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

- 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

O Can infant industry protection work?

- Idea has long tradition in the history of economic thought
- Empirical challenges make identification difficult
- Juhasz (2018) provides natural experiment that plausibly replicates infant industry protection

Natural experiment from 19th century France

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

Identifying infant industry mechanism in two steps

- Short run: Did regions which became better protected from trade increase capacity in new technology more?
- Output: Did the effects persist after pre-blockade variation in trade protection was restored?

Data Collection – Mechanized spindles

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MIT 14.582 (Costinot and Donaldson)

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MIT 14.582 (Costinot and Donaldson)

- 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



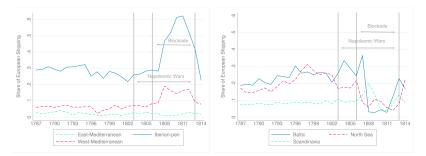
Exports of British merchandise and other produce, Crouzet (1987)

MIT 14.582 (Costinot and Donaldson)

Trade and Growth (Empirics II)

Spring 2018 (lecture 24)

Significant change in routes within regions

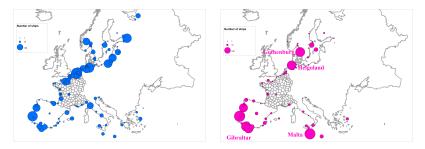


Southern Europe

Northern Europe

Share of shipping with Britain

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

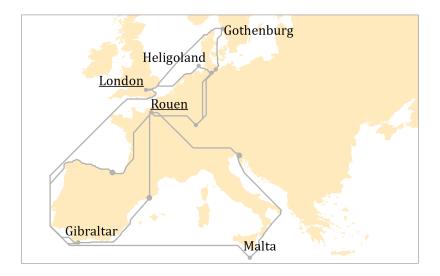


Port usage, "Before blockade"

Port usage, "Blockade"

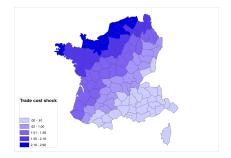
Unconstrained shortest route



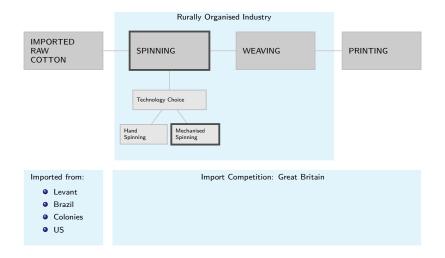


Quantifying effective distance to Britain

- 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



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

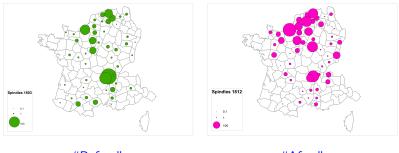
- Question: Did protection render cotton spinning profitable in the short-run?
- Blockade serves as source of exogenous variation in trade protection
- Baseline specification (where S_{it} is spinning capacity in *department i* in year t, and D_{it} is as defined earlier):

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

• 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"



Short-run effects of temporary trade protection

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	D	ependent [,]	variable: S	pindles pe	r thousand	l inhabitar	nts
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Effective distance	33.47 0.47 (9.80)	33.48 0.47 (9.89)	34.78 0.49 (10.47)	24.73 0.35 (10.90)	32.96 0.46 (9.75)	42.18 0.52 (12.54)	38.82 0.48 (13.23)
Streams X 1812	(0.00) {10.00}	$\{10.06\}\ -0.14\ (1.50)$	(10.41) {10.58}	(10.50) {11.07}	{10.01}	$\{13.50\}$	$\{13.46\}\ -1.16\ (2.17)$
Coal X 1812			-3.93 (4.21)				4.11 (7.47)
Market potential X 1812			()	41.05 (21.58)			30.19 (30.19)
Knowledge access X 1812 $$				()	40.87 (15.22)		34.90 (21.79)
Literacy X 1812					(10.22)	46.41 (21.16)	(21.13) 27.79 (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) Num. clusters (gen)	88 40	88 40	88 40	88 40	88 40	63 30	63 30

	E	Dependent	variable: S	spindles pe	er thousand	l inhabitar	its
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Effective distance	33.47 0.47 (9.80) {10.00}	24.73 0.35 (10.90) $\{11.07\}$	33.58 0.47 (9.90) {10.15}	40.56 0.57 (12.37) {13.49}	38.50 0.54 (10.41) {11.04}	44.04 0.62 (11.36) {11.74}	30.33 0.43 (12.15) {12.59}
Market potential X 1812	[10:00]	41.05 (21.58)	[10.10]	[10.10]	[11.01]	(11.11)	32.04 (22.55)
Market potential (time var.)		. ,	-20.68 (92.70)			-248.90 (136.52)	()
Market potential (ext.) X 1812			. ,	40.04 (33.48)			
Market potential (ext. exc. ESP) X 1812				. ,	32.41 (13.38)	59.60 (19.04)	23.72 (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

Table 2: Robustness to changing market access

Check for pre-treatment trends on the extensive margin

	Pre-trea	atment per	iod: 1794-1803	Trea	tment pe	eriod: 180	3-1812
	(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

Table 3: Falsification tests

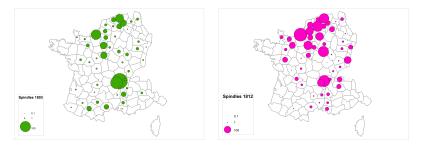
Empirical strategy - Long-run, within-country

- 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



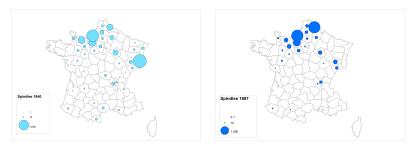
"Before"

"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.

						Depe	ndent varia	ble: Spindl	es per th	ousand ir	nhabitants					
				0	LS				2SLS							
DepVar measured in	(1) 1840	(2) 1840	(3) 1840	(4) 1840	(5) 1887	(6) 1887	(7) 1887	(8) 1887	(9) 1840	(10) 1840	(11) 1840	(12) 1840	(13) 1887	(14) 1887	(15) 1887	(16) 1887
Spindles 1812	2.23 (0.78) {0.81}	3.04 (0.99) {0.99}	1.95 (0.85) {0.86}	2.47 (0.93) {0.93}	3.43 (1.24) {1.29}	4.75 (1.54) {1.57}	3.49 (1.31) {1.37}	5.06 (1.71)	2.49 (1.13) {1.11}	2.12 (1.27) {1.27}	3.41 (1.05) {1.06}	2.68 (0.93) {0.94}	5.17 (1.22) {1.28}	4.72 (1.26) {1.29}	6.24 (1.93) {2.15}	4.85 (1.39)
Spindles 1803	[0.01]	-2.95 (1.53)	[0.00]	-1.55 (1.01)	[1.20]	-4.69 (2.17)	[1.01]	-4.86 (2.42)	[]	-1.61 (1.56)	[1.00]	-1.85 (1.04)	[1.20]	-4.64 (1.68)	[2.10]	-4.57 (1.84)
Literacy		(1.00)	119.93 (60.19)	71.18 (55.35)		(2.11)	114.36 (91.42)	-16.63 (92.54)		(1.00)	55.75 (74.68)	60.98 (55.34)		(1.00)	-44.49 (150.41)	-4.29 (95.46)
Market potential			31.39 (101.65)	2.67 (109.61)			45.42 (150.51)	-33.57 (132.55)			-131.66 (161.27)	-15.75 (104.61)			-239.48 (242.47)	-16.38 (129.33)
Knowledge access			-155.58 (80.52)	-141.21 (83.05)			-183.81 (119.19)	-159.55 (108.88)			-163.82 (86.21)	-140.59 (78.31)			-219.59 (119.44)	-159.00 (101.80)
Coal			-39.01 (25.30)	-27.19 (20.57)			-19.14 (45.69)	(100.00) 12.23 (44.00)			-55.88 (42.29)	-27.43 (18.84)			-56.09 (81.23)	12.76 (41.19)
Streams			(25.30) -8.16 (7.28)	(20.57) -11.19 (5.80)			(45.69) -16.34 (14.88)	(44.00) -16.85 (10.08)			(42.29) -3.93 (8.93)	(18.84) -10.45 (4.86)			(81.23) -9.22 (14.32)	(41.19) -17.54 (8.34)
Observations	75	70	68	63	72	67	66	61	75	70	68	63	72	67	66	61
Adjusted R-squared KP F-stat	0.32	0.39	0.54	0.61	0.49	0.61	0.47	0.61	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

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

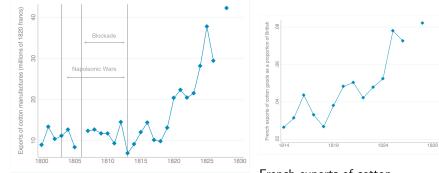
Dependent variable: Spindless per thousand inhabitants for the respective yar denoted at the top of each column. Departments held fixed at its 1511 level across all variables measured in per capital terms. Regressor of interest: Spindless per thousand inhabitants in 1521. The instrument is the track cost shock. Carolos: Spindles per thousand inhabitants in 1532, Uteracy measured as the proportion of nen able to sign their wedding certificate in 1786; Caoli is the inverse of log distance to the closest coafield; Streams is defined as the natural logarithm of mean streamflow (m3/s); Knowledge access is defined as market access to universities in 1892; Market potential is defined as distance to threat population in 1890. On a stream streamflow (m3/s); Knowledge access is defined as market access to universities in 1892; Market potential is defined as distance to the closest coafield; Streams is defined as the natural logarithm of mean streamflow (m3/s); Knowledge access is defined as market are unising for some departments, while territorial losses to Germany in 1871 account for the difference in observations across there the number of discretations in the stand. arcs in the practile stream account of griefulficit is to the stand error on the stream of griefulficit is that and the constitution of griefulficit is that and the stress in the stand. arcs in the stand arcs on the sta

Table 6: Industrial value added per c	ita outcomes, 1860-2000 - OLS and 2SLS
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				Dep	pendent var	iable: Natu	nm of industrial value added per capita									
OLS									2SLS							
(1) 1860	(2) 1860	(3) 1896	(4) 1896	(5) 1930	(6) 1930	(7) 2000	(8) 2000	(9) 1860	(10) 1860	(11) 1896	(12) 1896	(13) 1930	(14) 1930	(15) 2000	(16) 2000	
0.0047 0.5007	0.0037 0.3925	0.0039 0.3771	0.0025 0.2394	0.0053 0.5244	0.0040 0.3965	0.0041 0.4141	0.0025 0.2527	0.0079 0.8433	0.0075 0.7987	0.0012 0.1173	0.0010 0.0937	0.0015 0.1461	0.0016 0.1590	0.0040 0.4032	0.0031 0.3128	
0.0009) 0.0010}	(0.0012) {0.0013} 0.0035	(0.0010) $\{0.0011\}$	(0.0012) {0.0013} 0.0048	(0.0013) $\{0.0014\}$	$\{0.0016\}$	(0.0011) $\{0.0011\}$	$\{0.0012\}$	(0.0026) $\{0.0021\}$	$\{0.0021\}$	(0.0026) $\{0.0024\}$	$\{0.0025\}$	(0.0029) $\{0.0029\}$	$\{0.0028\}$	(0.0025) $\{0.0024\}$	(0.0026) {0.0025} 0.0044	
	(0.0020)		(0.0019)		(0.0020)		(0.0017)		(0.0035)		(0.0036)		(0.0041)		(0.0032)	
	68	71	66		68			73	68	71	66	73	68	73	68	
								7.079	12.60	7.994	15.25	7.079	12.60	7.079	12.60 33	
0	1860 0.0047 0.5007 0.0009)	1860 1860 0.0047 0.0037 0.5007 0.3925 0.0009 (0.0012) 0.0035 (0.0020) 73 68 0.2401 0.2414	$\begin{array}{cccccccccccccccccccccccccccccccccccc$			$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$										

Dependent variable: Natural logarithm of industrial value added per capita messured at the level of the department. For the first stage regressions, dependent variable is spindles per thousand inhibitants in 1812. Departmental population held fixed at its 1811 level across all variables messured in per capita terms. Regressor of interest: Spindles per thousand inhibitants in 1812. The interment is the trade cost short-fixed coefficient in italis. The number of observations differ across columns because of entricoling losses to Germany between 1817 - 1919. Entricol and a case Appendix A. Robust standard errors in parenthese, standard errors induced to geriaritiki in curry branchests.

Mills test: Increasing exports



French exports of cotton manufactures, millions of 1820 francs

French exports of cotton manufactures as a share of British exports