Impact of the *Grain for Green* program on forest cover in China

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INTRODUCTION

- Payments for environmental services (PES) have been widely launched in many developing countries (e.g., China, Mexico, and Costa Rica.).Theory indicates, however, that PES may not be effective in achieving environmental protection (Ferraro 2008).Poor administrative program area targeting, asymmetric information and spillover effects can largely offset or mitigate the program impacts.
- Rigorous evaluation of their environmental impact has been limited to few programs with mixed results.
- China's Grain for Green (GFG) program is one of the largest PES programs in the world. It was officially launched in 2002 and implemented to fight the soil runoff caused by deforestation thus to lower the risk of flood in downstream areas. However, whether GFG has successfully achieve its main goal of encouraging reforestation has not been assessed with rigorous estimation strategy
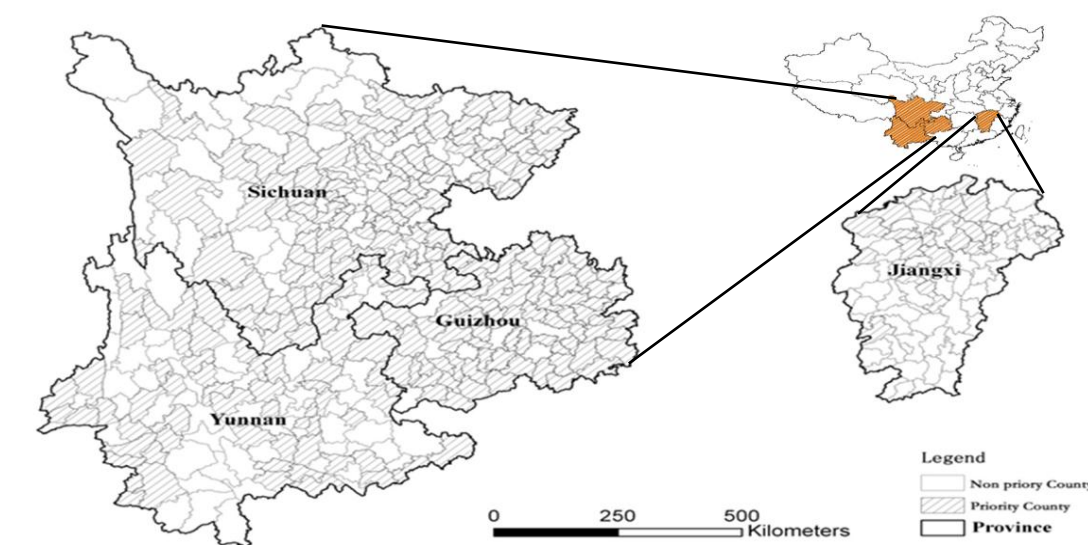
OBJECTIVE

Evaluate the impact of China's Grain for Green program on forest cover and forest structure

STUDY REGION AND DATA

- 409 counties in 4 provinces in China (Sichuan, Yunnan, Guizhou and Jiangxi)

- Outcome Variable: Forest cover in pre-program years (1988, 1995, 2000) and post-program years (2005, 2008);
- Four forest types: Closed canopy, shrub-covered canopy, open canopy and other forests.
- Treatment variable: binary (=1 if the county was designated as a priority county in the GFG program; 0 otherwise.
- Priority counties: 252 out of 409 counties
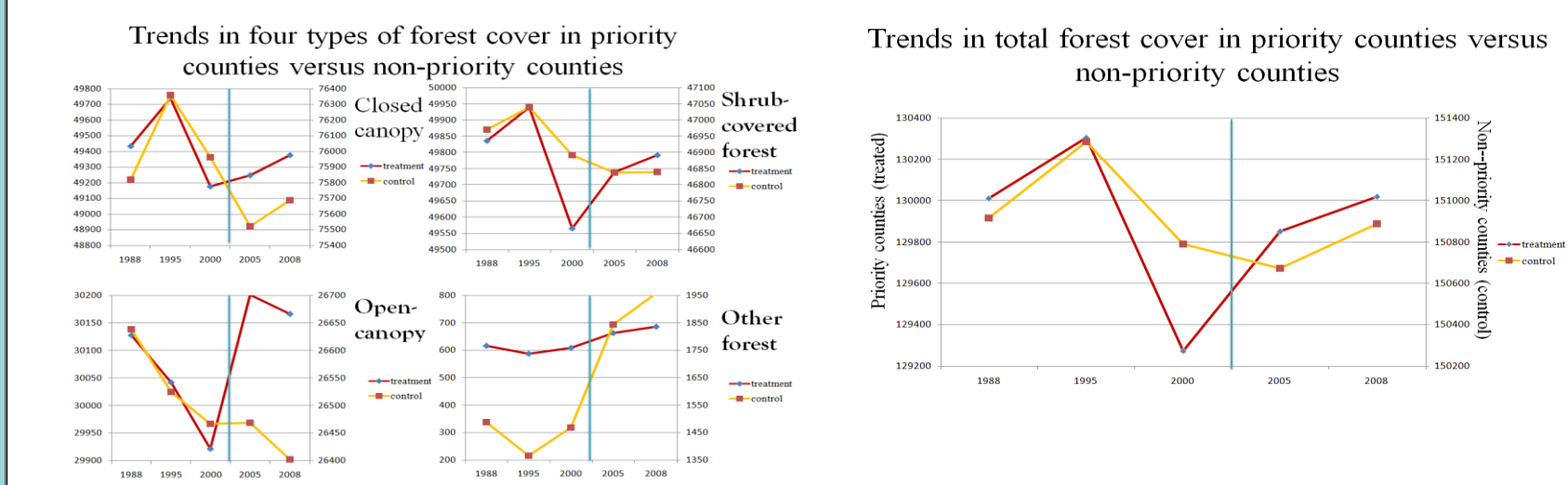
EMPIRICAL FRAMEWORK

- Identification strategy: Difference-in-differences model for multiple time periods.
- Additional controls: Control for pre-program trend in forest cover, which could potentially determine the Priority designation.
- Reduce the five-year panel to a two period panel: 1995-2000 as the pre-program period and 2005-2008 as the post program period.
- Main model:

$$\Delta Y_{it} = \beta 1^* \text{Priority}_{it} + \delta^* \Delta X_{it} + T + \Delta Y_{i0} + \alpha_i + \Delta \varepsilon_{it}$$

where $\Delta Y it$ is the deforestation at each time period; Priority_{it} is equal to 0 for all counties in the pre-program time period (1995-2000) and equal to 1 for the priority counties in the post program time period (2005-2008). $\Delta X it$ is the net change of the covariates in each time period. We controlled for αi, the county specific time trend which does not change over the two time periods.; ΔY_{i0} is the lag term of ΔY_{i1} to control for the pre-program trend.

REFERENCES

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Arriagada, R.A., Ferraro, P.J., Pattanayak, S.K., Sills, E.O., and S. Cordero. "Do payments for environmental services reduce deforestation? A farm-level evaluation from Costa Rica." Working Paper, 2009.

TREND IN FORESET COVER

Trends in four types of forest cover in priority counties versus non-priority counties

Trends in total forest cover in priority counties versus non-priority counties

The trends in four types of forest cover and total forest cover are very similar across the two groups during the pre-program time period 1988-1995 and 1995-2000. The trends in forest cover across the two groups are quite different in the program period 2000-2005, suggesting a potential impact of GFG.

RESULTS

- The GFG program has lead to an increase of 612 ha in total forest cover in the priority counties during our study period. This is equivalent of +0.47% forest cover growth compared to the forest cover in the priority counties in the baseline year (2000). This rate is larger than global annually mean change in forest cover of -0.13% (2000-10).
- We find evidence of heterogeneous impact: closed canopy increased by 382 ha and shrub-covered canopy by 215 ha. The larger impact on closed-canopy forests is counterintuitive. GFG is a reforestation program and we expected a larger impact on shrub-covered or open canopy forests.
- Caveats: The results may be confounded with uncontrolled time-variant variables such as other forest policies implemented during the same time period.