

Defensive Innovation: Technological Rivalry and College Major Choice

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UIBE

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Motivation

College major choice matters for

- **Individual** career trajectory, earning potential, personal fulfillment, and societal value
- **Aggregate** supply of skilled workers and skill composition

Determinants of major choice

- Expected wages, gender belief, information friction, etc. (Wiswall and Zafar, 2015; Gemici and Wiswall, 2014)
- Geopolitics could have a significant impact and few studies on labor market opportunities triggered by trade shocks

How do geopolitical tensions affect major choices?

We find the U.S. punitive tariff unexpectedly increased admission scores, especially for engineering majors and among national elite universities.

Reuters World Business Markets Sustainability Legal Breakthroughs Technology Investigations

Technology

Trade war or not, China is closing the gap on U.S. in technology IP race

By Marisa Zaharia

April 10, 2018 8:25 PM CDT · Updated 6 years ago



FILE PHOTO: A Chinese national flag flies at the headquarters of a commercial bank in a financial street in central Beijing, China November 24, 2014. REUTERS/Kim Kyung-ho/Anadolu Photo. GUYAZZ/GETTY IMAGES

The Washington Post
Democracy Dies in Darkness

How the U.S.-China trade war became a conflict over the future of tech

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TECH

Trade War Punctures China's Pride in Its Technology

'There is a big gap between the science and technology of China and those of the United States'

By Yoko Kubota [Follow](#)
June 28, 2018 7:51 am ET

Our story

- **External demand:** the U.S. tariffs hurt less productive firms with smaller market shares and markups, leading to market exit
- **Defensive innovation:** more productive firms with higher market shares and markups
 - ⇒ $\left\{ \begin{array}{l} \text{Government Subsidy } \uparrow \\ \text{Firm innovation investment } \uparrow \end{array} \right. \Rightarrow \text{R\&D occupation wages and demands } \uparrow$
 - ⇒ Talented students choose exposed STEM majors in elite colleges \uparrow

Preview of Results

Use granular college admission data to examine how trade policies shape students' major choices in the context of trade war

- Tariff exposures by major, province of origin, and year (2017-2020)
- The U.S. punitive tariff unexpectedly increased admission scores
Export tariff exposure 1 p.p. \uparrow \Rightarrow Admission score 2 to 3 p. sd \uparrow
- More significant for engineering majors at national elite universities
- Number of quotas for exposed majors also increased
- The target of U.S. punitive tariff is to contain the development of China's high-tech industries. However, it did not prevent talent from flowing into high-tech industries.

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Preview of Results

Addressing threats to empirical identification

- Pretends and pre-trade war industrial policy: event study + control for Made in China 2025 + Major-province-year FE
- Students preferences and changes of admission rules: college-province FE, college-year FE

Mechanism

- Government subsidies ↑ for firms exposed to the tariff after the trade war
- For occupations more exposed to the U.S. punitive tariff
 - Wages and job postings of non R&D occupations ↓
 - Wages of R&D occupations ↑, job postings of R&D occupations =
- Generally, for exposed occupations, the relative wages and job postings for R&D ones were increased by the tariff

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Literature Review

Trade, education choices, and human capital accumulation

- Export affects collegeing decision through better labor market opportunities
Atkin (2016); Greenland and Lopresti (2016); Blanchard and Olney (2017); Li (2018)
Burstein, Cravino, and Vogel (2013); Parro (2013); Fan (2019); Fan and Li (2023)

Trade liberalization \Rightarrow job opportunity \uparrow \Rightarrow education attainment \Rightarrow **major choice**

- Increased capital goods imports raise skill premium
- This paper: trade tension and major choice
 - New outcome: major choices
 - Novel channel: on defensive innovation
 - Good setting: the U.S.-China trade war
 - Unique data: granular college admission data

We examine the impact of trade on major choices and skill composition.

Literature Review

- Economic implications of trade protectionism and U.S.-China trade war
 - Trade flows and pass-through
Amiti, Redding, and Weinstein (2019); Fajgelbaum et al. (2020); Jiao et al. (2022); Feng, Han, and Li (2023); Jiang et al. (2023)
 - Investment and supply chain adjustments
Amiti, Kong, and Weinstein (2020); Handley, Kamal, and Monarch (2020)
 - Wage and employment in the labor market
Flaen and Pierce (2024); Benguria and Saffie (2020); Goswami (2020); Autor et al. (2024); He, Mau, and Xu (2021)

We examine the impact of trade tensions on major choice and talent flow in the context of technology competition.

Literature Review

- Determinants of major choices
 - Expectations and information on future career
Arcidiacono, Hotz, and Kang (2012); Gemici and Wiswall (2014); Wiswall and Zafar (2015); Conlon (2021)
 - Macroeconomic condition and economic recessions
Amiti, Kong, and Weinstein (2020); Handley, Kamal, and Monarch (2020)
 - Wage and employment in the labor market
Blom, Cadena, and Keys (2021)

We underscore the role of government industrial policy and corporate innovation investment behavior in shaping college major choices from the perspective of defensive innovation.

Outline

- 1 Introduction
- 2 Background
 - U.S.-China Trade War
 - College Enrollment and Major Choice in China
- 3 Data and Variable Construction
- 4 Main Results
 - Econometric specification
 - Baseline Results
 - Heterogeneity
 - Alternative Measure: Export Control
 - Robustness Checks
- 5 Mechanism Analysis
- 6 Conclusion

Background: U.S.-China Trade War

- The USTR started the 301 investigation on China in 2017, and released the results in March 2018
- Concluding China's unfair practices concerning intellectual property
- U.S. then imposed 25% tariff on \$50 billion Chinese imports
- Specifically, targeting on China's high-tech products (Ju et al., 2024)
- Covering aircraft 72.08%, optical instrument 73.41%, machinery 63.72%
- The correlation between tariff and U.S. imports from China is actually negative (Feng, Han, and Li, 2023)

Background: U.S.-China Trade War

- China quickly responded by several rounds of retaliatory tariffs
- In addition, Chinese gov introduced various policies to support exposed firms
 - Land allocation restriction for high-tech industries was relaxed
 - Direct innovation subsidies for firms in impacted industries [▶ Subsidies Figure](#)
- Chinese companies actively responded by increasing R&D investment, enhancing salaries for talent [▶ Wage Figure](#)
 - R&D subsidy and support from government
 - Alleviate the threat on supply chain (bottleneck technology)
 - Changing marketing strategy

Background: College Enrollment and Major Choice in China

- College enrollment in China almost fully depends on the score of National College Entrance Exam (NCEE), or Gaokao
- Ministry of Education (MOE) establishes main principles, province governments implement it
- Procedure: College allocates admission quotas to each province \Rightarrow Students take exams \Rightarrow Students application \Rightarrow College admission
- Two systems: (Arts Track vs. Science Track); (Comprehensive Track)
- Exams and admissions are implemented at province-track level

Background: College Enrollment and Major Choice in China

- In application, students have to applied for college-major combinations
 - Three batches of college-major combinations
 - For each batch, usually choose 5 colleges with 6 majors in each college
- Parallel Mechanism in admission: Combining DA and Boston mechanism
- DA for college allocation, Boston for major allocation in each college
- Major change is not common in Chinese universities \Rightarrow Major choice after NCEE is very important!

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College Enrollment Data

- Administrative NCEE admission data from 2017 to 2020 ▶ Summary statistics
- Admission cutoff scores, rankings, and quotas at college-major-province-track-year level
- Large cutoff score gap between elite colleges and non-elite ones

Table: Descriptive Statistics

Panel A college	Enrollment Number		Number of Majors		Enrollment Provinces		Observations	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	N	Share
Nation Elite College	2985.17	1901.09	42.59	21.65	28.84	2.89	471	9.66%
Local Elite College	3180.69	1880.78	44.52	18.50	26.22	5.84	990	20.29%
Ordinary College	1729.45	1368.81	26.49	14.13	18.03	8.27	3417	70.05%
Panel B College-Province-Major	Admission Score		Admission Percentile		Enrollment Number		Observations	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	N	Share
Nation Elite College	583.85	65.89	0.93	0.09	5.34	13.82	263308	19.89%
Local Elite College	521.87	62.73	0.80	0.14	7.07	21.31	445247	33.65%
Ordinary College	465.84	64.47	0.63	0.19	9,61	24.98	614821	46.46%

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Tariff and Trade Data

Tariff

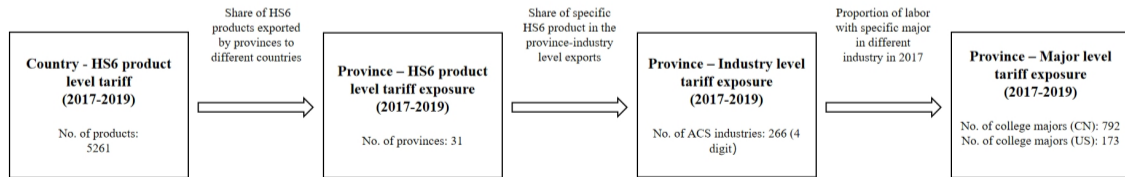
- Tariff escalation (2017-2019)
 - China's State Council and the U.S. International Trade Commission
 - HS 8-digit (10-digit product), trade partner, and date
 - **Considers tariff exemption**
- Baseline tariffs
 - Common practice: HS 6-digit annual MFN tariffs by country: UNCTAD database
 - Chinese MFN tariffs vary by **HS 10-digit product and month considering monthly adjustments** (e.g., July/December 2017, May/July/November 2018, and January/July 2019)
 - Chinese preferential tariffs (**HS 10-digit, trade partner, and month**), 42% of imports in 2017 (e.g., ASEAN, Korea, Australia)
 - U.S. MFN/preferential/specific/compound tariffs from USITC (**HS 8-digit product, trade partner, and year**)

Tariff and Trade Data

Import: value and quantity

- China Customs: 2017-2019
 - by HS 8-digit, country, trading regime, province, and month
 - Firm, HS-8-digit product, and trade partner (2016)

Convert product-level tariffs to province-major level tariff exposures



Job Posting and Wage Data

- Online job posting data from six major online platforms
- We have 1.2 billion recruitment entries from 2017 to 2020
- Number of positions, job titles, job descriptions, company names and profiles, posting dates, wages
- This is the most comprehensive real-time labor demand data in China

In the descriptive analysis, we have two main findings:

- U.S. punitive tariffs mainly affected STEM
- Higher increase in tariffs \Rightarrow Higher increase in admission scores

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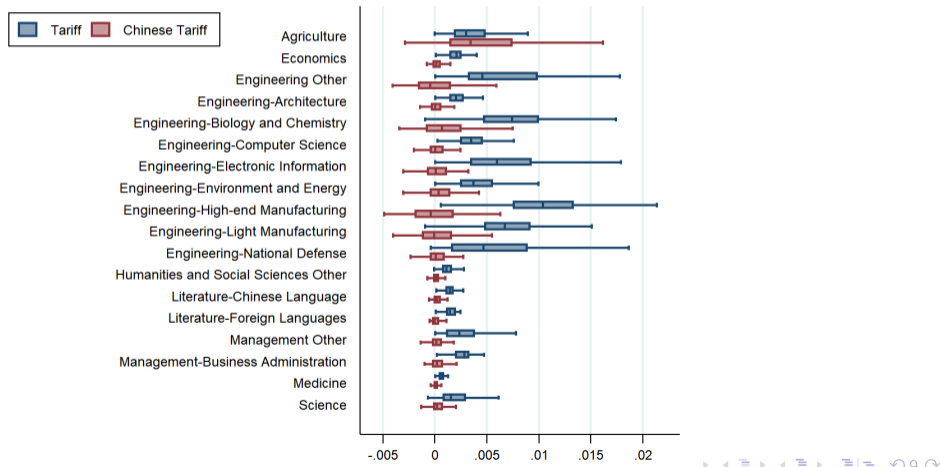
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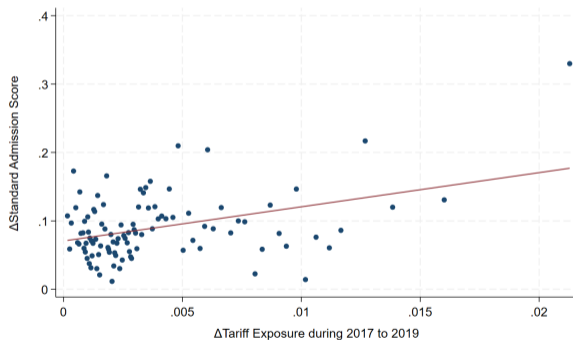
Tariff Exposure across Majors

U.S. punitive tariffs mainly affected STEM majors, especially, high-end manufacturing majors



Flow of Talents

Changes in admission scores are positively correlated with changes in tariff exposures



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Econometric specification

- The impact of U.S.-China trade war tariff on students' major choices

$$NCEE_Score_{ipsbmt} = \alpha + \beta_1 Tariff_{pm,t-1} + \beta_2 CHN_Tariff_{pm,t-1} \\ + \gamma NumAdm_{ipsbmt} + \delta_{pst} + \mu_{m'pt} + \xi_{ipbt} + \varepsilon_{ipsbmt}$$

- i - university; p - applicant province; s - NCEE track; b - batch; m - major; t - year
- $NCEE_Score_{ipsbmt}$: Standardized admission score cutoff (mean=0, sd=1)
Standardized at province-track-year level
- $Tariff_{pm,t-1}$: represents the province-major level average tariffs on Chinese exports in the previous year.
- $CHN_Tariff_{pm,t-1}$: Chinese import tariff exposure on major m in province p
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 \end{aligned}$$

- δ_{pst} province-track-year FE: Exams are comparable at province-track-year level
- $\mu_{m'pt}$ major category-province-year FE: Absorb major category-province level shocks
Some province built a large vehicle factory which would recruit a lot of engineers
- ξ_{ip} college-province FE: Absorb college-province level unobservables
Renmin U is more popular in the north, SHUFE is more popular in the south
- θ_{it} college-year FE: Absorb college level shocks
Change of college administrations, key faculty etc.

Main Results: Baseline Result

Table: Baseline Results

Variables	Standardized Admission Score			
	(1)	(2)	(3)	(4)
Tariff Exposure	2.885*** (0.698)	2.842*** (0.640)	2.915*** (0.635)	2.134*** (0.428)
Controls	Y	Y	Y	Y
Province-Track-Year FE	Y	Y	Y	Y
Major Category-Province-Year FE	Y	Y	Y	Y
College-Province FE	Y	Y	N	N
College-Year FE	N	Y	N	N
College-Province-Year FE	N	N	Y	N
College-Province-Batch-Year FE	N	N	N	Y
Observations	918,010	918,010	918,010	918,010
R-squared	0.923	0.927	0.931	0.968

Main Results: Event Study

$$\begin{aligned}
 NCEE_Score_{ipsbmt} = & \alpha + \sum_{q=-2}^4 \beta_q I(event_q) \times \Delta Tariff_{pm} \\
 & + \sum_{q=-2}^4 \gamma_q I(event_q) \times \Delta CHN_Tariff_{pm} + \theta NumAdm_{ipsbmt} \\
 & + \delta_{ps} + \xi_{ip} + \mu_{m't} + \varepsilon_{ipsbmt}
 \end{aligned}$$

- $\Delta Tariff_{pm}$ represents the province-major level tariff surge in Dec. 2019 relative to that of Dec. 2017
- $I(event_q)$ are a set of year dummies in the event window, 2018 is the baseline year
- $\mu_{m't}$, ξ_{ip} , δ_{ps} are the major category-year FE, college-province FE, and province-track FE.

Main Results: Event Study

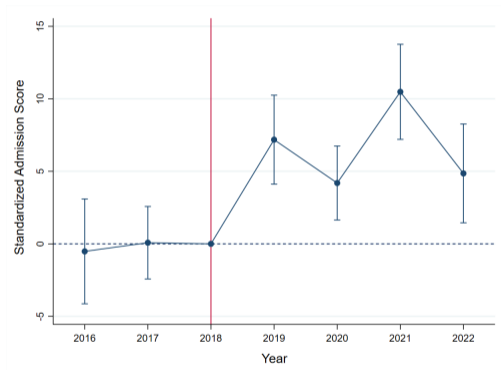


Figure: Event Study of Tariff Effect on Admission Score

Main Results: Elite Colleges vs. Others

Table: Tariff Effect on Admission Score across College Types

Admission Score	(1)	(2)	(3)	(4)
Tariff Exposure	2.134*** (0.428)	1.366*** (0.429)	1.961*** (0.496)	0.583 (0.497)
Tariff × National Elite		4.801*** (0.794)		5.578*** (0.825)
Tariff × Local Elite			0.491 (0.660)	1.802*** (0.662)
Controls	Y	Y	Y	Y
Province-Track-Year FE	Y	Y	Y	Y
Major Category-Province-Year FE	Y	Y	Y	Y
College-Province-Batch-Year FE	Y	Y	Y	Y
Observations	918,010	918,010	918,010	918,010
R-squared	0.968	0.968	0.968	0.968

Main Results: STEM vs. other majors

Table: Tariff Effect on Admission Score across Major Categories

Admission Score	(1) Engineering	(2) Science	(3) Management	(4) Economics	(5) Literature	(6) Agriculture	(7) Medicine
Tariff × Nation Elite	2.622*** (0.778)	8.747** (4.333)	-2.528 (3.771)	11.292 (35.736)	26.818 (19.091)	0.499 (1.276)	-3.629 (40.546)
Tariff Exposure	-0.242 (0.391)	0.886 (1.994)	-3.236*** (0.998)	-20.518* (11.534)	-22.165*** (6.325)	1.644** (0.806)	125.077*** (17.967)
Controls	Y	Y	Y	Y	Y	Y	Y
Province-Track-Year FE	Y	Y	Y	Y	Y	Y	Y
College-Province-Batch-Year FE	Y	Y	Y	Y	Y	Y	Y
Observations	346,128	63,706	170,751	58,137	96,996	16,108	57,101
R-squared	0.978	0.975	0.967	0.982	0.974	0.979	0.934

Main Results: Tariff Effect on Enrollment Number

Table: Enrollment Number Changing

	Ln(Enrollment number)			Enrollment Share		
	(1) All Majors	(2) Drop New Majors	(3) By College Type	(4) All Majors	(5) Drop New Majors	(6) By College Type
Tariff Exposure	2.866*** (0.859)	3.063*** (0.859)	-0.435 (0.898)	0.167*** (0.056)	0.176*** (0.056)	0.013 (0.056)
Tariff × Nation Elite			9.659*** (1.667)			0.491*** (0.110)
Tariff × Local Elite			4.672*** (1.052)			0.181*** (0.060)
Controls	Y	Y	Y	Y	Y	Y
Province-Track-Year FE	Y	Y	Y	Y	Y	Y
Major Category- Province-Year FE	Y	Y	Y	Y	Y	Y
College-Province-Batch-Year FE	Y	Y	Y	Y	Y	Y
Observations	944,549	942,397	942,397	944,549	942,397	942,397
R-squared	0.779	0.779	0.780	0.774	0.774	0.775

Main Results: Export Control

Table: Alternative Measure: Export Control Baseline Result

VARIABLES	Standardized Admission Score		
	(1)	(2)	(3)
Export Control	0.036*		
	(0.019)		
Export Control (Asset)		0.004***	
		(0.001)	
Export Control (Employee)			0.012***
			(0.002)
Tariff Exposure	2.018***	1.921***	1.712***
	(0.426)	(0.424)	(0.426)
Controls	Y	Y	Y
Province-Track-Year FE	Y	Y	Y
Major Category-Province-Year FE	Y	Y	Y
College-Province-Batch-Year FE	Y	Y	Y
Observations	917,991	917,991	917,991
R-squared	0.968	0.968	0.968

Export Control Effect on Admission Score across College Types

Table: Export Control Effect on Admission Score across College Types

Admission Score	(1)	(2)	(3)	(4)
Export Control	0.036* (0.019)	0.013 (0.020)	-0.004 (0.020)	-0.046** (0.022)
Tariff Exposure	2.018*** (0.426)	1.330*** (0.426)	1.978*** (0.490)	0.787 (0.491)
Export Control \times National Elite		0.229*** (0.036)		0.286*** (0.037)
Tariff \times National Elite		4.266*** (0.772)		4.806*** (0.803)
Export Control \times Local Elite			0.137*** (0.035)	0.181*** (0.035)
Tariff \times Local Elite			0.136 (0.636)	1.258** (0.639)
Controls	Y	Y	Y	Y
Province-Track-Year FE	Y	Y	Y	Y
Major Category-Province-Year FE	Y	Y	Y	Y
College-Province-Batch-Year FE	Y	Y	Y	Y
Observations	917,991	917,991	917,991	917,991
R-squared	0.968	0.968	0.968	0.968

Main Results: Main Takeaways

- 1 p.p. \uparrow in exposure to export tariff \Rightarrow 2 to 3 p.sd \uparrow in admission score
- The positive effect exists only for elite colleges, especially national elite colleges
- Number of quotas for exposed majors also increased
- Engineering and Science majors in national elite colleges become even more popular after the U.S. began the trade war
- Export control entity list has similar effect to punitive tariff
- U.S.'s efforts to suppress the development of high-tech industries in China backfire, pushing more Chinese talent to STEM

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Robustness Checks

- Excluding special groups of students [▶ Special Students](#)
 - Minority students, Students with required future employment, Arts/sports students
- Excluding special majors [▶ Special Majors](#)
 - Teacher training programs, Sino-foreign programs, New majors after 2017
- Pre-trade war industrial policies [▶ Pre Industrial Policy](#)
- COVID-19 pandemic [▶ COVID-19 Pandemic](#)
- Colleges in the entity list [▶ Entity list colleges](#)
- College upgrades and renames [▶ College Upgrades](#)
- University location city-level tariff [▶ College Location Tariff](#)
- Alternative dependent variables [▶ Dependent Variables](#)
- Only consider U.S. and China tariffs [▶ U.S. and China Tariffs](#)
- Using National Export Structure in Tariff Exposure [▶ National Export](#)

Outline

- 1 Introduction
- 2 Background
 - U.S.-China Trade War
 - College Enrollment and Major Choice in China
- 3 Data and Variable Construction
- 4 Main Results
 - Econometric specification
 - Baseline Results
 - Heterogeneity
 - Alternative Measure: Export Control
 - Robustness Checks
- 5 Mechanism Analysis**
- 6 Conclusion

Mechanism Analysis

- With higher U.S. tariffs, the future development of affected industries are in doubt
- Chinese students will get away from majors related to those industries
- However, more talents are attracted to high-tech STEM majors. Why?
- "Defensive innovation" response by Chinese government and firms
 - Chinese government increased the subsidy to exposed firms [▶ Government Subsidies](#)
 - Firms invested more on innovation, recruiting more R&D workers with higher wages [▶ Job Postings](#)
 - Complementary evidence: public awareness about trade war [▶ Baidu index](#)

[▶ Conclusion](#)

Mechanism Analysis: Government Subsidy

- Using government subsidy data for publicly listed firms from 2017 to 2020
- We run the following regression for firm i in industry j year t :

$$Sub_{it} = \alpha + \beta_1 Tariff_{jt} + \beta_2 CHN_Tariff_{jt} + X_{it} + \delta_i + \lambda_t + \epsilon_{it} \quad (1)$$

$$Tariff_{kt} = \sum_c \frac{Exp_{ck,2017}}{Exp_{k,2017}} \times Tariff_{ckt} \quad (2)$$

$$Tariff_{jt} = \sum_{k \in j} \frac{Exp_{k,2017}}{Exp_{j,2017}} \times Tariff_{kt} \quad (3)$$

- $Tariff_{jt}$ measures the weighted average tariff across all trade partners c on Chinese industry j during the trade war.
- These are calculated from the product k -level original tariff

Mechanism Analysis

Table: Effect of Tariff on Government Subsidy

Log(Subsidy)	All sample			No Start-ups
	(1)	(2)	(3)	(3)
Tariff	2.311 (2.100)	4.026* (2.210)	7.992* (4.164)	9.279** (4.191)
Firm Controls	N	Y	Y	Y
Year FE	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y
Industry#year	N	N	Y	Y
Observations	6,582	6,582	6,582	6,103
R-squared	0.815	0.831	0.833	0.836

Mechanism Analysis: Labor Demand

- Using job posting data from 2017 to 2020
- We run the following regression for occupation n in city p year t :

$$Y_{pit} = \alpha + \beta_1 \text{Tariff}_{pi,t-3} + \beta_2 \text{CHN_tariff}_{pi,t-3} + \varphi_{pt} + \delta_{it} + \lambda_{pi} + \epsilon_{pit} \quad (4)$$

- Likewise, we convert original product-level tariff to occupational-level
- $\text{Tariff}_{pi,t-3}$ and $\text{CHN_Tariff}_{pi,t-3}$ capture the weighted average tariff on Chinese exports and imports for occupation i in city p , respectively, lagged by three months to account for labor market adjustment.

Mechanism Analysis

Table: Effect of Tariff on job Postings and Wages

	(1) Log(Postings)	(2) Log(Wage)	(3) Log(Postings)	(4) Log(Wage)
Tariff	-2.505 (3.418)	-3.790*** (0.870)	-5.414 (4.057)	-4.291*** (1.036)
Tariff × R&D			13.661*** (4.847)	2.772** (1.293)
Controls	Y	Y	Y	Y
City-Year-Month FE	Y	Y	Y	Y
Occupation-Year-Month FE	Y	Y	Y	Y
City-Occupation FE	Y	Y	Y	Y
Observations	789,074	718,086	789,074	718,086
R-squared	0.998	0.921	0.998	0.921

Mechanism Analysis

Table: Tariff and Public Awareness of Trade War

	Mobile Terminal			PC Terminal		
	(1) U.S.-China Trade war	(2) U.S.-China Trade friction	(3) Composite Index	(4) U.S.-China Trade war	(5) U.S.-China Trade friction	(6) Composite Index
Tariff	5.457*** (3.387)	4.646 (1.078)	3.195** (2.267)	3.340** (2.227)	8.618** (2.369)	5.468*** (3.340)
City Controls	Y	Y	Y	Y	Y	Y
Year-Month FE	Y	Y	Y	Y	Y	Y
City FE	Y	Y	Y	Y	Y	Y
Observations	5,434	5,434	5,434	5,434	5,434	5,434
R-squared	0.892	0.715	0.895	0.885	0.673	0.896

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Conclusion

- We investigate the impact of the U.S.-China trade war on the college major choices of Chinese students
- Surprisingly, we find an increase in NCEE cutoff scores for majors more exposed to the U.S. punitive tariffs
- Particularly for engineering majors at national elite universities
- It is driven by the Chinese government's increasing subsidies and firms' increasing investment in R&D-related occupations
- The consequences of anti-free trade policies can be complicated and may deviate from policymakers' expectations, especially if they overlook the reactions of their trading partners

Constructing Tariff Exposures

- Step 1: From original country-product tariff to province-product tariff

$$ExportTariff_{pkt} = \sum_c \frac{Export_{pck,2017}}{Export_{pk,2017}} \times ExportTariff_{ckt}$$

- c, p, k, t - export destination country, Chinese province, HS-6-product, year
- $ExportTariff_{ckt}$: tariff imposed by destination country c on product k from China in year t
- $\frac{Export_{pck,2017}}{Export_{pk,2017}}$: the share of product k from province p sold to country c in 2017.

Constructing Tariff Exposures

- Step 2: From province-product tariff to province-industry tariff

$$ExportTariff_{pjt} = \sum_{k \in j} \frac{\frac{1}{N_k} Export_{pk,2017}}{Export_{pj,2017}} \times ExportTariff_{pkt}$$

- We use the concordance from Pierce and Schott (2012) to map HS-6 products to NAICS6 industries
- p, j, k, t - province, industry, HS-6 product, year
- $ExportTariff_{pkt}$: tariff exposure at province-HS-6 level derived from the first step
- $\frac{\frac{1}{N_k} Export_{pk,2017}}{Export_{pj,2017}}$ evaluates the importance of product k in industry j

Constructing Tariff Exposures

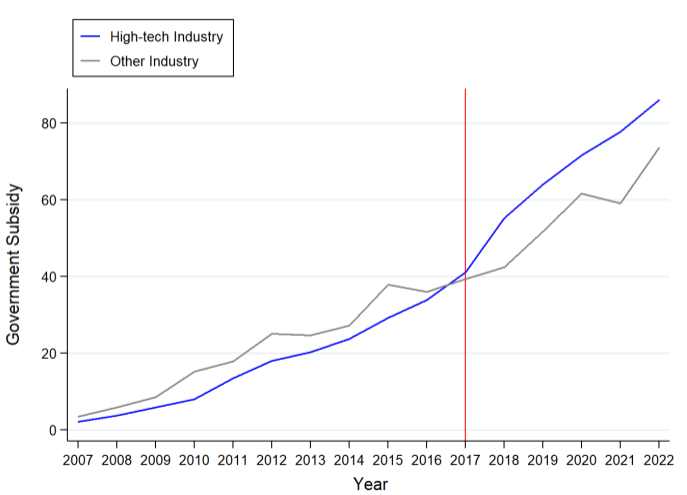
- Step 3: From province-industry tariff to province-major tariff

$$ExportTariff_{pmt} = \sum_j Weight_{jm,2017} \times ExportTariff_{pjt}$$

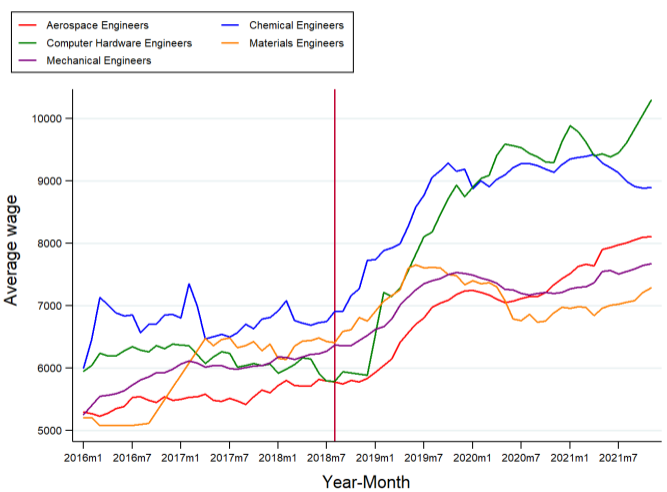
$$Weight_{jm,2017} = \frac{Employ_{jm,2017}}{\sum_j Employ_{jm,2017}}$$

- $ExportTariff_{pjt}$: province-industry tariff exposure calculated from the second step
- $Weight_{jm,2017}$: the proportion of workers with major m employed in industry j during the baseline year of 2017 (from ACS data)

Appendix: Subsidies to Manufacturing Sector



Appendix: Wages of Engineering Occupations



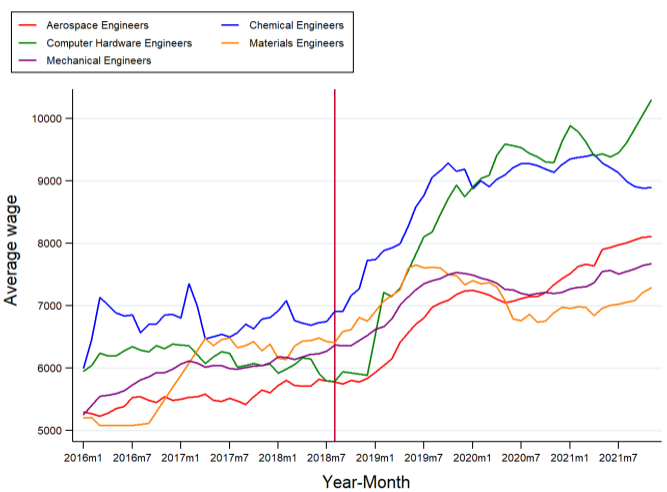
Appendix: Summary Statistics

Table: Summary Statistics

Variable	Mean	Sd	Min	Max	N
Export Tariff	0.007	0.006	0	0.046	934477
Import Tariff	0.007	0.006	0	0.054	934477
Standardized Admission Score	0.038	0.984	-6.056	4.915	934477
Admission Number	7.956	21.69	1	1297	934477

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Appendix: Wages of Engineering Occupations



Appendix: Robustness Checks

Table: Excluding Special Student Group

Admission Score	(1) Non-Minority	(2) Minority Province	(3) Drop Oriented Student	(4) Drop Arts/sports Student
Tariff Exposure	2.049*** (0.448)	3.197** (1.380)	2.118*** (0.427)	2.143*** (0.428)
Controls	Y	Y	Y	Y
Province-Track-Year FE	Y	Y	Y	Y
Major Category-Province-Year FE	Y	Y	Y	Y
College-Province-Batch-Year FE	Y	Y	Y	Y
Observations	806,281	111,729	917,858	917,292
R-squared	0.969	0.966	0.968	0.968

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Appendix: Robustness Checks

Table: Excluding Special Major Group

Admission Score	(1) Non-teacher Major	(2) Teacher Major	(3) Drop Sino-foreign Program	(4) Drop New Majors
Tariff Exposure	2.045*** (0.426)	1.725 (1.951)	2.354*** (0.383)	2.084*** (0.431)
Controls	Y	Y	Y	Y
Province-Track-Year FE	Y	Y	Y	Y
Major Category-Province-Year FE	Y	Y	Y	Y
College-Province-Batch-Year FE	Y	Y	Y	Y
Observations	874,409	40,076	903,712	915,882
R-squared	0.970	0.970	0.972	0.968

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Appendix: Alternative Story

Table: The Pilot Cities of MIC2025

Province	City
Zhejiang	Ningbo, Huzhou
Liaoning	Shenyang
Jilin	Changchun
Jiangsu	Nanjing, Wuxi, Changzhou, Zhenjiang, Suzhou
Guangdong	Foshan, Zhaoqing, Jiangmen, Zhuhai, Yangjiang, Zhongshan, Guangzhou
Fujian	Quanzhou
Henan	Zhengzhou, Luoyang, Xinxiang
Hunan	Zhuzhou, Xiangtan, Hengyang, Changsha
Sichuan	Chengdu
Anhui	Hefei
Hubei	Wuhan
Jiangxi	Ganzhou
Shandong	Qingdao
Ningxia	Wuzhong

Appendix: Robustness Checks

Table: Robustness checks

VARIABLES	(1) Pre-Trade War Industry Policy	(2) Excluding the Impact of the Pandemic	(3) Excluding Colleges in Entity List	(4) Interaction of Entity List Colleges
Tariff Exposure	2.225*** (0.473)	2.499*** (0.465)	1.981*** (0.426)	1.947*** (0.422)
Tariff × Entity List College				3.577*** (1.346)
Controls	Y	Y	Y	Y
Year-Province-Track FE	Y	Y	Y	Y
Year-Province-College-Batch FE	Y	Y	Y	Y
Major Category-Province-Year FE	Y	Y	Y	Y
Observations	633,951	638,879	897,122	918,010
R-squared	0.965	0.970	0.967	0.968

Appendix: Robustness Checks

Table: Other Robustness Checks

	(1)	(2)	(3)
Admission Score	Drop Upgrading Colleges	Drop Renamed Colleges	Add City-Level Tariff
Tariff Exposure	2.114*** (0.429)	2.147*** (0.430)	3.194*** (0.532)
College Location Tariff			2.293* (1.268)
Controls	Y	Y	Y
Province-Track-Year FE	Y	Y	Y
Major Category-Province-Year FE	Y	Y	Y
College-Province-Batch FE	N	N	Y
College-Province-Batch-Year FE	Y	Y	Y
Observations	914,726	911,657	583,089
R-squared	0.968	0.968	0.965

Appendix: Robustness Checks

Table: Alternative Measures of the Dependent Variable

	(1) Standardized Admission Score	(2) Ln(Admission score)	(3) Score Percentile
Tariff Exposure	2.134*** (0.428)	0.208*** (0.050)	0.280* (0.140)
Controls	Y	Y	Y
Province-Track-Year FE	Y	Y	Y
Major Category-Province-Year FE	Y	Y	Y
College-Province-Batch-Year FE	Y	Y	Y
Observations	918,010	918,010	918,010
R-squared	0.968	0.979	0.949

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Appendix: Robustness Checks

Table: Using Only U.S. Punitive and Chinese Retaliatory Tariff

	Standardized Admission Score			
	(1)	(2)	(3)	(4)
Tariff Exposure	1.930*** (0.269)	1.946*** (0.257)	1.968*** (0.255)	1.522*** (0.162)
Controls	Y	Y	Y	Y
Year-Province-Track FE	Y	Y	Y	Y
Major Category-Province-Year FE	Y	Y	Y	Y
Province-College FE	Y	Y	N	N
Year-College FE	N	Y	N	N
Year-Province-College FE	N	N	Y	N
Year-Province-College-Batch FE	N	N	N	Y
Observations	918,010	918,010	918,010	918,010
R-squared	0.923	0.927	0.932	0.968

Appendix: Robustness Checks

Table: Using National Export Structure in Tariff Exposure Construction

Variables	Standardized Admission Score			
	(1)	(2)	(3)	(4)
Tariff Exposure	1.858*** (0.925)	2.031*** (0.845)	2.192*** (0.830)	1.257*** (0.565)
Controls	Y	Y	Y	Y
Province-Track-Year FE	Y	Y	Y	Y
Major Category-Province-Year FE	Y	Y	Y	Y
College-Province FE	Y	Y	N	N
College-Year FE	N	Y	N	N
College-Province-Year FE	N	N	Y	N
College-Province-Batch-Year FE	N	N	N	Y
Observations	918,010	918,010	918,010	918,010
R-squared	0.923	0.927	0.931	0.968