

Can Technology Transfers Save Innovation? Evidence from China



Zhangfeng Jin, PhD^{1,2}

¹Zhejiang University, ²Global Labor Organization

Motivations

- Effectiveness of **foreign aid** in promoting economic growth is far from clear.
 - Africa V.S. Western Europe (e.g., the Marshall Plan)
- Most of the aid puts more emphasis on financing investments, structural adjustments, and improving the quality of governance.
- Insufficient discussion of the consequences of foreign aid **in the form of technology transfers** persists.

Research Questions

This article examines the impact of technology transfers on innovation inputs based on China's adoption of Soviet-aided industrial projects:

- Has China's adoption of the 156 Projects **affected** local industrial firms' long-term innovation inputs after nearly half a century?
- And if so, what is the likely underlying **mechanism** for its effect?

Soviet-aided 156 Projects

- On February 14, 1950, China and the Soviet Union signed the Sino-Soviet Treaty of Friendship, Alliance and Mutual Assistance, followed by the large-scale economic and military cooperation between the two nations.
- Between 1950 and 1957, China and the Soviet Union reached various agreements in support of large-scale, capital-intensive industrial development (i.e., 156 Projects), 150 projects were actually constructed.
- These 156 Projects were unevenly distributed across cities (**Figure 1**) for reasons such as (1) proximity to resources, (2) ability to change economically underdeveloped areas, and (3) military considerations.

Model Specification

To examine the impact of adopting the 156 Projects on firms' innovation inputs, I use a two-stage least squares model:

$$T_c = \beta_T^Z \cdot Z_c + \beta_T^K K_{ic} + \varepsilon_{ic} \quad (1)$$

$$Y_{ic} = \beta_Y^T \cdot T_c + \beta_Y^K K_{ic} + \eta_{ic} \quad (2)$$

- Y_{ic} is a dummy variable indicating positive R&D for each firm i in city c .
- T_c is a dummy variable indicating adoption of a project in city c .
- Z_c is the instrument, defined as the geographical distance between the centroid of each mainland Chinese city c and the centroid of Jinmen.
- β_Y^T and β_T^Z are parameters of interest.

Table 1. Impact of the 156 Projects on Firms' Innovation Inputs.

Variables	OLS	IV	First Stage	Reduced
β_Y^T	-0.0636*** (0.0228)	-0.3585*** (0.1103)		
β_T^Z			0.0003*** (0.0001)	-0.0001*** (0.0000)
Observations	11195	11195	11195	11195
Weak identification test		14.4622		
Endogeneity test		0.0001		

Note: Standard errors are in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.

Contact

<Zhangfeng Jin>
<Zhejiang University & Global Labor Organization>
Email: zhangfeng_jin@zju.edu.cn
Website: <https://sites.google.com/view/zhangfeng-jin>
Phone: 86-15657917237

Results

- China's adoption of the Soviet-aided 156 Projects **reduced** long-run innovation inputs.
 - IV estimate shows that the average probability of investing in R&D **decreases** by 0.36 in adopting localities (**Table 1**).
- The decline in innovation inputs is further supported by firms' lower probability of patenting in adopting localities.
- Low adoption of performance-based reward systems, rather than a lack of capital and skilled workers, is likely an underlying mechanism for the decline.

China's Adoption of the 156 Projects

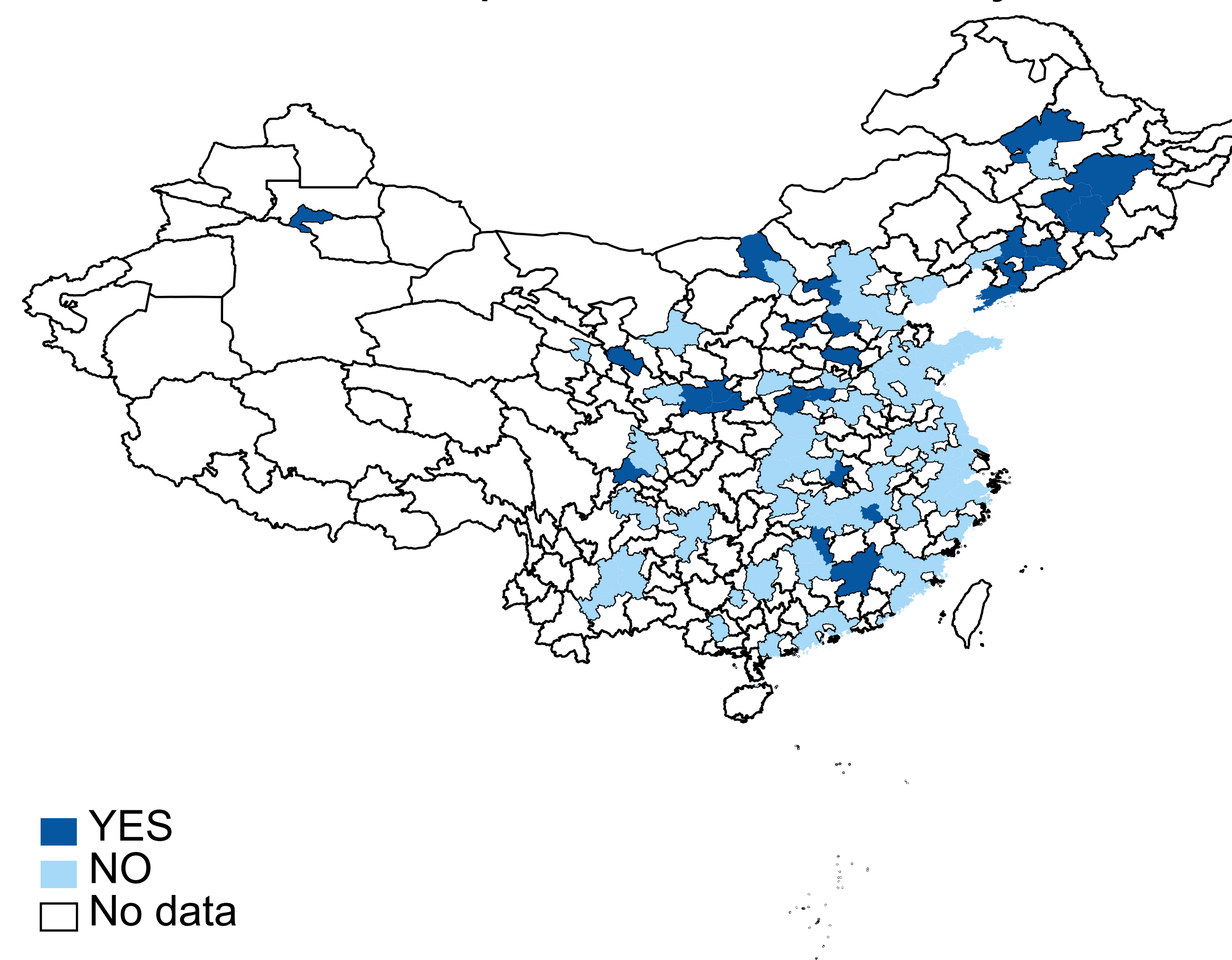


Figure 1. The adoption of the 156 Projects across Chinese cities.

Note: This map may not fully capture the entire Chinese administration.

Table 2. Impact of the 156 Projects on the use of performance-based reward systems.

Variables	OLS	IV	First Stage	Reduced
β_Y^T	-9.2425*** (1.6714)	-32.0128*** (9.4444)		
β_T^Z			0.0003*** (0.0001)	-0.0088*** (0.0012)
Observations	10938	10938	10938	10938
Weak identification test		13.9820		
Endogeneity test		0.0003		

Note: Standard errors are in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.

Discussions

- Various reasons may explain the decline in innovation inputs in adopting localities. One could be that Soviet-aided industrialization helped to sustain the centrally planned economy that emphasized **collectivism**, which hindered the adoption of performance-based reward systems.
- Using the same approach, we show that adopting the 156 Projects led to a 32-unit **decrease** in the intensity of pay for performance on average (**Table 2**).
- We also rule out alternative channels such as overspecialization, use of capital and use of skilled workers.

References

- Bloom, Nicholas, Erik Brynjolfsson, Lucia Foster, Ron Jarmin, Megha Patnaik, Itay Saporta-Eksten, and John Van Reenen. 2019. "What Drives Differences in Management Practices?" *American Economic Review* 109 (5): 1648–83.
- Burnside, Craig, and David Dollar. 2000. "Aid, Policies, and Growth." *American Economic Review* 90 (4): 847–68.
- DeLong, J Bradford, and Barry Eichengreen. 1991. "The Marshall Plan: History's Most Successful Structural Adjustment Program." National Bureau of Economic Research Cambridge, Mass., USA.
- Djankov, Simeon, Jose G Montalvo, and Marta Reynal-Querol. 2008. "The Curse of Aid." *Journal of Economic Growth* 13 (3): 169–94.
- Giorcelli, Michela. 2019. "The Long-Term Effects of Management and Technology Transfers." *American Economic Review* 109 (1): 121–52.
- Giorcelli, Michela, and Bo Li. 2021. "Technology Transfer and Early Industrial Development: Evidence from the Sino-Soviet Alliance." Available at SSRN.
- Heblisch, Stephan, Marlon Seror, Hao Xu, and Yanos Zylberberg. 2019. "Industrial Clusters in the Long Run: Evidence from Million-Rouble Plants in China."
- Zhang, Baichun, Jiuchun Zhang, and Fang Yao. 2006. "Technology Transfer from the Soviet Union to the People's Republic of China: 1949–1966." *Comparative Technology Transfer and Society* 4 (2): 105–67.