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The Impact of Data Transfer Restrictions on Data Centre Geography

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Motivation

- 172+ countries restrict cross-border personal data transfers
- **Research question:** Do restrictions increase domestic data centre investment?

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Two opposing forces

- **Localisation:** Process data domestically \Rightarrow investment \uparrow
- **Contraction:** Higher compliance costs \Rightarrow compute demand \downarrow

Net effect is empirically ambiguous

Outline

1. Introduction
- 2. Data and Empirical Strategy**
3. Results
4. Theory
5. Conclusions

Data: Law Classification

Cross-Border Data Transfer Restrictiveness

- LLM-based classification of national laws using OECD taxonomy
- Validated against manual coding
- 7-level scale (0-6) from unrestricted to strict authorization
- Treatment: First adoption of GDPR-level rules (level 4+)

Restrictiveness Levels

Level	Examples
0: No cross-border rules	Afghanistan
1: Free transfer; sender liable	Canada, Hong Kong
2: Sender checks adequacy	Australia, India
3: Govt adequacy list; fallback safeguards	Japan, United States
4: GDPR-level (treatment)	EU, UK
5: Adequacy list; else approval needed	Russia, Saudi Arabia
6: Approval for every transfer	China, Egypt

Data Centre Measurements

- S&P Capital IQ Real Estate database
- Global panel of new data centre openings
- 101 countries, 2000-2024
- Sourced from public company filings and investor communications

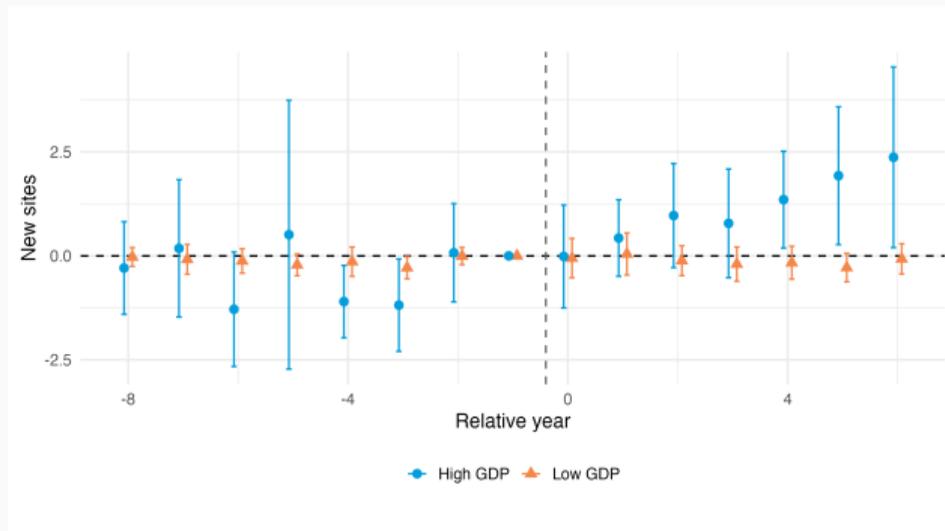
Empirical Strategy

- Two-way fixed effects event study (Sun & Abraham, 2021)
- Compare treated countries (adopt GDPR-level rules) vs not-yet-treated/never-treated
- 63 treatment events (countries \times adoption years)
- Dependent var: new data centre site openings per year
- Focus on heterogeneity by GDP, population, industry structure, and infrastructure

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Main Results: Heterogeneity by GDP

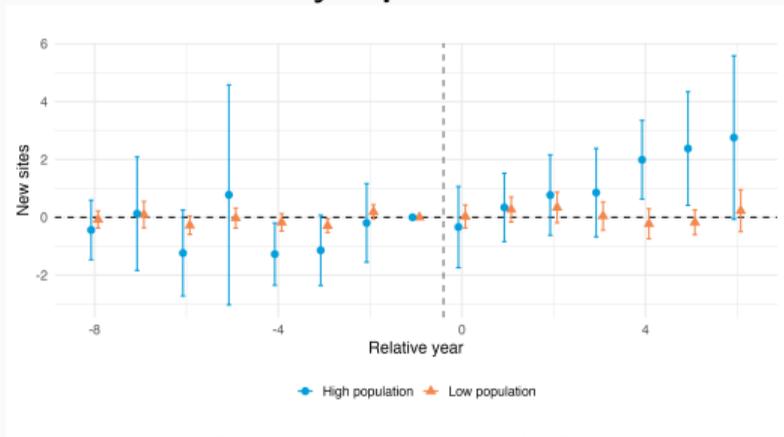


Key finding: Effect concentrated in larger economies (GDP > median)

- High GDP: +1.1 sites/year (36% increase); Low GDP: Near-zero

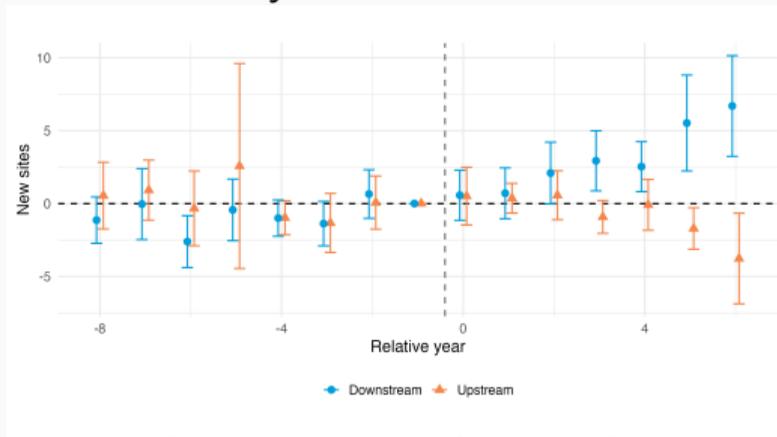
Heterogeneity: Population and Industry Structure

By Population



High pop: +1.3 sites/year (33%)

By Downstreamness



High downstream: +3.0 sites/year (86%)

Interpretation: Effects stronger in larger markets and consumer-facing industries

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Theory: Compliance Quota Model

Production and Profit

Firm produces digital good using compute $C = C_L + C_R$ and data D :

$$Y_c = C^\alpha \log(1 + D^\gamma)$$

Profit function with population N_c , costs $F + p_L C_L$ (local) and $p_R C_R$ (remote):

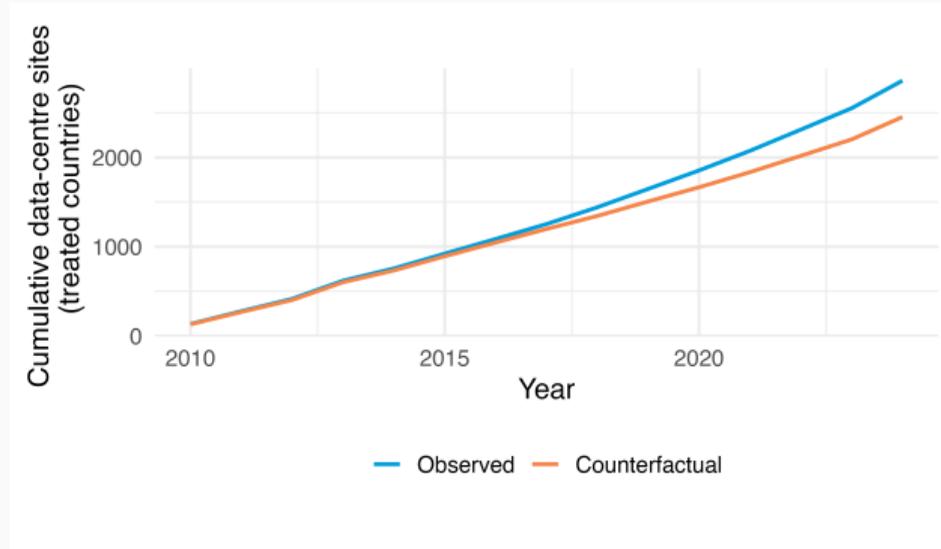
$$\pi_c = N_c \cdot C^\alpha \log(1 + D^\gamma) - (F + p_L C_L) - p_R C_R$$

Regulation as Compliance Quota

- Constraint: $C_L \geq \omega(\tau) \cdot C$ (minimum local share)
- Tighter regulation ($\uparrow \tau$) raises $\omega(\tau)$
- When $p_L > p_R$: effective price $p(\omega) = p_R + (p_L - p_R)\omega(\tau)$

Key insight: Local C_L can increase despite higher costs if fixed cost F is amortized over larger required local share

Quantification: Counterfactual Analysis



Back-of-envelope: Treated countries would have ~15% fewer sites by 2024 absent tightening

- Substantial heterogeneity; largest effects in rich, populous, downstream economies

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Conclusions

Main Finding

- Tightening data transfer rules **increases** domestic data centre entry
- Effect concentrated in larger, richer, downstream economies
- Robust to pre-trends, spillovers, placebo tests

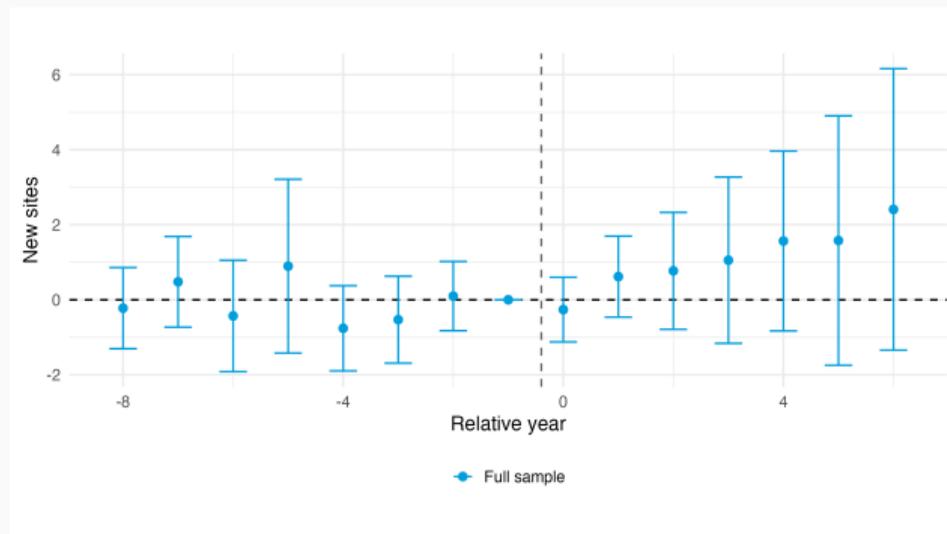
Policy Implications

- Data restrictions fragment global compute infrastructure
- Acts like costly industrial policy - raises investment but also costs
- Fixed costs \Rightarrow smaller/poorer countries excluded
- Trade-off: Economic costs vs privacy/sovereignty/security benefits

Contribution

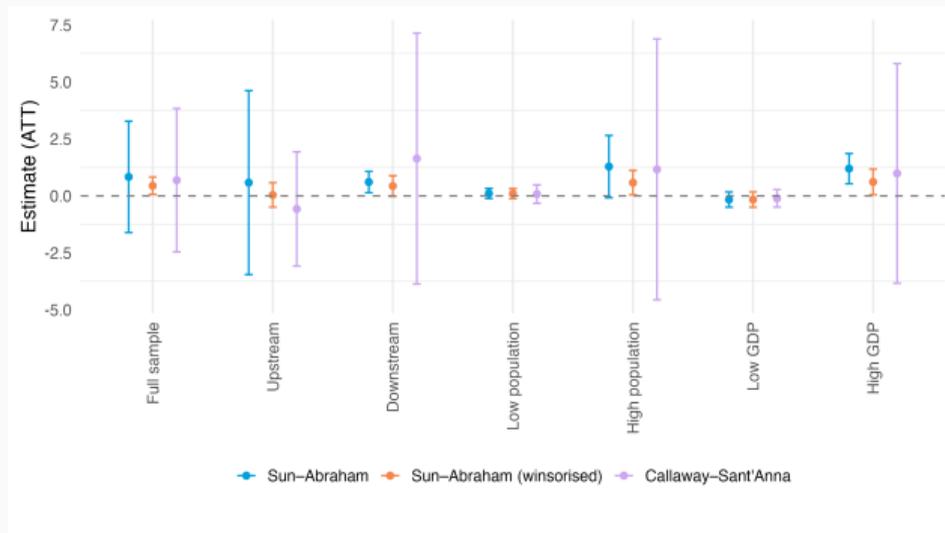
- First global evidence linking data regulation to physical infrastructure
- New measurements: data centre panel + harmonized law classification

Robustness: Event Study and Pre-Trends



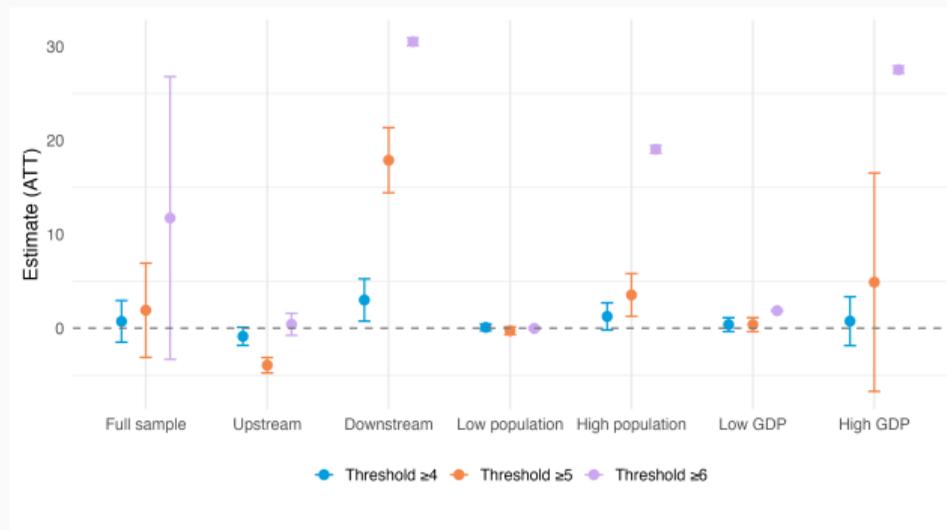
- No systematic pre-trends; effect emerges post-treatment

Robustness: Sensitivity to Outliers and Estimator Choice



- Blue: baseline Sun-Abraham estimates
- Orange: winsorised estimates (95% level) - not driven by outliers
- Purple: Callaway-Sant'Anna estimates - robust to estimator choice

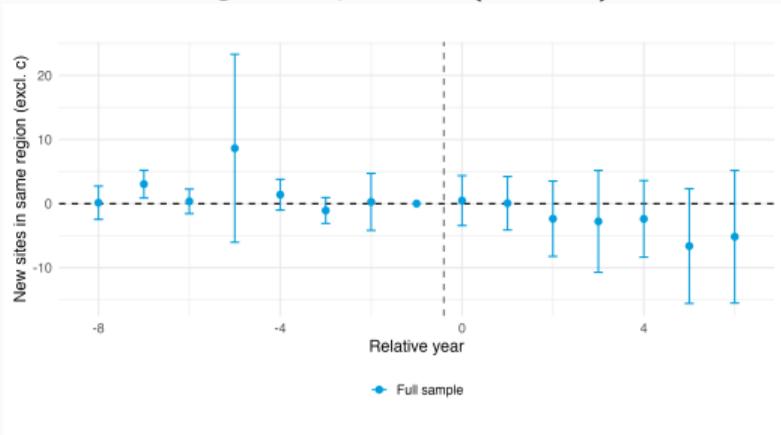
Robustness: Sensitivity to Treatment Threshold



- Results robust to alternative threshold definitions for treatment
- Baseline uses level 4+ (GDPR-level) as treatment

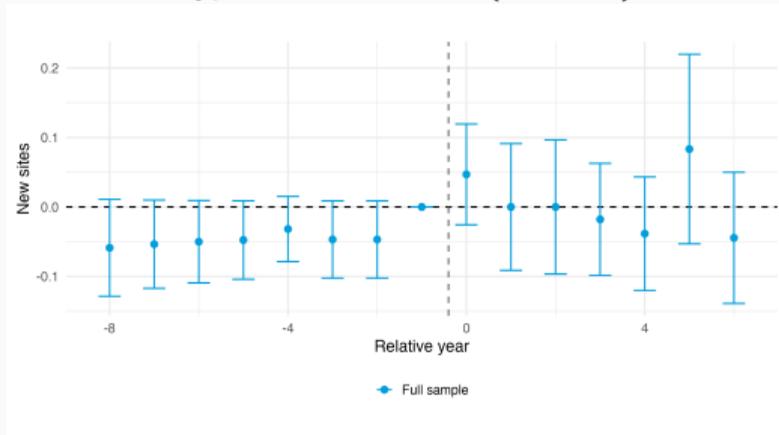
Robustness: Spillovers and Falsification Tests

Regional Spillovers (SUTVA)



No spillovers to neighbors

Crypto Data Centres (Placebo)

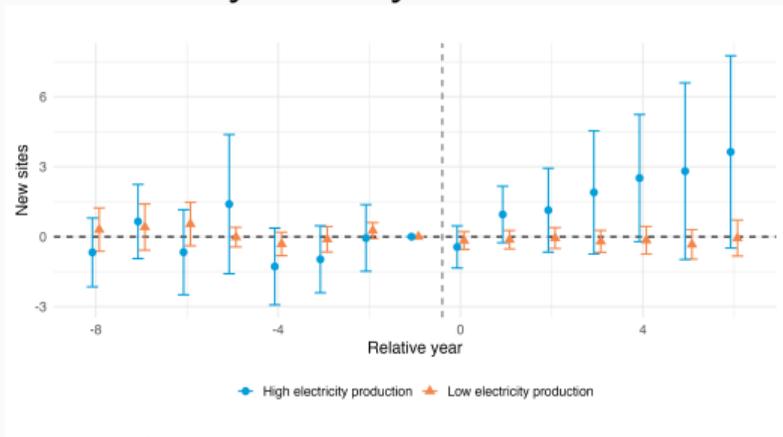


Zero effect (no personal data)

Both tests support identification assumptions

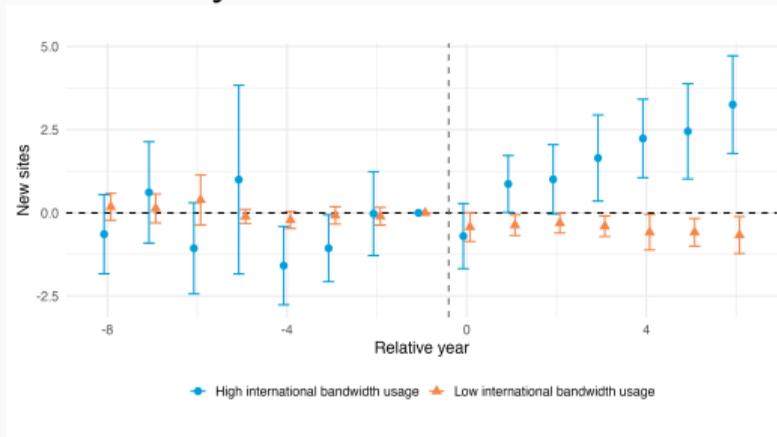
Additional Heterogeneity: Cost and Connectivity

By Electricity Production



Larger in high-electricity (proxies lower p_L)

By International Bandwidth



Larger in high-connectivity (proxies lower p_R)

Consistent with theory predictions