

The Effects of the Broadband Village Pilot Program on Rural Household Incomes in China

Dan Liu

College of Finance, Nanjing Agricultural University, China
liudan1987@njau.edu.cn

Han Yan

College of Finance, Nanjing Agricultural University, China
2019118005@njau.edu.cn

Jia You

College of Finance, Nanjing Agricultural University, China
1219558282@qq.com

Yanhong Jin*

Department of Agricultural, Food and Resource Economics, Rutgers University
Yanhong.Jin@rutgers.edu

* Corresponding author

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RUTGERS The Effects of the Broadband Village Pilot Program on Rural Household Incomes in China

New Jersey Agricultural Experiment Station

Dan Liu¹, Han Yan¹, Jia You¹, Yanhong Jin^{2*}

¹ College of Finance, Nanjing Agricultural University, China

² Department of Agricultural, Food and Resource Economics, Rutgers University

* Corresponding author

INTRODUCTION AND BACKGROUND

- Over the past three decades, high-speed internet access through broadband infrastructure has been rapidly deployed in both developed and emerging economies.
- Different from other infrastructures (e.g., roads, bridges, and railways), which primarily facilitate physical movement and transpiration, broadband infrastructure enables the movement of data and information, leading to significant impacts on economic development and individual well-beings.
- Due to the high cost of investigating in broadband infrastructure, decentralized economic agents may not be able to do so individually. Additionally, even if individuals have the resource to invest in broadband, they may not be able to fully internalized the economic benefits because they often cannot internalize all the benefits from such investment as they often extend beyond the individual level and impact communities as a whole.
- The lack of access to broadband internet is a significant issue primarily affecting people in developing countries, rural areas, and low-income communities.
- The Chinese government carried out a Broadband Village pilot project (BVPP) in 120 counties in 2014-2016. The objective of the BVPP is to build and expand broadband coverage to rural China. The first phase of the BVPP was in Sichuan and Yunnan provinces in 2014. Other provinces gradually started to build broadband infrastructure after 2015.

STUDY OBJECTIVES

- Investigate the effects of the BVPP on incomes of rural households
- Exploring the potential mechanisms through which the BVPP affected rural household incomes

DATA

- DATA SOURCES:** The China Household Finance Survey (CHFS) collected in 29 provinces/municipalities/regions, excluding Xinjiang and Tibet, by Southwestern University of Finance and Economics in 2011, 2013, 2015, and 2017.
- Study Observations:** This study chose Sichuan and Yunnan provinces in the treatment group and Chongqing and Guizhou in the control group based on their geographic proximities and similarities in socioeconomic conditions. Compiling the CHFS rural households in these four provinces in the pre-pilot years (2011 and 2013) and post-pilot years (2015 and 2017) yields a total of 2,100 by household and year.

Figure1. Number and growth rate of broadband internet uses among rural households in Sichuan (treatment group) and Chongqing (control group)

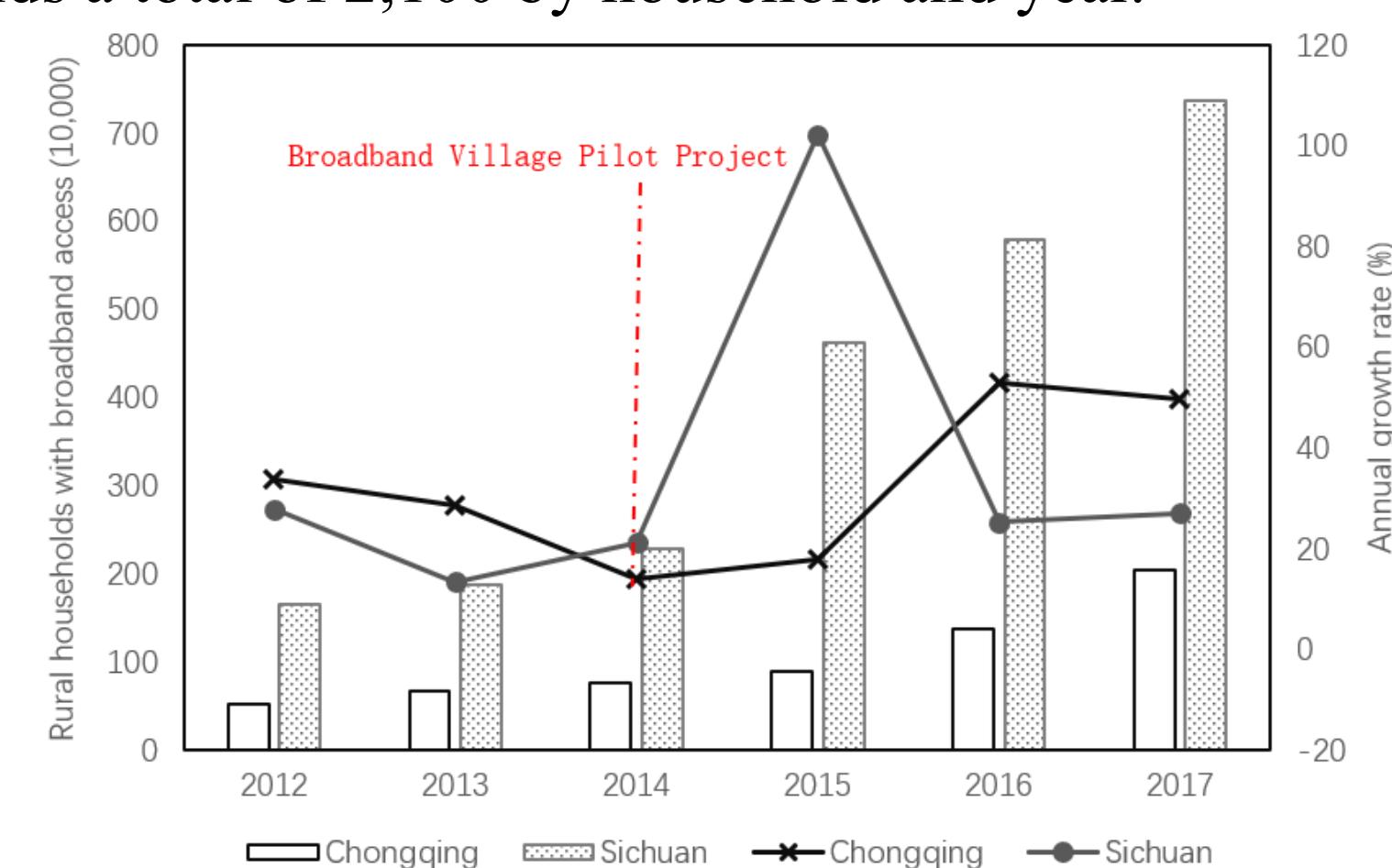
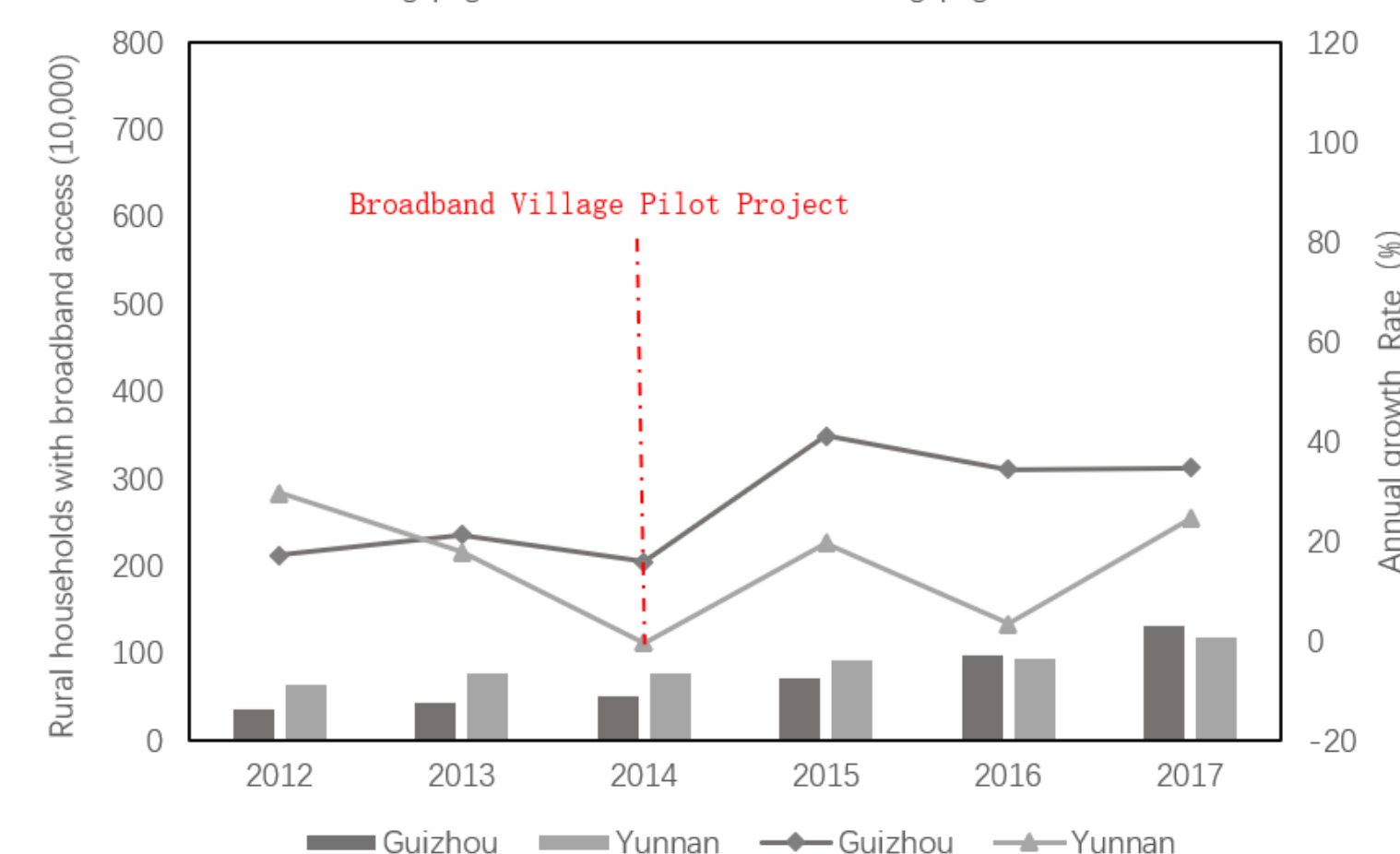


Figure2. Number and growth rate of broadband internet users among rural households in Yunnan (treatment group) and Guizhou (control group)



DATA AND KEY VARIABLES

- Outcome variables:** per capita household incomes
- Variable of interest:** gained access to broadband internet via the BVPP
- Control variables:**
 - Characteristics of household heads:** age, sex, marital status, off-farm employment, education level, risk preference, self-reported health condition, covered by health insurance, registered as a local rural resident
 - Household characteristics:** having cell phones and computer, family size, number of children younger than 16 years old, social capital measured by transfer incomes and expenses, having family member being a village cadre or a party member
 - Regional factors:** region fixed effects

Empirical Strategy

PSM-DID model estimation:

$$Y_{ijt} = \alpha_0 + \alpha_1 G_i + \alpha_2 T_t + \alpha_3 G_i T_t + \beta X_{it} + \mu_j + \lambda_t + \varphi_j + \varepsilon_{ijt}$$

- Y_{ijt} : per capita household income for household i living in county j in year t
- G_i : A dummy variable indicating household i in treatment group where the BVPP was launched in his/her residing county or not
- T_t : A dummy variable reflecting either pre-BVPP and post-BVPP time periods
- α_3 : Effect of the BVPP on per capita income
- X 's: control variables including characteristic of household heads and households
- μ_i : Individual fixed effects
- λ_t : Year fixed effects
- φ_j : County fixed effects
- ε_{ijt} : Error term

Empirical Results

- Balancing test:** Six out of 18 control variables are found to be statistically different between the treatment group and the control group before matching; and none is statistically significant between two groups after matching.
- Main results:**
 - The BVPP improved per capita income of rural households.
 - The BVPP increased off-farm income and decreased agricultural income.
 - The BVPP effect was stronger for households with off-farm income.

	Full Sample: Rural Households			Subsample: Households with off-farm income		
	Household income per capita	Agricultural Income per capita	Non-agricultural income per capita	Household income per capita	Agricultural Income per capita	Non-agricultural income per capita
BVPP Effects	0.5932*** (0.2071)	-0.9926*** (0.3731)	0.4629*** (0.1782)	0.8437*** (0.2664)	-1.0101** (0.4211)	0.2926* (0.1554)

Mechanisms through which the BVPP affected income of rural households:

- The BVPP increased the probability of non-agricultural employments, including temporary worker, self employed, and freelancing.

	Farming	Off-farm employment	Types of off-farm employments			
			Employed	Temporary worker	Self employed	Freelance
BVPP Effects	-0.0374 (0.0281)	0.0987*** (0.0320)	-0.0172 (0.0343)	0.0976*** (0.0328)	0.0323** (0.0162)	0.0546** (0.0255)

Heterogeneity Analysis:

- The BVPP effect on income was stronger for rural households with low social capital measured by the sum of transfer incomes and expenses for social relationships, households who live out of poverty, and households whose head had high school education or above.

	Subsample by Social Capital Level		Subsample by the Education Level of Household Heads		Subsample: Living under the poverty or not	
	High	Low	High school and above	Less than high school	Living under Poverty	Out of Poverty
BVPP effects	1.9648 (1.506)	0.6396* (0.3749)	1.0671* (0.5856)	0.6962** (0.2878)	0.8508 (0.6300)	0.7732*** (0.2904)

Robustness Checks and Placebo Test

Using alternative matching algorithms yield consistent results.

	Kernel	Radius	LLR
BVPP effects	0.5923*** (0.2072)	0.5913*** (0.2071)	0.5913*** (0.2071)

- Placebo test:** Assuming the BVPP was deployed in Yunnan and Sichuan in 2012 instead of 2014. The newly estimated BVPP effect was not statistically significant (p-value = 0.89).
- Coefficient stability analysis:** Oster (2019) connected omitted variable bias with coefficient stability and developed validation tests. We denote the R-squared from a hypothetical regression of the outcome on treatment and both observed and unobserved controls by R_{max} ; value for the relative degree of selection on observed and unobserved variables by δ ; and the estimated treatment effect by α .
 - Approach 1:** Assuming value for R_{max} , calculate the value of δ for $\alpha = 0$. This can be interpreted as the degree of selection on unobservables relative to observables that would be necessary to produce a treatment effect of zero.
 - Approach 2:** Assume a value of R_{max} and δ and calculate the bound of α . If $\alpha^*(R_{max}, \delta)$ falls within the 95% confidence interval of the estimated parameter, the estimated treatment effect is robust even subjected to the possible selection on unobservables.

The coefficient stability analysis supports the robust BVPP effects.

		Value of R_{max}		
		1.3	2.2	
Approach 1	δ	16.041	4.175	Cutoff value of δ : $\delta = 1$
Approach 2	$\alpha^*(R_{max}, \delta)$	0.488	0.340	Bound of α : [0.1869, 0.1000]

CONCLUSIONS AND POLICY IMPLICATIONS

- The BVPP had a significant, positive effect on income of rural households in China.
- The effects was stronger
 - for rural households with off-farm income sources. Improve information and training of off-farm employments to empower rural households to benefits more from the broadband internet.
 - for rural households with relatively highly educated household heads.
 - for rural households with low social capital, which can be partially explained by the lack of alternative resources to obtain information and opportunities for rural households with low social capital.
 - for rural households who living above poverty, which provides supporting evidence that anti-poverty polices can facilitate the impact of broadband internet.
- One of the important mechanisms through which the BVPP increased household incomes was to improve off-farm employment opportunities, especially of temporary employment, self employment, and freelancing. Training of off-farm jobs may provide companionship support to magnify the BVPP effect on income of rural household.

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