14.582: International Trade II
— Lecture 24: Trade and Growth (Empirics II)

Plan for Today's Lecture

- We will look at a common dynamic motive for industrial policy: dynamic production externalities.
- This gives rise to the so-called "infant-industry argument" for protection (Hamilton, 1791)
- We will then look at evidence for this from Juhasz (AER, 2018)
  - See also: David (1970) on US cotton textiles, Baldwin and Krugman (1986) simulation of computer hardware industry, Head (1994) on steel rail, and Irwin (2000) on tinplate industry

Juhasz (2018): Research Questions

1. Can infant industry protection work?
   - Idea has long tradition in the history of economic thought
   - Empirical challenges make identification difficult

2. Juhasz (2018) provides natural experiment that plausibly replicates infant industry protection

Natural experiment from 19th century France

1. Context: Development of mechanized cotton spinning across French Empire during and after the Napoleonic Wars (1803-1815)

2. Empirical challenges:
   - Protection usually implemented at the country-wide level. (Here: within-country variation in trade protection)
   - Protection usually implemented by policymaker. (Here: temporary protection driven by changes in external trade costs)

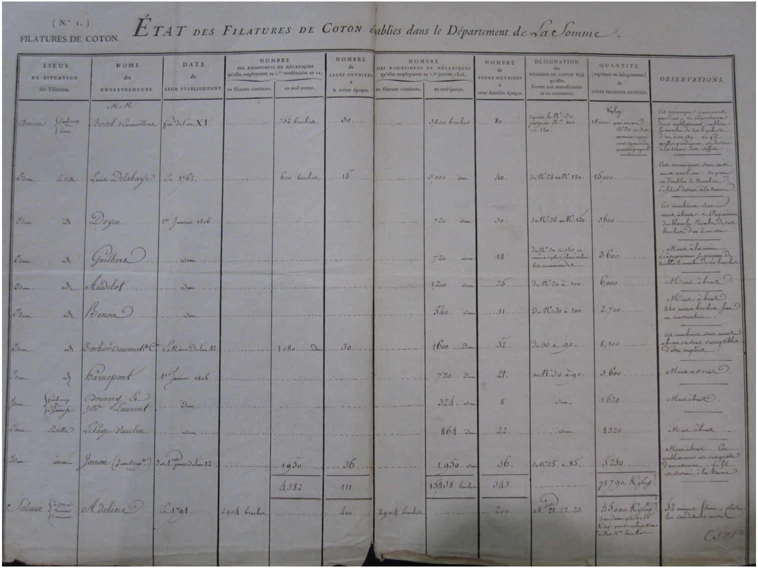
3. Main idea here: costs of trading with Britain increase temporarily and differentially across French regions

Identifying infant industry mechanism in two steps

1. Short run: Did regions which became better protected from trade increase capacity in new technology more?

2. Long-run: Did the effects persist after pre-blockade variation in trade protection was restored?

Data Collection – Mechanized spindles



(N.° 1.)
FILATURES DE COTON.

ÉTAT DES FILATURES DE COTON établies dans le Département de La Somme.

LIEUX DE SITUATION des Filatures.	NOMS des ENTREPRENEURS.	DATE de LEUR ÉTABLISSEMENT.	NOMBRE DES ASSORTIMENS DE MÉCANIQUES qu'elles employaient au 1.er vendémiaire an 12, en filatures continues.	en mul-jennys.	NOMBRE de LEURS OUVRIERS à la même époque.	NOMBRE DES ASSORTIMENS DE MÉCANIQUES qu'elles employaient au 1.er janvier 1806, en filatures continues.	en mul-jennys.	NOMBRE de LEURS OUVRIERS à cette dernière époque.	DÉSIGNATION des NUMÉROS DE COTON FILÉ qu'elles livrent aux manufactures et au commerce.	QUANTITÉ (exprimée en kilogrammes) de LEURS PRODUITS ANNUELS.	OBSERVATIONS.
Amiens {faubourg de Hem	M.M. Boitel d'Erawilliers	fin de l'an XI		752 broches	30		3800 broches	80	depuis le N.° 30 jusqu'au N.° 100 et 120.	Kylog. 18000. par an au N.° 30 et des numéros supér. [illegible]	Ces mécaniques sont mues par l'eau. Le Propriétaire de cet établissement doublera le nombre de ses broches d'ici à un an. Le fil qu'elles produisent est destiné à la trame des étoffes.
Idem ... la Ville	Louis Delahaye	En 1762.		600 broches	15		3,000 ... idem	40.	du N.° 24 au N.° 120.	15,000	Ces mécaniques sont aussi mues par l'eau. On pense en doubler le Nombre. Le fil est destiné à la trame.
Idem. id.	Doyen	1.er Janvier 1806.					720. idem	30.	du N.° 26 au N.° 150.	3600	Ces machines sont mues à bras. Le Propriétaire doublera le Nombre de ses broches d'ici à un an.
Idem id.	Guilbert	idem					720. idem	18.	du N.° 30 à 150 et même plus élevé selon les commandes.	3600	Mues à la main. L'Entrepreneur se propose de doubler le nombre de ses broches.
Idem. id.	Audelot	idem					1,200. idem	25.	du N.° 20 à 100.	6,000	Mues à bras.
Idem. id.	Benoist	idem					540 idem	11.	du N.° 30 à 100.	2,700.	Mues à bras. 540 autres broches sont en construction.
Idem id.	Barbier Daucourt & C.ie	En Nivose de l'an 12		1080 idem	30.		1600 idem	52.	du 30 à 90.	8,100	Ces machines sont mues à bras et sont susceptibles d'être triplées.
Idem id.	Harnepont	1.er Janvier 1806.					720. idem	21.	du N.° 30 à 90.	3,600	Mues à bras.
Idem. {faubourg de [illegible]	Derivery et J.B.te Laurent	idem					324. idem	8.	idem	1620	Mues à bras.
Idem. la Ville	Lelage Vauclin	idem					864 idem	22.	idem	1320	Mues à bras.
Idem idem	Joiron (Jean Bap.te)	du 1.er jour de l'an 12.		1950	36		1,950. idem	36.	du N.° 25 à 85.	5250	Mues à bras. Cet établissement est susceptible d'accroissement. Le fil est destiné à la trame.
				4382.	111.		15438. broches	343.		71790. Kylog.	
Saleux {[illegible]	Adeline	En 1791.	2904 broches		400.	2904 broches		200.	N.os 21. 22. 23.	45000 Kylog. [illegible]	[illegible]

Data Collection – Shipping Routes


LLOYD'S LIST.

No. 4375] LONDON, TUESDAY, AUGUST 1, 1809.

LONDON: Printed by W. PHILLIPS, George Yard, Lombard Street.

PRICES OF STOCKS.

COURSE OF EXCHANGE.

THE MARINE LIST.

Digitized by Google

Original from HARVARD UNIVERSITY

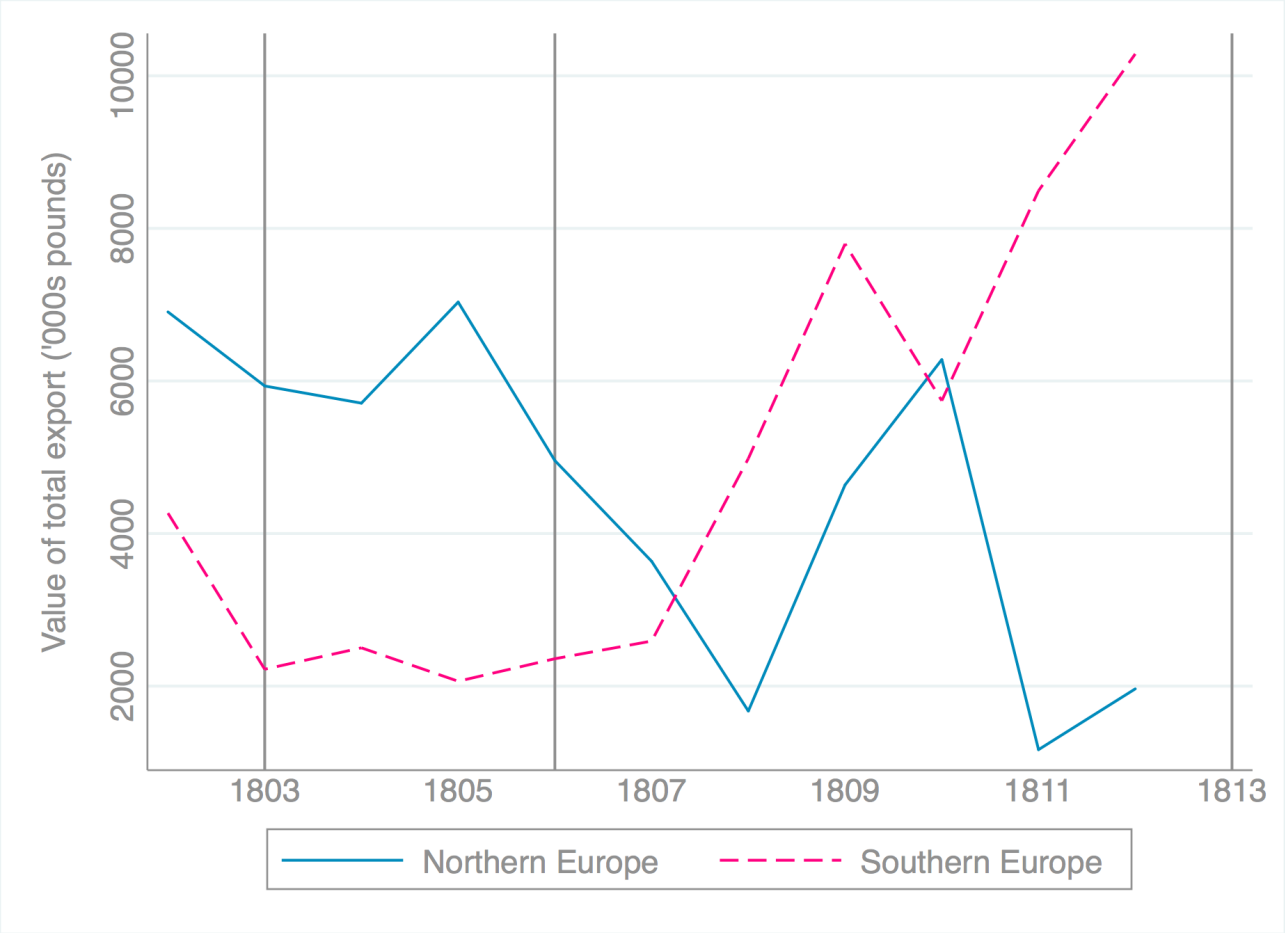
	A	B	C
1	Date	To Harbor	Sailed for (S) / Arrived from (A)
2	1809-3-JANUARY	Stockholm	A
3	1809-3-JANUARY	Carlscrona	A
4	1809-3-JANUARY	Heligoland	A
5	1809-3-JANUARY	Cork	S
6	1809-3-JANUARY	Dublin	S
7	1809-3-JANUARY	Cadiz	S
8	1809-3-JANUARY	Belfast	S
9	1809-3-JANUARY	Oporto	S
10	1809-3-JANUARY	Lisbon	S
11	1809-3-JANUARY	Corunna	S
12	1809-3-JANUARY	Madeira	S
13	1809-3-JANUARY	Malta	S
14	1809-3-JANUARY	Cork	S
15	1809-3-JANUARY	Lisbon	A

The Napoleonic Blockade against Britain

- NB: Implemented as a "self-blockade"
- Displacement of trade routes increased trade costs with Britain differentially across France

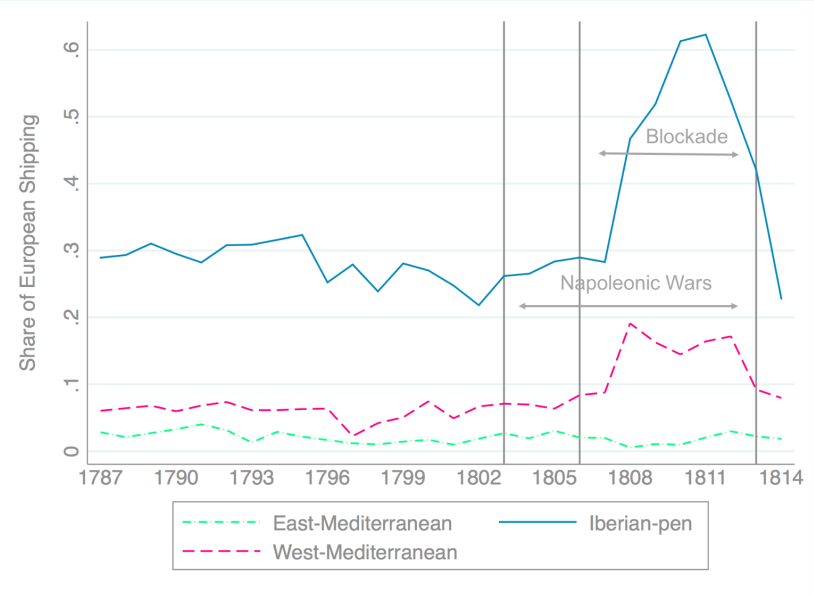
Blockade successful in North, not in South

Trade did not stop; direction changed

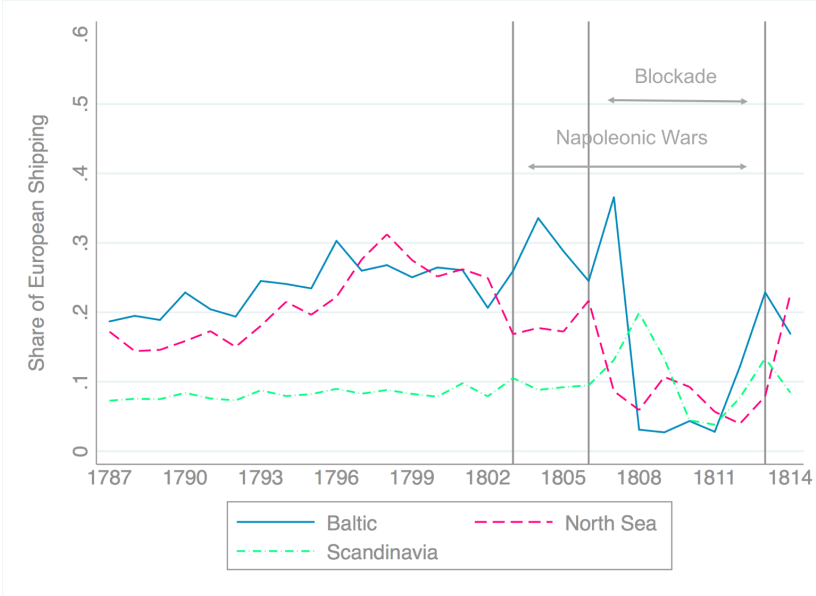


Exports of British merchandise and other produce, Crouzet (1987)

Significant change in routes within regions



Southern Europe

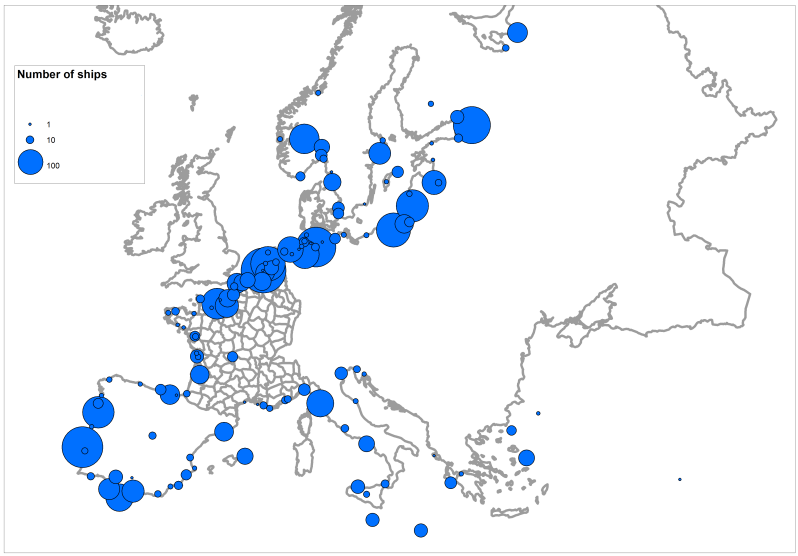


Northern Europe

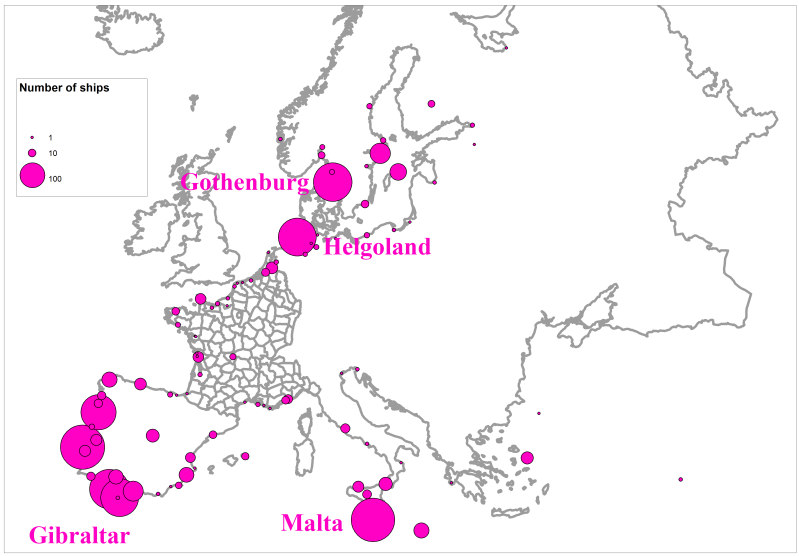
Share of shipping with Britain

Variation in blockade at the port level

Smuggling via stable ports outside the French Empire accessible to Great Britain



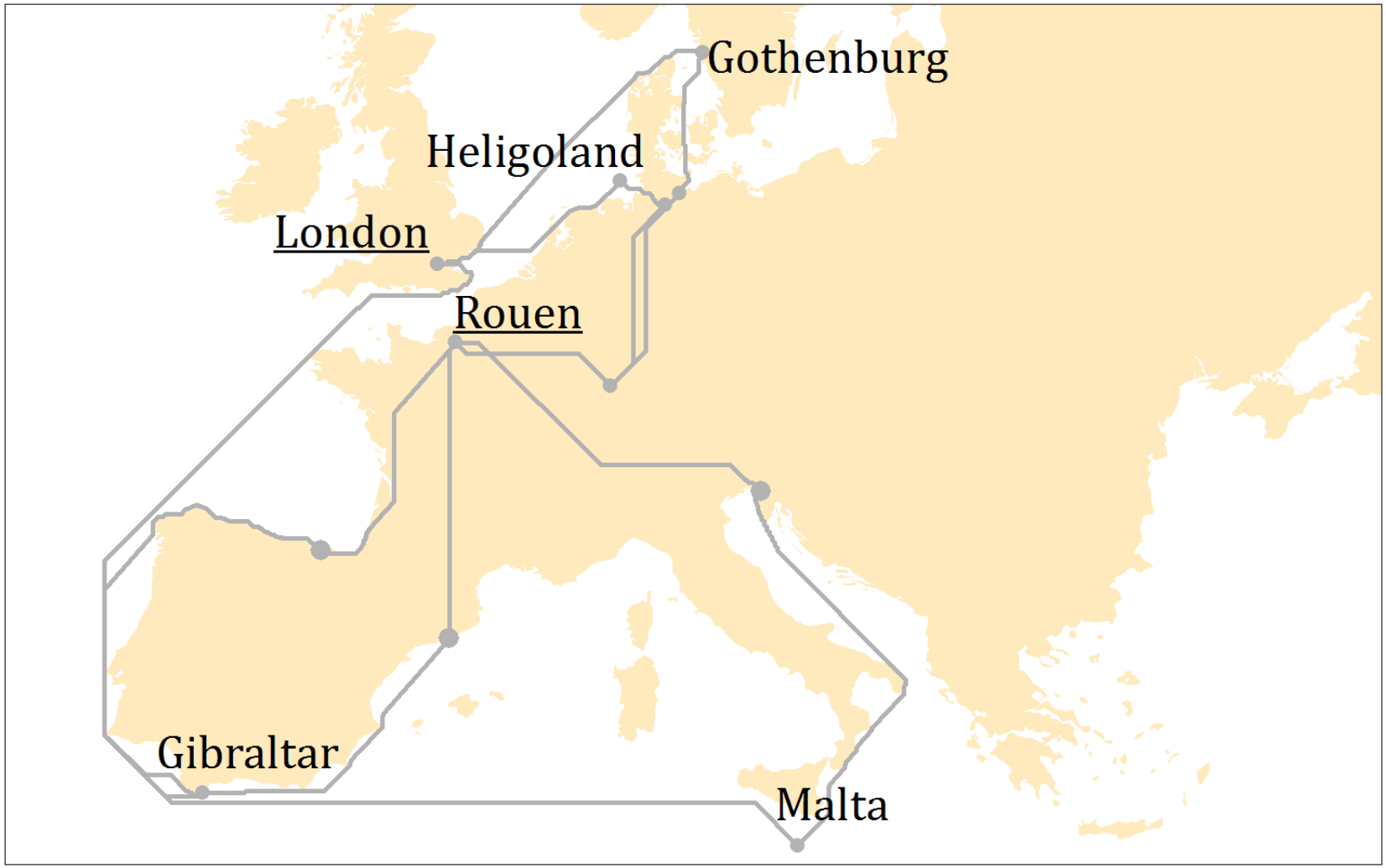
Port usage, "Before blockade"



Port usage, "Blockade"

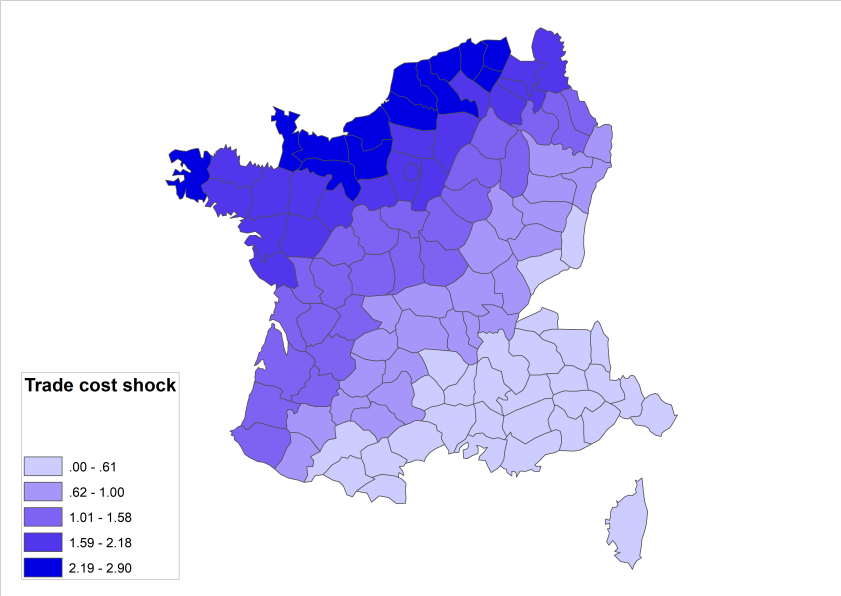
Unconstrained shortest route

Smuggling routes

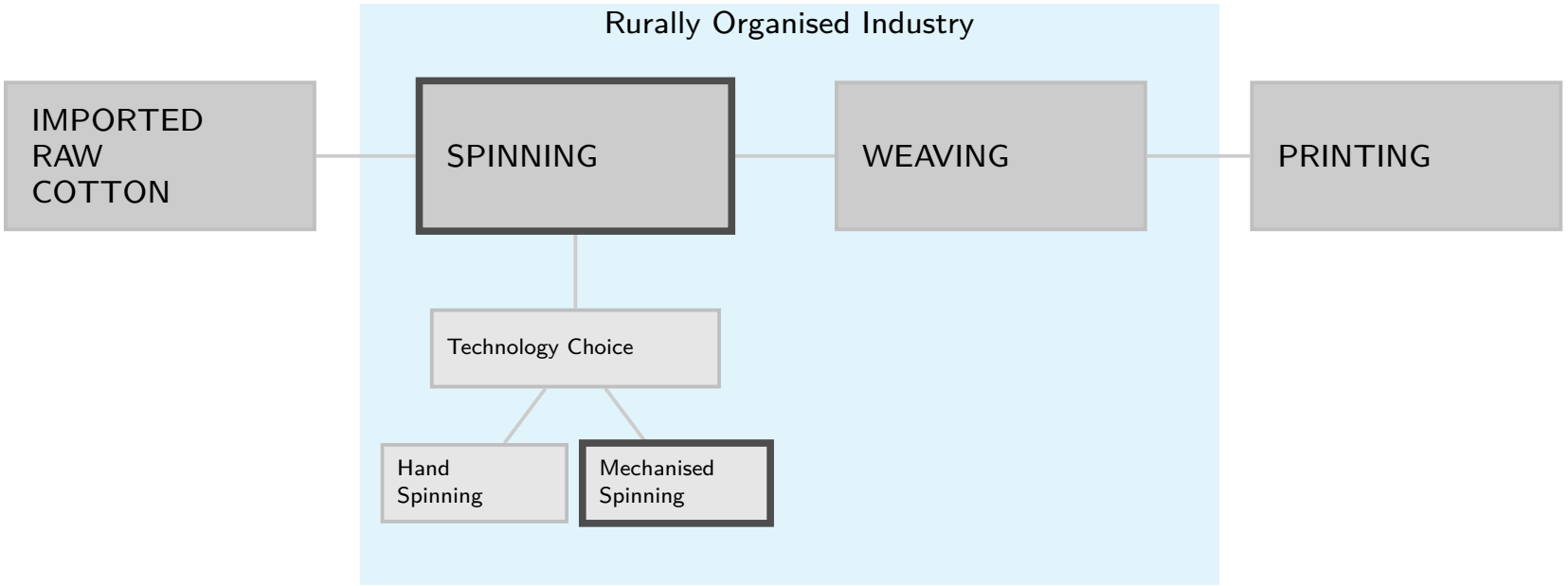


Quantifying effective distance to Britain

- Unrestricted shortest route prior to Napoleonic Wars
- Restricted to smuggling routes during Napoleonic Wars
- Trade cost shock $= \ln D_{it} - \ln D_{it-1}$



The cotton industry in France



Imported from:

- Levant
- Brazil
- Colonies
- US

Import Competition: Great Britain

Invention and diffusion in Britain vs. non-adoption in France

- Similar conditions prior to mechanization
- Rapid diffusion of technology in Britain
  - Machine was cheap and depreciated fast
  - First industry to adopt modern, factory-based production methods
- Surprisingly slow adoption in France (1790: 800 vs 19,000 jennies)
- 1800: France not competitive in cotton textiles

Empirical Strategy – Short run

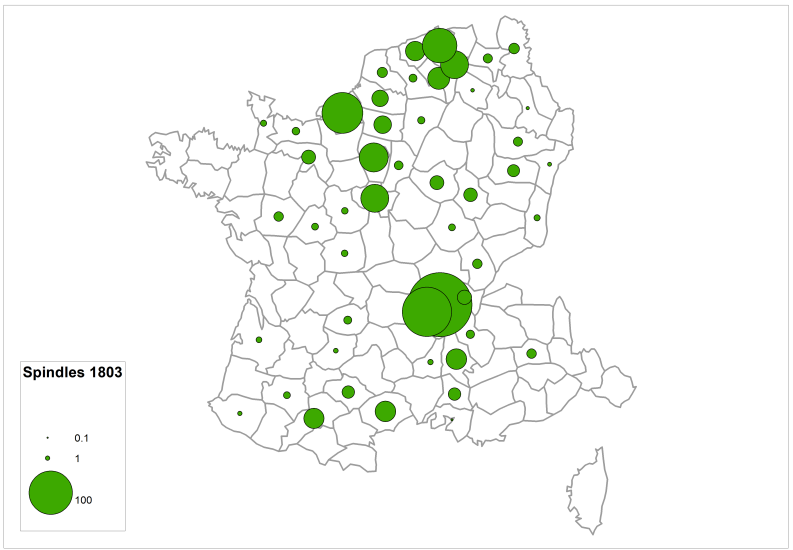
- Question: Did protection render cotton spinning profitable in the short-run?
- Blockade serves as source of exogenous variation in trade protection
- Baseline specification (where S_{it} is spinning capacity in *department* i in year t, and D_{it} is as defined earlier):

$$S_{it} = \alpha_i + \delta_t + \gamma \ln D_{it} + \varepsilon_{it}$$

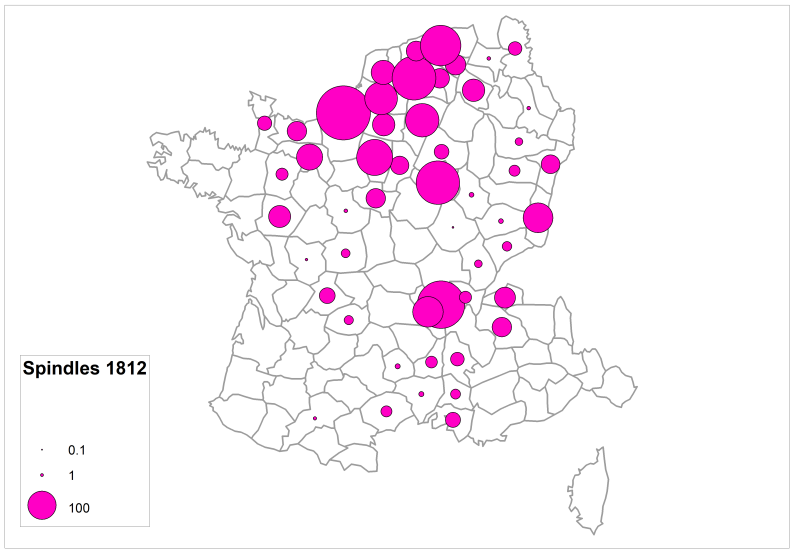
- Identifying assumption: No contemporaneous shock correlated with trade cost shock to imported yarn

Variation used: 1803-12

- 1803-12: spinning capacity quadrupled
- Development highly uneven...



"Before"



"After"

Spindles per capita

Short-run effects of temporary trade protection

Table 1: Short-run effect of trade protection on mechanized cotton spinning capacity

	Dependent variable: Spindles per thousand inhabitants						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Effective distance	33.47	33.48	34.78	24.73	32.96	42.18	38.82
	0.47	*0.47*	*0.49*	*0.35*	*0.46*	*0.52*	*0.48*
	(9.80)	(9.89)	(10.47)	(10.90)	(9.75)	(12.54)	(13.23)
	{10.00}	{10.06}	{10.58}	{11.07}	{10.01}	{13.50}	{13.46}
Streams X 1812		-0.14					-1.16
		(1.50)					(2.17)
Coal X 1812			-3.93				4.11
			(4.21)				(7.47)
Market potential X 1812				41.05			30.19
				(21.58)			(30.19)
Knowledge access X 1812					40.87		34.90
					(15.22)		(21.79)
Literacy X 1812						46.41	27.79
						(21.16)	(18.86)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Department FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	176	176	176	176	176	126	126
Adjusted R-squared	0.34	0.33	0.34	0.36	0.37	0.42	0.45
Num. clusters (dept)	88	88	88	88	88	63	63
Num. clusters (gen)	40	40	40	40	40	30	30

Robustness

Table 2: Robustness to changing market access

	Dependent variable: Spindles per thousand inhabitants						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Effective distance	33.47	24.73	33.58	40.56	38.50	44.04	30.33
	0.47	*0.35*	*0.47*	*0.57*	*0.54*	*0.62*	*0.43*
	(9.80)	(10.90)	(9.90)	(12.37)	(10.41)	(11.36)	(12.15)
	{10.00}	{11.07}	{10.15}	{13.49}	{11.04}	{11.74}	{12.59}
Market potential X 1812		41.05					32.04
		(21.58)					(22.55)
Market potential (time var.)			-20.68			-248.90	
			(92.70)			(136.52)	
Market potential (ext.) X 1812				40.04			
				(33.48)			
Market potential (ext. exc. ESP) X 1812					32.41	59.60	23.72
					(13.38)	(19.04)	(14.58)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Department FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	176	176	176	176	176	176	176
Adjusted R-squared	0.34	0.36	0.33	0.34	0.36	0.37	0.37
Num. clusters (dept)	88	88	88	88	88	88	88
Num. clusters (gen)	40	40	40	40	40	40	40

Check for pre-treatment trends on the extensive margin

Table 3: Falsification tests

	Pre-treatment period: 1794-1803			Treatment period: 1803-1812			
	(1) Spind.	(2) Spind.	(3) Spind.	(4) K/L	(5) Mach.	(6) Wool	(7) Leather
Effective distance	5.89	3.32	2.08	-0.07	-0.02	-2.25	-0.02
	0.18	*0.10*	*0.06*	*-0.07*	*-0.06*	*-0.07*	*-0.13*
	(2.94)	(3.56)	(4.90)	(0.26)	(0.10)	(2.93)	(0.01)
	{3.22}	{4.01}	{5.69}			{3.11}	
Market potential X 1812		12.08	9.47				
		(5.85)	(8.93)				
Streams X 1812			-0.10				
			(0.53)				
Coal X 1812			2.53				
			(3.23)				
Knowledge access X 1812			4.93				
			(5.74)				
Literacy X 1812			0.44				
			(3.33)				
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Department FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	176	176	126	78	74	138	116
Adjusted R-squared	0.19	0.21	0.15	0.32	0.11	0.18	0.05
Num. clusters (dept)	88	88	63	39	37	69	58
Num. clusters (gen)	40	40	30	23	21	32	28

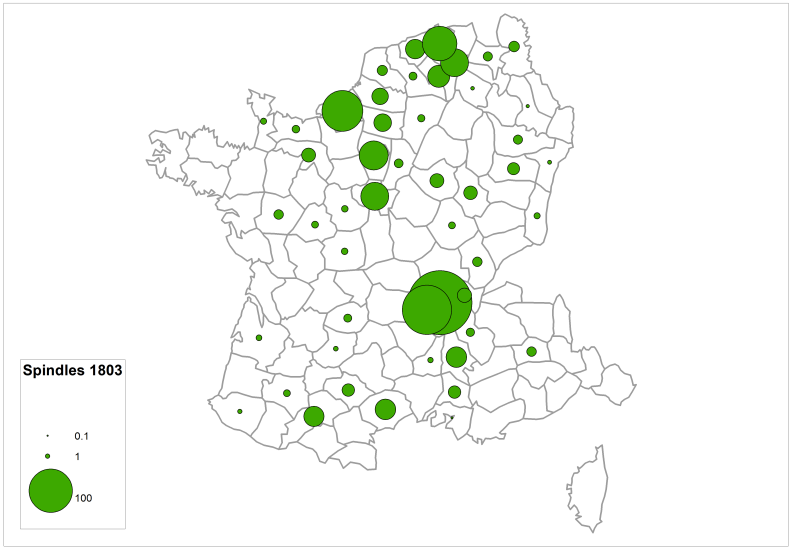
Empirical strategy - Long-run, within-country

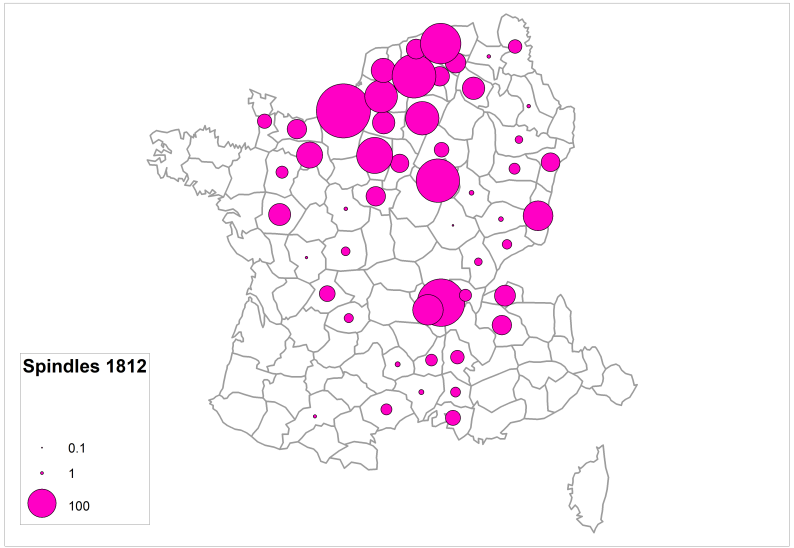
- Question: Did short-run protection affect the long-term profitability of production?
- Outcomes of interest: persistence and aggregate regional effects
- Trade cost shock solves the endogeneity of location of cotton spinning capacity—IV for capacity with trade cost shock we saw earlier.
- Specification (where Y_{it} represents various outcomes and $S_{i,1812}$ is spinning capacity in 1812):

$$Y_{it} = \alpha_0 + \beta_{0t} S_{i,1812} + \eta_{it}$$

- Identifying assumption: trade cost shock uncorrelated with other determinants of location of industry

Recall: location of cotton industry 1803-12





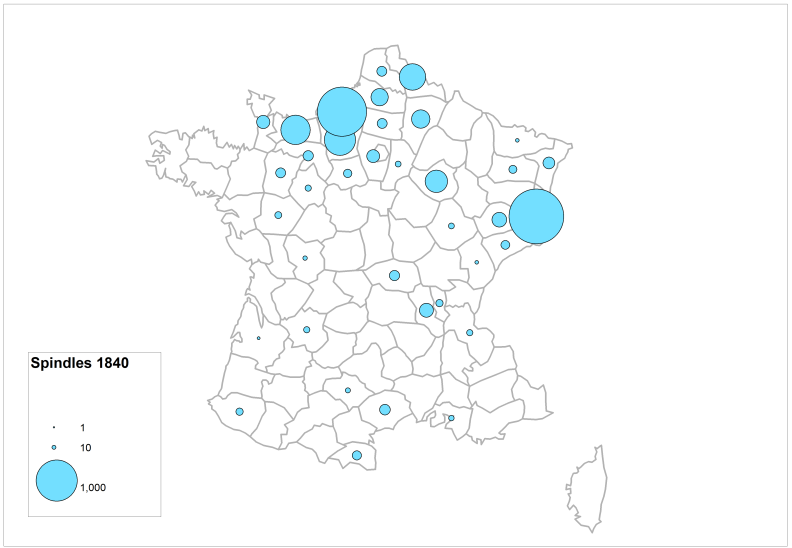
"Before"

"After"

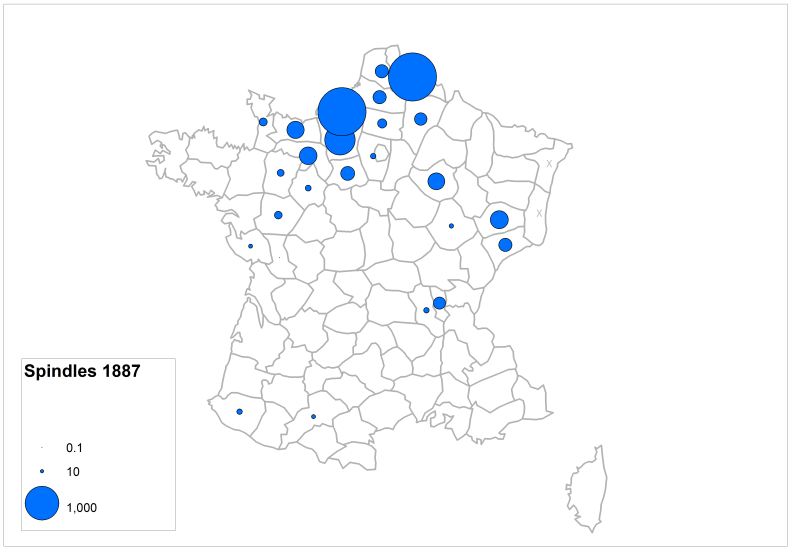
Spindles per capita

Persistence in location of cotton industry 1840-87

Between 1803-1887 spinning capacity increased fivefold



1840



1887

Note: The label "X" denotes the two departments, Haut-Rhin and Bas-Rhin, ceded to Germany 1871 - 1918. Data for 1887 is not available for these regions.

Persistence in location

Table 4: Persistence in the location of cotton spinning activity, 1840-1887 - OLS and 2SLS

	Dependent variable: Spindles per thousand inhabitants															
	OLS								2SLS							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
DepVar measured in	1840	1840	1840	1840	1887	1887	1887	1887	1840	1840	1840	1840	1887	1887	1887	1887
Spindles 1812	2.23	3.04	1.95	2.47	3.43	4.75	3.49	5.06	2.49	2.12	3.41	2.68	5.17	4.72	6.24	4.85
	(0.78)	(0.99)	(0.85)	(0.93)	(1.24)	(1.54)	(1.31)	(1.71)	(1.13)	(1.27)	(1.05)	(0.93)	(1.22)	(1.26)	(1.93)	(1.39)
	{0.81}	{0.99}	{0.86}	{0.93}	{1.29}	{1.57}	{1.37}		{1.11}	{1.27}	{1.06}	{0.94}	{1.28}	{1.29}	{2.15}	
Spindles 1803		-2.95		-1.55		-4.69		-4.86		-1.61		-1.85		-4.64		-4.57
		(1.53)		(1.01)		(2.17)		(2.42)		(1.56)		(1.04)		(1.68)		(1.84)
Literacy			119.93	71.18			114.36	-16.63			55.75	60.98			-44.49	-4.29
			(60.19)	(55.35)			(91.42)	(92.54)			(74.68)	(55.34)			(150.41)	(95.46)
Market potential			31.39	2.67			45.42	-33.57			-131.66	-15.75			-239.48	-16.38
			(101.65)	(109.61)			(150.51)	(132.55)			(161.27)	(104.61)			(242.47)	(129.33)
Knowledge access			-155.58	-141.21			-183.81	-159.55			-163.82	-140.59			-219.59	-159.00
			(80.52)	(83.05)			(119.19)	(108.88)			(86.21)	(78.31)			(119.44)	(101.80)
Coal			-39.01	-27.19			-19.14	12.23			-55.88	-27.43			-56.09	12.76
			(25.30)	(20.57)			(45.69)	(44.00)			(42.29)	(18.84)			(81.23)	(41.19)
Streams			-8.16	-11.19			-16.34	-16.85			-3.93	-10.45			-9.22	-17.54
			(7.28)	(5.80)			(14.88)	(10.08)			(8.93)	(4.86)			(14.32)	(8.34)
Observations	75	70	68	63	72	67	66	61	75	70	68	63	72	67	66	61
Adjusted R-squared	0.32	0.39	0.54	0.61	0.49	0.61	0.47	0.61								
KP F-stat									7.404	12.78	3.247	10.35	8.281	15.21	3.169	10.15
Num. clusters (gen)	34	34	31	30	33	33	30	29	34	34	31	30	33	33	30	29

Dependent variable: Spindles per thousand inhabitants for the respective year denoted at the top of each column. Departmental population held fixed at its 1811 level across all variables measured in per capita terms. Regressor of interest: Spindles per thousand inhabitants in 1812. The instrument is the trade cost shock. Controls: Spindles per thousand inhabitants in 1803, Literacy measured as the proportion of men able to sign their wedding certificate in 1786; Coal is the inverse of log distance to the closest coalfield; Streams is defined as the natural logarithm of mean streamflow (m3/s); Knowledge access is defined as market access to universities in 1802; Market potential is defined as distance to urban population in 1800. All variables measured at their pre-blockade values. The number of observations differ across columns as controls are missing for some departments, while territorial losses to Germany in 1871 account for the difference in observations across the years 1840 and 1887. For further details on the data, see Appendix A.3. Robust standard errors in parentheses, standard errors clustered by généralités in curly brackets. The latter is not reported in cases where the number of généralités is less than 30.

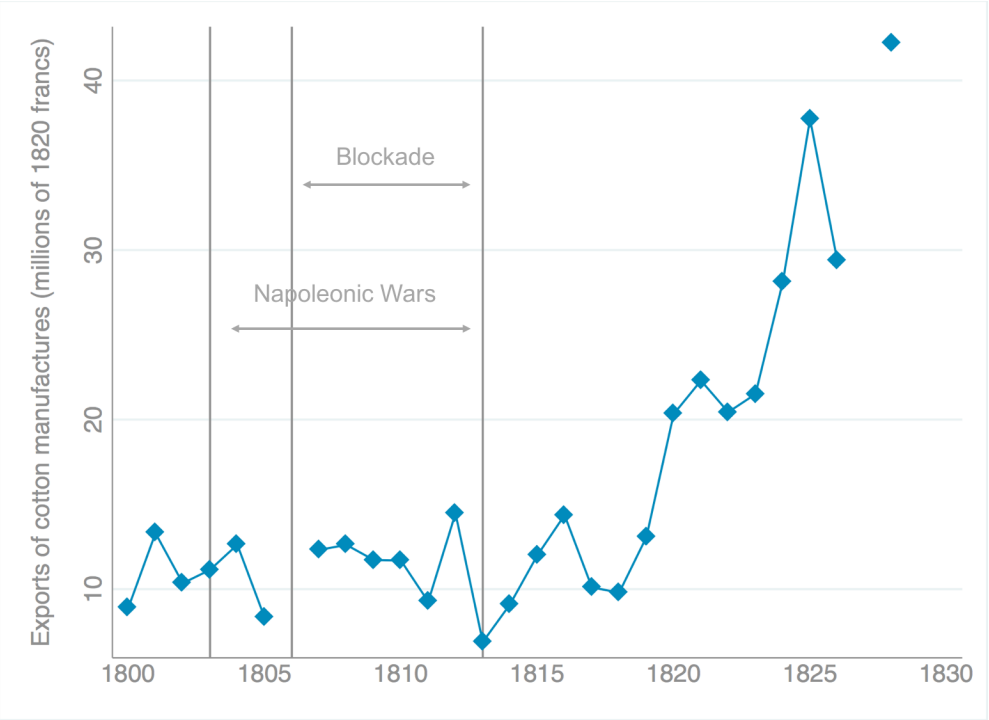
(Very) long-run effect on industrial output

Table 6: Industrial value added per capita outcomes, 1860-2000 - OLS and 2SLS

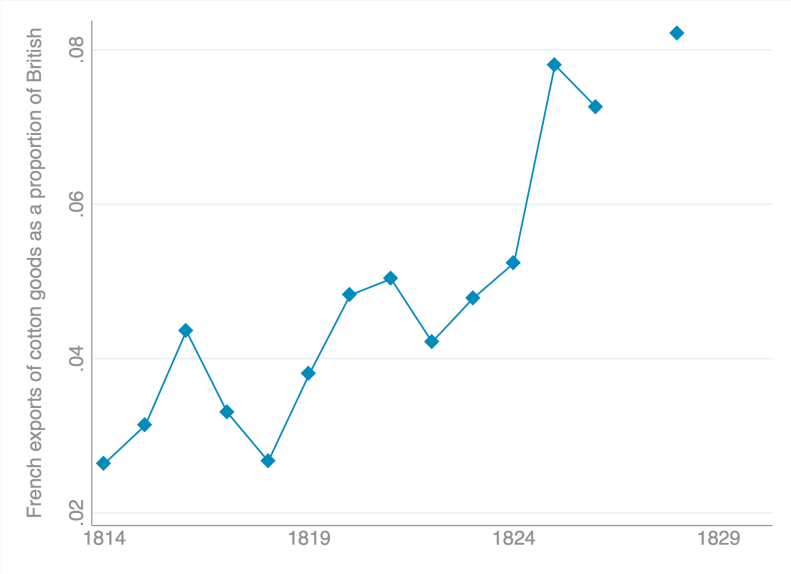
	Dependent variable: Natural logarithm of industrial value added per capita															
	OLS								2SLS							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
DepVar measured in	1860	1860	1896	1896	1930	1930	2000	2000	1860	1860	1896	1896	1930	1930	2000	2000
Spindles 1812	0.0047	0.0037	0.0039	0.0025	0.0053	0.0040	0.0041	0.0025	0.0079	0.0075	0.0012	0.0010	0.0015	0.0016	0.0040	0.0031
	0.5007	*0.3925*	*0.3771*	*0.2394*	*0.5244*	*0.3965*	*0.4141*	*0.2527*	*0.8433*	*0.7987*	*0.1173*	*0.0937*	*0.1461*	*0.1590*	*0.4032*	*0.3128*
	(0.0009)	(0.0012)	(0.0010)	(0.0012)	(0.0013)	(0.0016)	(0.0011)	(0.0012)	(0.0026)	(0.0026)	(0.0026)	(0.0026)	(0.0029)	(0.0030)	(0.0025)	(0.0026)
	{0.0010}	{0.0013}	{0.0011}	{0.0013}	{0.0014}	{0.0016}	{0.0011}	{0.0012}	{0.0021}	{0.0021}	{0.0024}	{0.0025}	{0.0029}	{0.0028}	{0.0024}	{0.0025}
Spindles 1803		0.0035		0.0048		0.0046		0.0053		-0.0020		0.0070		0.0081		0.0044
		(0.0020)		(0.0019)		(0.0020)		(0.0017)		(0.0035)		(0.0036)		(0.0041)		(0.0032)
Observations	73	68	71	66	73	68	73	68	73	68	71	66	73	68	73	68
Adjusted R-squared	0.2401	0.2414	0.1298	0.1369	0.2648	0.2772	0.1598	0.1718								
KP F-stat									7.079	12.60	7.994	15.25	7.079	12.60	7.079	12.60
Num. clusters (gen)	33	33	32	32	33	33	33	33	33	33	32	32	33	33	33	33

Dependent variable: Natural logarithm of industrial value added per capita measured at the level of the department. For the first stage regressions, dependent variable is spindles per thousand inhabitants in 1812. Departmental population held fixed at its 1811 level across all variables measured in per capita terms. Regressor of interest: Spindles per thousand inhabitants in 1812. The instrument is the trade cost shock. Standardized coefficient in italics. The number of observations differ across columns because of territorial losses to Germany between 1871 - 1919. For further details on the data, see Appendix A.3. Robust standard errors in parentheses, standard errors clustered by généralités in curly brackets.

Mills test: Increasing exports



French exports of cotton manufactures, millions of 1820 francs



French exports of cotton manufactures as a share of British exports