

# LAND-USE REGULATION AND ECONOMIC DEVELOPMENT: EVIDENCE FROM THE FARMLAND RED LINE POLICY IN CHINA

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## Introduction

- Most countries regulate the growth of cities [5, 2, 1, 4].
- Many land-use regulations aim to protect farmland from urban land expansion [6, 7, 9].
- Little is known about how these regulations affect economic development.
  - Land-use regulations are endogenous.
  - Therefore, it is challenging to establish a causal impact of land-use regulation on economic development or to quantify its distortionary effects.
- **This Paper**
  - Exploits China's Farmland Red Line Policy (1999) as a natural experiment in China to identify the causal impact of land-use regulation on local GDP and population growth.
    - \* Since 1999, the policy forbids the conversion of farmland into urban land unless an equal amount of unused land in the nearby rural area is converted into farmland.
    - \* The policy creates an additional cost of urban land development that depends on exogenous local geographical features.
    - \* In locations less affected by the policy, there is more urban land, higher GDP, and larger population after the policy was adopted.
  - Estimates the aggregate effects of land-use regulation on the welfare of workers and rural-to-urban migration using a quantitative spatial equilibrium model with endogenous land-use decisions.
    - \* The policy costs 6% of workers' aggregate welfare.
    - \* A cap-and-trade platform that achieves the same policy goal can save 60% of workers' welfare costs.

## Policy Background

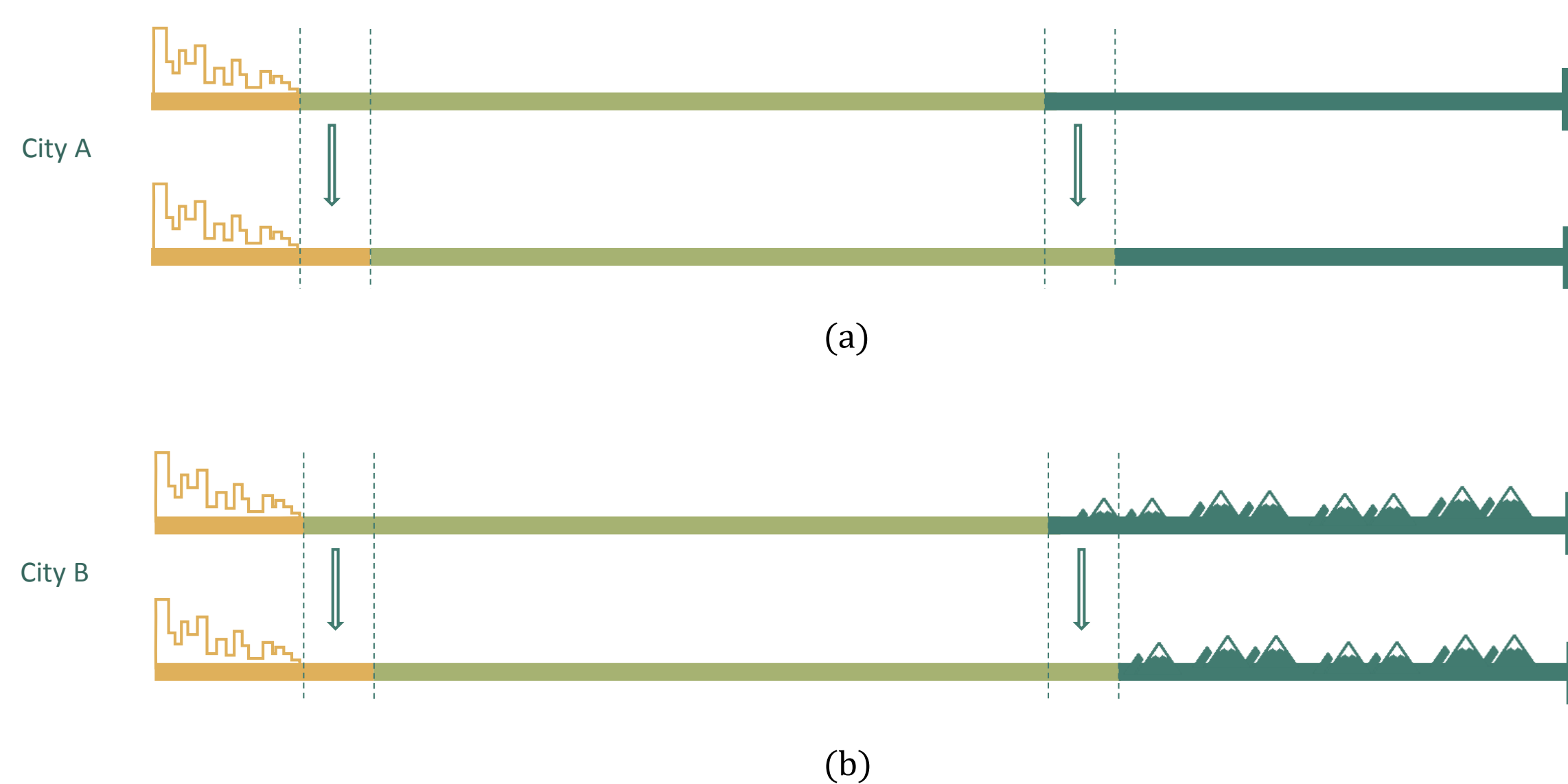
- Within a city jurisdiction, land is divided into urban, farm, and unused land.



- The administrative boundaries do not change in almost all city jurisdictions.
- Before 1999, there was no restriction on converting farmland into urban land.
- Since 1999, conversion of farmland into urban land is forbidden unless an equal amount of unused land (within the city jurisdiction) is converted into farmland.
- The policy creates an **additional cost of urban land development** that varies across city jurisdictions.

## Identification Strategy

- The additional cost is endogenously affected by local economic conditions, such as labor costs and price levels.
- Isolate exogenous variation in the additional cost of urban land development
  - The ruggedness of unused land [8]



- Unused land concentrates near the administrative boundary
- **Land conversion barrier** as the cross-sectional variation: the ruggedness of land near the administrative boundary of a city jurisdiction.

- **Regression Specification: Difference-in-Difference**

$$\ln y_{it} = \beta C_{u,i} \times \text{Post1999}_t + \alpha_i + \gamma_t + \sum_{\tau \in [1991, 2015]} X_i' \theta^\tau + \epsilon_{it}$$

- $y_{it}$ : outcome variable of interest, including urban land supply, GDP and population.
- $C_{u,i}$ : land conversion barrier.
- $\alpha_i$ : city jurisdiction fixed effects.
- $\gamma_t$ : year fixed effects.
- $X_i$ : region dummies and economic characteristics in 1990.
  - \* Economic characteristics include (log) population, employment rate, % employment from non-agriculture, % employment in the construction sector, % in-migrants, illiteracy rate and % college graduates.

## Regression Results

- City jurisdictions with a lower land conversion barrier have more urban land, higher GDP, and larger population after policy implementation.

In of	(1) Urban land	(2) GDP <sub>Secondary</sub>	(3) GDP <sub>Service</sub>	(4) GDP <sub>Agriculture</sub>	(5) GDP <sub>All</sub>	(6) Population
Cu × Post99	-0.187** (0.072)	-0.204*** (0.066)	-0.076 (0.059)	-0.135** (0.063)	-0.139** (0.054)	-0.141*** (0.049)
Observations	12,044	13,552	13,552	13,552	13,552	2,524

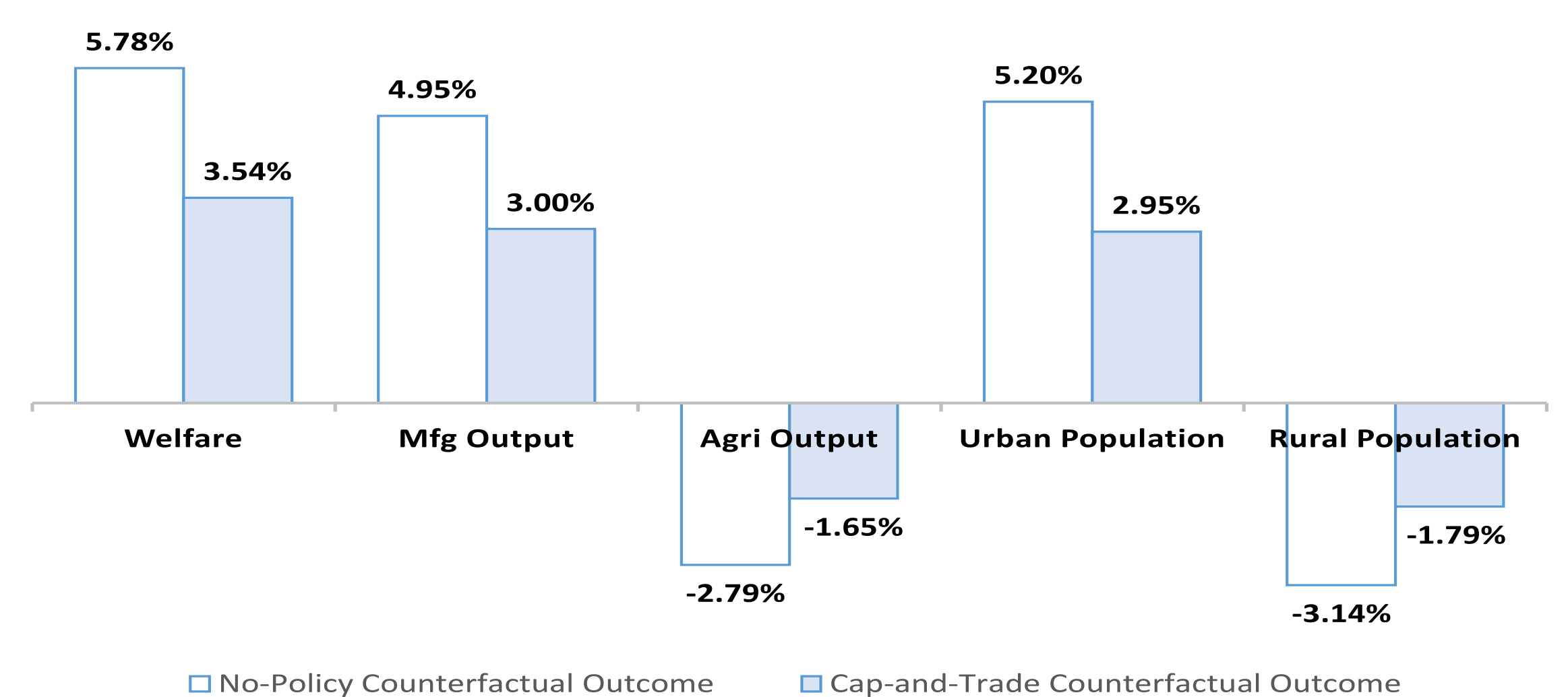
- The results are robust to adding a variety of additional control variables and alternative ways to specify the land conversion barriers.
- The results cannot be explained by alternative channels, such as the deterioration of urban compactness [3] or poorer government service in the more constrained city jurisdictions.

## Quantitative Spatial Equilibrium Model

- **Summary of the Model**

- Multiple locations, each with two sectors: an urban sector and a rural sector.
- Two types of agents: workers and landlords
  - \* Workers solve a location and sector choice model.
  - \* Immobile landlords supply farmland and urban land subject to the constraint of the policy.
- The Farmland Red Line Policy is modeled as a minimum farmland quantity constraint to each location. If the constraint is binding:
  - \* **Cross-sector** land misallocation: an excess supply of farmland and an under-supply of urban land.
  - \* **Cross-location** variation: more severe under-supply of urban land in locations with more inelastic supply of developed land.
- General equilibrium forces amplify the distortionary effects of the policy:
  - \* The allocation of labor across sectors and locations responds to land mis-allocation
  - \* Spillover of inefficiencies via trade across locations
- Quantify the model to estimate the aggregate costs of the policy.

- **Counterfactual Outcomes**



- Without the Farmland Red Line Policy, workers' welfare would have been 6% higher.
- Introduce a cap-and-trade platform on which one local government can pay another local government to develop new farmland within the administrative area of the latter.
  - \* 60% of the welfare cost could be saved if a cap-and-trade platform is used.

## Conclusions

- The paper uses China's Farmland Red Line Policy to quantify the distortionary effects of land-use regulation on the local and the national economy.
  - At the local level, city jurisdictions with a lower land conversion barrier due to the policy have significantly more urban land supply, higher GDP, and larger population.
  - At the aggregate level, the policy reduces workers' welfare by 6%.
  - A cap-and-trade platform that achieves the same policy goal can save 60% of workers' welfare costs from the Farmland Red Line Policy.

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