

# Opposing firm-level responses to the China shock: output competition versus input supply?

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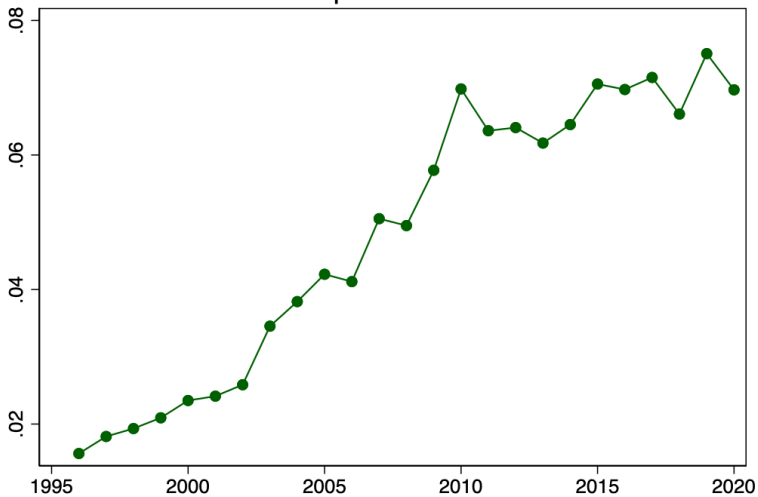
**Introduction**

Empirical strategy

Results

Conclusion

## China's import share in France



Source: BACI, CEPII, HS96.

## What do we know?

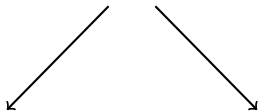
- ▶ Increased competition from China contributed  $\sim 10\%$  to the decline in manufacturing employment (Autor et al., 2013, 2016; Malgouyres, 2017).
  - ▶ Long term impact on displaced workers' earnings (Autor et al., 2014; Basco et al., 2020).
  - ▶ But up to some point increased competition could foster innovation Aghion et al. (2005).
  - ▶ Conflicting findings of Autor et al. (2020a) in the US and Bloom et al. (2016) in Europe.
  - ▶ Trade also allows firms to access cheaper inputs Amiti and Konings (2007); Goldberg et al. (2010):
- Distinguish **output** from **input** trade competition.

Firm

Firm

Exports

Imports



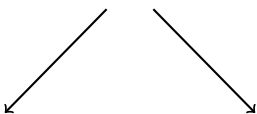
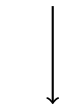
Firm

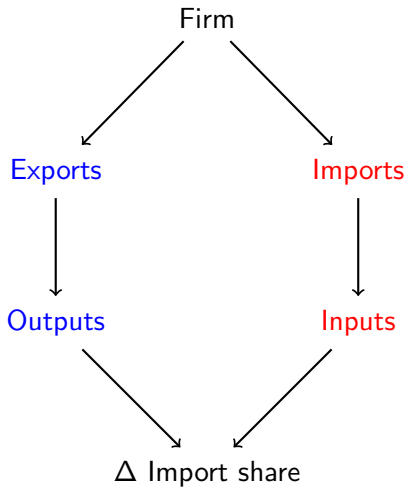
Exports

Imports

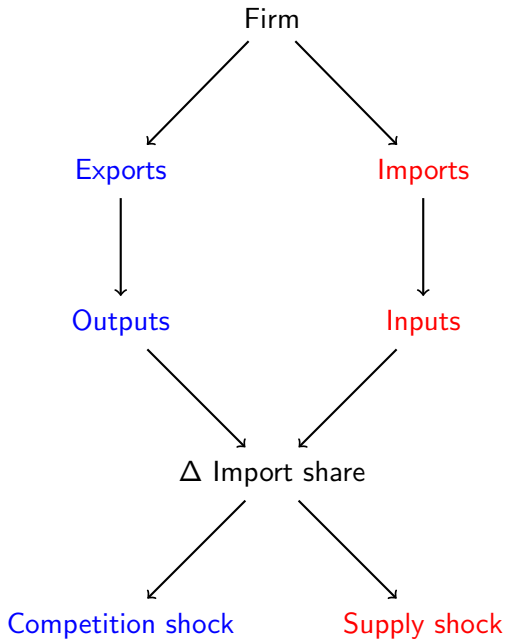
Outputs

Inputs









# Multiple response margins to trade competition

- ▶ automation,  
→ buying machines
- ▶ technology improvements,  
→ patenting new processes
- ▶ multidimensional changes in the product mix,  
→ upstream/downstream? Away from low comparative advantage goods?
- ▶ outsourcing of production tasks,  
→ buying final good itself, exit manufacturing.
- ▶ decline and exit.

Introduction

**Empirical strategy**

Results

Conclusion

## Empirical strategy

Our empirical strategy depends upon merging different sources of information at the firm level:

- ▶ firm level trade data on French firms' HS6 exports and imports (~ 5000 products)
- ▶ Product level global trade data: BACI.
- ▶ Various firm level variables which can be found in fiscal files (FICUS)
- ▶ Firm level patenting behavior: PATSTAT matched to administrative identifiers through Lequien et al. (2019)'s matching algorithm.

### **Potential pitfalls:**

1. Selected sample of firms = trading firms
2. Selected sample of products within firms = only products for which French firms have a comparative advantage.

## Sample - I

We restrict our sample to:

1. privately managed french manufacturing firms recorded with positive sales as of  $t_0 = 1999$ ,
2. which are measured with at least 10 employees at least once in our time window,
3. and which have customs data available prior to base year  $t_0$ .

Our various data sources run from 1994 to 2007:

- ▶ we use the 1994-1999 period to construct exposure measures and firm level controls,
- ▶ and 2000-2007 data to construct shocks and analyze outcomes.

## Sample - II

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	All mean	Manufacturing mean	Customs mean	Patenting mean
Sales	8358.75	13592.21	17266.54	60233.90
Employees	40.44	60.22	81.25	259.28
Value added	2220.25	3236.57	4450.29	15881.26
Value added per worker	44.26	41.47	45.43	54.28
Labor share	0.58	0.60	0.59	0.52
Export intensity	0.05	0.13	0.13	0.21
Exported products	1.23	5.17	7.87	19.14
Imported products	1.99	8.38	12.75	27.90
Patent applications	0.00	0.25	0.37	2.96
Triadic patents	0.00	0.01	0.02	0.15
Exit	0.25	0.27	0.27	0.10
Death	0.14	0.14	0.14	0.06
Observations	243056	57764	37956	4710

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*Note:* Mean of descriptive variables by firm group in 1999.

# Trade shocks

More concretely:

- ▶ let  $x_{i,t_0}^f$  and  $m_{i,t_0}^f$  denote firm  $f$ 's exports and imports of product  $i$  in base year  $t_0$ ,
- ▶ let  $S_{i,t}$  be the share of France's total imports of good  $i$  originating in China in year  $t$ .

We define firm  $f$ 's horizontal and vertical exposures to Chinese import competition in year  $t$ , as predicted by its base year  $t_0$  export/import structure as:

$$O_t^f = \sum_i \frac{x_{i,t_0}^f}{\sum_j x_{j,t_0}^f} S_{i,t}$$

and

$$I_t^f = \sum_i \frac{m_{i,t_0}^f}{\sum_j m_{j,t_0}^f} S_{i,t}$$

## Empirical specification

To identify the causal impact of increased exposure to trade competition on firm level outcome consider the following long-difference specification:

$$\Delta_{t-k}^t Y_f = \alpha + \beta_O \Delta_{t-k}^t O_f + \beta_I \Delta_{t-k}^t I_f + \gamma' X_{f,t_0} + \eta_{s(f)} + \epsilon_f$$

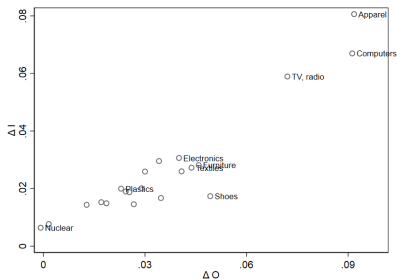
Where:

- ▶  $Y_f$  is firm  $f$ 's outcome,
- ▶  $\Delta_{t-k}^t$  either denotes the long difference or Davis-Haltiwanger long difference of a variable between  $t$  and  $t - k > t_0$ ,
- ▶  $X_{f,t_0}$  are a set of firm level pre- $t_0$  controls,
- ▶  $\eta_{s(f)}$  are 2-digits industry fixed effects.

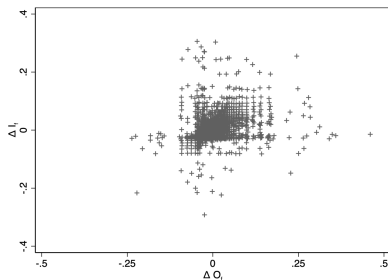
To get rid of potential biases on  $\beta_O$  and  $\beta_I$ , instrument  $\Delta_{t-k}^t \tilde{O}_f$  and  $\Delta_{t-k}^t \tilde{I}_f$  by their counterpart in a set of 6 economically advanced countries excluding France.



Figure: Comparing output and input exposure



(a) Industry level



(b) Firm level

Note: while (a) plots of the long differences over the 2000/2007 period of our output and input shocks aggregated at the industry level, (b) plots the firm level residual variation of our long difference input and output shocks controlling for industry fixed effects.

Introduction

Empirical strategy

**Results**

Conclusion

# Industry vs firm level evidence on employment

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Output	-0.728*** (0.213)	-0.467* (0.272)	-1.012*** (0.386)	-2.310*** (0.792)	-2.703*** (0.765)	-0.872*** (0.197)	-0.367** (0.167)	-0.0130 (0.0311)
Input				1.868* (1.075)	1.833* (1.003)	-0.0214 (0.189)	0.136 (0.179)	-0.0208 (0.0312)
Firm controls	✓	✓	✓	✓	✓	✓	✓	✓
Sector FE							✓	✓
Shocks	Industry	Industry	Industry	Industry	Industry	Firm	Firm	Firm
Sample	All	All	All	All	Trading	Trading	Trading	Trading
F		131.6	119.6	17.66	14.00	160.1	142.2	142.2
Mean outcome	-0.0657	-0.0657	-0.0657	-0.0657	-0.108	-0.108	-0.108	0.0416
N	42323	42323	42323	42323	27884	27884	27883	27883

Standard errors in parentheses

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

# Innovation

## Patents:

- ▶ Look at the yearly flow of patents after 2000 versus before 2000 (DH growth rate)
- ▶ Set of "patenting" firms (at least one patent over the period)
- ▶ Different measures of patenting: triadic, EPO, priority, applications (fractional counts).

## Products:

- ▶ For exporting firms, look at exported products after 2000.
- ▶ Share of products exported prior to 2000 which disappeared as of 2007.
- ▶ Evolution of the average comparative advantage relative to China of a firm's exported products.
- ▶ *Relative comparative advantage* = France/China relative exports to the rest of the world at the product level, over time.
- ▶ Concentration of exported products: HHI at the HS6 product level.

# Main results

	Main outcomes					Patents		Products		
	(1) Sales	(2) Employment	(3) Labor share	(4) Exit mfg	(5) Death	(6) Triadic	(7) Appln	(8) Discontinued	(9) New	(10) Comp Adv
Output	-0.417** (0.197)	-0.367** (0.167)	-0.255** (0.106)	0.0104 (0.0751)	0.0707 (0.0798)	-1.312*** (0.487)	-1.488* (0.854)	0.196* (0.117)	0.191 (0.161)	0.637*** (0.155)
Input	0.0653 (0.186)	0.136 (0.179)	0.136 (0.114)	0.301*** (0.0890)	-0.0765 (0.0931)	-0.179 (0.482)	0.412 (0.945)	-0.133* (0.0738)	-0.488*** (0.112)	-0.288* (0.151)
F-stat	142.2	142.2	133.2	142.2	169.9	141.8	141.8	131.3	162.0	148.2
Mean outcome	0.0704	-0.108	-0.0236	0.0745	0.160	0.100	0.289	0.815	0.472	0.00161
Observations	27,883	27,883	24,999	27,883	33,203	4,710	4,710	24,232	17,307	16,090

# Frontier vs Laggard firms

	Main outcomes					Patents		Products		
	(1) Sales	(2) Employment	(3) Labor share	(4) Exit mfg	(5) Death	(6) Triadic	(7) Appln	(8) Discontinued	(9) New	(10) Comp Adv
Output*(q=1)	-0.409* (0.247)	-0.489** (0.206)	-0.244* (0.127)	-0.0326 (0.0648)	0.0349 (0.116)	-1.259** (0.516)	-1.888* (1.058)	0.0189 (0.0926)	-0.0368 (0.192)	0.578*** (0.208)
Output*(q=2)	-0.403 (0.264)	-0.0778 (0.204)	-0.263 (0.168)	0.117 (0.127)	0.0442 (0.0888)	-1.159 (0.838)	-0.904 (1.372)	0.411** (0.184)	0.377** (0.178)	0.694*** (0.178)
Input*(q=1)	0.0185 (0.204)	-0.207 (0.200)	-0.0181 (0.128)	0.220*** (0.0740)	0.126 (0.110)	-0.0668 (0.481)	0.255 (1.139)	-0.0925 (0.0853)	-0.415** (0.172)	-0.327 (0.213)
Input*(q=2)	0.117 (0.328)	0.488* (0.282)	0.348* (0.188)	0.371** (0.162)	-0.322** (0.143)	-0.341 (0.901)	0.428 (1.622)	-0.224* (0.120)	-0.577*** (0.156)	-0.264 (0.194)
F-Stat	70.32	70.32	66.66	70.32	83.93	32.23	32.30	65.32	51.80	49.59
Mean outcome	0.0704	-0.108	-0.0236	0.0745	0.160	0.100	0.289	0.815	0.472	0.00161
Observations	27,883	27,883	24,999	27,883	33,203	4,710	4,710	24,232	17,307	16,090

Introduction

Empirical strategy

Results

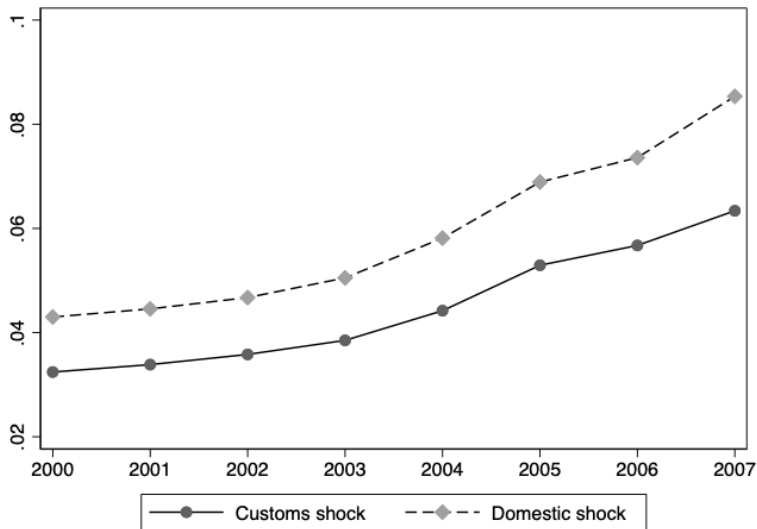
**Conclusion**

# Conclusion

- ▶ We separately identify firms' responses to **output competition** and **input supply** trade shocks.
- ▶ Negative effect of the output competition component on:
  1. sales, employment both across and within industries
  2. the labor share within sectors: consistent with firms moving away labor-intensive, low comparative advantage goods?
  3. firm survival at the industry level only
- ▶ ...concentrated on low-productivity, low-comparative advantage, downstream firms.
- ▶ Surviving firms leaving manufacturing in response to increased vertical exposure: dropping manufactured goods and concentrating on associated services?



## Domestic vs customs - I



# Domestic vs customs - II

	EMPLOYMENT							
	Without industry FE (column 6 of Table ??)				With industry FE (column 7 of Table ??)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Output	-0.879*** (0.194)	-1.017*** (0.227)	-0.897*** (0.304)	-0.894*** (0.301)	-0.328** (0.160)	-0.434** (0.190)	0.214 (0.435)	0.243 (0.437)
Shocks	Customs	Customs	EAE	EAE	Customs	Customs	EAE	EAE
Sample	Customs	Customs and EAE	Customs and EAE	EAE	Customs	Customs and EAE	Customs and EAE	EAE
Firm controls	✓	✓	✓	✓	✓	✓	✓	✓
Industry FE					✓	✓	✓	✓
F-Stat	310.9	161.7	89.00	75.34	232.0	141.1	104.2	96.15
Mean outcome	-0.108	-0.182	-0.182	-0.183	-0.108	-0.182	-0.182	-0.183
Observations	27884	12864	12864	14438	27883	12863	12863	14437

	TRIADIC PATENTS							
	Without industry FE (column 6 of Table ??)				With industry FE (column 7 of Table ??)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Output	-1.465*** (0.492)	-1.789*** (0.569)	-1.740** (0.749)	-1.740** (0.749)	-1.382*** (0.483)	-1.470*** (0.545)	-1.913** (0.908)	-1.913** (0.908)
Shocks	Customs	Customs	EAE	EAE	Customs	Customs	EAE	EAE
Sample	Customs	Customs and EAE	Customs and EAE	EAE	Customs	Customs and EAE	Customs and EAE	EAE
Firm controls	✓	✓	✓	✓	✓	✓	✓	✓
Sector FE					✓	✓	✓	✓
F-Stat	176.0	130.4	155.1	155.1	159.2	128.8	149.7	149.7
Mean outcome	0.100	0.110	0.110	0.110	0.100	0.110	0.110	0.110
Observations	4710	3510	3510	3510	4710	3509	3509	3509

## Appendix: common shock

	Main outcomes					Patents		Products		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Sales	Employment	Labor share	Exit mfg	Death	Triadic	Appln	Discontinued	New	Comp Adv
Horizontal	-0.403** (0.195)	-0.374** (0.175)	-0.336*** (0.108)	0.0385 (0.0710)	0.0512 (0.0890)	-1.240** (0.553)	-1.967* (1.029)	0.279*** (0.102)	0.243 (0.164)	0.462*** (0.167)
Vertical	0.205 (0.202)	0.322* (0.191)	0.0808 (0.119)	0.269*** (0.0828)	0.0159 (0.0929)	-0.560 (0.457)	-1.040 (0.799)	0.0297 (0.0736)	-0.225* (0.129)	-0.00775 (0.141)
Common	-0.215 (0.222)	-0.215 (0.186)	0.140 (0.134)	0.0113 (0.0968)	-0.0563 (0.112)	-0.0744 (0.420)	1.104 (0.935)	-0.278*** (0.0714)	-0.288** (0.131)	-0.0332 (0.168)
F	88.05	88.05	79.67	88.05	118.6	71.79	71.79	105.4	123.2	125.9
Mean outcome	0.0704	-0.108	-0.0236	0.0745	0.160	0.100	0.289	0.815	0.472	0.00161
N	27883	27883	24999	27883	33203	4710	4710	24232	17307	16090

## Appendix: all patent measures

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	(1)	(2)	(3)	(4)
	Triadic	EPO	Priority	Applications
Horizontal	-1.312*** (0.487)	-1.687** (0.820)	-1.138 (0.751)	-1.488* (0.854)
Vertical	-0.179 (0.482)	0.940 (0.746)	0.0968 (0.925)	0.412 (0.945)
F	141.8	141.8	141.7	141.8
Mean outcome	0.100	0.235	0.217	0.289
N	4710	4710	4710	4710

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Standard errors in parentheses

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

## Appendix: all patent measures, frontier vs laggard

	(1)	(2)	(3)	(4)
	Triadic	EPO	Priority	Applications
Horizontal*(q=1)	-1.259** (0.516)	-1.827* (0.955)	-1.276 (1.004)	-1.888* (1.058)
Horizontal*(q=2)	-1.159 (0.838)	-1.507 (1.299)	-1.106 (1.216)	-0.904 (1.372)
Vertical*(q=1)	-0.0668 (0.481)	0.438 (0.866)	-0.410 (1.069)	0.255 (1.139)
Vertical*(q=2)	-0.341 (0.901)	1.544 (1.340)	0.729 (1.632)	0.428 (1.622)
F	32.23	32.42	32.27	32.30
Mean outcome	0.100	0.235	0.217	0.289
N	4710	4710	4710	4710

Standard errors in parentheses

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