The Effect of Place-based Agricultural Policy on Food Security

Zongyin Zhao
China Academy for Rural Development (CARD), Zhejiang University, China.
zhaozongyin@zju.edu.cn

Xiaoxiao Dou
China Academy for Rural Development (CARD), Zhejiang University, China.
shawn_douxiaoxiao@outlook.com

Wenrong Qian
China Academy for Rural Development (CARD), Zhejiang University, China.
wrqian@zju.edu.cn

Selected Poster prepared for presentation at the 2023 Agricultural & Applied Economics Association Annual Meeting, Washington DC: July 23- 25, 2023

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Introduction

Food security is a critical issue for countries around the world, especially for developing countries. Our study explores whether place-based agricultural policy may be effectively implemented to boost food production and guarantee food security. Most of the literature focuses on whether place-based policies will promote local economic development, and less on its impact on agricultural outcomes. Although most agricultural policies are place-based, less attention has been paid to them in the literature.

This paper examines one of the biggest and most ambitious place-based agricultural policies in China, Grain Production Growth (GPG) Policy, which aims to increase 50 billion kg of production capacity. And we a difference-in-differences (DID) approach for policy evaluation and mechanism analysis.

Data and Method

Our data source is the annual National Fixed Point (NFP) survey, collected by the Research Center of Rural Economy (RCRE) under the Chinese Ministry of Agriculture. Our sample is from 2005 to 2013.

As the GPG program split agricultural zones according to the quota of grain outputs, we utilize a DD framework based on temporal and spatial variance and identify the impact of this policy on grain outputs. The regression is specified as below:

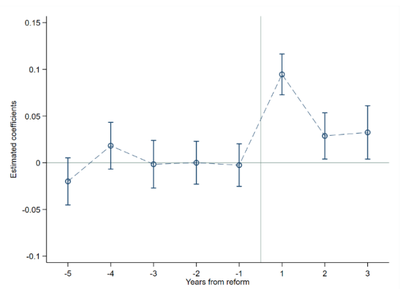
$$\boldsymbol{Y_{ict} = \alpha + \beta \times PostGraincounty_{ct} + X'_{ct} + Z'_{ict} + \eta_i + \gamma_t + \varepsilon_{ict}},$$

where Y_{ict} refers to grain outputs of farmer i in county c in year t. The indicator variable $PostGraincounty_{ct}$ equals one for farmers in grain county zone in the years after the GPG program was implemented; otherwise, it is zero. The coefficient β provides the DID estimate. X_{ct} and Z_{ict} respectively denote county-level and farmer-level control variables. η_i denotes farmer fixed effects. And γ_t denotes year fixed effects.

Results

Baseline: Effect of GPG policies on grain outputs

	Log (Grain yield)	Log (Grain sown area)	Log (Grain yield per unit area)	Log (Grain yield per capita)
	(1)	(2)	(3)	(4)
Post × Graincounty	0.044***	0.019***	0.021***	0.130***
	(6.68)	(3.41)	(4.73)	(16.27)
Farmer fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Controls × year dummy	Yes	Yes	Yes	Yes
Adjusted R-squared	0.879	0.897	0.567	0.840
No. of observation	115232	115448	127894	115234



Mechanism: Subsidies and farmer`s responses to the policies

	Log(Total subsidy)	Encouraging grain cultivation		Supporting grain seed purchase	
		Log(Grain direct subsidy)	Log(Grain sown area)	Log(Seed subsidy)	Log(Seed purchase)
	(1)	(2)	(3)	(4)	(5)
Post × Graincounty	0.040***	0.087***	0.019***	0.109***	0.019*
	(4.26)	(5.92)	(3.41)	(6.17)	(1.72)
Farmer fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Controls × year dummy	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.813	0.864	0.897	0.856	0.892
No. of observation	109370	55573	115448	39889	57210

Mechanism: Expansion of cultivation land area

Farmer sample	Log(Land area increased)			Log(Rent-in area)		
	All	Sample 1: land area owned<40	Sample 2: land area owned>=40	All	Sample 1: land area owned<40	Sample 2: land area owned>=40
	(1)	(2)	(3)	(4)	(5)	(6)
Post × Graincounty	0.078**	0.066*	0.839***	0.102***	0.069*	0.982***
	(2.2)	(1.74)	(3.13)	(2.69)	(1.74)	(3.19)
Farmer fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Controls × year dummy	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.917	0.870	0.911	0.941	0.899	0.920
No. of observation	12393	10882	1511	9924	8504	1420

Mechanism: Expansion of cultivation land area (Robustness)

Farmer sample	Log(Land area increased)		Log(Rent-in area)	
	Sample A1: land area owned<20	Sample A2: land area owned>=20	Sample B1: land area owned<30	Sample B2: land area owned>=30
	(1)	(2)	(3)	(4)
Post × Graincounty	0.070*	0.740***	0.070*	1.055***
	(1.74)	(7.82)	(1.78)	(4.51)
Farmer fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Controls × year dummy	Yes	Yes	Yes	Yes
Adjusted R-squared	0.852	0.913	0.892	0.908
No. of observation	9469	2923	8175	1747

Mechanisms

Our empirical results reveal two main mechanisms of place-based agricultural policy.

The first mechanism is about agricultural subsidy. Government increased grain direct subsidy to encourage grain cultivation, and farmers responded to it by enlarging grain sown area. Government added seed subsidy to support grain seed purchase, and farmers responded to it by purchasing more high-yielding seeds. Furthermore, enlarging grain sown area and purchasing high-yielding seeds represent respectively quantity-based and quality-based grain growth patterns.

The second mechanism is to increase land scale. To boost land integration and land use efficiency, the government encouraged farmers to increase and rent in land. From the empirical results, the coefficients of larger farmers are much bigger than small farmers, which means that the place-based policy prefers to the larger farmers.

Conclusions

Food security has always been a global issue, especially to developing countries. We choose the Grain Production Growth (GPG) program in China, using micro-level data from 2005 to 2013, to explore how the place-based agricultural policy works and its potential mechanisms.

Our results show that the place-based agricultural policy resulted in a significant increase in grain outputs, including grain yield, grain sown area, grain yield per unit area, and grain yield per capita. Increasing agricultural subsidy and encouraging land scale up are two main mechanisms of place-based agricultural policy.

Our findings contribute to a better understanding of how to address the global challenge of food security and grain production by implementing the place-based agricultural policy.