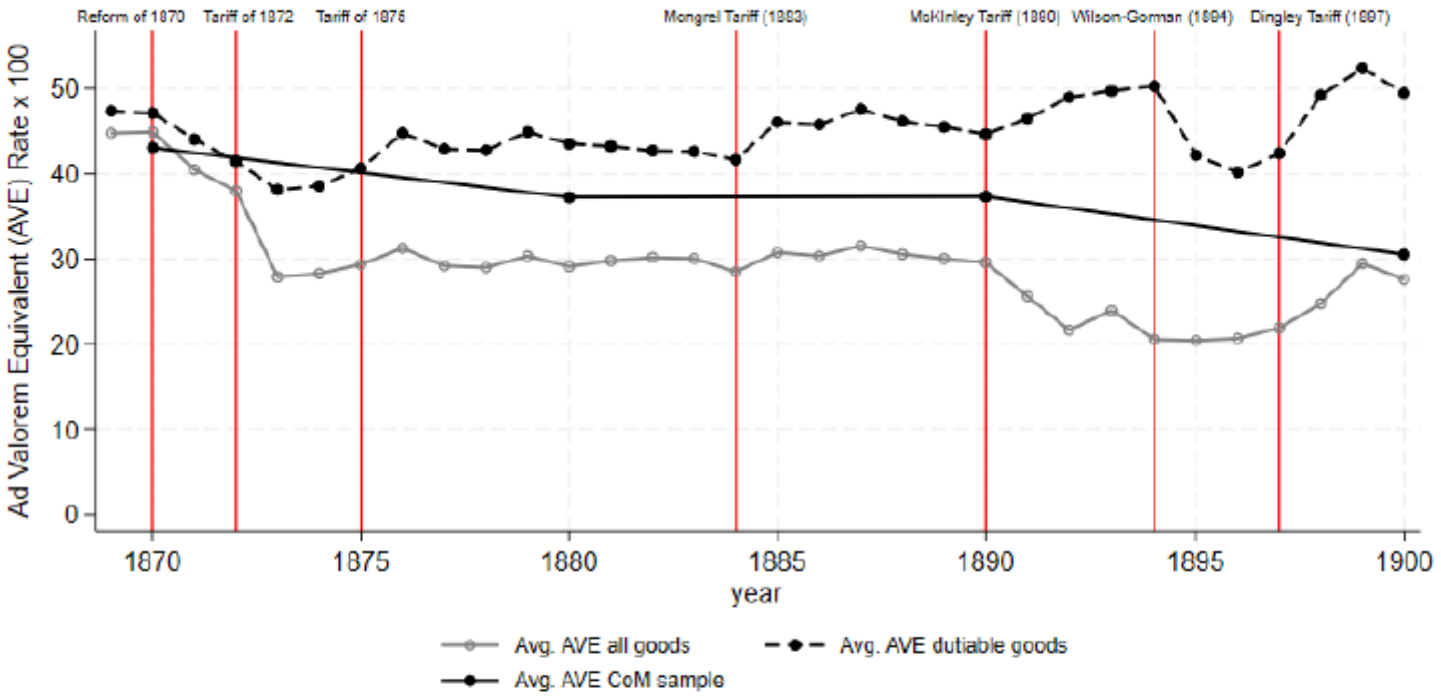
Did Tariffs Make American Manufacturing Great? New Evidence from the Gilded Age

Alex Klein
(University of Kent, CEPR, CAGE)

Christopher M. Meissner
(University of California, Davis & NBER)

Figure 1: Major Tariff Laws and Average Tariff Rates, 1869-1900



Notes: Figure 1 shows the annual average ad valorem equivalent (AVE) tariff rate (x 100) for all US imports, all US imports subject to a tariff (dutiable goods), and for the four census years for our sample which come from the Census of Manufactures. AVE is calculated as the total tariff revenue divided by the total value of imports. Trade and tariff data are for fiscal years ending June 30. Finally, we place vertical lines in each calendar year in which there was a major change in the US tariff law. Tariff laws approved by Congress are discussed in Taussig (1931) and Irwin (2017).

Tariffs and productivity growth

- We explore the association between tariffs and labor productivity in manufacturing in the late 19^{th} century/early 20^{th} century American Economy.

- Very few studies have attempted a causal interpretation of trade policy (in any economy)
  - Juhasz (2018)
  - Cf. O'Rourke and Lehmann (2011), Bairoch (1972), Amiti & Konings (2007)

- We present evidence from an instrumental variables approach leveraging price shocks and specific tariff "exposure" – shift-share style IV +

Do tariffs matter for productivity growth?

- How might tariffs matter?
  - Infant industry
  - Rent-seeking/lobbying
  - Competition
  - Lerner-symmetry: the "export" tax
  - Welfare

- No evidence of a positive relationship between tariffs and labor productivity

- We pair manufacturing data with a new hand-collected granular data set on tariffs and imports
  - SIC 3 digit industries (state level data)
  - SITC 4-5 digit product – tariff lines
  - Specific and ad valorem tariff policy data

Historical Context

- Bigger project: How did US trade relate to the evolution of the American economy over the period 1866 - 1914?

- Currently also a building
  - bilateral/product level trade dataset: >2m lines
  - tariff line data 1789 - 1972 with Acosta, Cox, Greenland, Lopresti, Rotemberg, and Traiberman: >1m tariff lines

- US trade and trade policy stylized facts, 1866-1914
  - Emerging net exporter of manufactured products
  - Diversification of partners and product space
  - (very) restrictive trade policy
    - Tariffs comparatively high
    - Trade treaties are limited
    - Many industries and sectors protected
    - Democrats (free-traders) vs Republicans (protectionists)

"If the links between protective tariffs and the expansion of the labor force or the accumulation of capital are weak, their relationship to aggregate productivity growth is equally tenuous..."

"...In sum, it is difficult to make the case that high import tariffs were an important factor driving late nineteenth century US economic growth

-Irwin, 2017

Previous Research on Tariffs & Growth pre-World War I

- Relationship between GDP growth and tariffs
  - (Bairoch, 1972; O'Rourke, 2000; Lehmann and O'Rourke, 2011; Clemens and Williamson, 2004)
- Specific tariffs and the US Economy in the 19th century
  - (Irwin, 1998)
- Tariffs and the US economy in the late 19th century/early 20th century
  - (Irwin, 2000; Irwin, 2002; Irwin, 2017; Yoon, 2020; Head, 1994; Greenland & Lopresti, 2022)
- **Tariffs matter** (O'Rourke, Lehmann and O'Rourke):
  - Manufacturing tariffs raise ***aggregate*** productivity growth

Empirical Strategy

$$\ln\left(\frac{Y_{kst}}{L_{kst}}\right) = \beta_1[\ln(1 + \text{AVE}_{kt-10})] + \mu_{ks} + \delta_t + \epsilon_{kst}$$

Regress value added (Y) per worker (L) in industry k, state s, and year t (and other outcomes) on **lagged** levels of tariffs for industry k + controls.

IV: Derivation of Realized Protection (RP) (cf. Greenland & Lopresti, 2024)

$$\mathrm{AVE}_{ct} \equiv \tau_{ct} + \frac{f_{ct}}{p_{ct}} \qquad STS_{ct} \equiv \frac{f_{ct}}{p_{ct}\tau_{ct} + f_{ct}}$$

$$d\ln(1 + \mathrm{AVE}_{ct}) \approx -\Delta\ln(p_{ct})STS_{c,t-1}\frac{\mathrm{AVE}_{c,t-1}}{1 + \mathrm{AVE}_{c,t-1}}$$

$$\Delta RP_{ct} \equiv -\Delta\ln(p_{ct})STS_{c,t-1}$$

Empirical Strategy: Instrumental Variables

Two-stage process to generate an instrument for industry level changes in protection

1)Predict change in product level AVE using changes in product level unit values and the initial share of specific tariff revenue in total product tariff revenue.

2)Aggregate (weighting by value share w/in SIC industry) across all products within an SIC 3 industry in each reference year.

$$\Delta \ln(1 + \mathrm{AVE}_{ct}) = \gamma_0(\Delta RP_{ct}) + \delta_t + \eta_{ct}$$

$$\mathrm{IV}_{kt} = \ln\left[\frac{1 + \widehat{AVE}_{kt}}{1 + AVE_{kt-1}}\right] = \frac{1}{N_{kt}} \sum_{c \in k} \left\{\exp\left[\widehat{\gamma_0}(\Delta RP_{ct}) + \widehat{\delta_t}\right]\right\}$$

Tariff Data

Foreign Commerce and Navigation of the United States

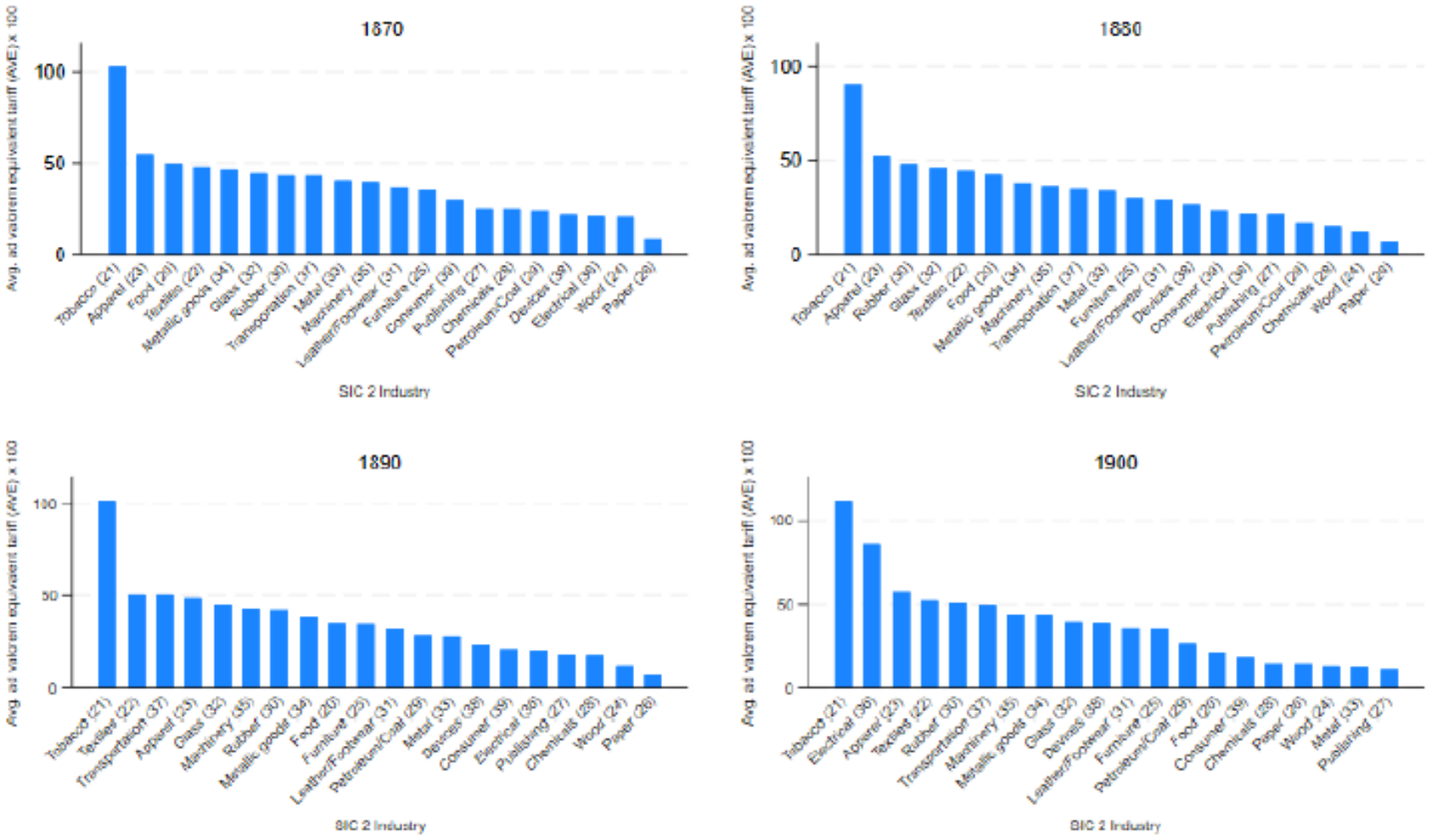
- (fiscal years ending) 1870, 1880, 1890, 1900
- Item descriptions, imports($), tariff revenue($), quantities, statutory tariffs

Data

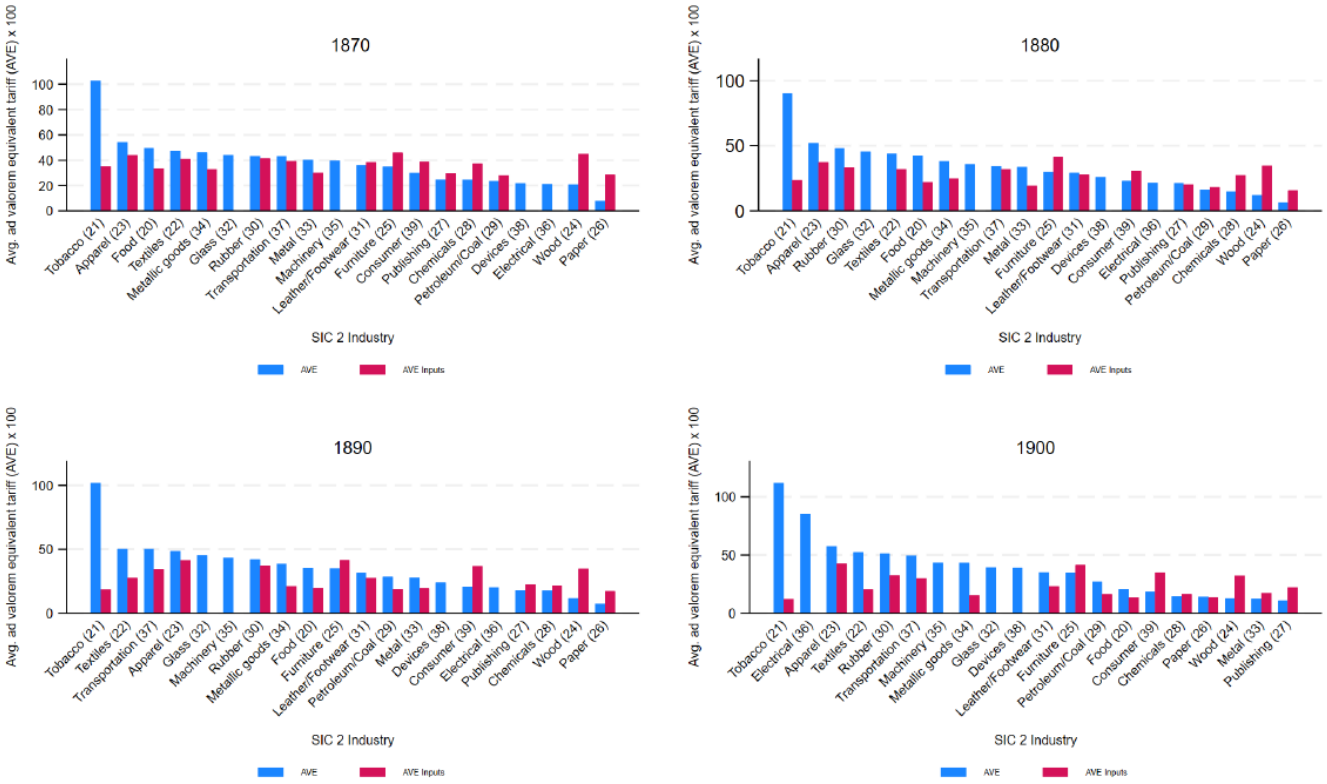
No. 21.—*Statement of quantity, value, and duty of Foreign Merchandise entering into Consumption in the United*

COMMODITIES DUTIABLE.	Rate of duty.	1869.			1870.		
		Quantity.	Value.	Duty.	Quantity.	Value.	Duty.
Copper, &c.—Continued.							
Sheets, plates, braziers' copper, copper bottoms, rods, bolts, nails, and spikes..lbs..	35 per cent	114¼	$39 00	$23 65	.....	.....	.....
(Act February 24, 1869) .lbs..	45 per cent	.....	.....	.....	.....	$2, 038 69	$917 41
Yellow metal .....lbs..	3⅛ cents per pound.	25, 566	3, 655 00	894 81	.....	.....	.....
Do.....	3 cents per pound..	43, 669	6, 592 00	1, 310 07	.....	.....	.....
Cork: Manufactures of.....	50 per cent	.....	195, 627 73	97, 813 87	.....	171, 849 92	85, 924 96
Unmanufactured	30 per cent	.....	186, 635 07	55, 990 52	.....	207, 907 41	62, 372 22
Cotton, and manufactures of:							
Unmanufactured.....lbs..	3 cents per pound..	121, 886	26, 999 00	3, 656 58	1, 317	125 00	39 51
Unbleached, weight less than 5 ounces per square yard, not exceeding 100 threads to the square inch, counting the warp and filling.....sq. yds..	2½ cts. per sq. yd...	17, 199	699 00	529 97	44, 549	3, 320 00	1, 113 74
As above, bleached....sq. yds..	3 cts. per sq. yd....	1, 453, 112	102, 789 00	43, 593 36	2, 346, 219	160, 599 00	70, 386 57
Do.....	3½ cts. per sq. yd...	73, 450	5, 041 00	2, 570 75	52, 642	4, 011 00	1, 842 47
Do.....	3 c. p. s. y. & 10 p. c	.....	.....	.....	.....	.....	.....
Colored, stained, painted, or printed.....sq. yds..	3½ c. p. s. y. & 10 p.c.	1, 317, 252	101, 199 00	56, 222 72	3, 952, 776½	352, 154 00	173, 562 65
As above .....sq. yds..	3½ c. p. s. y. & 20 p.c.	1, 834	190 00	102 19	.....	.....	.....
Plain, brown, or not bleached, value 16 cents, or less per square yard.....sq. yds..	5 cts. per sq. yard..	820, 164	44, 976 04	41, 008 20	20, 141½	2, 078 81	1, 007 08
Value over 16 cents per square yard.....sq. yds..	35 per cent	251, 484	43, 636 00	15, 272 60	295, 428	50, 597 00	17, 708 95
Plain, bleached, value over 20 cts. per square yard..sq. yds..	5½ cts. per sq. yd...	17, 619, 748½	2, 345, 738 48	969, 086 17	18, 558, 297½	2, 519, 855 21	1, 020, 706 44
Value over 20 cents per square yard.....sq. yds..	35 per cent	3, 915, 583	861, 653 00	301, 578 55	4, 180, 012	920, 519 00	322, 181 65
Printed or colored, value 25 cts.							

Figure 2: Average Tariff Rate by SIC 2-Digit industry in 1870, 1880, 1890, and 1900



Notes: Figure 2 shows the average tariff rate (x 100) in ad valorem equivalent terms (AVE) for US imports tariff revenue divided by the total value of imports) by SIC 2-digit industry.



Notes: Figure 3 shows the average tariff rate (x 100) in ad valorem equivalent terms (AVE) for US imports (tariff revenue divided by the total value of import "for home consumption") by SIC 2 digit industry. The figure also shows the average input tariff for each industry. Industries with no input tariffs have missing data due to a lack of information in the input-output-tables.

Manufacturing output data

- Census of Manufactures – state level (and national)
  - 1870, 1880, 1890, 1900, 1909
- Start with $>$ 141 SIC 3 digit industries $\sim$ 80 after clean up – unbalanced sample
- Value added, workers, gross output, establishments
- SIC 2 digit deflators

Table 1: Summary Statistics for Tariffs and Industry Outcomes Data, 1880 - 1909

	mean	sd	p10	p90
Levels				
ln(value added/worker)	7.41	0.78	6.49	8.43
Real ln(value added)	13.45	2.03	10.79	16.04
Real ln(gross output)	14.21	2.13	11.40	16.96
ln(workers)	6.04	2.02	3.37	8.62
ln(establishments)	3.76	1.65	1.61	6.07
Lagged ln(1+AVE)	0.27	0.16	0.07	0.48
Lagged ln(1+AVE) input tariffs	0.25	0.07	0.16	0.34
Share of Specific Tariffs (STS)	0.33	0.38	0.00	0.96
Ten-Year log Changes				
Δ ln(value added/worker)	0.25	0.57	-0.36	0.95
Δ ln(output per establishment)	0.43	1.02	-0.65	1.59
Δ Real ln(value added)	0.63	1.15	-0.56	1.91
Δ Real ln(gross output)	0.64	1.18	-0.56	1.95
Δ ln(workers)	0.37	1.13	-0.77	1.63
Δ ln(establishments)	0.21	1.00	-0.85	1.29
Δ Lagged ln(1+AVE)	-0.01	0.09	-0.10	0.09

Notes: Table 1 shows summary statistics for our baseline estimating sample in Table 2. The AVE is calculated as tariff revenue divided by the value of imports. The sample average share of specific tariff revenue in total tariff revenue collected is the average of sample industry ratios. Real variables are measured in 1870 dollars. Data are for all industries and states for which data are available in our baseline sample of Table 2.

Initial Stage to generate IV, Product-level

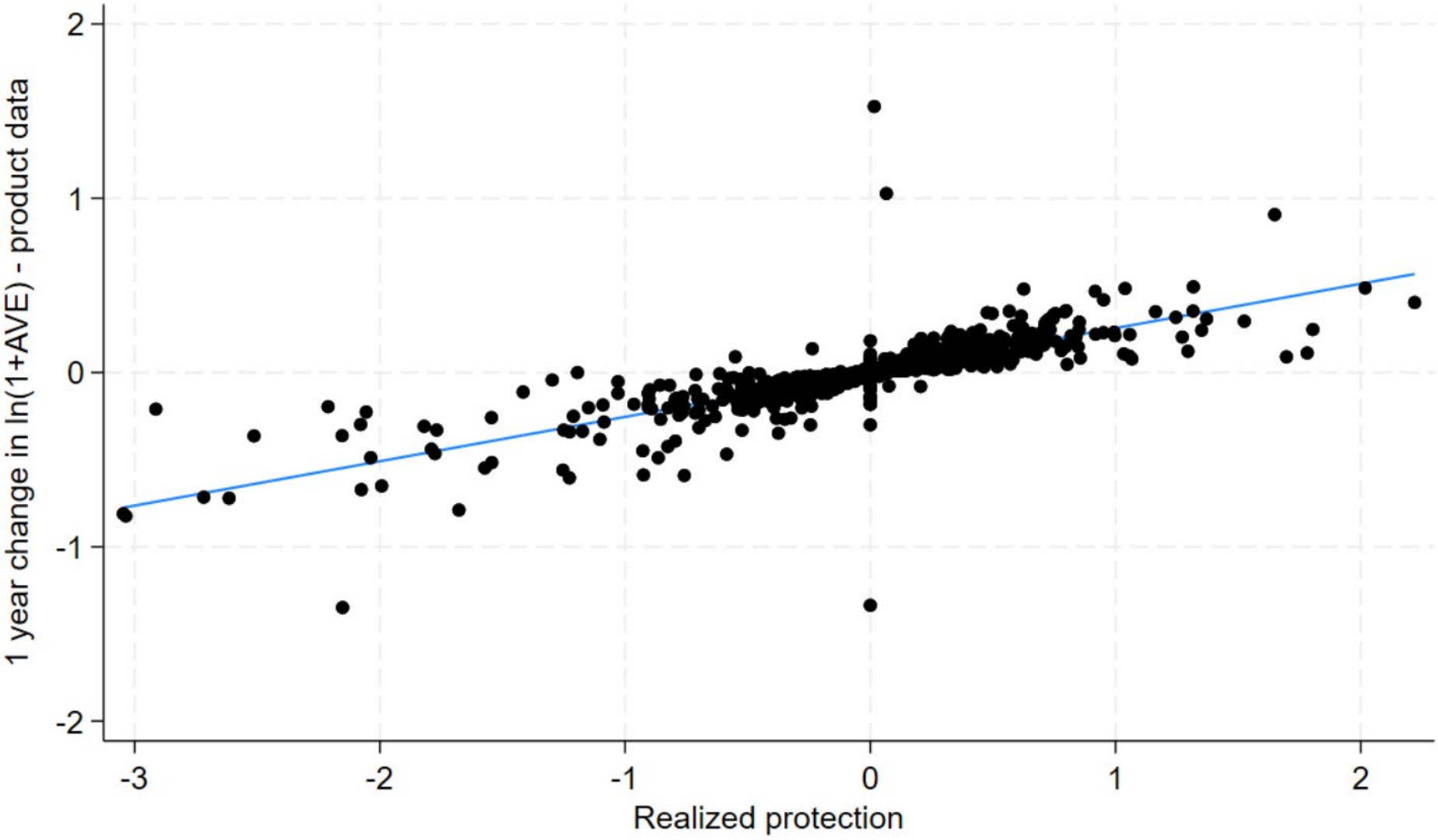
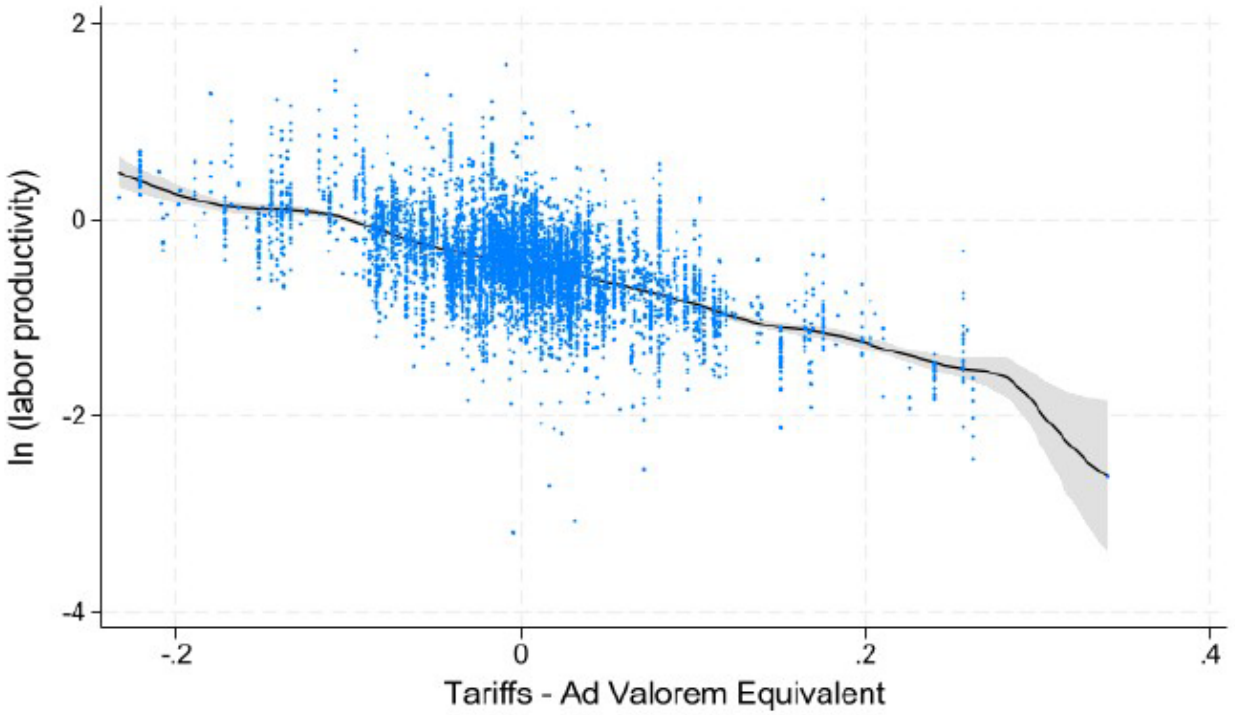
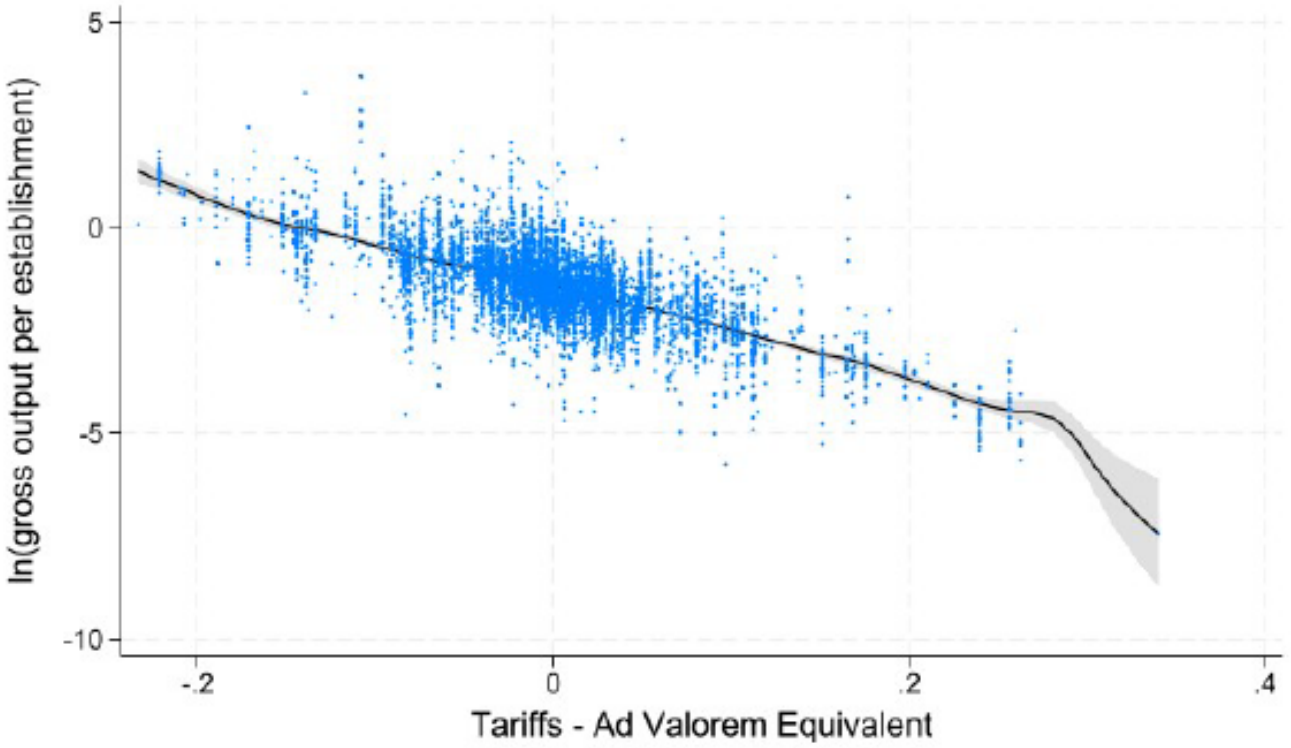


Figure B1: Non-parametric Estimates of the Relationship between the Labor Productivity and the Average Tariff, 1880-1909



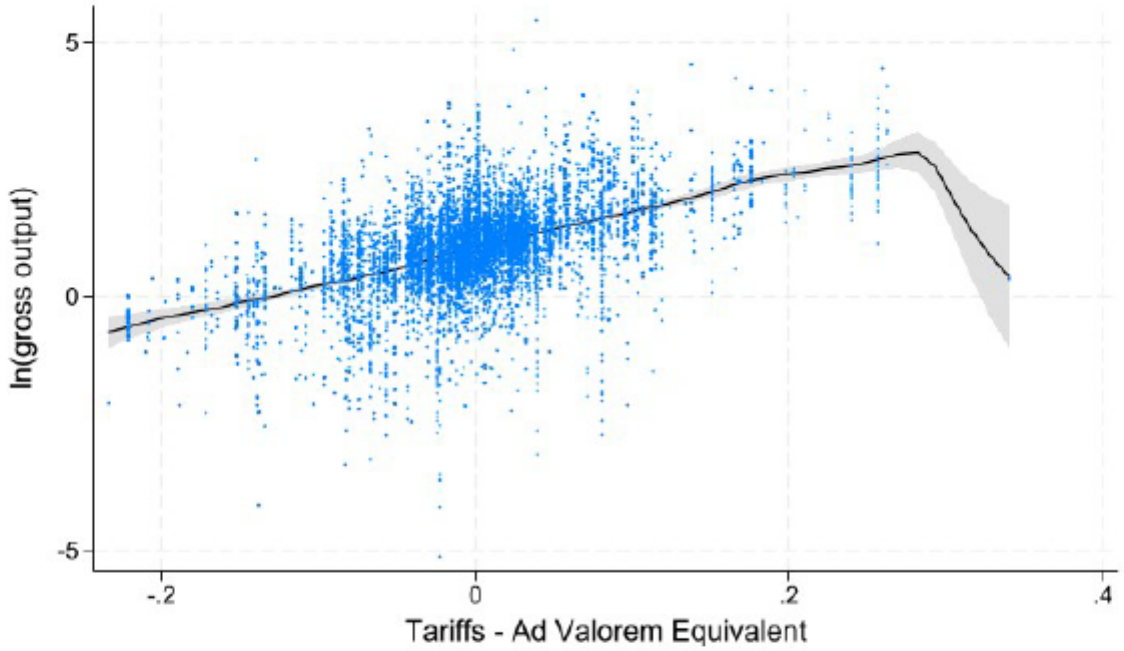
Notes: Figure B1 plots the non-parametric part of equation (10) which estimates a relationship between the initial level of $\ln(1 + AVE)$ and the subsequent real labor productivity using Robinson's (1988) double residual semi-parametric estimator and control function approach to instrumental variable estimation. The sample covers up to 82 industries at the SIC 3-digit level and 48 states/territories and we have four periods, 1880, 1890, 1900, and 1909. Real labor productivity is measured as industry value added divided by the total number of workers using data from the US Census of Manufactures. Value added is deflated using 2 digit industry price indexes. See text for further details. Tariff and labor productivity data are also residualized after controlling for state-by-industry fixed effects, and year fixed effects.

Figure B2: Nonparametric Estimates of the Relationship between the Real Gross Output per Establishment and the Average Tariff, 1880-1909



Notes: Figure B2 plots the non-parametric part of equation (10) which estimates a relationship between the initial level of $\ln(1 + AVE)$ the subsequent real gross output per establishment using Robinson's (1988) double residual semi-parametric estimator and control function approach to instrumental variable estimation. The sample covers up to 82 industries at the SIC 3-digit level and 48 states/territories and we have four periods, 1880, 1890, 1900, and 1909. Gross output is deflated using 2 digit industry price indexes. See text for further details. Tariff and gross output per establishment data are also residualized after controlling for state-by-industry fixed effects, and year fixed effects.

Figure B4: Nonparametric Estimates of the Relationship between the Real Gross Output and the Average Tariff, 1880-1909



Notes: Figure B4 plots the nonparametric part of equation (10) which estimates a relationship between the initial level of $\ln(1 + AVE)$ the subsequent real gross output using Robinson's (1988) double residual semi-parametric estimator and control function approach to instrumental variable estimation. The sample covers up to 82 industries at the SIC 3-digit level and 48 states/territories and we have four periods, 1880, 1890, 1900, and 1909. Gross output is deflated using 2 digit industry price indexes. See text for further details. Tariff and gross output data are also residualized after controlling for state-by-industry fixed effects, and year fixed effects.

Table 2: Tariffs and Various Industry Outcomes

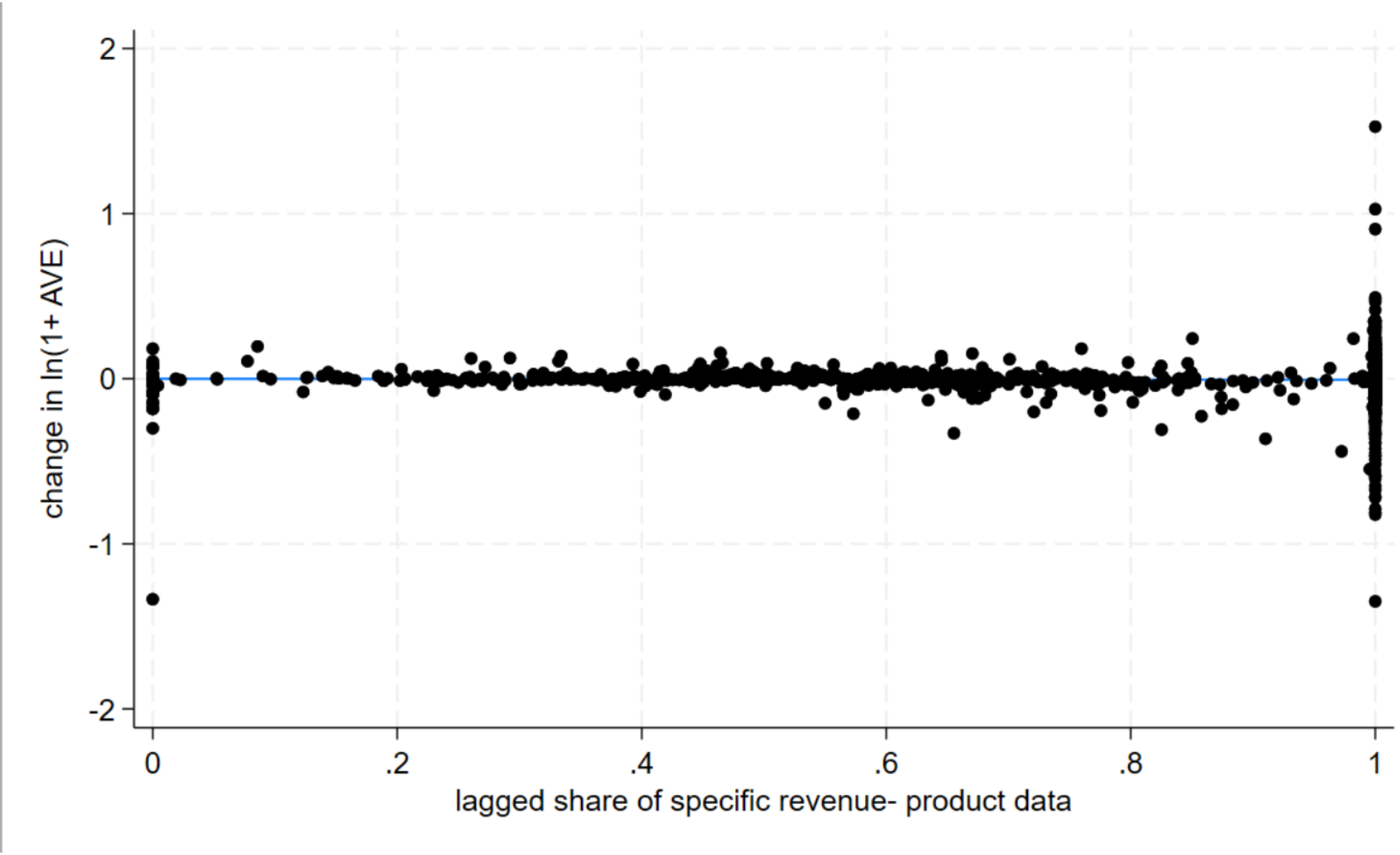
	Value Added per Worker	Gross Output per Establ.	Real Value Added	Real Gross Output	# Workers	# Establs.
Panel A: OLS Regressions						
$\ln(1+AVE_{t-10})$	-0.34***	0.71***	-0.42**	-0.19	-0.07	-0.89***
	[0.09]	[0.18]	[0.20]	[0.20]	[0.20]	[0.18]
Year FEs	Y	Y	Y	Y	Y	Y
SIC 3 x State FEs	Y	Y	Y	Y	Y	Y
N	6788	6788	6788	6788	6788	6788
N SIC x States	1962	1962	1962	1962	1962	1962
R^2	0.78	0.81	0.86	0.87	0.86	0.82
Panel B: IV Regressions						
$\ln(1+AVE_{t-10})$	-4.41**	-10.11**	13.19**	7.63	17.60***	17.75***
	[2.00]	[4.81]	[5.58]	[4.99]	[6.26]	[6.01]
Year FEs	Y	Y	Y	Y	Y	Y
SIC 3 x State FEs	Y	Y	Y	Y	Y	Y
N	6788	6788	6788	6788	6788	6788
N SIC x States	1962	1962	1962	1962	1962	1962
Kleibergen-Paap F-stat	15.06	15.06	15.06	15.06	15.06	15.06
Anderson-Rubin F-stat	8.10	5.56	5.67	2.15	9.64	9.56
Anderson-Rubin F-stat p-value	0.00	0.02	0.02	0.14	0.00	0.00
Panel C: IV Regressions - State x Year Fixed Effects						
$\ln(1+AVE_{t-10})$	-3.98**	-11.27**	15.16**	9.57*	19.14***	20.84***
	[1.98]	[5.00]	[6.20]	[5.45]	[6.89]	[6.76]
State x Year FEs	Y	Y	Y	Y	Y	Y
SIC 3 x State FEs	Y	Y	Y	Y	Y	Y
N	6788	6788	6788	6788	6788	6788
N SIC x States	1962	1962	1962	1962	1962	1962
Kleibergen-Paap F-stat	13.77	13.77	13.77	13.77	13.77	13.77
Anderson-Rubin F-stat	6.28	6.96	6.70	3.00	10.34	12.39
Anderson-Rubin F-stat p-value	0.01	0.01	0.01	0.08	0.00	0.00

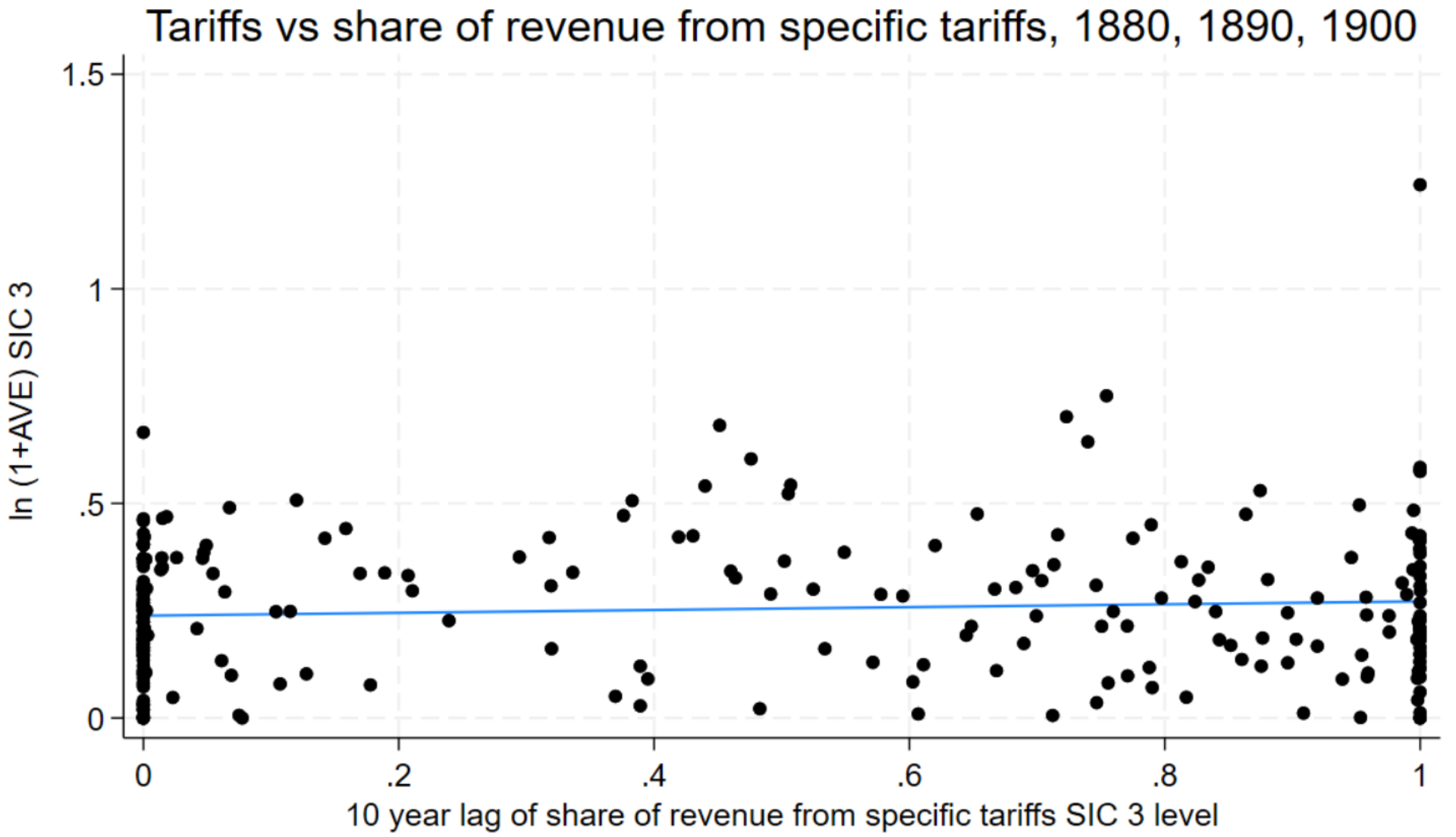
Notes: Table 2 shows the relationship between several outcomes for state-level SIC 3-digit industries in four census years (1880, 1890, 1900, and 1909) and the level of $\ln(1 + \text{AVE})$ at a ten year lag. The dependent variables are measured at the state-industry level. Estimation is by OLS or two stage least squares as indicated. Excluded instrument is the average of the predicted change in $\ln(1 + \text{AVE})$ at the product level within an SIC industry. Predictions are generated with a regression of the one-year product level change in $\ln(1 + \text{AVE})$ on time dummies and the Greenland-Lopresti measure of realized protection using product level changes in import unit values and the share of specific tariff revenue for the item. Period fixed effects are included in Panels A and B while Panel C uses state by year fixed effects. Standard errors are clustered at the state-SIC 3-digit industry level.

Table B1: Relationship Between the Share of Revenues Generated by Specific Tariffs (STS) and Industry Characteristics, SIC 3-Digit Industries, US 1870-1909.

	Linear Panel Two-Way FE	Linear Panel Two-Way FE	Fractional Estimator	Fractional Estimator	Fractional Panel FE	Fractional Panel FE
Share of gross output	-0.008	0.005	-4.089	-5.015	-3.620	-2.087
	[1.651]	[1.655]	[5.978]	[5.875]	[3.815]	[4.532]
Share of workers	-1.541	-1.467	-0.970	0.547	-1.585	-3.139
	[2.759]	[2.832]	[8.433]	[9.722]	[7.305]	[8.626]
Labor productivity	-0.000	-0.000	0.000	0.000	-0.000	0.000
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Labor productivity growth rate		0.169		-0.342		0.468
		[0.295]		[1.311]		[1.075]
N	316	311	316	313	316	313
R^2	0.84	0.84	.	.	.	.

Notes: Table B1 shows results for regressions with the share of revenues generated by specific tariffs as the dependent variable. The data set is a panel of SIC 3-digit industries in 1870, 1880, 1890, and 1900. The coefficients in the first and second column were estimated using a linear two-way fixed effects estimator (fixed effects cover industries and years). The coefficients in the third and fourth columns were estimated with a pooled fractional response estimator, and coefficients in the fifth and sixth columns were estimated using a fractional response panel data estimator. We use a correlated random effects approach to calculate the fixed effects in the last two columns. Shares of gross output and workers respectively were calculated relative to the total gross output in US manufacturing and total number of workers in US manufacturing respectively in the relevant years. Labor productivity growth rates are calculated between t and $(t-10)$ for the decades 1870-1900 and between t and $t-9$ for 1900-1909. Standard errors were clustered at the level of SIC 3-digit industries and are reported in the parentheses. *** p<0.01, ** p<0.05, * p<0.1.


2
1
0
-1
-2
change in ln(1+ AVE)
0
.2
.4
.6
.8
1
lagged share of specific revenue- product data


Tariffs vs share of revenue from specific tariffs, 1880, 1890, 1900
ln (1+AVE) SIC 3
1.5
1
.5
0
0
.2
.4
.6
.8
1
10 year lag of share of revenue from specific tariffs SIC 3 level

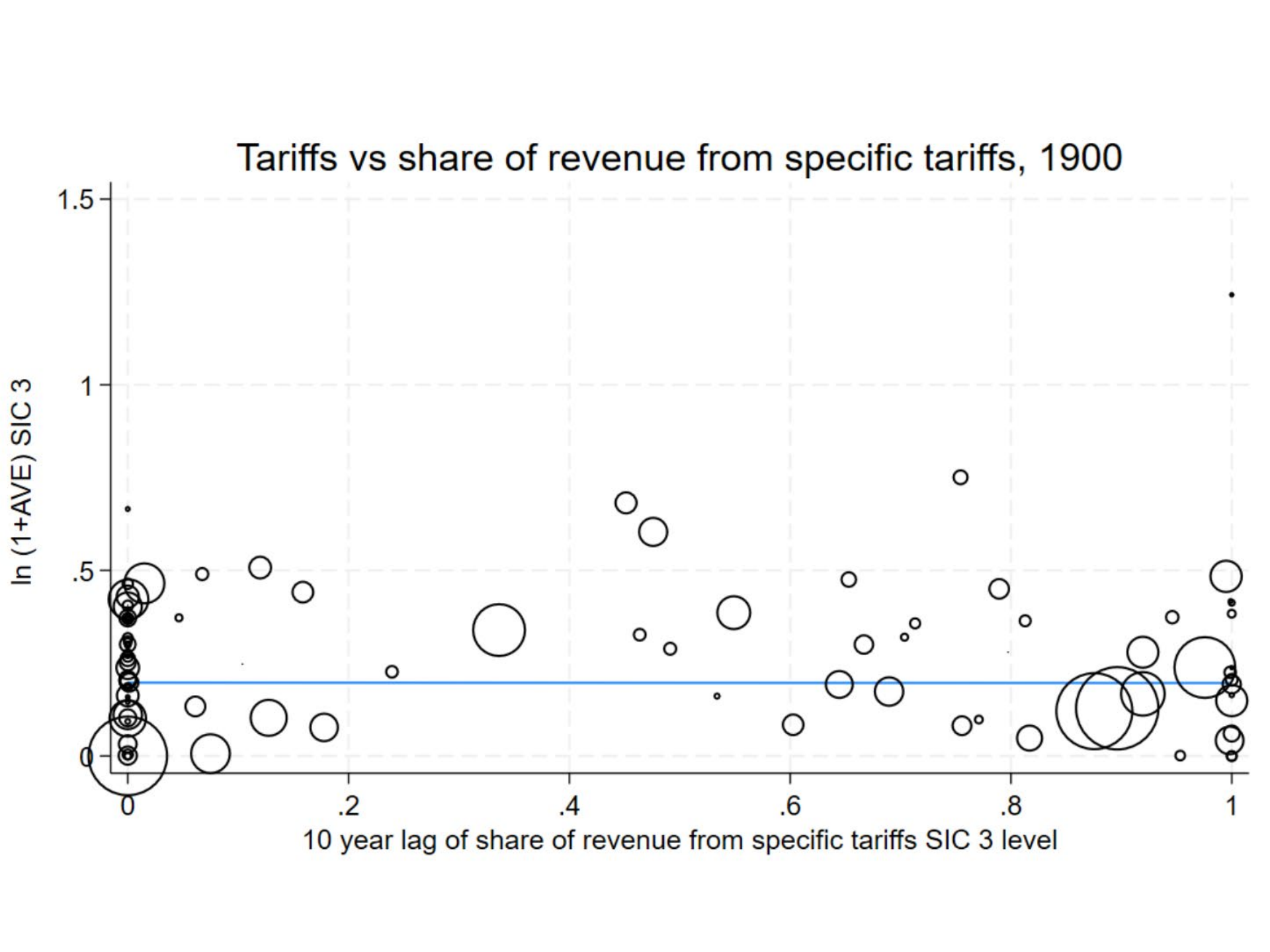

Tariffs vs share of revenue from specific tariffs, 1900
ln (1+AVE) SIC 3
1.5
1
.5
0
0
.2
.4
.6
.8
1
10 year lag of share of revenue from specific tariffs SIC 3 level

Table 3: Tariffs Various Industry Outcomes – Second Industrial Revolution

	Value Added per Worker	Gross Output per Establ.	Real Value Added	Real Gross Output	# Workers	# Establs.
Panel A: OLS Regressions						
$\ln(1+AVE_{t-10})$	-1.10***	1.51***	0.19	0.33	1.29**	-1.18**
	[0.25]	[0.56]	[0.56]	[0.54]	[0.56]	[0.50]
Year FEs	Y	Y	Y	Y	Y	Y
SIC 3 x State FEs	Y	Y	Y	Y	Y	Y
N	959	959	959	959	959	959
N SIC x States	305	305	305	305	305	305
R^2	0.69	0.79	0.85	0.85	0.82	0.75
Panel B: IV Regressions						
$\ln(1+AVE_{t-10})$	14.32*	13.30	9.30	4.78	-5.01	-8.51
	[7.61]	[9.01]	[9.22]	[8.19]	[8.04]	[8.14]
Year FEs	Y	Y	Y	Y	Y	Y
SIC 3 x State FEs	Y	Y	Y	Y	Y	Y
N	959	959	959	959	959	959
N SIC x States	305	305	305	305	305	305
Kleibergen-Paap F-stat	5.05	5.05	5.05	5.05	5.05	5.05
Anderson-Rubin F-stat	13.96	3.47	1.36	0.37	0.41	1.26
Anderson-Rubin F-stat p-value	0.00	0.06	0.24	0.54	0.52	0.26

Notes: Table 3 shows the relationship between several outcomes for state-level SIC 3-digit industries in four census years (1880, 1890, 1900, and 1909) and the level of $\ln(1 + \text{AVE})$ at a ten year lag. The dependent variables are measured at the state-industry level. Estimation is by OLS or two stage least squares as indicated. Excluded instrument is the average of the predicted change in $\ln(1 + \text{AVE})$ at the product level within an SIC industry. Predictions are generated with a regression of the one-year product level change in $\ln(1 + \text{AVE})$ on time dummies and the Greenland-Lopresti measure of realized protection using product level changes in import unit values and the share of specific tariff revenue for the item. Period and state-SIC 3-digit industry fixed effects are included in all specifications. Standard errors are clustered at the state-SIC 3-digit industry level.

Table 4: Tariffs Various Industry Outcomes, State Level Data (by SIC 2 Industry Groups)
Positive Effects on Extensive Margins

	Value Added per Worker	Gross Output per Establ.	Real Value Added	Real Gross Output	# Workers	# Establs.
SIC 22 & 23 Textile and Apparel						
$\ln(1+AVE_{t-10})$	-4.73*	-7.38	15.08**	12.56**	19.82***	19.94***
	[2.77]	[5.96]	[6.92]	[6.16]	[6.44]	[7.57]
N	695	695	695	695	695	695
Kleibergen-Paap F-stat	17.53	17.53	17.53	17.53	17.53	17.53
SIC 24 & 25 Wood and Furniture						
$\ln(1+AVE_{t-10})$	2.56***	-0.03	38.05***	37.83***	35.49***	37.86***
	[0.95]	[1.67]	[6.02]	[6.04]	[5.52]	[5.88]
N	556	556	556	556	556	556
Kleibergen-Paap F-stat	60.78	60.78	60.78	60.78	60.78	60.78
SIC 33 and 34 Metals						
$\ln(1+AVE_{t-10})$	-3.31***	-4.17	8.26***	5.95**	11.57***	10.11***
	[1.22]	[3.29]	[2.92]	[2.86]	[3.79]	[3.24]
N	871	871	871	871	871	871
Kleibergen-Paap F-stat	51.30	51.30	51.30	51.30	51.30	51.30
SIC 38 Instruments						
$\ln(1+AVE_{t-10})$	8.44**	-48.65***	38.46**	36.92**	30.02*	85.57***
	[3.71]	[14.90]	[17.13]	[16.36]	[16.75]	[21.61]
N	319	319	319	319	319	319
Kleibergen-Paap F-stat	19.34	19.34	19.34	19.34	19.34	19.34
SIC 39 Consumer Goods						
$\ln(1+AVE_{t-10})$	0.48	36.39***	72.91***	77.25***	72.43**	40.85**
	[5.39]	[13.49]	[27.16]	[28.64]	[28.11]	[16.60]
N	479	479	479	479	479	479
Kleibergen-Paap F-stat	14.65	14.65	14.65	14.65	14.65	14.65

Notes: Table 4 shows the relationship between the levels of several outcomes for state-level SIC 3-digit industries for census years (1880, 1890, 1900, and 1909) and $\ln(1 + \text{AVE})$ lagged ten years. The "extensive margin" is defined as total value added, gross output, workers, and establishments. The dependent variables are measured at the state-industry level. Estimation is by two stage least squares as indicated. Excluded instrument is the average of the predicted change in $\ln(1 + \text{AVE})$ at the product level within an SIC industry. Predictions are generated with a regression of the one-year product level change in $\ln(1 + \text{AVE})$ on time dummies and the Greenland-Lopresti measure of realized protection using product level changes in import unit values and the share of specific tariff revenue for the item. Period and state-SIC 3-digit industry fixed effects are included in all specifications. Standard errors are clustered at the state-SIC 3-digit industry level.

Table 5: Tariffs and Various Industry Outcomes, State Level Data (by SIC 2 Industry Groups) Negative Effects on Extensive Margins

	Value Added per Worker	Gross Output per Establ.	Real Value Added	Real Gross Output	# Workers	# Establs.
SIC 20 & 21 Food & Tobacco						
$\ln(1+AVE_{t-10})$	-0.60	5.31***	-3.71***	-0.78	-3.11***	-6.09***
	[0.50]	[0.82]	[0.99]	[1.03]	[0.97]	[0.98]
N	1184	1184	1184	1184	1184	1184
Kleibergen-Paap F-stat	136.00	136.00	136.00	136.00	136.00	136.00
SIC 26 & 27 Paper & Publishing						
$\ln(1+AVE_{t-10})$	-1.81***	0.20	-3.12***	-2.40***	-1.31	-2.60***
	[0.31]	[0.62]	[0.89]	[0.87]	[0.79]	[0.66]
N	478	478	478	478	478	478
Kleibergen-Paap F-stat	55.78	55.78	55.78	55.78	55.78	55.78
SIC 37 Transportation Equipment						
$\ln(1+AVE_{t-10})$	-4.31***	-5.32*	-13.56***	-11.97***	-9.26***	-6.65*
	[1.09]	[2.85]	[3.36]	[3.22]	[3.05]	[3.44]
N	271	271	271	271	271	271
Kleibergen-Paap F-stat	20.49	20.49	20.49	20.49	20.49	20.49

Notes: Table 5 shows the relationship between the levels of several outcomes for state-level SIC 3-digit industries for census years (1880, 1890, 1900, and 1909) and $\ln(1 + \text{AVE})$ lagged ten years. The "extensive margin" is defined as total value added, gross output, workers, and establishments. The dependent variables are measured at the state-industry level. Excluded instrument is the average of the predicted change in $\ln(1 + \text{AVE})$ at the product level within an SIC industry. Predictions are generated with a regression of the one-year product level change in $\ln(1 + \text{AVE})$ on time dummies and the Greenland-Lopresti measure of realized protection using product level changes in import unit values and the share of specific tariff revenue for the item. Period and state-SIC 3-digit industry fixed effects are included in all specifications. Standard errors are clustered at the state-SIC 3-digit industry level.

Table 6: Tariffs and Various Industry Outcomes, State Level Data (by SIC 2 Industry Groups) Neutral Effects on Extensive Margins

	Value Added per Worker	Gross Output per Establ.	Real Value Added	Real Gross Output	# Workers	# Establs.
SIC 28 & 29 Chemicals/Petroleum/Coal						
$\ln(1+AVE_{t-10})$	-8.01***	-6.28	-2.66	-2.99	5.35	3.29
	[2.96]	[4.14]	[4.09]	[4.30]	[4.70]	[3.16]
N	521	521	521	521	521	521
Kleibergen-Paap F-stat	12.00	12.00	12.00	12.00	12.00	12.00
SIC 32 Glass						
$\ln(1+AVE_{t-10})$	-0.22	2.81**	1.67	1.88	1.90	-0.93
	[0.64]	[1.16]	[1.24]	[1.19]	[1.40]	[0.95]
N	595	595	595	595	595	595
Kleibergen-Paap F-stat	41.25	41.25	41.25	41.25	41.25	41.25
SIC 35 & 36 Machinery & Electrical Goods						
$\ln(1+AVE_{t-10})$	3.12	1.36	-12.94	-15.48	-16.06	-16.06
	[4.17]	[8.52]	[9.35]	[10.58]	[11.66]	[11.66]
N	347	347	347	347	347	347
Kleibergen-Paap F-stat	3.96	3.96	3.96	3.96	3.96	3.96

Notes: Table 6 shows the relationship between the levels of several outcomes for state-level SIC 3-digit industries for census years (1880, 1890, 1900, and 1909) and $\ln(1 + AVE)$ lagged ten years. The "extensive margin" is defined as total value added, gross output, workers, and establishments. The dependent variables are measured at the state-industry level. Estimation is by two stage least squares as indicated. Excluded instrument is the average of the predicted change in $\ln(1 + AVE)$ at the product level within an SIC industry. Predictions are generated with a regression of the one-year product level change in $\ln(1 + AVE)$ on the Greenland-Lopresti measure of realized protection using product level changes in import unit values and the share of specific tariff revenue for the item. Period and state-SIC 3-digit industry fixed effects are included in all specifications. Standard errors are clustered at the state-SIC 3-digit industry level.

Table B2: Tariffs, Input Tariffs, and Various Industry Outcomes

	Value Added per Worker	Gross Output per Establ.	Real Value Added	Real Gross Output	# Workers	# Establs.
Panel A: OLS Regressions						
$\ln(1+AVE_{t-10})$	-0.29***	0.56***	-0.77***	-0.51**	-0.48**	-1.08***
	[0.10]	[0.20]	[0.23]	[0.24]	[0.24]	[0.22]
$\ln(1+AVE_{t-10})$ input tariffs	-5.30***	-2.90***	-3.07***	-2.83***	2.23***	0.06
	[0.29]	[0.60]	[0.68]	[0.74]	[0.69]	[0.62]
Year FEs	Y	Y	Y	Y	Y	Y
SIC 3 x State FEs	Y	Y	Y	Y	Y	Y
N	5527	5527	5527	5527	5527	5527
N SIC x States	1596	1596	1596	1596	1596	1596
R^2	0.79	0.81	0.86	0.86	0.86	0.81
Panel B: IV Regressions						
$\ln(1+AVE_{t-10})$	-2.05	-3.74	13.06*	7.12	15.10**	10.86
	[1.97]	[5.10]	[6.78]	[5.94]	[7.25]	[6.70]
$\ln(1+AVE_{t-10})$ input tariffs	-0.92	-15.01***	3.50	3.44	4.42	18.45***
	[1.83]	[3.29]	[5.04]	[4.03]	[5.42]	[4.57]
Year FEs	Y	Y	Y	Y	Y	Y
SIC 3 x State FEs	Y	Y	Y	Y	Y	Y
N	5527	5527	5527	5527	5527	5527
N SIC x States	1596	1596	1596	1596	1596	1596
Kleibergen-Paap F-stat	4.04	4.04	4.04	4.04	4.04	4.04
Anderson-Rubin F-stat	1.49	17.90	4.49	2.20	6.20	31.14
Anderson-Rubin F-stat p-value	0.23	0.00	0.01	0.11	0.00	0.00

Notes: Table B2 shows the relationship between the levels of several outcomes for state-level SIC 3 digit industries in four census years (1880, 1890, 1900, and 1909) and the level of $\ln(1 + \text{AVE})$ at a ten-year lag for industry tariffs and industry input tariffs. The dependent variables are measured at the state-industry level. Estimation is by OLS or two stage least squares as indicated. Excluded instrument is the average of the predicted change in $\ln(1 + \text{AVE})$ at the product level within an SIC industry. For the input tariffs, a similar procedure is followed but using input weights to make the instrument. Predictions are generated with a regression of the one-year product level change in $\ln(1 + \text{AVE})$ on the Greenland-Lopresti measure of realized protection using product level changes in import unit values and the share of specific tariff revenue for the item. Period fixed effects are included in all specifications. Standard errors are clustered at the state-SIC 3-digit industry level.

Table B3: Tariffs and Long Differences of Various Industry Outcomes

	Value Added per Worker	Gross Output per Establ.	Real Value Added	Real Gross Output	# Workers	# Establs.
Panel A: OLS Regressions						
Δ ln(1+AVE$_{t-10}$)	-0.36***	0.35*	-0.88***	-0.67***	-0.52**	-1.01***
	[0.09]	[0.19]	[0.20]	[0.21]	[0.21]	[0.18]
Year FEs	Y	Y	Y	Y	Y	Y
N	5128	5128	5128	5128	5128	5128
N SIC x States	1962	1962	1962	1962	1962	1962
R^2	0.02	0.03	0.02	0.01	0.02	0.09
Panel B: IV Regressions						
Δ ln(1+AVE$_{t-10}$)	-6.26**	-21.15**	7.88	-1.79	14.14*	19.37**
	[3.13]	[8.52]	[7.33]	[6.72]	[8.36]	[8.66]
Year FEs	Y	Y	Y	Y	Y	Y
N	5128	5128	5128	5128	5128	5128
N SIC x States	1962	1962	1962	1962	1962	1962
Kleibergen-Paap F-stat	14.31	14.31	14.31	14.31	14.31	14.31
Anderson-Rubin F-stat	5.28	8.49	1.21	0.07	3.33	5.57
Anderson-Rubin F-stat p-value	0.02	0.00	0.27	0.79	0.07	0.02

Notes: Table B3 shows the relationship between the inter-census year changes of several outcomes for state-level SIC 3 digit industries and the inter-census year change in ln(1 + AVE) at a 10 year lag for industry tariffs. Estimation is by OLS or two stage least squares as indicated. Excluded instrument is the average of the predicted change in ln(1 + AVE) at the product level within an SIC industry. Period fixed effects are included in all specifications. Standard errors are clustered at the state-SIC 3-digit industry level.

Table B4: Tariffs and Average Annual Growth Rates of Various Industry Outcomes

	Value Added per Worker	Gross Output per Establ.	Real Value Added	Real Gross Output	# Workers	# Establs.
Panel A: OLS Regressions						
$\ln(1+AVE_{t-10})$	-0.04***	0.08***	-0.05**	-0.03	-0.01	-0.08***
	[0.01]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]
$\ln(\text{level of dep. variable}_{t-10})$	-0.09***	-0.10***	-0.09***	-0.09***	-0.09***	-0.08***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Year FEs	Y	Y	Y	Y	Y	Y
SIC 3 x State FEs	Y	Y	Y	Y	Y	Y
N	6783	6783	6783	6783	6783	6783
N SIC x States	1961	1961	1961	1961	1961	1961
R^2	0.59	0.56	0.62	0.61	0.59	0.55
Panel B: IV Regressions						
$\ln(1+AVE_{t-10})$	-0.32*	-1.05*	1.07*	0.31	1.45**	1.74**
	[0.18]	[0.56]	[0.57]	[0.58]	[0.66]	[0.68]
$\ln(\text{level of dep. variable}_{t-10})$	-0.09***	-0.10***	-0.09***	-0.09***	-0.09***	-0.07***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Year FEs	Y	Y	Y	Y	Y	Y
SIC 3 x State FEs	Y	Y	Y	Y	Y	Y
N	6783	6783	6783	6783	6783	6783
N SIC x States	1961	1961	1961	1961	1961	1961
Kleibergen-Paap F-stat	16.56	14.59	15.09	14.96	15.88	17.34
Anderson-Rubin F-stat	4.07	4.13	3.33	0.27	4.71	6.51
Anderson-Rubin F-stat p-value	0.04	0.04	0.07	0.60	0.03	0.01

Notes: Table B4 shows the relationship between the average annual growth rate of several outcomes for state-level SIC 3 digit industries for four census periods (1870-1880, 1880-1890, 1890-1900, and 1900-1909) and $\ln(1 + \text{AVE})$ in the initial years 1870, 1880, 1890, and 1900. Estimation is by OLS or two stage least squares as indicated. Excluded instrument is the average of the predicted change in $\ln(1 + \text{AVE})$ at the product level within an SIC industry. Predictions are generated with a regression of the one-year product level change in $\ln(1 + \text{AVE})$ on the Greenland-Lopresti measure of realized protection using product level changes in import unit values and the share of specific tariff revenue for the item. Period and state-SIC 3-digit industry fixed effects are included in all specifications. Standard errors are clustered at the state-SIC 3-digit industry level.

Table B7: Panel Data with Endogenous Variable and Sample Selection

Main Variables of interest	Coefficient on $\ln(1+AVE)$	N	t-statistics	P-value	AR t-statistics	AR p-value
IV Regressions						
Real VA/L	-4.38	6788	-2.16	0.03	-2.79	0.01
Gross Output per Establ.	-11.09	6788	-2.18	0.03	-2.53	0.02
Real Value Added	14.88	6788	2.45	0.01	2.58	0.02
Real Gross Output	9.46	6788	1.77	0.08	1.74	0.12
Number of Workers	19.26	6788	2.82	0.00	3.26	0.01
Number of Establishments	20.54	6788	3.04	0.00	3.46	0.01
IV Regressions - State x Year Fixed Effects						
Real VA/L	-3.56	6788	-1.93	0.05	-2.34	0.02
Gross Output per Establ.	-10.69	6788	-2.23	0.03	-2.57	0.02
Real Value Added	15.17	6788	2.52	0.01	2.67	0.02
Real Gross Output	9.65	6788	1.83	0.07	1.80	0.11
Number of Workers	18.73	6788	2.81	0.00	3.23	0.01
Number of Establishments	20.33	6788	3.12	0.00	3.53	0.00

Notes: Table B7 presents regression results for a panel data model of sample selection with an endogenous variable as discussed in Section A.4. 'AR' stands for Anderson-Rubin. Wild-bootstrapping with 999 replications was used to estimate t-statistics and p-values.

Narrative evidence/case studies: Paper and Publishing (SIC 26 & 27)

- Final goods had relatively low tariffs but benefitted from the Platt-Simmonds Act of 1891
- Meanwhile, inputs of paper products, while low, could possibly have been even cheaper if Canadian products were allowed in free of tariffs. By 1913 they were.
- Still, publishing benefitted from high tariffs and non-tariff barriers on consumer goods potentially leading to concentration and a lack of competition.

Narrative evidence/case studies: Transportation (SIC 37)

- Heterogeneous set of products: carriages, bicycles, ships, automobiles
- Average tariffs of 40% - 50% rising over time – partially reflecting a change in the composition of imports from carriages/wagons to railroad equipment.
- According to Foreman-Peck (2019), "US engineers and designers continued to address into the twentieth century problems already solved in Europe," attributing this backwardness to "lack of market integration and competition compared to Europe...and the 45% protective tariff " (emphasis added).

Conclusions

- New data set of tariffs, manufacturing productivity, imports
- We ask whether labor productivity & other outcomes are associated with tariffs in the late 19th century US
- We find a negative/non-positive association between tariffs and productivity.
  - Interpretation: More competition → higher productivity
  - Interpretation 2: Endogenous tariffs/lobbying
- It is unlikely that US manufacturing exports could have grown so much due to tariffs.
  - Other causes: agglomeration, patent system, natural resources, immigration