

ARTIFICIAL INTELLIGENCE AND GOVERNMENTS: THE GOOD, THE BAD, AND THE UGLY

Martin Beraja (MIT and NBER)

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 2. **The Bad:** AI is an automation technology. How should gov'ts respond?
"Inefficient automation" (with Zorzi)
 3. **The Ugly:** AI is a surveillance technology. Gov't misuse for repression and social control?
"AI-tocracy" (with Kao, Yang and Yuchtman)
"Exporting the surveillance state via trade in AI" (with Kao, Yang and Yuchtman)

- ▶ Much focus on how data collected by **private** firms shapes AI innovation
(Agrawal et al., 2019; Jones and Tonetti, 2020)
- ▶ Yet, throughout history, **states** have also collected massive quantities of data
- ▶ The state has a large role in many areas
 - ▶ Public security, health care, education, basic science...

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Can access to **government data** stimulate **commercial** AI innovation?

A common way in which firms **access** to gov't data is by **providing services** to the state

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Think about **facial recognition AI sector in China**...

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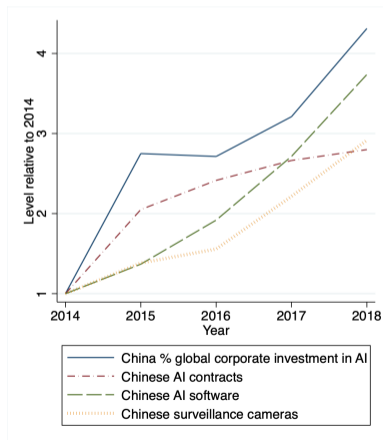
DATA-INTENSIVE INNOVATION AND THE STATE: EVIDENCE FROM AI FIRMS IN CHINA

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AI and the State in China



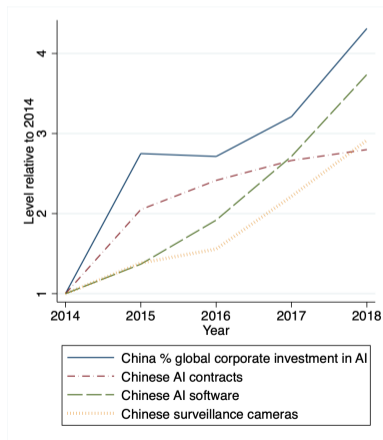
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- ▶ Government units collect this data through their surveillance apparatus, and contract AI firms
- ▶ Firms gaining access to this data use it to train algorithms and provide gov't services
- ▶ If gov't data or algorithms are **sharable** across uses, they can be used to develop commercial AI (e.g., a facial recognition platform for retail stores)

AI and the State in China



DATA 1: LINKING AI FIRMS TO GOVT. CONTRACTS

1. Identify all facial recognition AI firms

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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)

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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20日 16:28 来源: 中国政府采购网 打印 | [收藏](#) | [分享](#)

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. 项目序号: S3200000000007081001
4. 项目联系人: 王继刚
5. 项目联系人电话: 0851-85226523
6. 项目用途: 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. 公告媒体: 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:
邱险峰、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	中标单位	中标供应商地址	主要中标内容	中标金额 (元)
1	上海保田网络科技有限公 司	上海市闵行区昆 山路189号, 德必易 创 3132-446室	嵌入式"人脸识别"系统软件开发	639000.00

15. PPP项目:
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: 0851-85220880
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国际金融北街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):
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Categorize by intended customers (with RNN model using tensorflow):

1. **Commercial:** e.g., *visual recognition system for smart retail;*
2. **Government:** e.g., *smart city – real time monitoring system on main traffic routes;*
3. **General:** e.g., *a synchronization method for multi-view cameras based on FPGA chips.*

Within AI public security contracts: variation in the data collection capacity of the public security agency's local surveillance network

1. Identify non-AI contracts: police department purchases of street cameras
2. Measure quantity of advanced cameras in a prefecture at a given time
3. Categorize public security contracts as coming from “high” or “low” camera capacity prefectures

PUBLIC SECURITY CONTRACTS “DATA-RICHNESS” & COMMERCIAL AI INNOVATION

Regional variation in contracts



Empirical strategy

- ▶ **Triple diff:** software releases before and after firm receives 1st data-rich contract (relative to data-scarce)

$$y_{it} = \sum_T \beta_{1T} T_{it} \text{Data}_i + \sum_T \beta_{2T} T_{it} + \alpha_t + \gamma_i + \sum_T \beta_{3T} T_{it} X_i + \epsilon_{it}$$

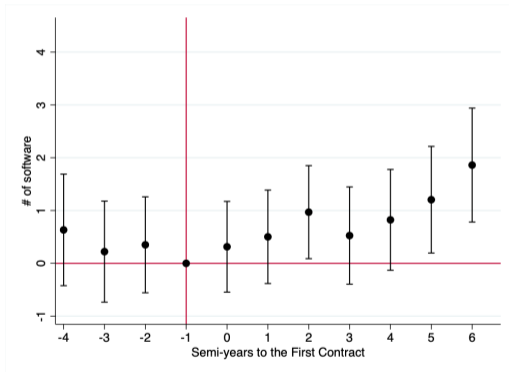
- T_{it} : 1 if T semi-years before/since firm i 's 1st contract
- Data_i : 1 if firm i receives “data rich” contract
- X_i pre-contract controls: age, size, and software prod

PUBLIC SECURITY CONTRACTS “DATA-RICHNESS” & COMMERCIAL AI INNOVATION

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Cumulative commercial software releases



Magnitude: 2 new products over 3 years

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- ▶ Two **literatures** can justify taxing automation

Tax automation

Guerreiro et al 2017; Costinot-Werning 2018

- (i) Govt. has preference for redistribution
- (ii) Automation/reallocation are efficient

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Tax capital (long-run)

Aiyagari 1995; Conesa et al. 2002

- (i) Improve efficiency in economies with IM
- (ii) Worker displacement/reallocation absent

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- ▶ Recognize that displaced workers face two important **frictions**:
 - (i) **Slow reallocation**: workers face mobility barriers and may go through unempl./retraining
 - (ii) **Imperfect credit markets**: workers have limited ability to borrow against future incomes

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Could firms automate excessively? How should the gov't respond?

Environment

Optimal Policy

Quantitative Analysis

Continuous time $t \geq 0$



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Occupations



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$h = A$ (degree $\alpha \geq 0$) or $h = N$

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$$y^A = F(\mu^A, \alpha) \quad , \quad y^N = F^*(\mu^N) \equiv F(\mu^N, 0)$$

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Final good producer

$$G^*(\mu^A, \mu^N; \alpha) \equiv G(\{y^h\}) - C(\alpha)$$

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 $\partial_A G^*(\mu^A, \mu^N; \alpha) \downarrow$ in α (labor-displacing) $G^*(\mu^A, \mu^N; \alpha)$ concave in α (costly)

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$$\Pi_t(\alpha) \equiv \max_{\mu^A, \mu^N \geq 0} G^*(\mu^A, \mu^N; \alpha) - \mu^A w_t^A - \mu^N w_t^N$$

Preferences

$$U_0 = \int \exp(-\rho t) \frac{C_t^{1-\sigma}}{1-\sigma} dt$$

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Initial allocation

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Budget constraint

$$da_t^h = [y_t^{h,*} + r_t a_t^h - c_t^h] dt$$

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Mobility opportunities arrive at rate λ

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Unempl. / retrain. exit at rate κ

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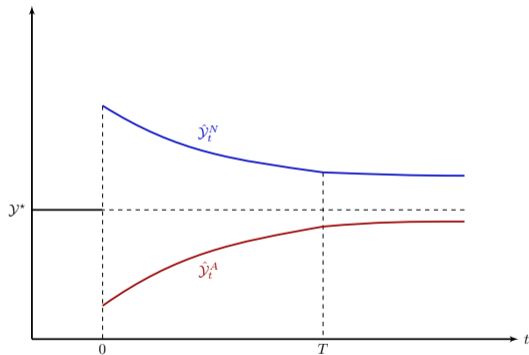
Unempl. / retrain. exit at rate κ

Borrowing constraint

$$a_t(\mathbf{x}) \geq \underline{a} \text{ for some } \underline{a} \leq 0$$

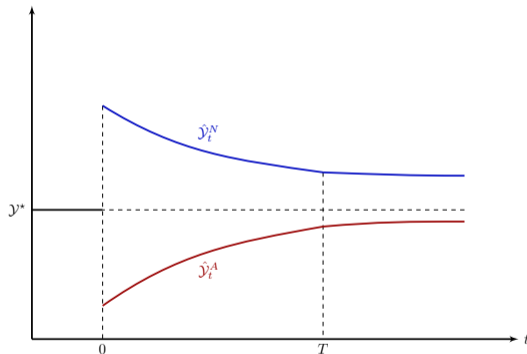
BINDING BORROWING CONSTRAINTS

Average income



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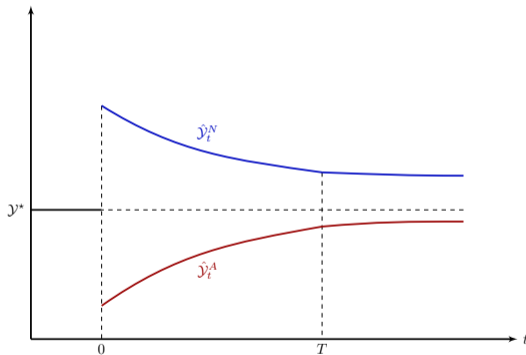
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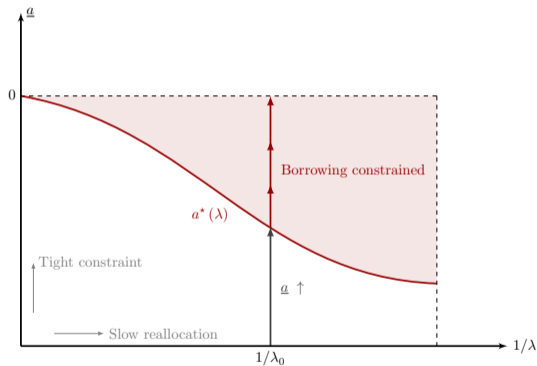
Workers expect income to improve as they reallocate → Motive for **borrowing**

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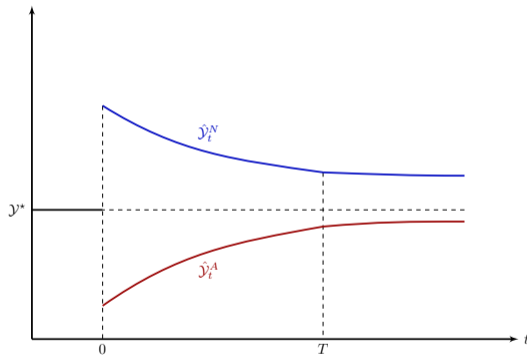
Binding borrowing constraints



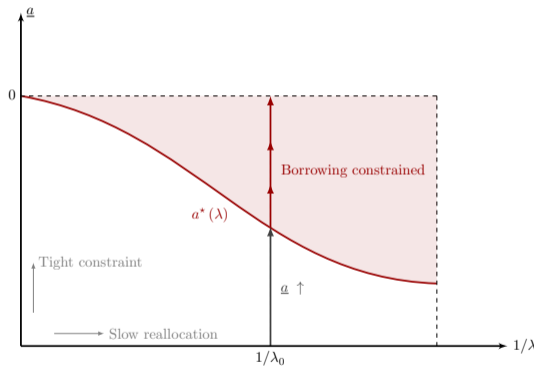
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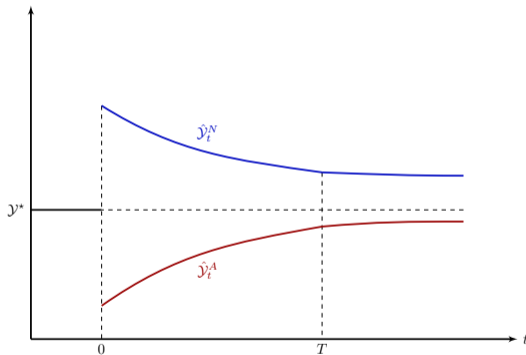
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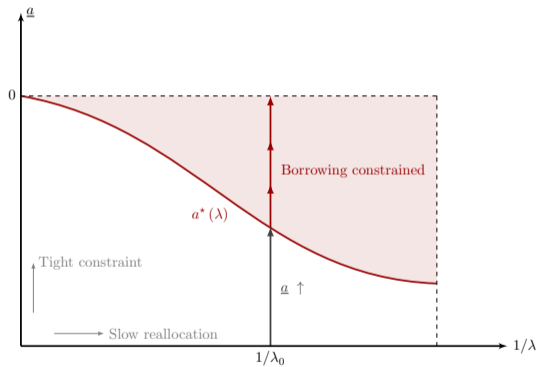
Two benchmarks: instant realloc. (Costinot-Werning) or no borrowing frictions (Guerreiro et al)

BINDING BORROWING CONSTRAINTS

Average income



Binding borrowing constraints



Evidence: Earnings partially recover (Jacobson et al) + Imperfect cons. smoothing (Landais-Spinnewijn)

Environment

Optimal Policy

Quantitative Analysis

How should a government respond to automation?

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- ▶ Depends on the **tools** available

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- ▶ **First best tools: lump sum transfers** (directed, UBI)
Info requirements? Fiscal cost? (Guerreiro et al., 2017; Costinot-Werning, 2018, Guner et al., 2021)

How should a government respond to automation?

- ▶ Depends on the **tools** available
- ▶ **Second best tools:** tax automation (*ex ante*) + labor market interventions (*ex post*)
E.g., South Korea's reduction in automation tax credit in manuf; Geneva's tax on automated cashiers.

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E.g., South Korea's reduction in automation tax credit in manuf; Geneva's tax on automated cashiers.
- ▶ **Primal problem:** The government maximizes the social welfare function

$$U \equiv \sum_h \eta^h \int_0^{+\infty} \exp(-\rho t) u(c_t^h) dt$$

by choosing $\{\alpha, T, \mu_t^A, \mu_t^N, c_t^A, c_t^N\}$ subject to workers choosing consumption optimally, the law of motion of labor, firms choosing labor optimally, and market clearing.

AGGREGATE VS. DISTRIBUTIONAL EFFECTS

- Consider a perturbation $\delta\alpha$ starting from the laissez-faire. Welfare change

$$\begin{aligned} \frac{\delta\mathcal{U}}{\delta\alpha} &= \eta^N u'(c_0^N) \times \int_0^{+\infty} \underbrace{\exp(-\rho t) \frac{u'(c_t^N)}{u'(c_0^N)}}_{=\exp(-\int_0^t r_s ds)} \times (\Delta_t^* + \Sigma_t^{N,*}) dt \\ &+ \eta^A u'(c_0^A) \times \int_0^{+\infty} \underbrace{\exp(-\rho t) \frac{u'(c_t^A)}{u'(c_0^A)}}_{\text{How automated workers value flows}} \times (\Delta_t^* + \Sigma_t^{A,*}) dt \end{aligned}$$

where Δ_t^* is aggregate term and $\Sigma_t^{A,*} + \Sigma_t^{N,*} = 0$ are distributional terms.

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$$+ \eta^A u'(c_0^A) \times \underbrace{\int_0^{+\infty} \exp(-\rho t) \frac{u'(c_t^A)}{u'(c_0^A)} dt}_{\text{How automated workers value flows}} \times (\Delta_t^* + \Sigma_t^{A,*})$$

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- ▶ No borrowing constraints $\rightarrow \frac{u'(c_t^N)}{u'(c_0^N)} = \frac{u'(c_t^A)}{u'(c_0^A)} \rightarrow$ **Efficiency** (only distributional terms)

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where Δ_t^* is aggregate term and $\Sigma_t^{A,*} + \Sigma_t^{N,*} = 0$ are distributional terms.

- ▶ No borrowing constraints $\rightarrow \frac{u'(c_t^N)}{u'(c_0^N)} = \frac{u'(c_t^A)}{u'(c_0^A)} \rightarrow$ **Efficiency** (only distributional terms)
- ▶ Still rationale for redistribution since $u'(c_t^N) < u'(c_t^A)$, e.g., utilitarian weights

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There is a **conflict** between how the firm and displaced workers value the **effects of automation over time**. This creates room for **Pareto improvements**.

CONSTRAINED INEFFICIENCY (FOR ANY PARETO WEIGHTS)

Proposition. (Constrained inefficiency)

Generically, there exists $\{\delta\alpha, \delta T\}$ such that $\delta U^A > 0$ and $\delta U^N = 0$. This requires $\delta\alpha < 0$.

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3. Set $\delta\alpha < 0$, and $\delta T < 0$ to compensate non-auto. workers (akin to future transfer)

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Taxing automation increases **aggregate consumption** and **redistributes** early on during the transition, precisely when **displaced workers** value it more.

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- ▶ **Pref. for equity:** Government taxes even more with utilitarian weights

Environment

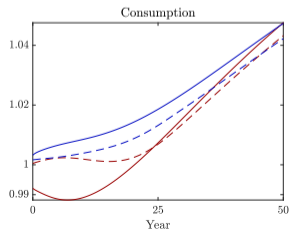
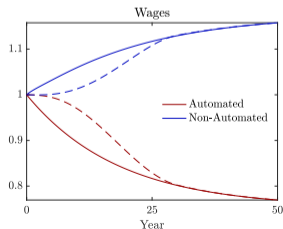
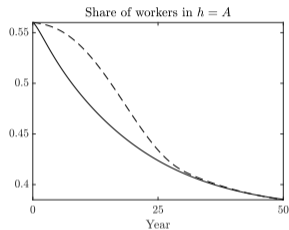
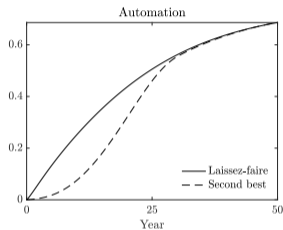
Optimal Policy

Quantitative Analysis

- ▶ **Adds:** gradual autom. + idiosync. risk (Huggett-Aiyagari) + gross flows (McFadden)

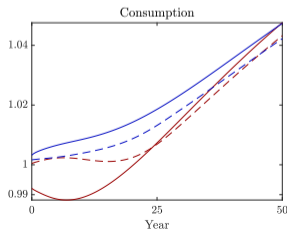
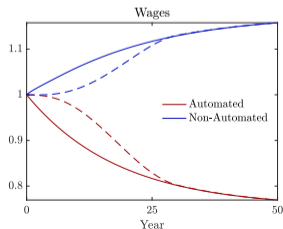
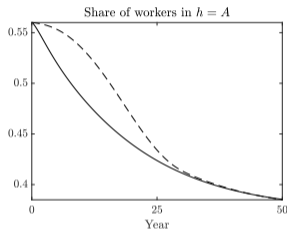
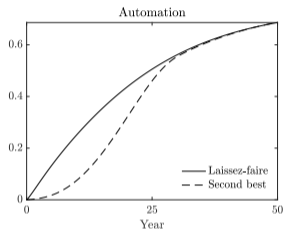
QUANTITATIVE MODEL

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Half-life of automation
15 years at LF v. 20 years at SB

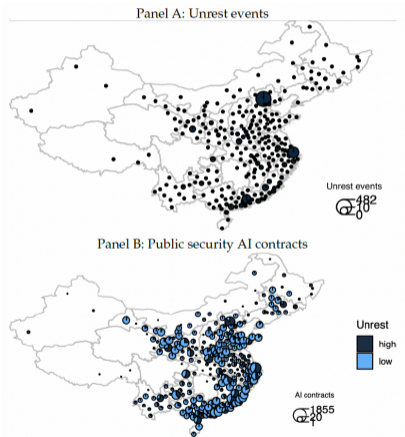
Welfare gains
0.8% for A workers and 0.2% overall

- ▶ As a technology of **prediction**, gov'ts may use AI for repression and social control (Zuboff, 2019; Tirole, 2021; Acemoglu, 2021)
- ▶ Facial recognition AI, in particular, is a technology of **surveillance** (and dual-use)

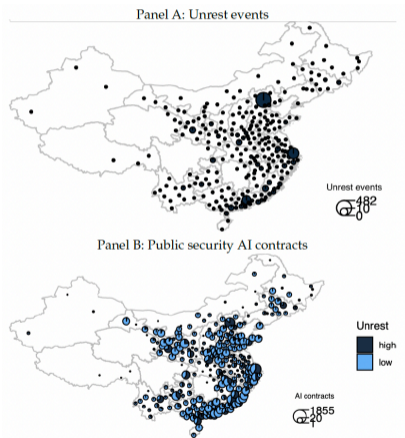
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Evidence from China?

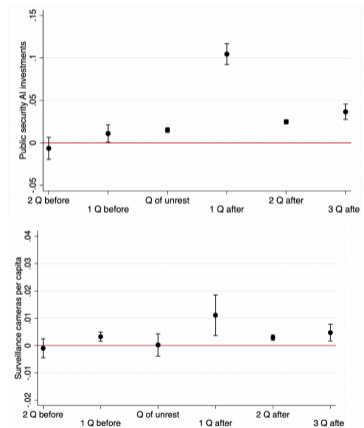
Unrest and gov't procurement of AI



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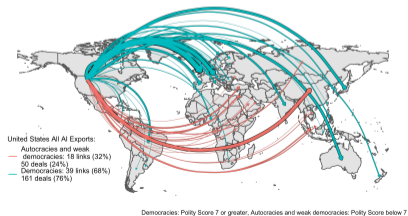
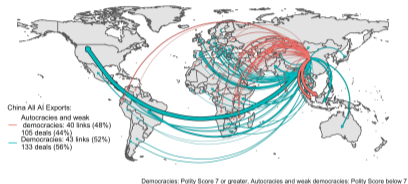


Unrest → Gov't buys AI and cameras



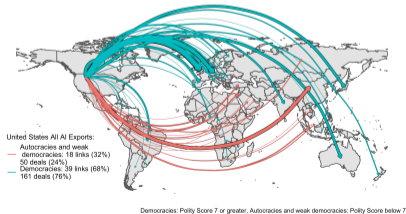
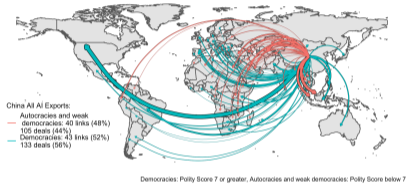
EXPORTING THE SURVEILLANCE STATE VIA TRADE IN AI

Exports of AI: China v. US

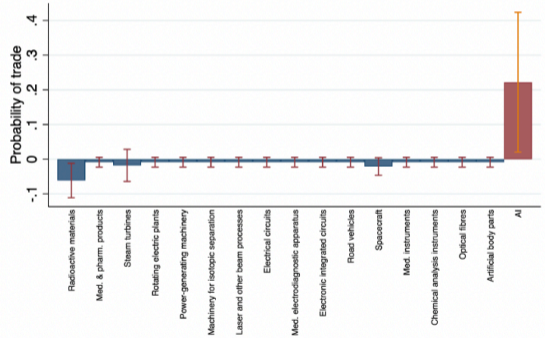


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Autocracies and weak democracies are more likely to import AI from China



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- ▶ Touches on issues **across fields**: macro (growth, innovation, labor), pol. econ, IO

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- ▶ Touches on issues **across fields**: macro (growth, innovation, labor), pol. econ, IO
- ▶ Social scientists have a **responsibility** to study the benefits, risks, and policy implications of AI
 - ▶ Otherwise, we leave the task to computer scientists, tech firms, pundits, politicians...
- ▶ We have only started to scratch the surface. **More questions** as AI is widely adopted.

Much work ahead!