

# Impacts of Information about COVID-19 on Pig Farmers' Production Willingness: Evidence from China

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## Introduction

- The COVID-19 pandemic has emerged as a significant risk in agricultural production. Previous research has evaluated the negative impacts of COVID-19 on various agricultural sections. However, limited evidence of causal effect of COVID-19 on farmers' production behavior because of difficulty finding a control group and endogeneity problems.
- China is a global leader in pig production and consumption, with more than 671.28 million slaughtered hogs and 449.22 million pigs in stock in 2021. COVID-19 and related restrictions, especially transportation restrictions, pose significant impacts on feed supply, drug supply, and hog sales.

## Objectives

- This study uses endorsement experiments and follow-up surveys conducted in 2020 and 2021
  - ☆ To examine the causal effects of information about COVID-19 on farmers' production willingness, and evaluate heterogeneous impacts of information according to the prevailing backgrounds of COVID-19.
  - ☆ To understand the influence of actual COVID-19 experience, and investigate whether farmers whose production of pigs were actually affected by COVID-19 are less willing to scale up when they learn the information about COVID-19.

## Data

- Data used in this study come from two experiments and phone surveys conducted together in 2020 and 2021 in Jiyuan County, Henan Province of China. Survey sample are from a baseline survey conducted in August 2017 and include information of 1343 pig farms in Jiyuan County.
- The first phone survey was conducted in June and July of 2020, and we reached 1111 farmers, but only 784 farmers were still raising pigs. In the second phone survey in October 2021, the number of farmers still raising pigs was 734.

## Endorsement Experiments

- In endorsement experiments (Table 1), respondents were first randomly divided into two groups.
- Respondents in the control group were asked to answer a specific question whether they are willing to scale up pig production, while for respondents in the treatment group, the same question was asked but with an endorsement. Endorsement information are different between two years and reflect corresponding prevailing stages of COVID-19.
- The difference in responses between the treatment group and the control group, therefore, can be interpreted as the effect of endorsement.

Table 1. Endorsement Experiments in 2020 and 2021

Treatments	2020	2021
Control	-	-
Information	The second wave of COVID-19 might occur without a vaccine.	COVID-19 might continue to spread despite the introduction of vaccines
Questions	Do you plan to scale up the production of pig raising?	

- Most demographic variables and production characteristics are balanced between treatment and control groups, suggesting the success of randomization in our experiments.

Table 2. Descriptive Statistics of Variables

Variables	2020			2021		
	Treatment Mean	Control Mean	Difference	Treatment Mean	Control Mean	Difference
Age	53.298	54.538	-1.240**	55.120	55.074	0.046
Education	8.627	8.441	0.186	8.540	8.447	0.092
Health status	1.862	1.847	0.015	1.912	1.810	0.102*
Experience	14.456	14.512	0.056	15.009	15.683	-0.634*
Number of sows	21.041	13.982	7.060	11.572	10.622	0.950
Number of hogs	79.649	86.831	-7.182	92.402	79.558	12.844
Income ratio	62.564	63.170	-0.606	3.663	5.807	-2.144
Number of workers	1.997	2.121	-0.124	2.106	1.926	0.180*
Risk perception	8.000	7.971	0.029	8.824	8.844	-0.020
Sow insurance	0.851	0.889	-0.038	0.856	0.849	0.007
Hog insurance	0.851	0.850	0.001	0.897	0.878	0.019
N	362	379	--	341	378	--

Note: \*\* p<0.05, \* p<0.1.

## Results

### 1. Farmers were less willing to scale up production when they were informed information about COVID-19.

- The information in 2020 reduced farmers' willingness to scale up by 13.4%, while the information in 2021 reduced farmers' willingness by 4.4%.
- The treatment effects are varied between two years for two possible reasons.
  - Endorsement information and prevailing backgrounds of COVID-19.
  - The pork prices. 44.98 yuan/kg (in July, 2020) vs. 19.56 yuan/kg (in October, 2021).

Table 3. The Impacts of Negative Information about COVID-19

Variables	2020			2021		
	(1)	(2)	(3)	(4)	(5)	(6)
Information treatment	-0.124***	-0.124***	-0.134***	-0.042*	-0.039*	-0.044*
	(0.035)	(0.035)	(0.035)	(0.023)	(0.023)	(0.024)
Control variables	No	Yes	Yes	No	Yes	Yes
Town fixed effects	No	No	Yes	No	No	Yes
N	741	741	741	719	719	719

Note: Robust standard errors are in parentheses. \*\*\* p<0.01, \* p<0.1.

### 2. Farmers who were actually affected by COVID-19 were much less willing to scale up, given access to information about COVID-19.

- We divided samples into two sub-samples according to whether farms' supply chain of pig feed, veterinary drugs, hired labor, and hog sales were affected by COVID-19.
- As shown in Table 4, the impact of information regarding COVID-19 is greater for farms whose feed supply was affected by COVID-19 than farms that were not affected and significant at the 1% level. The influence of drug supply, workers hired, and hog sales show similar results.

Table 4. The Impacts of Influence of Actual COVID-19 Experience

Variables	2020		2021	
	(1) Nonaffected	(2) Affected	(3) Nonaffected	(4) Affected
Information treatment	-0.104**	-0.164***	-0.009	-0.130***
	(0.048)	(0.055)	(0.030)	(0.041)
N	411	330	463	256
Information treatment	-0.113***	-0.226***	-0.023	-0.125**
	(0.040)	(0.076)	(0.027)	(0.057)
N	565	176	586	133
Information treatment	-0.135***	-0.287	-0.035	-0.158
	(0.036)	(0.226)	(0.025)	(0.095)
N	702	39	651	68
Information treatment	-0.101**	-0.197***	-0.012	-0.108***
	(0.042)	(0.065)	(0.032)	(0.040)
N	521	220	436	283

Note: All regressions include control variables and town fixed effects. Robust standard errors are in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

### 3. Farmers production willingness could predict their actual production behaviors.

- We collected the number of pigs raised by farmers in the end of 2020 by a follow-up phone survey in 2021, and then combined two sources of data.
- The results show that compared with farmers who didn't want to scale up production in experiment, farmers indicated their willingness to scale up in experiment actually raised 47-52 more hogs at the end of 2020.

## Policy Implications

- COVID-19 and related restrictions, especially transportation restrictions, negatively impact pig production and sales. Local governments should facilitate the transport of related products during the pandemic.
- China's pork market is vulnerable, with pork supply and prices fluctuating frequently. Pig farmers' willingness to produce is closely linked to market conditions. Therefore, the government should take measures to stabilize the market supply and pork prices.

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