

# Trade Protection Along Supply Chains

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# Motivation

- The last few decades have witnessed the **rise of China** as a world trading power: thanks to deep economic reforms in the 1980s and 1990s and the country's joining the World Trade Organization (WTO) in 2001, between 1990 and 2011, the share of global manufacturing exports originating from China surged from 2% to 16% (Acemoglu *et al.*, 2016)
- US-China trade war and **"return to protection"** (e.g. Amiti *et al.*, 2019; Blanchard *et al.*, 2020; Cavallo *et al.*, 2019; Flaaen and Pierce, 2019; Fajgelbaum *et al.*, 2020; Flaaen *et al.*, 2020)
- However, **China had already been the target of increasing US protection**: between 1988 and 2016, average US antidumping (AD) duties against China more than tripled (from 44.8% to 147.7%)

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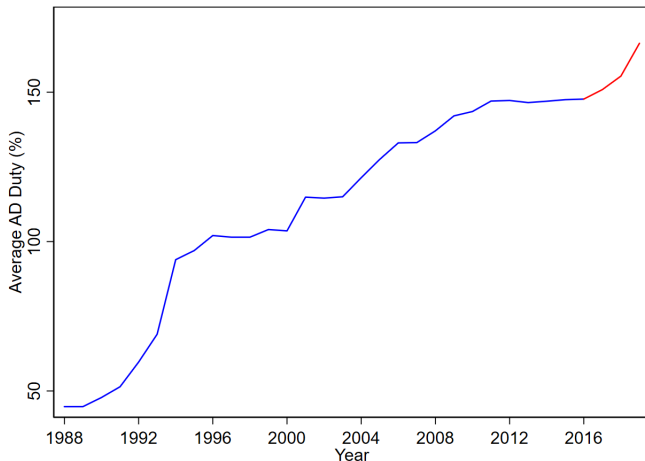
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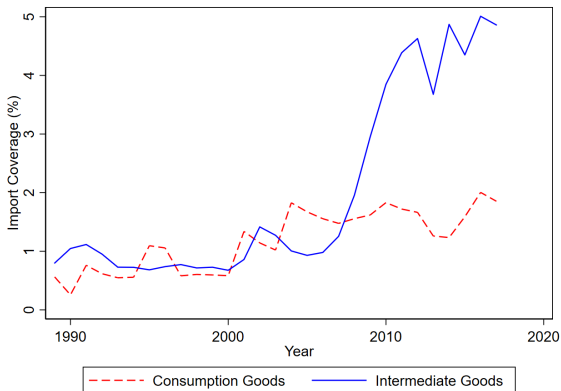
Average AD duty against China



- The last few decades have also witnessed the emergence of [global supply chains](#) and rise of trade in intermediate goods, which accounts for 2/3 of total trade (e.g. Yi, 2003; Johnson and Noguera, 2012)
  - A Honda is made of up to 30,000 parts produced by hundreds of different plants (Bartelme and Gorodnichenko, 2015)
  - iPhone's software and product design done by Apple, most parts produced by suppliers around the world (Xing, 2011)

Intermediate goods have been subject to increasing protection

Share of US imports from China covered by temporary trade barriers



Source: Bown (2019)

- Input protection hurts downstream producers:

*Tariffs on bike components, steel and aluminium have “raised the costs of Bicycle Corporation of America” so “plans to expand are on hold, costing American jobs” (“The Trouble with Putting Tariffs on Chinese Goods,” Economist, May 16, 2019)*

- This paper: we collect detailed information on all protectionist measures applied by the United States during the last decades and combine it with disaggregated US input-output data to identify vertical linkages between industries study the [effects of trade protection along supply chains](#)
- Key challenge for identification: [endogeneity of trade policy](#) (Trefler, 1993)



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# Main contributions of our paper

- We propose a **new instrument for AD duties**, the most widely used trade barrier, which exploits exogenous variation in
  - political importance of industries, driven by swing-state politics
  - historical experience in AD proceedings
- We use this instrument to identify the **causal impact of trade protection**: tariffs have large negative effects on downstream industries
  - increase production costs
  - decrease employment, sales, and investment

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## Related literature

- **Trade policy and vertical linkages** (e.g. Amiti and Konings, 2007; Goldberg *et al.*, 2010; Alfaro *et al.*, 2016; Blanchard *et al.*, 2017; Erbahar and Zi, 2017; Conconi *et al.*, 2018; Barattieri and Cacciatore, 2019; Bown *et al.*, 2020; Grossman and Helpman, 2020)
- **Antidumping protection** (e.g. Finger *et al.*, 1982; Besedes and Prusa (2017); Blonigen and Park, 2004; Bown and Crowley, 2007, 2013; Konings and Vandenbussche, 2001, 2008; Pierce, 2011; Blonigen and Prusa, 2016)
- **US-China trade war** (e.g. Amiti *et al.*, 2019; Blanchard *et al.*, 2020; Cavallo *et al.*, 2019; Flaaen and Pierce, 2019; Fajgelbaum *et al.*, 2020; Flaaen *et al.*, 2020)

# Outline

- 1 Introduction
- 2 Data**
- 3 Identification Strategy
- 4 Empirical Results
- 5 Conclusion
- 6 Appendix


# Data on tariffs

- We have updated the **Temporary Trade Barriers Database (TTBD)** of the World Bank (Bown, 2014), which contains detailed information on AD and other TTBs in more than 30 countries since 1980
- Baseline: **AD duties** applied by the United States against China 
- We map each AD case to a corresponding **4-digit SIC** sector
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# Data on input-output linkages

- Input-output (IO) tables from the Bureau of Economic Analysis (BEA) to **identify industries affected by input protection**
- BEA tables provide information on **vertical linkages** between 479 industries
- Following Acemoglu *et al.* (2016), we employ 1992 BEA tables, fixing technological linkages at the start of sample period 
- Some inputs play a key role in many industries 

## Other data sources

- County Business Patterns for **employment data**
- Comtrade for data on **trade flows** and **prices of imported inputs**
- Bureau of Labor Statistics for data on **domestic prices**
- NBER-CES for **other industry information** (e.g. sales, investment)

# Identification strategy

- Broad concern: **endogeneity** of trade policy (Trefler, 1993)
- Lobbying by downstream firms against input protection (e.g. Gawande *et al.*, 2012; Mayda *et al.*, 2018)
- OLS coefficients are likely to be biased upwards (i.e. underestimate the negative effects of protection)
- Similar concerns for **productivity shocks** that are correlated with the performance of downstream industries and the level of input protection

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# Identification strategy



- We use an **IV strategy** to identify the **causal effect** of tariffs
- We exploit exogenous variation in **supply and demand for protection**





# Supply for protection

- We exploit variation in the supply of AD coming from **swing-state politics**
- The **U.S. electoral system** creates incentives to favor swing states, where the vote gap between parties is expected to be small
- **Swing states** shape U.S. trade policy (e.g. Muûls and Petropoulou, 2013; Conconi *et al.*, 2017; Ma and McLaren, 2018; Fajgelbaum *et al.*, 2020)
- AD responds to **domestic political interests** (e.g. Finger *et al.*, 1982; Moore, 1992; Hansen and Prusa, 1997; Aquilante, 2018) 
- We provide evidence of the importance of **swing-state politics** in **AD** 
- $\text{Swing}_{s,T} = 1$  if the **difference in vote shares** of Democratic and Republican candidates in the previous presidential election is less than 5%



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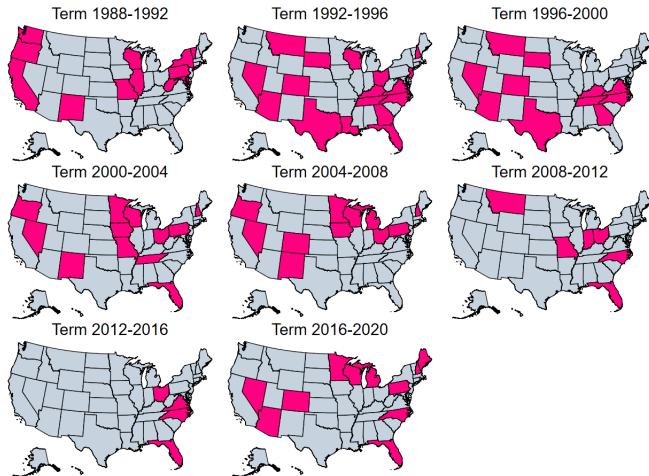
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# Swing states during the last eight presidential terms



## Swing Industry<sub>*i*,*T*</sub>


- Our measure of the **political importance of an industry** is the total number of workers employed in SIC4 industry *i* in states classified as swing in year *T*, over the total number of workers in tradable sectors in swing states:

$$Swing\ Industry_{i,T} = \frac{\sum_s L_{s,i}^{1988} \times Swing\ State_{s,T}}{\sum_s \sum_i L_{s,i}^{1988} \times Swing\ State_{s,T}}$$


- Sources of variation:
  - Treatment: changes in the political importance of states** across terms, driven by changes in the identity of swing states (*Swing<sub>s,T</sub>*)
  - Differences in exposure across industries**, driven by importance across states captured by initial employment shares ( $L_{s,i}^{1988}$ ) ▶

◀ 1988-2011 shares ▶

# Demand for protection

- Due to the complexity of AD procedures, **experience** in filing cases is a key determinant of AD success (Blonigen and Park, 2004; Blonigen, 2006)
- The **learning process** in AD
  - decreases the cost of initiating future AD cases
  - increases likelihood of successful outcomes
- Steep increase in **AD petitions during the 1980s** (Irwin 2005, 2017), particularly in sectors highly exposed to competition from Japan 
- *Experience<sub>i</sub>*: number of AD cases filed by industry  $i$  between 1980 to 1987

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# Combining supply and demand for protection

- Our instrument combines variation in supply and demand for protection:

$$IV_{i,T} = \text{Swing Industry}_{i,T} \times \text{Experience}_i$$

- The most protected industries should be those that are more **important in battleground states** (high  $\text{Swing Industry}_{i,T}$ ) and that can exploit this political advantage because of their **long-term knowledge of the complex institutional AD procedures** (high  $\text{Experience}_i$ )
- To obtain a consistent estimate of the causal impact of AD, our instrument has to satisfy the **exclusion restriction**, i.e. must be uncorrelated with any other determinant of the dependent variable (Angrist and Pischke, 2009)
- Interacting  $\text{Swing Industry}_{i,T}$  with  $\text{Experience}_i$  allows us to **isolate AD** from other policies that could be used to favor key industries in swing states

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# Predicting AD protection

- To verify whether our IV strategy allows us to predict AD protection, we estimate the following regression by OLS:

$$Tariff_{i,T} = \beta_0 + \beta_1 IV_{i,T} + \delta_i + \delta_T + \varepsilon_{i,T}$$

- We expect  $\beta_1$  to be positive

## Predicting AD protection

	(1) Tariff	(2) Dummy	(3) Product count	(4) Product coverage	(5) Import coverage	(6) All TTBs
$IV_{i,T}$	1.50*** (0.19)	0.83*** (0.14)	36.89*** (2.78)	0.13*** (0.02)	0.12*** (0.02)	1.42*** (0.19)
SIC4 FE	Yes	Yes	Yes	Yes	Yes	Yes
Term FE	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted $R^2$	0.50	0.67	0.89	0.69	0.31	0.50
Observations	2,835	2,835	2,835	2,835	2,835	2,835

$\beta_1$  is always positive and significant at 1 percent level, so our instrument is a good predictor of the level of AD protection granted to a SIC4 industry during a term

Our instrument is robust to alternative definitions of *Swing Industry*<sub>*i,T*</sub>

	(1) Number of electors	(2) 10% threshold	(3) Next presidential elections	(4) Employment in all industries
$IV_{i,T}$	0.12*** (0.01)	0.92*** (0.22)	1.68** (0.65)	6.01*** (0.78)
SIC4 FE	Yes	Yes	Yes	Yes
Term FE	Yes	Yes	Yes	Yes
Adjusted $R^2$	0.40	0.50	0.50	0.50
Observations	2,835	2,835	2,835	2,835

# Placebo tests

- The **political treatment variable** is defined at the state-term level ( $Swing_{s,T}$ )
- The effect of the treatment on AD protection should **vary across industries**: industries that are more important in swing states (high  $L_{s,i}^{1988}$ ) should get more protection, particularly if they have more knowledge of the complex legal and institutional AD procedures (high  $Experience_i$ )
- To verify the logic behind our IV strategy, we carry out two **placebo tests**:
  - To examine whether the **identity of swing states** matters, we randomly choose the swing states across the 50 US states
  - To investigate whether the **time-varying nature of swing states** matters, we randomly choose the swing states across those states that were classified as swing at least once during our sample period

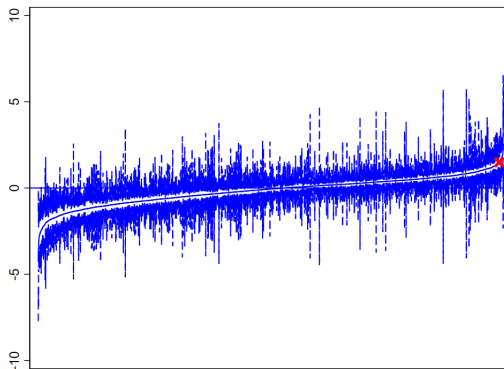
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- For each placebo test, we perform 5,000 randomizations, each producing a *Placebo*  $IV_{iT}$  and estimate

$$Tariff_{iT} = \beta_0 + \beta_1 Placebo\ IV_{iT} + \delta_i + \delta_T + \varepsilon_{iT}$$

- $\beta_1$  coefficients vary widely and have a negative mean  $\rightarrow$  predicting AD protection requires keeping track of the actual swing states in each term

5,000 estimated coefficients of  $Placebo IV_{iT}$





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# Measures of upstream protection

We construct two main measures of input protection:

$$\textit{Average Input Tariff}_{j,t} = \sum_{i=1}^N \omega_{i,j} \textit{Tariff}_{i,t}$$

$\omega_{i,j}$ : cost share of input  $i$  in the production of good  $j$

$\textit{Tariff}_{i,t}$ : AD duty on input  $i$  in year  $t$

$$\textit{Tariff on Key Input}_{j,t} = \textit{Tariff}_{1,j,t}$$

$\textit{Tariff}_{1,j,t}$ : AD duty on the most important input (highest  $\omega_{i,j}$ ) in year  $t$

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# Impact of upstream protection on downstream employment

Baseline two-stage least squares regression:

$$\Delta L_{j,T} = \beta_0 + \beta_1 \Delta \text{Input Tariff}_{j,T} + \delta_j + \delta_T + \varepsilon_{j,T},$$

Key variables:

$\Delta L_{j,T}$ : log change in employment in industry  $j$  during term  $T$

$\Delta \tau_{j,T}$ : change in input protection during term  $T$

$\delta_j$ : industry fixed effects at SIC4 level, accounting for sectoral trends

$\delta_T$ : term fixed effects, accounting for macroeconomic and political conditions

Standard errors clustered at the SIC3 level

## The impact of tariffs on employment in downstream industries (1988-2016)

	Manufacturing sectors		All sectors	
	Average input tariff (1)	Tariff on key input (2)	Average input tariff (3)	Tariff on key input (4)
$\Delta \text{Input Tariff}_{j,T}$	-0.073* (0.040)	-0.014*** (0.005)	-0.121*** (0.044)	-0.021*** (0.005)
SIC4 FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	2,742	2,742	3,351	3,351
KP F-statistic	142.4	1,437.7	157.3	2,002.1

1 p.p. increase in input tariff decreases annual growth rate of employment by 0.12 p.p

1 s.d. increase in input tariffs decreases the annual growth rate of employment by 0.4 p.p. (explaining 23% of the observed average growth rate)

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## The impact of tariffs on employment in downstream industries (OLS)

	Manufacturing sectors		All sectors	
	Average input tariff	Tariff on key input	Average input tariff	Tariff on key input
	(1)	(2)	(3)	(4)
$\Delta \text{Input Tariff}_{j,T}$	-0.009 (0.013)	-0.001 (0.003)	-0.015 (0.012)	-0.001 (0.002)
SIC4 FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	2,742	2,742	3,351	3,351
Adjusted $R^2$	0.35	0.35	0.37	0.37

Harder to identify negative impact of AD when **ignoring endogeneity of trade policy**

- We compute the **counterfactual jobs lost due to input protection**, we apply the methodology proposed by Acemoglu *et al.* (2016):

$$Employment\ losses = \sum_{j,t} L_{j,T} (1 - e^{-\hat{\beta}_1 \widetilde{\Delta\tau_{j,T}}})$$

$L_{j,T}$ : employment level in industry  $j$  at the end of term  $T$

$\hat{\beta}_1$ : estimated coefficient of  $\Delta\tau_{j,T}$  in the second stage

$\widetilde{\Delta\tau_{j,T}}$ : observed change in input duties weighted by the partial  $R^2$  of the first stage

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# Heterogeneous effects across industries

- Large losses in sectors that rely on highly protected inputs: 
  - Restaurants: more than 70,000 jobs lost (average input tariff of 13.44%, with average duties on crawfish and shrimps of 201.6% and 112.8%)
  - Construction: more than 50,000 jobs lost (average input tariff of 10.20%, with average duty on steel of 81.61%)
- The effects of protection also depend on the extent to which downstream producers rely on foreign suppliers for their inputs 

# Robustness checks

- Measure of protection: ▶
  - Alternative AD measures
  - Controlling for MFN, including other TTBs, AD duties on non-manufacturing inputs
- Vertical linkages: ▶
  - Weighting input tariffs by total IO coefficients
  - Including the diagonal of the IO matrix ( $\omega_{jj}$ )
- Political importance of industries ▶
  - Alternative measure of *Swing Industry*<sub>*i,T*</sub>
  - Controlling for *Swing Industry*<sub>*j,T*</sub>
- Econometric methodology: ▶
  - Alternative specification (first-differences)
  - Alternative clusters

# Extending the analysis to trade barriers under Trump

- Since Trump took office in 2017, the US has **further increased AD protection** against China (32 new measures, average duty rate of 225%)
- In 2018 Trump introduced **special tariffs** (under Sections 201 and 301 of 1974 US Trade Act, Section 232 of 1962 Trade Expansion Act)

## The impact of tariffs on employment in downstream industries (1988-2018)



	AD only		All TTBs + Trump's tariffs	
	Average input tariff	Tariff on key input	Average input tariff	Tariff on key input
	(1)	(2)	(3)	(4)
$\Delta \text{Input Tariff}_{j,T}$	-0.100** (0.041)	-0.017*** (0.005)	-0.127** (0.052)	-0.020*** (0.006)
SIC4 FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	3,829	3,829	3,829	3,829
KP F-statistic	172.5	1,353.7	151.3	944.6

The coefficient of  $\Delta \tau_{j,t}$  in column 3 implies around **193,000 US jobs lost** due to protectionist measures introduced in the first two years of Trump's presidency

# Effects of tariffs on other industry outcomes

	Blue Collar		White Collar	
	Average input tariff	Tariff on key input	Average input tariff	Tariff on key input
	(1)	(2)	(3)	(4)
$\Delta Input\ Tariff_{j,T}$	-0.153** (0.067)	-0.029*** (0.006)	-0.112* (0.061)	-0.018** (0.008)
SIC4 FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	2,320	2,320	2,320	2,320
KP F-statistic	126.9	1,816.8	126.9	1,816.8
	Investment		Sales	
	Average input tariff	Tariff on key input	Average input tariff	Tariff on key input
	(5)	(6)	(7)	(8)
$\Delta Input\ Tariff_{j,T}$	-0.140 (0.118)	-0.037** (0.017)	-0.135* (0.071)	-0.025*** (0.009)
SIC4 FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	2,320	2,320	2,320	2,320
KP F-statistic	126.9	1,816.8	126.9	1,816.8

# Mechanisms

- We provide evidence for the **mechanisms behind the detrimental effects of tariffs on downstream industries**: higher tariffs **raise the cost of production in downstream industries** since they
- **Decrease imports** of targeted products 
- **Raise prices** charged by both foreign and domestic producers 



# Conclusion

- We have proposed a **new instrument** for AD duties, which exploits exogenous variation in the political importance of industries and their historical experience in AD proceedings
- Using this instrument, we have identified the **causal effects of trade protection** along supply chains, showing that higher tariffs decrease imports and increase prices in the protected industries, and reduce employment, sales, and investment in downstream industries
- Our estimates for the 1988-2016 (2016-2018) period indicate that AD duties destroyed 570,000 (200,000) jobs
- Our results resonate with concerns heard in the media about the **costs of protection along supply chains**: *“Trump’s tariffs on steel will cost manufacturing jobs across the country”* (Financial Times, March 1, 2018)

# Implications for the world trading system

- Our paper helps to understand why the **WTO dispute settlement is dead-locked** over **US' refusal to appoint new Appellate Body (AB) members**
- Strong criticism of the AB by the United States, for overreaching in its handling of **disputes over US AD duties**
- Article 17.6 of the WTO's Antidumping Agreement: adjudicators can scrutinize members' use of antidumping duties, as long as they give deference to domestic investigating authorities (DOC and ITC in the United States)
- The AB ruled against the United States on disputes involving US AD duties because of the methodology used to determine dumping margins

*"The Appellate Body has diminished US rights by failing to comply with WTO rules, addressing issues it has no authority to address" (USTR, 2020)*

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- **Economic** rationale for flexible protectionist measures: the ability to protect industries in the face of import surges can act as a “safety valve,” allowing to sustain trade policy cooperation (Bagwell and Staiger, 1990)
- Our paper emphasizes the **political economy** motives for flexible protectionist measures (in the spirit of Bagwell and Staiger, 2005): being able to protect certain industries can help politicians to gain votes
- These motives are particularly important in the United States, where swing-state politics creates incentives to favor key industries in battleground states
- This can help to explain strong US opposition to the AB:

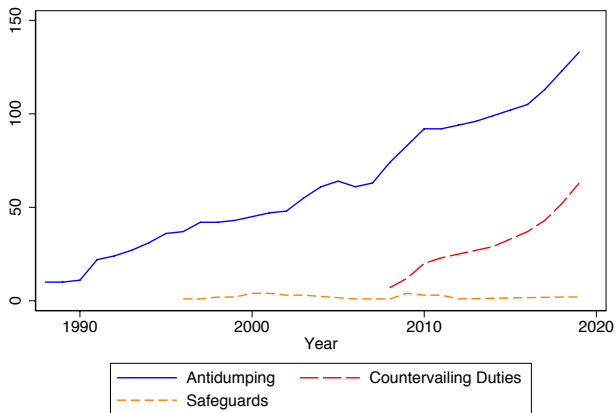
*“Antidumping protection is very sensitive here in a way that they may not be in other countries. The Appellate Body obviously hasn’t been sensitive to any of that, and they’ve simply trampled those laws every chance they’ve gotten” (Stephen Vaughn, former General Counsel of USTR)*

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Thank you!

## US AD duties, countervailing duties, and safeguards against China



Source: Authors' calculations based on the Temporary Trade Barriers Database (TTBD).



# Descriptive statistics on AD duties applied by the US against China (1988-2016)

Variable	Mean	Std. Dev.	Min	Max
$Tariff_{j,t}$	0.15	0.53	0.00	4.30
<i>Average Input Tariff</i> $_{j,t}$	0.14	0.15	0.00	1.07
<i>Tariff on Key Input</i> $_{1,j,t}$	0.36	0.63	0.00	3.77

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## Descriptive statistics on tariffs applied by the US against China under Trump

AD duties				
$Tariff_{j,t}$	0.36	0.81	0.00	4.93
<i>Average Input Tariff</i> $_{j,t}$	0.34	0.21	0.02	1.01
<i>Tariff on Key Input</i> $_{1,j,t}$	0.88	0.88	0.00	3.73
Section 201, 232, and 301 tariffs				
Variable	Mean	Std. Dev.	Min	Max
$Tariff_{j,t}$	0.11	0.07	0.00	0.25
<i>Average Input Tariff</i> $_{j,t}$	0.05	0.03	0.00	0.15
<i>Tariff on Key Input</i> $_{1,j,t}$	0.13	0.05	0.00	0.25

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## Descriptive statistics on MFN tariffs applied by the US (1988-2016)

Variable	Mean	Std. Dev.	Min	Max
$Tariff_{j,t}$	0.05	0.21	0.00	3.50
<i>Average Input Tariff</i> $_{j,t}$	0.02	0.03	0.00	0.43
<i>Tariff on Key Input</i> $_{1,j,t}$	0.05	0.23	0.00	3.50

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## Top-10 protected sectors, by average duty

SIC4	SIC4 description	Average tariff
710	Agriculture	245.5%
2033	Canned fruits and vegetables	243.5%
2037	Frozen fruits and vegetables	237.1%
2035	Pickles, sauces, and salad dressings	234.9%
3792	Travel trailers and campers	172.0%
3399	Primary metal products, n.e.c.	134.6%
3339	Primary nonferrous metals, n.e.c.	125.9%
2869	Industrial organic chemicals, n.e.c.	125.1%
900	Fishing, hunting, and trapping	120.7%
3494	Valves and pipe fittings, n.e.c.	117.7%

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## Top-10 downstream sectors, by average input duty

SIC4	SIC4 description	Average input duty	Average duty on key input	Key input SIC4	Key input description
3449	Miscellaneous metal work	49.98%	81.61%	3312	Blast furnaces and steel mills
2653	Corrugated and solid fiber boxes	43.79%	76.93%	2621	Paper mills
3412	Metal barrels, drums, and pails	43.64%	81.61%	3312	Blast furnaces and steel mills
3448	Prefabricated metal buildings	42.96%	81.61%	3312	Blast furnaces and steel mills
2821	Plastics materials and resins	42.16%	125.09%	2869	Industrial organic chemicals, n.e.c.
2674	Bags: uncoated paper and multiwall	40.57%	76.93%	2621	Paper mills
3084	Plastics pipe	40.53%	53.04%	2821	Plastics materials and resins
2655	Fiber cans, drums and similar products	39.58%	76.93%	2621	Paper mills
3465	Automotive stampings	39.05%	81.61%	3312	Blast furnaces and steel mills
2851	Paints and allied products	38.67%	125.09%	2869	Industrial organic chemicals, n.e.c.

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# Politics of AD

- Domestic politics can affect the two institutions that regulate AD:
  - **Department of Commerce (DOC)**: determines if imported goods are sold at less than “fair value”, sets **dumping margin**
  - **DOC** is part of the executive branch: the President nominates its top positions and can directly intervene in its decisions
  - **International Trade Commission (ITC)**: determines whether imports have caused **material injury** to the relevant US industry
  - Decisions of **ITC** reflect interests of key committees in Congress (e.g. Moore, 1992; Hansen and Prusa, 1997; Aquilante, 2018)

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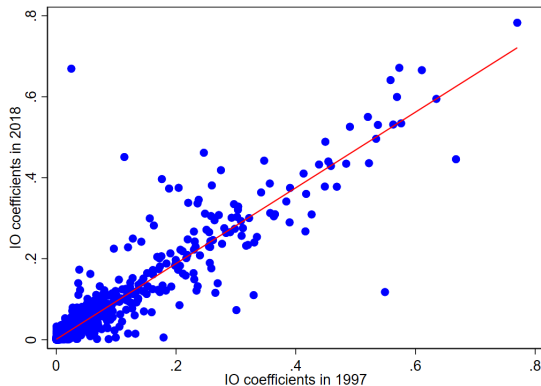
# Swing-state politics and AD

- **Swing states are overrepresented in key trade committees** in Congress: they account for around 21% of US states on average, but for 33% (36%) of new members of the Senate Finance (House Ways and Means) committee
- **ITC commissioners more likely to protect key industries in swing states**, particularly if they are from the same party as the president

## ITC votes and swing-state politics

	(1)	(2)
<i>Swing Industry<sub>i,T</sub></i>	19.391*** (4.372)	16.280*** (4.278)
<i>Swing Industry<sub>i,T</sub> × Party as President<sub>c,T</sub></i>		7.285*** (2.394)
<i>Same Party as President<sub>c,T</sub></i>		0.054 (0.039)
Commissioner FE	Yes	Yes
Year FE	Yes	Yes
SIC4 FE	Yes	Yes
Adjusted $R^2$	0.50	0.51
Observations	856	856

## IO coefficients

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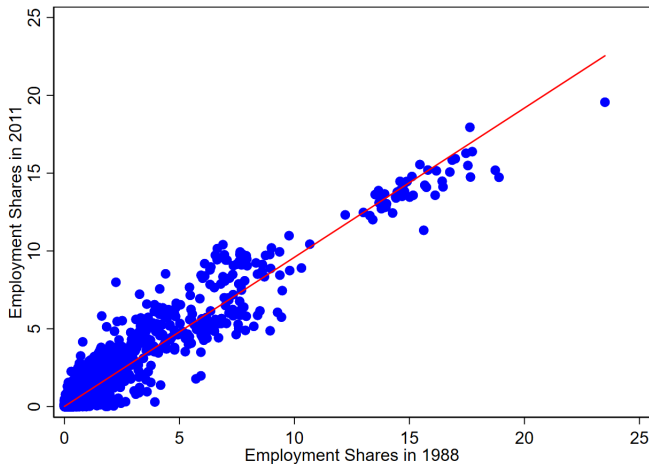


## Top-10 key inputs

SIC4	Input industry	Share downstream industries	Average cost share of key input
3312	Blast furnaces and steel mills	0.17	0.11
1221	Coal and petroleum	0.10	0.09
2221	Broadwoven fabric mills, manmade	0.06	0.10
2752	Commercial printing, lithographic	0.06	0.04
2621	Paper mills	0.05	0.20
3679	Electronic components, n.e.c.	0.05	0.06
2869	Industrial organic chemicals, n.e.c.	0.04	0.11
2821	Plastics materials and resins	0.03	0.12
2911	Petroleum refining	0.03	0.10
3674	Semiconductors and related devices	0.03	0.04

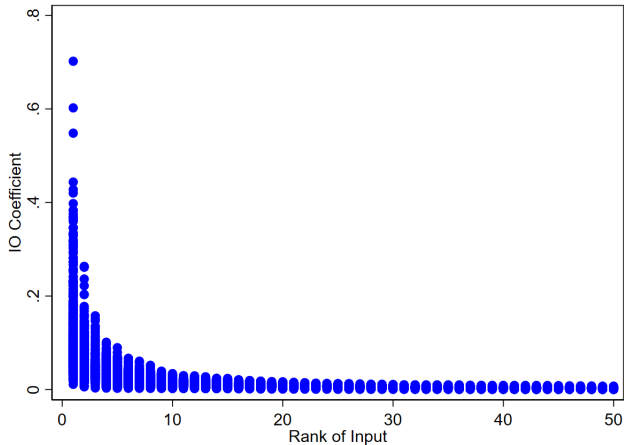
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## Employment shares, 1988-2011

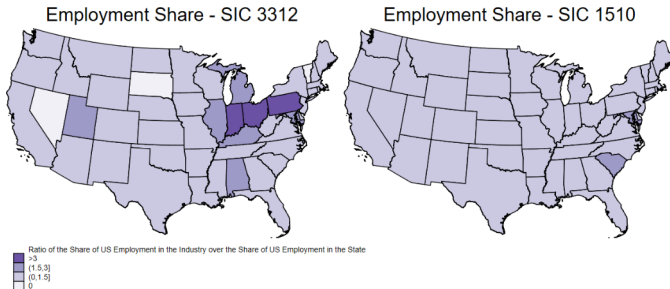


## Figure

Average IO coefficients of 50 most important inputs



## Geographical distribution of steel (SIC 3312) and construction (SIC 1510) (based on 1988 employment shares)



Indiana, Ohio, Pennsylvania: 13% of total employment, 56% of employment in steel  
State-level employment in construction proportional to size of employment force

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# Distribution of industries across states

- **Input industries are more geographically concentrated** than final good industries: the correlation between the measure of upstreamness by Antràs *et al.* (2012) and the index of industry spatial concentration from Ellison and Glaeser (1997) is 0.24 (significant at the 1% level)

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# Determinants of *Experience<sub>i</sub>*

	(1)	(2)	(3)	(4)	(5)	(6)
<i>Imports<sub>i</sub><sup>JP</sup></i>	0.22** (0.09)	0.31** (0.14)	0.24** (0.09)	0.31** (0.13)	0.25** (0.10)	0.32** (0.14)
<i>HHI<sub>i</sub></i>			-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)
<i>EGI<sub>i</sub></i>			3.25 (2.45)	1.23 (2.61)	3.24 (2.43)	1.35 (2.28)
<i>Unionization<sub>i</sub></i>			0.05 (0.04)	0.05 (0.04)	0.05 (0.04)	0.05 (0.04)
<i>Employment Growth<sub>i</sub></i>			-0.00 (0.01)	-0.00 (0.01)		
<i>Production Growth<sub>i</sub></i>					-0.00 (0.00)	-0.00 (0.00)
Industry FE	No	Yes	No	Yes	No	Yes
Observations	391	391	370	370	370	370

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# First-stage results

## First-stage results

	Manufacturing sectors		All sectors	
	Average input tariff (1)	Tariff on key input (2)	Average input tariff (3)	Tariff on key input (4)
$\Delta/V_{j,T}$	0.001*** (0.000)	0.724*** (0.019)	0.001*** (0.000)	0.720*** (0.016)
SIC4 FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	2,742	2,742	3,351	3,351
Adjusted $R^2$	0.25	0.21	0.23	0.18

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## The effect of tariffs and employment in protected industries

	(1)	(2)	(3)
$\Delta \text{Tariff}_{j,T}$	-0.008 (0.016)	-0.012 (0.019)	-0.009 (0.014)
$\Delta \text{Average Input Tariff}_{j,T}$		-0.078* (0.042)	-0.014*** (0.005)
SIC4 FE	Yes	Yes	Yes
Term FE	Yes	Yes	Yes
Observations	2,833	2,833	2,833
KP F-statistic	15.0	8.11	7.83

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## Top-10 affected sectors, by number of jobs lost due to input protection

SIC4	SIC4 description	Share of total US employment	Average input tariff	Employment loss due to average input tariffs
5812	Eating and drinking places	7.94%	13.4%	-73,616
1510	Construction	5.47%	10.2%	-50,639
5210	Retail trade	13.25%	3.2%	-43,900
5012	Wholesale trade	6.11%	4.1%	-27,038
8060	Hospitals	4.90%	6.1%	-20,559
7532	Auto repair	0.67%	20.2%	-13,206
8320	Social services	1.14%	6.7%	-9,915
2752	Commercial printing, lithographic	0.49%	21.9%	-9,604
7371	Computer services	1.60%	3.4%	-8,641
4210	Trucking	1.71%	4.6%	-7,808

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The impact of tariffs on employment in downstream industries  
(heterogeneous effects by import dependence)

	Import share (1)	Import penetration (2)
$\Delta Input\ Tariff_{j,T}$	-0.147*** (0.044)	-0.133*** (0.043)
$\Delta Input\ Tariff_{j,T} \times Import\ Dependence_j$	-98.336** (45.020)	-92.628** (37.161)
SIC4 FE	Yes	Yes
Term FE	Yes	Yes
Observations	3,351	3,351
KP F-statistic	81.0	133.8

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## Input protection and employment in downstream industries (alternative AD measures)

	Dummy		Product count	
	Average input tariff	Tariff on key input	Average input tariff	Tariff on key input
	(1)	(2)	(3)	(4)
$\Delta Input\ Tariff_{j,T}$	-0.168*** (0.061)	-0.029*** (0.007)	-0.029*** (0.010)	-0.005*** (0.001)
SIC4 FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	3,351	3,351	3,351	3,351
KP F-statistic	142.5	3,111.7	164.6	1,0297.4
	Product coverage		Import coverage	
	Average input tariff	Tariff on key input	Average input tariff	Tariff on key input
	(5)	(6)	(7)	(8)
$\Delta Input\ Tariff_{j,T}$	-14.768* (8.588)	-1.140*** (0.286)	-5.437*** (1.998)	-0.860*** (0.208)
SIC4 FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	3,351	3,351	3,351	3,351
KP F-statistic	5.53	307.3	112.3	1,266.0

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## The impact of tariffs on employment in downstream industries (controlling for MFN, all TTBs, all targeted countries)

	Controlling for MFN		All TTBs		All countries	
	Average input tariff (1)	Tariff on key input (2)	Average input tariff (3)	Tariff on key input (4)	Average input tariff (5)	Tariff on key input (6)
$\Delta \text{Input Tariff}_{j,T}$	-0.121*** (0.044)	-0.021*** (0.005)	-0.145*** (0.052)	-0.026*** (0.006)	-1.132** (0.558)	-0.315*** (0.114)
SIC4 FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,351	3,351	3,351	3,351	3,351	3,351
KP F-statistic	154.6	1,996.6	153.9	1,362.1	9.92	12.9

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## Input protection and employment in downstream industries (alternative IO linkages)

	Total requirements		Including diagonal	
	Average input tariff	Tariff on key input	Average input tariff	Tariff on key input
	(1)	(2)	(3)	(4)
$\Delta \text{Input Tariff}_{j,T}$	-0.162*** (0.060)	-0.023*** (0.006)	-0.128*** (0.044)	-0.023*** (0.005)
SIC4 FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	3,351	3,351	3,351	3,351
KP F-statistic	222.5	1,979.8	169.1	1,718.3

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## The impact of tariffs on downstream industries (alternative methodology and clusters)

	Year differences		SIC2 clusters		SIC4 clusters	
	Average input tariff	Tariff on key input	Average input tariff	Tariff on key input	Average input tariff	Tariff on key input
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta Input\ Tariff_{j,T}$	-0.487*** (0.175)	-0.086*** (0.021)	-0.121** (0.050)	-0.021*** (0.005)	-0.121*** (0.039)	-0.021*** (0.006)
SIC4 FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13,407	13,407	3,351	3,351	3,351	3,351
KP F-statistic	157.1	2,002.5	183.3	1,739.2	373.4	4,547.1

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The impact of tariffs on employment in downstream industries  
 alternative measure of  $Swing\ Industry_{i,T}$ , controlling for  $Swing\ Industry_{j,T}$

	Alternative measure of $Swing\ Industry_{i,T}$		Controlling for $Swing\ Industry_{j,T}$	
	Average input tariff	Tariff on key input	Average input tariff	Tariff on key input
	(1)	(2)	(3)	(4)
$\Delta Input\ Tariff_{i,T}$	-0.102** (0.046)	-0.019*** (0.006)	-0.101** (0.046)	-0.019*** (0.006)
$\Delta Swing\ Industry_{j,T}$			-0.183 (0.771)	-0.329 (0.856)
SIC4 FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	3,351	3,351	3,351	3,351
KP F-statistic	128.0	1,442.6	127.3	1,449.6

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## The impact of tariffs on imports

	(1)	(2)	(3)
$\Delta \text{Tariff}_{j,T}$	-0.354*** (0.119)	0.044* (0.024)	0.043* (0.025)
$\Delta \text{Tariff}_{j,T} \times \text{China}_c$		-0.398*** (0.133)	-0.397*** (0.134)
<i>AD on Third Country</i> <sub>j,c,T</sub>			-0.016 (0.024)
SIC4 FE	Yes	No	No
Term FE	Yes	No	No
SIC4 $\times$ Country FE	No	Yes	Yes
Term $\times$ Country FE	No	Yes	Yes
Observations	2,685	100,696	100,696
KP F-statistic	15.2	7.60	7.60

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## The impact of tariffs on prices

	Price of imported goods (1)	Price of domestic goods (2)	Price of inputs (3)
$\Delta \text{Tariff}_{j,T}$	0.138** (0.058)	0.087*** (0.018)	
$\Delta \text{Input Tariff}_{j,T}$			0.004** (0.002)
SIC4 FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	2,080	2,058	2,320
KP F-statistic	15.8	18.4	1,816.8

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