

AI-TOCRACY

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MOTIVATION: SUSTAINED INNOVATION UNDER AUTOCRACY?

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 1. Frontier technology increases autocrats' probability of maintaining power
 2. Autocrats' spending on this tech. generates broader innovation spillovers

MOTIVATION: SUSTAINED INNOVATION UNDER AUTOCRACY?

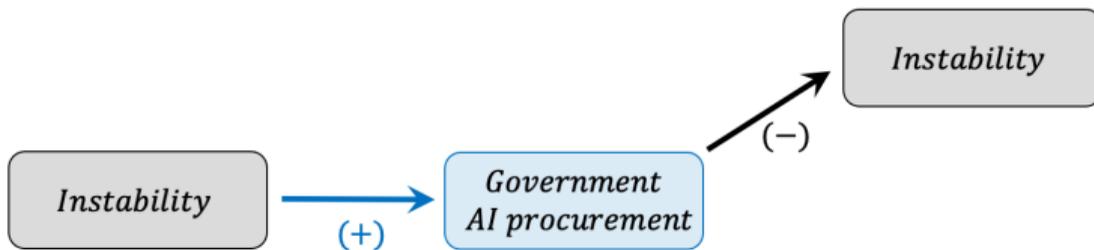
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 1. Frontier technology increases autocrats' probability of maintaining power
 2. Autocrats' spending on this tech. generates broader innovation spillovers
- ▶ **AI may possess features** that lead to a mutually reinforcing relationship
 1. As a technology of prediction, autocrats may be able to use AI for social / political control (Zuboff, 2019; Tirole, 2021; Acemoglu, 2021)
 2. Traditional spillovers (Moretti et al. 2019) + Sharability of gov't data / algo's (Beraja et al. 2022)

Test for a **mutually reinforcing relationship** between frontier innovation and autocracy in the context of China's facial recognition AI sector

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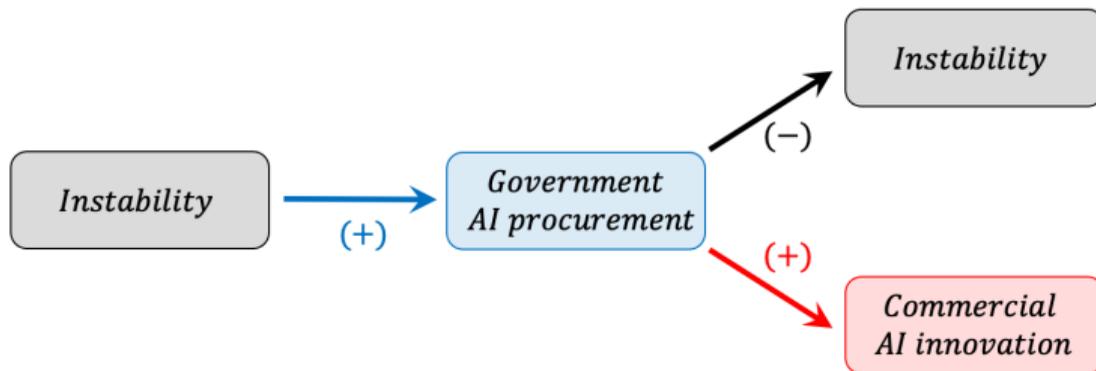


Test for a **mutually reinforcing relationship** between frontier innovation and autocracy in the context of China's facial recognition AI sector



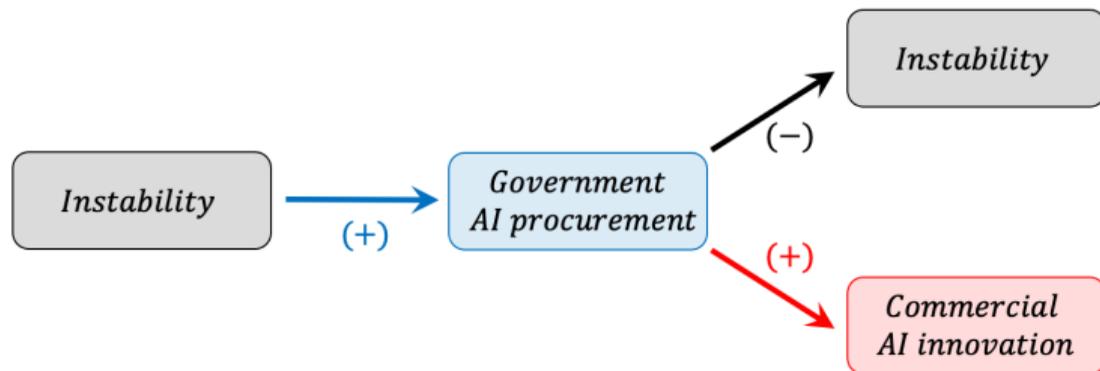
AI-TOCRACY AND ITS IMPLICATIONS

Test for a **mutually reinforcing relationship** between frontier innovation and autocracy in the context of China's facial recognition AI sector



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Test for a **mutually reinforcing relationship** between frontier innovation and autocracy in the context of China's facial recognition AI sector



What are the **international ramifications** of China's leadership in this surveillance tech?

DATA 1: LINKING AI FIRMS TO GOVT. CONTRACTS

1. Identify all facial recognition AI firms

- 7,837 firms
- Two sources: Tianyancha (People's Bank of China) and PitchBook (Morningstar)

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3. Link government buyers to AI suppliers

- 10,677 AI contracts issued by public security arms of government (e.g., local police department)
- Data also on procurement of **AI-capable surveillance cameras**

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政策法规 招标投标 中央采购 地方采购 采购服务 采购指南 PPP项目 政府采购 采购公告 热点专题

中国政府采购网 首页 > 地方采购 > 中标公告

道路交通安全综合管理平台维护升级项目中标(成交)公告

2016年12月30日 16:28 来源: 中国政府采购网 [打印] [回到顶部]

1. 项目名称: 道路交通安全综合管理平台维护升级项目
2. 项目编号: GZGC-2016-38
3. 项目序列号: S520000000007081001
4. 项目联系人: 王继刚
5. 项目联系人电话: 0851-85226523
6. 项目用途: 竞赛技术要求及合同履行日期: 嵌入式人脸识别系统软件开发
7. 采购方式: 公开招标
8. 采购日期: 2016-12-07
9. 公告载体: 贵州省政府采购网
10. 评审时间: 2016-12-29
11. 评审地点: 贵州省公共资源交易中心
12. 评审委员会成员名单:
邵良坤、李强、彭铁北、戚玉峰、黄荣伟
13. 定标日期: 2016-12-29
14. 中标(成交)信息:

序号	中标供应商	中标供应商地址	主要中标内容	中标金额(元)
1	上海依田网络科技有限公司	上海市闵行区吴中路189号, 德必易 3338-446室	嵌入式人脸识别系统软件开发	630000.00

15. 项目编号: 否
16. 采购人名称: 贵州省公安厅交通管理局
联系地址: 贵阳市龙洞堡观林路116号
项目联系人: 宋先生
联系电话: 0851-85226880
17. 采购代理机构名称: 贵州贵财招标有限责任公司
联系地址: 贵州省贵阳市观山湖区金阳北路233号贵州产业投资(集团)有限责任公司大楼413室
项目联系人: 王继刚
联系电话: 0851-85226523
18. 采购文件上传(PDF格式):
附件:
gzgc-2016-38/12月2日修改版.pdf
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无

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Protests and other episodes of political unrest:

- ▶ Daily level events in China from GDELT, a database tracking hundreds of news sites
- ▶ Use machine learning analysis to classify articles into those indicating political unrest (protests, demands, threats, etc.)
- ▶ There are 9,267 of these events from 2014 - 2020 throughout China
 - ▶ E.g., Shanghai residents protest against property law; traders protest against banks; ...
- ▶ Aggregate daily unrest to quarterly level; build on IV literature with different aggregation across stages (Inoue and Solon 2010, Angrist and Krueger 1992)

DATA 2: LOCAL POLITICAL UNREST AND WEATHER

Protests and other episodes of political unrest:

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Weather

- ▶ Daily weather data from 260 weather stations across China
- ▶ LASSO regression to predict unrest events with 30 weather variables (e.g., temperature, precipitation, windspeed) and their interactions

↑ LOCAL UNREST IN QUARTER $t \implies \uparrow$ PUBLIC SECURITY AI PROCUREMENT IN $t + 1$

- ▶ Diff-in-diff: panel specification, controlling for location and time FEs
- ▶ LASSO IV: instrument unrest with [local weather conditions](#)
 - ▶ Similar results using parsimonious IV, LIML, and JIVE
- ▶ AI x Cameras: complementarity?

	<i>Public security AI procurement</i>			
	(1)	(2)	(3)	(4)
Panel A.1: OLS, AI				
Unrest events	0.199*** (0.043)	0.198*** (0.045)	0.199*** (0.044)	0.200*** (0.043)
Panel A.2: Lasso IV, AI				
Unrest events	0.388*** (0.088)	0.387*** (0.088)	0.388*** (0.088)	0.388*** (0.087)
Panel B.1: OLS, AI X surveillance cameras				
Unrest events	0.681*** (0.154)	0.669*** (0.157)	0.680*** (0.155)	0.674*** (0.150)
Panel B.2: Lasso IV, AI X surveillance cameras				
Unrest events	1.099*** (0.390)	1.083*** (0.385)	1.099*** (0.390)	1.085*** (0.384)
GDP \times time	Yes	No	No	Yes
Population \times time	No	Yes	No	Yes
Gov. revenue \times time	No	No	Yes	Yes

↑ PUBLIC SECURITY AI STOCK IN QUARTER $t \implies$ EFFECT ON UNREST $t + 1$?

- ▶ Problematic to directly examine effect of AI stock on subsequent unrest events
Positive autocorrelation between such events; and AI procurement is endogenous

↑ PUBLIC SECURITY AI STOCK IN QUARTER $t \implies$ ↓ UNREST DUE TO GOOD WEATHER $t + 1$

- Instead, examine whether AI tempers the effect of good weather on unrest events
- Also, look at AI in combinations with cameras, and placebo using non-public security AI

	<i>Standardized number of unrest events</i>							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Procurement of AI								
Favorable weather	0.9082*** (0.1576)	0.9422*** (0.1564)	0.9089*** (0.1579)	0.9410*** (0.1510)	0.9315*** (0.1646)	0.9705*** (0.1632)	0.9323*** (0.1650)	0.9684*** (0.1574)
Public security procurement stock AI_{t-1}	-0.0096** (0.0048)	-0.0057 (0.0061)	-0.0096** (0.0048)	-0.0044 (0.0056)				
Favorable weather \times public security AI_{t-1}	-0.2626* (0.1563)	-0.3152* (0.1742)	-0.2623* (0.1570)	-0.3088* (0.1687)				
Non-public security procurement stock AI_{t-1}					-0.0025 (0.0017)	-0.0027 (0.0020)	-0.0025 (0.0017)	-0.0024 (0.0018)
Favorable weather \times non-public security AI_{t-1}					-0.0492 (0.0367)	-0.0576 (0.0411)	-0.0495 (0.0372)	-0.0535 (0.0375)
Panel B: Procurement of AI X procurement of surveillance cameras								
Favorable weather	0.8989*** (0.1549)	0.9325*** (0.1524)	0.8994*** (0.1552)	0.9327*** (0.1480)	0.9554*** (0.1691)	0.9945*** (0.1659)	0.9562*** (0.1695)	0.9926*** (0.1605)
Public security procurement stock AI_{t-1}	0.2923*** (0.1083)	0.3158*** (0.0991)	0.2917*** (0.1081)	0.3081*** (0.0948)				
Favorable weather \times public security AI_{t-1}	-0.7096*** (0.2302)	-0.7952*** (0.2412)	-0.7144*** (0.2323)	-0.7789*** (0.2248)				
Non-public security procurement stock AI_{t-1}					0.0605 (0.0600)	0.0626 (0.0592)	0.0608 (0.0603)	0.0601 (0.0572)
Favorable weather \times non-public security AI_{t-1}					0.7558 (0.6020)	0.8049 (0.6015)	0.7573 (0.6043)	0.7744 (0.5801)
GDP \times time	Yes	No	No	Yes	Yes	No	No	Yes
Log population \times time	No	Yes	No	Yes	No	Yes	No	Yes
Gov. revenue \times time	No	No	Yes	Yes	No	No	Yes	Yes

Registered with Min. of Industry and Information Technology

- Validation exercise: check against IPO Prospectus of MegVii

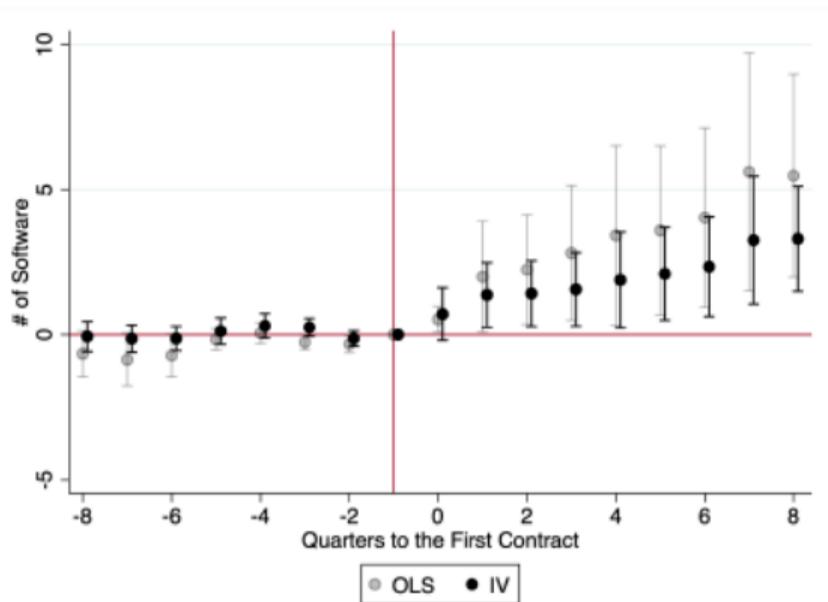
Categorize software outputs:

1. By intended customers: e.g., government, commercial (customer tracing system in retail space)
2. By intended use: e.g., surveillance related (tools to locate relatives in the city)
3. Use Recurrent Neural Network (RNN) model, LSTM algorithm; with 13,000 manually labeled training set

↑ POLITICALLY MOTIVATED PUBLIC SECURITY AI PROCUREMENT IN QUARTER $t \implies$
↑ COMMERCIAL AI INNOVATION IN $t + 1$

1. Politically motivated public security contracts: those from location with above median unrest at $t - 1$
2. Triple Diff: before/after firms receive 1st politically motivated contract, then compare to non-public sec. contracts

Panel B: Commercial



↑ POLITICALLY MOTIVATED PUBLIC SECURITY AI PROCUREMENT IN QUARTER $t \implies$

↑ EXPORTS OF AI IN $t + 1$

	<i>Newly exporting firm</i>			
	(1)	(2)	(3)	(4)
<hr/> Panel A: high unrest contracts <hr/>				
Public security	0.054*	0.049**	0.056**	0.052**
	(0.027)	(0.023)	(0.026)	(0.025)
<hr/>				
Contract quarter FE	No	Yes	Yes	Yes
Contract prefecture FE	No	Yes	Yes	Yes
Pre-contract software	No	No	Yes	Yes
Firm age	No	No	No	Yes
<hr/> <hr/>				

1. Alignment between autocrats demand for social control and AI innovation
 - ▶ Could shed light on prominent episodes of frontier innovation under non-democracies
 - ▶ Aerospace technology in the USSR
 - ▶ Chemical engineering innovation in Imperial Germany

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2. If China exports surveillance AI, what are the international ramifications?

- ▶ China's comparative advantage in AI: \uparrow state demand \implies \uparrow firms' global competitiveness
- ▶ Political bias: support autocracies and weak democracies abroad

1. Global trade in facial recognition AI from 2008 to 2021

1.1 Trade deals from the bibliography of “Carnegie report” (Feldstein, 2019)

- ▶ International procurement of **AI surveillance tech by governments** (1300 citations, 75 countries)
- ▶ Identify key variables with Stanza: exporting / importing countries, year of the deal, **exporting firm**, and whether smart city. Then, human verifies that entries are indeed AI trade deals.

1.2 Report not comprehensive → Search **firm websites** and **news/media** references to them

- ▶ Examples: *“Safe City Service Brings the Future to Laos: Huawei case studies,” “Bosch equips Hong Kong-Zhuhai-Macao Bridge with customized security solutions”*
- ▶ Again, use Stanza plus human verification.

In all, 1377 AI trade deals from 37 exporting countries to 132 importing countries

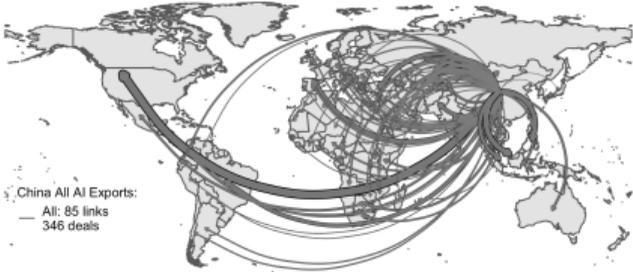
2. Trade in other frontier technologies and country characteristics

- ▶ UN Comtrade database: trade volume in 16 SITC codes related to 10 techs. in the OECD's "Science, Technology and Innovation Outlook" (Robotics, genomics, neuroscience, ...)
- ▶ Helpman et al (2008): distance between countries, common border, free trade agreement, colonial history, legal system, language, or religion
- ▶ GDP (World Bank), AI investment (Netbase Quid), **regime type** (Polity IV Project)

3. Political unrest

- ▶ GDELT project: **unrest events** from a global, comprehensive set of news feeds
- ▶ E.g., *"Laos: Police arrests 8 activists planning to stage protests to condemn land grabs and dam projects, later releases 6 of them"*

CHINA'S COMPARATIVE ADVANTAGE IN FACIAL RECOGNITION AI



CHINA'S COMPARATIVE ADVANTAGE IN FACIAL RECOGNITION AI

More likely to export AI than other frontier technologies relative to the rest of the world



Linear probability model

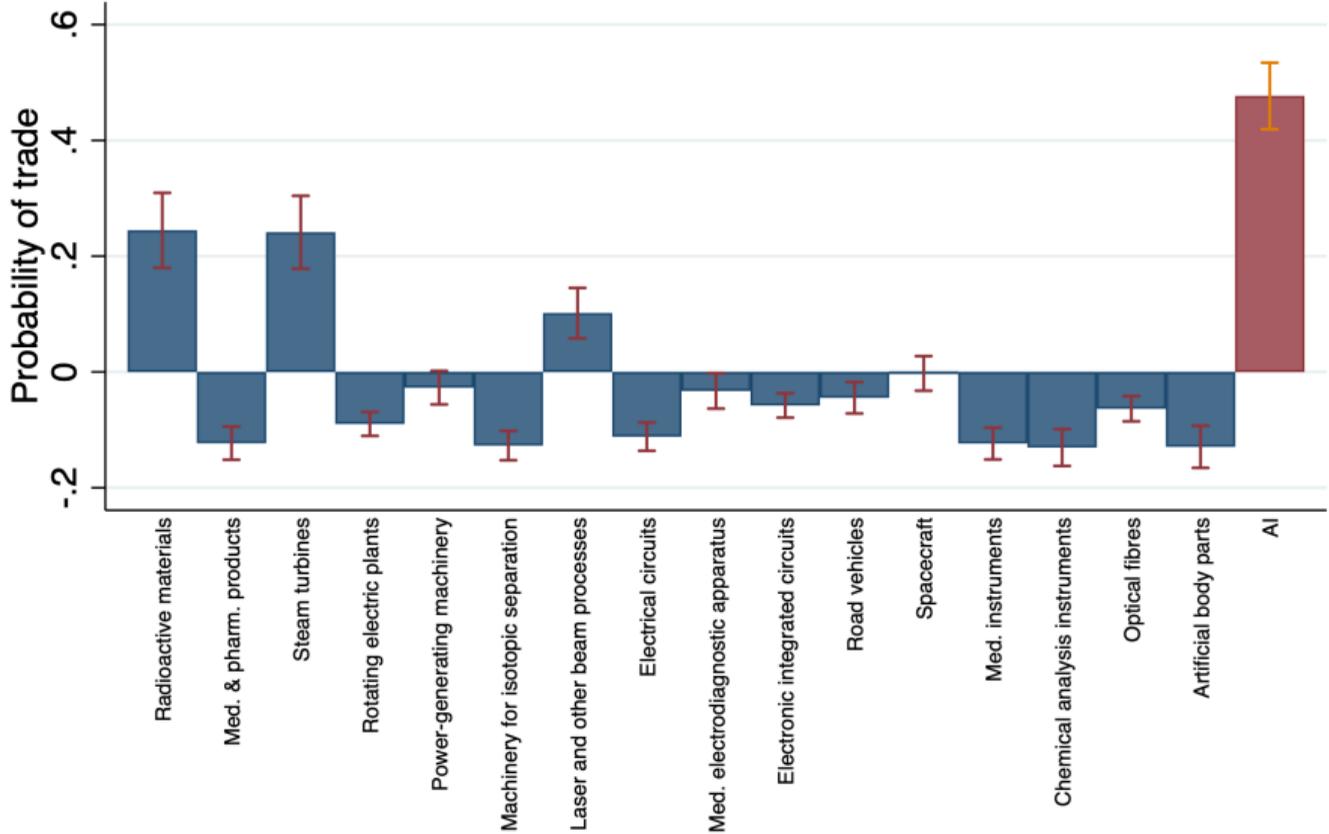
$$trade_{ijs} = \beta_1 \mathbf{1}_{i=China} + \beta_2 \mathbf{1}_{s=AI} + \beta_3 \mathbf{1}_{i=China, s=AI} + X_{ij} + u_{ijs}$$

Table 1: China vs. rest of world, AI vs. frontier technologies

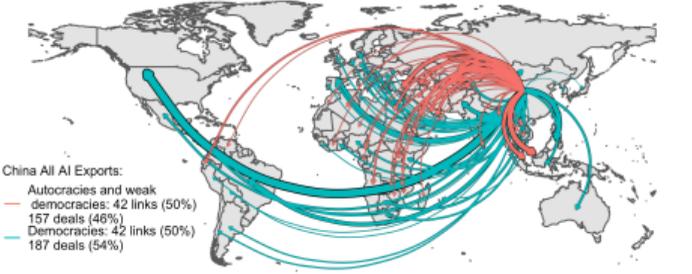
	<i>Engage in trade</i>			
	(1)	(2)	(3)	(4)
Origin China	-0.026 (0.024)	-0.026 (0.025)	-0.012 (0.025)	-0.026 (0.024)
AI	-0.358*** (0.012)	-0.359*** (0.012)	-0.357*** (0.012)	-0.356*** (0.012)
Origin China X AI	0.477*** (0.029)	0.477*** (0.032)	0.463*** (0.031)	0.477*** (0.030)
N	402300	402300	402300	402300
Importer/exporter GDP	Yes	Yes	Yes	Yes
Log distance	Yes	Yes	Yes	Yes
Border/trade characteristics	No	Yes	No	No
Institutional characteristics	No	No	Yes	No
Geographical characteristics	No	No	No	Yes

Same relative to the US or focusing on smart city AI

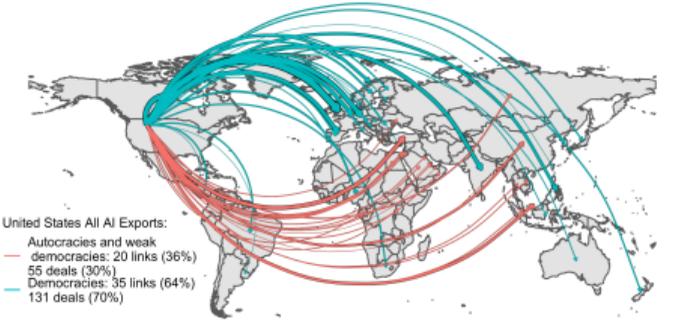
IN NO OTHER TECH CHINA HAS SUCH EXPORTING DOMINANCE



POLITICAL BIAS IN CHINESE FACIAL RECOGNITION AI EXPORTS



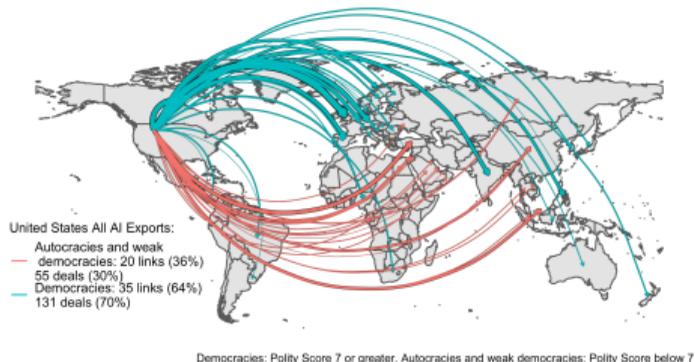
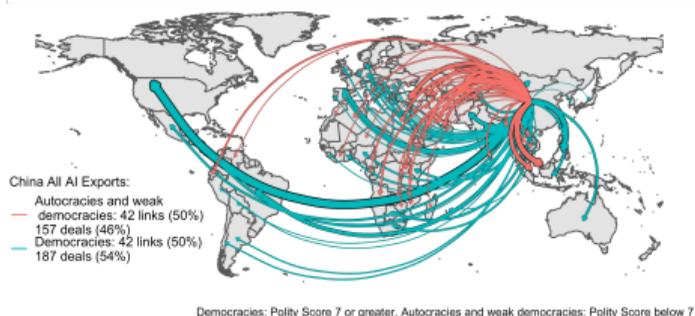
Democracies: Polity Score 7 or greater, Autocracies and weak democracies: Polity Score below 7



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POLITICAL BIAS IN CHINESE FACIAL RECOGNITION AI EXPORTS

More likely to export AI to autocracies and weak democ. relative to other frontier tech



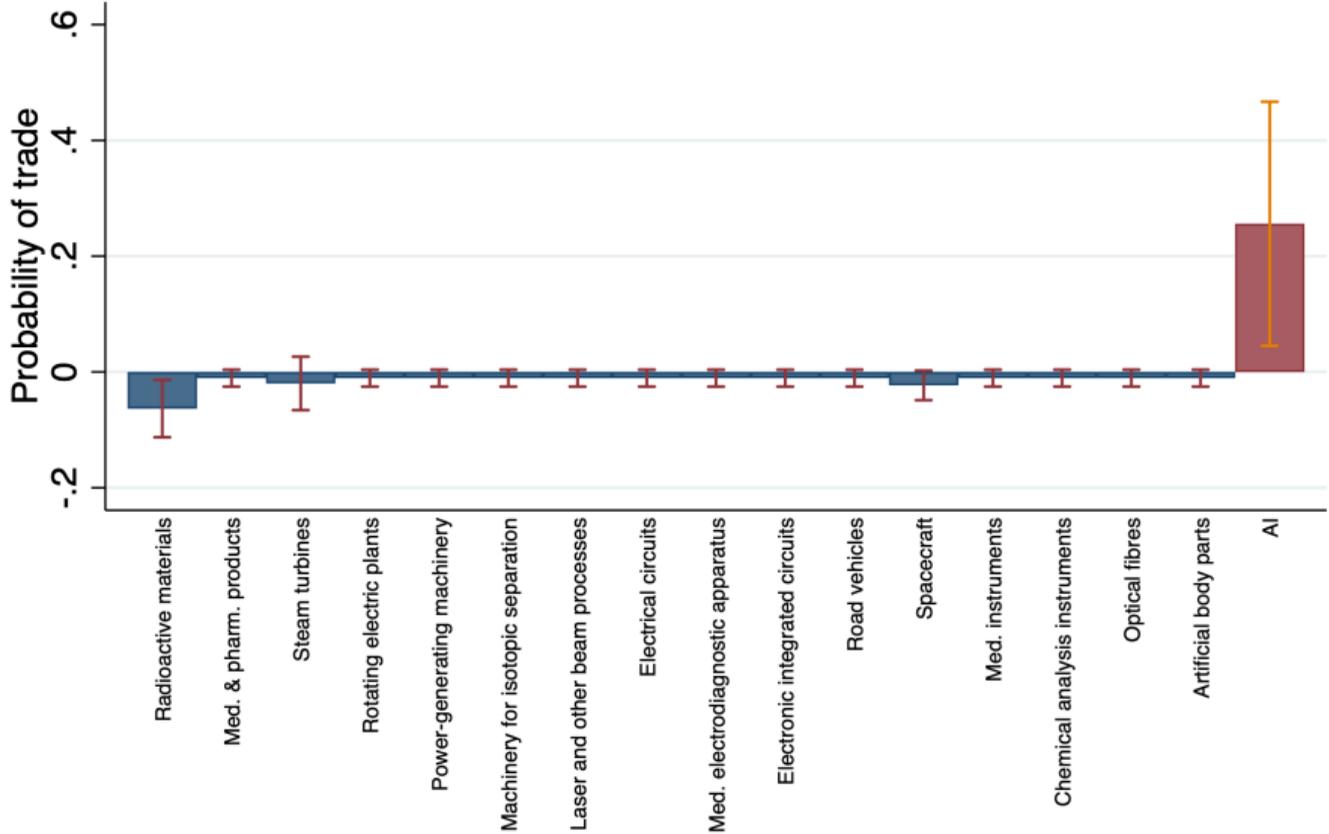
Linear probability model

$$\text{trade}_{js}^{\text{China}} = \beta_1 \mathbf{1}_{j=\text{Low}} + \beta_2 \mathbf{1}_{s=\text{AI}} + \beta_3 \mathbf{1}_{j=\text{Low}, s=\text{AI}} + X_j + u_{js}$$

	China exports			
	(1)	(2)	(3)	(4)
Destination low Polity score	-0.004 (0.003)	-0.003 (0.003)	-0.003 (0.005)	0.000 (0.003)
AI	-0.650*** (0.103)	-0.668*** (0.105)	-0.151 (0.839)	-0.653*** (0.102)
Destination low Polity score X AI	0.256** (0.108)	0.309*** (0.105)	0.245* (0.125)	0.251** (0.112)
N	2394	2394	2394	2394
Importer GDP	Yes	Yes	Yes	Yes
Log distance	Yes	Yes	Yes	Yes
Border/trade characteristics	No	Yes	No	No
Institutional characteristics	No	No	Yes	No
Geographical characteristics	No	No	No	Yes

No bias in US AI exports

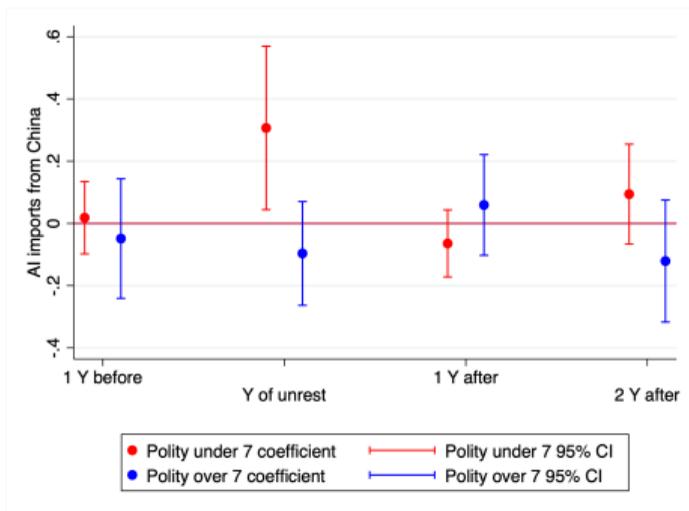
NO BIAS IN ANY OTHER FRONTIER TECH EXPORTED BY CHINA



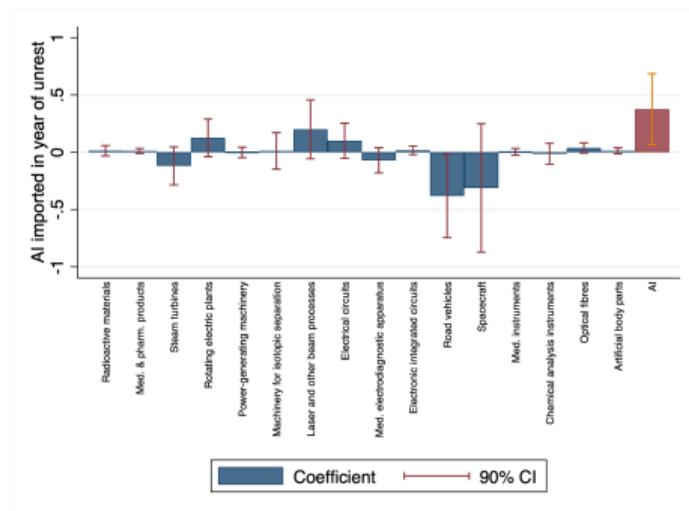
DETERMINANTS OF CHINA'S AI EXPORTS TO AUTOCRACIES AND WEAK DEMOCRACIES

More likely to export AI to autocracies and weak democracies experiencing political unrest

$$trade_{jt}^{China, AI} = \sum_T \beta_{1T} unrest_{jt} + \alpha_t + \gamma_j + u_{jt}$$



Other frontier tech imports in weak democracies aren't associated with unrest



1. China's facial recognition AI exports may **strengthen and beget** autocracies abroad
2. Frame **AI trade regulations** around those on products with **global externalities**
 - ▶ Dual-use (military-civilian) technologies, which can contribute to global conflict
 - ▶ Goods using inputs that are unethically sourced, such as child labor
 - ▶ Polluting goods