

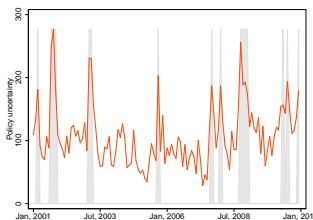
Dep. var:	(1) <i># disrupted trade relationships</i>	(2)	(3)	(4) <i>Export Value</i>	(5)
Uncertainty shock dummy		0.02*** (0.004)	0.02*** (0.011)	-0.02*** (0.005)	
- × RS index	-0.15*** (0.008)	-0.23*** (0.008)	-0.26*** (0.025)	0.10*** (0.012)	0.13*** (0.011)
Observations	2,546,156	2,546,156	2,546,156	5,687,280	5,687,280
R-squared	0.676	0.718		0.699	0.658
Method	LPM	LPM	Poisson	LPM	LPM
Period	1996-2006	1996-2006	1996-2006	1996-2010	1996-2010
<i>Fixed Effects</i>					
Product × quarter	✓		✓	✓	
Product × period		✓			✓
Country		✓	✓		✓
Country × period	✓			✓	

Conclusion

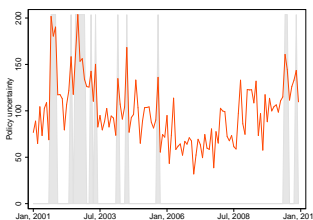
- New method to reveal relationship stickiness using transaction data
- More sticky product markets are more strongly affected by economic uncertainty
- Topical issues in a context of high uncertainty + strong degree of stickiness in GVCs

Policy uncertainty, 2000-2015 (Baker, Bloom, Davis 2016)

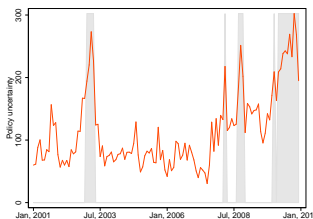
Germany



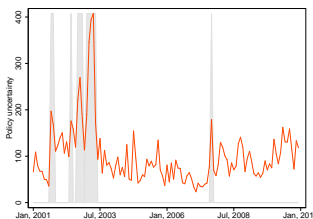
Italy



UK



Spain



Policy uncertainty, 2000-2015 (Baker, Bloom, Davis 2016)

Table: Correlation - uncertainty

	DE	IT	UK	ES
Germany	1,00			
Italy	0,52	1,00		
UK	0,67	0,55	1,00	
Spain	0,54	0,49	0,45	1,00

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