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Impacts of the COVID-19 pandemic on rural poverty and policy responses in China

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Abstract

Given the sudden outbreak of the COVID-19 pandemic, a timely study on the impacts of and policy response to the pandemic on rural poverty in China is critically important because China has aimed to completely eradicate extreme poverty by the end of 2020. This paper uses data from the latest round of a nationally representative household panel survey to examine the impacts of the pandemic on rural poverty in China. Our data show that 11.9% of sample households were ever officially registered as poor households between 2013 and 2019, and this poverty incidence fell to 2.7% by the end of 2019. In the middle February of 2020, 23% of the households who have graduated from poverty since 2013 perceived that they would fall back into poverty due to the COVID-19. Among those never poor households, 7.1% perceived that they would possibly fall into poverty due to the pandemic. Results from both descriptive and multivariate analyses consistently show the interruptions that the pandemic caused in off-farm employment is an important channel that led households to perceive of falling back into or falling into poverty. We also find households in the bottom four quintiles when ranked in terms of household income per capita are much more likely to perceive themselves of falling back into or falling into poverty during this pandemic than those in the richest quintile. Meanwhile, our results show that the education and age of household heads, as well as being from Hubei Province matter in explaining household perception about falling back into or falling into poverty in some cases but not all. The paper concludes with a set of policy responses that China has taken to mitigate the impact of COVID-19 pandemic on poverty alleviation.

Keywords: COVID-19 pandemic, perception, poverty, rural households, China

1. Introduction

The coronavirus disease 2019 (COVID-19) has become a global pandemic. As of April 10, 2020, the COVID-19 pandemic had spread to all but three countries/regions in the world, with more than 1 604 500 confirmed cases, including more than 95 700 deaths (WHO 2020). In China, COVID-19 had spread to all of its 31 provinces/special administrative regions by January 29, 2020, with 7 711 confirmed cases,

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including 170 deaths, and with the majority inside Hubei Province (NHC 2020a).

Faced with the escalating virus outbreak, many countries have asked their people to stay at home and shut down the population movement. For example, China began to lock down Wuhan City on January 23, 2020, followed by the entire Hubei Province (World Bank 2020). Immediately afterward, interprovincial travel restrictions and cancellations of air, rail, highway, and water traffic limited population movement during the traditional Chinese New Year holiday. This was followed by the extension of the Chinese New Year holiday, closures of schools, stores and factories across all provinces, centralized quarantine and treatment measures, mandatory mask-wearing in public places, as well as social/physical distancing (Tian *et al.* 2020; Wu and McGoogan 2020). The government also stepped up public health support, including building up two temporary hospitals within 10 days and the provision of free treatment and testing across China (Cai *et al.* 2020; Li *et al.* 2020).

While these measures can help to contain the transmission of the virus, there have been growing concerns worldwide that they can also have unintended social and economic consequences for people, especially for the poorest and most vulnerable ones (World Bank 2020). According to projections by the World Bank (2020), the COVID-19 shock and the containment measures will have a serious impact on poverty through many channels, such as health and lost incomes. Specifically, under the baseline growth scenario where a severe slowdown of the economy is followed by a strong recovery, nearly 24 million fewer people are estimated to escape poverty across developing countries in East Asia and Pacific regions in 2020 than would have in the absence of the pandemic (World Bank 2020). Moreover, households linked to affected sectors, such as services, manufacturing, tourism, will suffer disproportionately (Ahmed *et al.* 2020; World Bank 2020).

While these projections help to reveal the magnitude of its potential impacts on poverty and the need for urgent and concerted actions, it remains unclear about what are the impacts of this COVID-19 disease on poverty in China, the former epicenter of the disease and also the country that has contributed more than 70% to world poverty reduction over the past four decades (United Nations 2015; Gao 2019; Liu *et al.* 2019). As poverty in China is mainly a rural phenomenon, several questions emerge: How do rural households perceive their likelihood of falling into or back into poverty in the face of COVID-19 disease? Speaking of their perception about falling into or back into poverty, any heterogeneity by their poverty status before the COVID-19 disease? What are the protective or risk factors? What policy responses have China's governments taken during the virus spread? Answers to these questions have important implications for the world as a whole since "No Poverty" ranks first among the United Nation's Sustainable Development Goals. These questions are even more salient for China as the country has been committed to eradicating extreme poverty in its rural areas in 2020 through the "Targeted Poverty Alleviation Program (TPAP)". China adopted TPAP in late 2013 (The State Council 2020a). One important component of this program is to identify and register poor households based on their wellbeing status in 2013. These poor households are called "officially registered poor households", which we call "poor" for short in the rest of the paper. Under TPAP, targeted and concerted measures have been undertaken to help the poor to escape poverty (SCLGOPAD 2014).

Given the sudden outbreak of the COVID-19 in China and the globe, a timely study on the impacts of the pandemic on rural poverty and policy response to it is critically important. Whilst there have been some reports by international organizations, such as the World Bank (2020), as far as we know, the literature on China's poverty is almost completely lacking in evidence-based empirical work about the impact of the COVID-19 pandemic on rural poverty. This paper seeks to fill the gap in knowledge by shedding light on the questions raised above. To do so, we use the latest round of a nationally representative household panel survey of 1 733 rural households in eight provinces in China. Two recent waves of data were used, which were collected in December 2019 and February 2020, respectively.

Our data collected in the 2020 wave capture rural households' perception in the flattening phase of the pandemic (Pan *et al.* 2020). At the launch of the survey in 2020, on February 12, there had been more than 59 864 confirmed COVID-19 cases and 1 367 deaths attributed to COVID-19 in China (NHC 2020b). Among the eight sample provinces, the number of confirmed cases ranged from 116 in Liaoning to 48 206 in Hubei whereas that of deaths ranged from none in Zhejiang to 1 310 in Hubei (NHC 2020b). In other words, the 2020 survey wave spans a time when the government has been implementing strict centralized quarantine and treatment. As such, our results could be interpreted as the upper bound of farmers' perceived impact of the COVID-19 pandemic on their likelihood of falling back into or falling into poverty.

In the rest of this article, we begin by introducing our methods and data. Then we document poverty incidence in terms of the proportion of the poor during the study period, followed by a description of the perception about falling back into or falling into poverty by those poverty graduates and households who have never been registered as poor (never poor), respectively. Furthermore, we examine what factors are correlated with the perception of falling back into or falling into poverty. As of February 12, 2020, these eight sample

provinces accounted for 87.9% of all known COVID-19 cases, and 96.4% of deaths attributed to COVID-19 in China. This article also gives a quick summary of how China has responded rapidly and strongly to the challenges that the COVID-19 pandemic has imposed on rural poverty alleviation. It concludes with policy implications.

2. Data and methods

We draw on data from the China Rural Revitalization Strategy Thinktank Survey (CRRSTS). CRRSTS is a longitudinal study of households in rural China, which was administered by the China Center for Agricultural Policy at Peking University and their local collaborators. CRRSTS began in 2000 with a survey of 1 199 rural households at 60 villages in six provinces: Hubei, Hebei, Liaoning, Shaanxi, Sichuan, and Zhejiang. The survey was expanded to Guangdong Province in 2016 (Wang and Huang 2018; Wang *et al.* 2019) and followed by Jiangxi Province in 2018 (Huang *et al.* 2019). The sample provinces were randomly selected from each of China's major agri-ecological zones respectively. When each sample province entered the CRRSTS for the first time, the sample households were selected by a standardized multi-stage stratified random sampling process that the survey teams implemented uniformly across provinces. Within each sample province, sample counties were randomly selected based on their per capita gross value of industrial outputs (Rozelle 1990, 1996). Following the same sampling procedure as the county selection, sample townships and villages were selected randomly. Within each sample village, sample households were randomly selected from a roster of households that reside in the village at the time of the survey. For a detailed description of the sampling procedure of this survey as well as its follow-up waves since 2000, please refer to de Brauw *et al.* (2002), Brandt *et al.* (2004), Wang and Huang (2018), Wang *et al.* (2019) and Huang *et al.* (2019).

In this paper, we focus on the data from the 2020 waves of CRRSTS. The 2019 wave before the COVID-19 outbreak was conducted by trained enumerators in December 2019 through one-on-one, face-to-face interviews, respectively. But the 2020 wave, also conducted by trained enumerators on February 12, 2020, had to take a one-on-one telephone interview manner as the entire country had been put under strict containment at that time.

The recent two waves of CRRSTS share at least three features that allow us to examine the impact of the COVID-19 on rural poverty in China. First, as described above, the standardized multi-stage randomized sampling procedure makes our sample representative of China. In the 2020 wave, we ended up surveying a total of 1 733 rural households at 233 villages of 112 townships in 48 counties in eight provinces in China. Ideally, each province would contribute an average of about 12% of households to the entire sample. While seven sample provinces each contribute 9 to 12% of households to the entire sample, Jiangxi contributes 31%. As the sample size in Jiangxi is much bigger than that of other sample provinces, in the analysis we presented below, we weight each sample household by the inverse of the product of eight times the number of sample households in the sample province under discussion. For example, the number of sample households in Liaoning Province is 211, the weight attached to each sample household in Liaoning Province would be 1/(8×211). The second feature of the CRRSTS panel data is that different waves were focused on the same households in the same villages in the same provinces, and the protocols during each of the waves were kept as similar as possible[1].

Finally, and most importantly, each of the two survey waves contains blocks that focused on the poverty status of households. Because we wanted to be able to estimate the change in household poverty status over time, for the 2020 wave, we asked each household a set of questions on poverty. The first two questions are about the poverty status of each household before the start of the COVID-19 disease. Specifically, enumerators asked each household "Was your household ever registered as poor?" "If ever being registered as poor, has your household graduated from the list of the poor by the end of 2019?" Based on their responses to these two questions, we classified the households into three categories: never poor, poverty graduates, and remaining poor. Specifically, never poor refers to those households who have never been registered as poor. Poverty graduates refer to those who had been registered as poor but had escaped poverty by the end of 2019. The remaining poor refers to those who had been registered as poor but have not escaped poverty by the end of 2019.

For never poor and poverty graduates, we continued to ask them one more question to seek their perception about falling back into or falling into poverty. Specifically, for poverty graduates, they were asked "How do you perceive the likelihood of your household falling back into poverty due to this COVID-19 pandemic?" For those never poor, they were asked "How do you perceive the likelihood of your household falling into poverty due to this COVID-19

[1] As it happens in almost all longitudinal studies, some sample households were not available in certain followup waves. Whenever this happens, we randomly selected a similar household from the same village to replace the missing household.

pandemic?" In responses, they chose one from the following three options that fit their cases the most: impossible, not sure, and possible. Based on their responses, we created a three-value categorical variable to measure their perceptions about falling back into or falling into poverty, which takes a value of 1 for the response of impossible, 2 for not sure, and 3 for possible.

To examine what factors might be correlated with household perception about falling back into or falling into poverty, we draw on information from both sample households and their village leaders to create potential correlates. One of the key variables we are interested in is *exposure* to the COVID-19 pandemic. We measure exposure by two dummy variables. One dummy variable indicates whether the village had any confirmed or suspected COVID-19 cases by the time of the telephone survey on February 12, 2020, whereas the other indicates whether the household is from Hubei Province, the hardest hit one in China (Li *et al.* 2020).

In the meantime, we are also interested in the interruptions that the COVID-19 has brought to rural households. We focus on interruptions in off-farm employment as it contributes to 30 to 40 percent of rural households' income (Zhang *et al.* 2018; NBSC 2019). As a proxy for interruptions in off-farm employment, we create a dummy variable indicating whether a household had any member who had returned to his/her off-farm job by February 12, 2020, the time of the telephone survey.

As a robustness check, we construct an alternative measure of interruptions by comparing the off-farm employment status of household members at the same time of 2020 and 2019. Specifically, at each sample household, for each household member who was employed off-farm in 2019, we asked them two questions. One is whether she/he had returned to off-farm work by the time of the telephone survey on February 12, 2020, which happened to be January 19, 2020, according to the lunar calendar. The other question is when she/he returned to off-farm work in 2019 according to the lunar calendar. Based on their responses to these two questions, we know whether she/he had returned to off-farm work by January 19 in the year of 2020 in the lunar calendar and whether she/he had returned to off-farm work by January 19 in the year of 2019 according to the lunar calendar. With such information, we group her/his joint status of off-farm employment on January 19 of 2019 and 2020 by the lunar calendar into one of the following three categories: No in 2019 and No in 2020, Yes in 2019 and No in 2020, Yes or No in 2019 and Yes in 2020. The next step is for each household, we calculate the proportion of labor force with these three types of joint status of off-farm employment, respectively. The village average for each of the three household-level proportions is then used to proxy interruptions in off-farm employment caused by the COVID-19 pandemic.

Considering the interruptions in off-farm employment might vary by the location of jobs, we construct two extra variables to indicate the location of household members' off-farm employment in 2019. Specifically, with the proportion of household members employed within the county as the base, we create one variable indicating the proportion of family members worked outside of his/her home county but within his/her home province in 2019. We also create another variable indicating the proportion of family members worked outside of his/her home province in 2019.

Besides, we also take into account the following factors that might be correlated with the household perceived likelihood of falling back into or falling into poverty. Following the literature, we control for four-vectors as follows. One is the income vector, which is proxied by four variables indicating whether the household falls into the lowest, second, third, or fourth quintiles in terms of their household income per capita in 2019 (with the richest quantile as the base) (Haggblade *et al.* 2010; Liu *et al.* 2018). The second is the commercial production vector, which includes three dummy variables indicating whether a household produced and sold any of fresh fruits (Schreckenberg *et al.* 2006; Hoang *et al.* 2008), vegetables (Berg *et al.* 2007; Shrestha 2016) or pigs (Neo and Chen 2009; Katagame and Nugroho 2017) in 2019, respectively. The third is the other characteristics vector that includes three variables: A dummy variable indicating whether the household head got at least junior high school education (Kurosaki and Khan 2006; Luo 2010; Callander and Schofield 2015; Liu and Liu 2018), the age of household head (Xu 2011; Cai *et al.* 2019), the area of arable land (Wodon 2000; Berg *et al.* 2007). Finally, we also include a vector of provincial dummy variables. Summary statistics of these variables for all samples as well as by poverty status are presented in Table 1.

3. Results

3.1. Poverty incidence

At the household level Our data show a downward trend in the poverty incidence at the household level with significant variations across regions. From the adoption of the Targeted Poverty Alleviation Program in late 2013 to the end of 2019, 11.9% of the 1 733 sample households have ever been identified as poor. By December 2019, 2.7% of sample households were poor (Table 2, Columns 1 and 3). However, these aggregate numbers have masked variations across regions. Disaggregated data show that between 2013 and 2019, 7% of sample households in Zhejiang have ever been identified as poor whereas this number is 16.8%

Table 1 Summary statistics (mean values of key variables)

Variables	All sample	Poverty graduates	Never poor	Remaining poor	*P*-value H0: (2)=(3)=(4)
	(1)	(2)	(3)	(4)	(5)
A. Exposure to the COVID-19 shock					
(1) Any suspected or confirmed cases in your village (1=yes, 0=no)	0.07	0.04	0.07	0.07	0.41
(2) Hubei Province (1=yes, 0=no)	0.09	0.09	0.09	0.04	0.50
B. Interruption in off-farm employment					
(3) Any family member has returned to off-farm work by February 12, 2020 (1=yes, 0=no)	0.17	0.11	0.18	0.13	0.06
(4) Village average of households' proportion of labors with the following joint status of off-farm employment by January 19 in lunar calendar					
(4a) No in 2019, No in 2020	0.09	0.09	0.09	0.07	0.82
(4b) Yes in 2019, No in 2020	0.44	0.45	0.44	0.25	0.02
(4c) Yes/No in 2019, Yes in 2020	0.13	0.08	0.13	0.09	0.43
(5) Households' proportion of labors' off-farm employment location in 2019					
(5a) Outside the county but within his/her home province (1=yes, 0=no)	0.13	0.10	0.14	0.14	0.39
(5b) Outside his/her home province (1=yes, 0=no)	0.14	0.16	0.14	0.06	0.21
C. Quintiles of household income per capita in 2019					
(6a) Poorest quintile (1=yes, 0=no)	0.19	0.31	0.17	0.35	0.00
(6b) Second quintile (1=yes, 0=no)	0.21	0.26	0.20	0.41	0.00
(6c) Third quintile (1=yes, 0=no)	0.23	0.22	0.23	0.11	0.14
(6d) Fourth quintile (1=yes, 0=no)	0.18	0.13	0.18	0.09	0.06
(6e) Richest quintile (1=yes, 0=no)	0.20	0.08	0.21	0.04	0.00
D. Produced and sold the following products in 2019					
(7) Fresh fruits	0.07	0.08	0.07	0.02	0.38
(8) Vegetables	0.06	0.07	0.04	0.76	0.76
(9) Pigs	0.05	0.06	0.05	0.07	0.62
E. Other characteristics					
(10) Household head got at least junior high school education (1=yes, 0=no)	0.40	0.32	0.42	0.22	0.00
(11) Age of household head (years)	59.4	54.8	59.9	60.4	0.08
(12) Area of arable land (mu)[1)]	9.40	4.09	10.13	3.77	0.31
Number of observations	1 733	161	1 526	46	–

[1)] 1 mu=1/15 ha.
Source: Authors' survey.

in Sichuan. Hubei (10.6%) ranked the 5th out of the eight provinces in this number during the same period. By 2019, the range of poverty incidence at the household level has decreased and narrowed to from 1.2% in Hubei to 4.3% in Sichuan. Hubei (1.2%) ranked the lowest in terms of poverty incidence in December 2019.

At the individual level What we have just shown is poverty incidence at the household level in our study area. Before we could compare them with the national statistics on poverty indigence, we have to convert them into incidence at the individual level by using the information on household size that we collected during each survey wave. Specifically, for the same period, we sum up the size of each sample household to get the denominator. We also sum up the size of each poor household to get the nominator. The ratio of these two summations would produce an estimate of the poverty incidence at the individual level in our study areas in the study period. Our data show that judging by the incidence at the individual level, our study area experienced higher poverty incidence than the national averages for rural China as a whole. Between 2013 and 2019, individuals from poor households account for 11.5% of the sample population in the study area. By 2019, this number has decreased to 1.8% (Table 2, Columns 2 and 4). This poverty incidence is higher than that of rural China in 2019 (0.6%). The comparatively higher poverty incidence in the study area seems to be understandable because 10 out of the 48 counties (21%) used to be nationally designated poverty counties, slightly higher than the proportion of poverty counties in China as a whole (20%).

A close examination of the poverty incidence in December 2019 in the study area reveals that in the year under discussion, the poverty incidence at the household level tends to be slightly higher than that at the individual level. For example, the poverty incidence at the household level was 2.7% in 2019, 0.9 percentage point higher than that at

Table 2 Poverty incidence at different levels (%)

Provinces of China	The proportion of households ever identified as poor between 2013 and 2019		Poverty incidence in December 2019	
	Household-level	Individual-level	Household-level	Individual-level
	(1)	(2)	(3)	(4)
All sample	11.9	11.5	2.7	1.8
Sichuan	16.8	15.6	4.3	1.8
Guangdong	8.8	8.8	2.0	1.0
Jiangxi	15.0	14.4	2.6	2.0
Hebei	11.5	8.9	3.8	3.2
Zhejiang	7.0	7.3	2.2	1.8
Hubei	10.6	9.4	1.2	0.8
Liaoning	8.1	8.3	2.8	2.8
Shaanxi	12.4	11.4	2.3	1.7
Rural China		8.5		0.6

Source: Authors' survey.

the individual level (1.8%) in the same year. There is one exception though. In Liaoning Province in 2019, the poverty incidence at the household level is the same as that at the individual level at 2.8%.

3.2. Household's poverty status in December 2019

With an understanding of the accumulative incidence of poverty at both the household and individual levels between 2013 and 2019, we continue to examine the poverty status of sample households in December 2019, the time immediately before the COVID-19 pandemic. Our data show that of the 1 733 households that we surveyed, in December 2020, 2.7% remained as poor, 9.3% were poverty graduates, and the rest 88.1% were never poor (Table 3). This distribution varies significantly across provinces. Specifically, at the same time, the proportion of remaining poor ranges from 1.2% in Hubei to 4.4% in Sichuan. The proportion of poverty graduates ranges from 4.8% in Zhejiang to 12.4% in Sichuan and Jiangxi. The proportion of never poor ranges from 83.2% in Sichuan to 93.0% in Zhejiang.

Table 3 The proportion of households by their poverty status in December 2019 (%)

Provinces of China	Poverty graduates	Never poor	Remaining poor
All sample	9.3	88.1	2.7
Sichuan	12.4	83.2	4.3
Guangdong	6.8	91.2	2.0
Jiangxi	12.4	85.0	2.6
Hebei	7.6	88.5	3.8
Zhejiang	4.8	93.0	2.2
Hubei	9.3	89.4	1.2
Liaoning	5.2	91.9	2.8
Shaanxi	10.2	87.6	2.3

Source: Authors' survey.

3.3. Perception about falling back into or falling into poverty due to the COVID-19 pandemic

Faced with such an outbreak of the pandemic, for those rural households who have escaped poverty (poverty graduates) or those who have never been registered as poor by the end of 2019 (never poor), how do they perceive their likelihood of falling back into or falling into poverty? In this subsection, we first describe the perception about falling back into poverty of poverty graduates, followed by the perceived likelihood of falling into poverty of never poor.

Poverty graduates Responses by our sample households show that among the 161 poverty graduates, 23.0% self-reported that they may fall back into poverty due to this COVID-19 pandemic (Table 4). Similarly, there are variations across provinces. As could be expected, this percentage is the highest in Hubei at 33.3%. It is about one quarter in Sichuan (25.0%) and Jiangxi (25.8%), about one fifth in Guangdong (20.0%), Zhejiang (22.2%), and Shaanxi (22.2%). In contrast, it is less than 10% in Hebei (8.3%) and Liaoning (9.1%). Our data also show that 19.3% of poverty graduates reported feeling not sure about whether they would fall back into poverty due to this pandemic. Similarly, this percentage is the highest in Hubei (26.7%), followed by Jiangxi (25.8%) and Zhejiang (22.2%) in turn. It ranges from 8.3% (Hebei) to 18.2% (Liaoning) in the rest five provinces. Lastly, the rest 58% of poverty graduates reported it is impossible that their households will fall back into poverty. As the flip side of the proportions of feeling possible or unsure of falling back into poverty, this percentage is the lowest in Hubei (40%), followed by Jiangxi (48.5%) and Zhejiang (55.6%) in turn. It ranges from 65.0% (Sichuan) to 83.3% (Hebei) in the rest five provinces.

Never poor How about those never poor households? Our data show that among 1 526 never poor, 7.1% self-reported that they may fall into poverty due to this COVID-19 pandemic. Similar to the pattern observed among the

Table 4 Proportions of households by perceptions of falling back into or falling into poverty on February 12, 2020 (%)

Provinces of China	Poverty graduates: Perceptions of falling back into poverty			Never poor: Perceptions of falling into poverty		
	Impossible	Unsure	Possible	Impossible	Unsure	Possible
	(1)	(2)	(3)	(4)	(5)	(6)
All sample	57.8	19.3	23.0	79.3	13.6	7.1
Sichuan	65.0	10.0	25.0	76.1	15.7	8.2
Guangdong	70.0	10.0	20.0	79.9	11.9	8.2
Jiangxi	48.5	25.8	25.8	82.6	12.1	5.3
Hebei	83.3	8.3	8.3	79.9	13.7	6.5
Zhejiang	55.6	22.2	22.2	85.0	13.3	1.7
Hubei	40.0	26.7	33.3	68.8	18.1	13.2
Liaoning	72.7	18.2	9.1	82.5	11.9	5.7
Shaanxi	66.7	11.1	22.2	71.0	16.1	12.9

Source: Authors' survey.

poverty graduates, this percentage is the highest in Hubei at 13.2%, followed by Shaanxi (12.9%). It is the lowest in Zhejiang (1.7%). It ranges from 5.3% (Jiangxi) to 8.2% (Sichuan and Guangdong) in the rest five provinces. Our data also show that 13.6% of never poor reported being not sure about whether they would fall into poverty due to this pandemic. Similarly, this percentage is the highest again in Hubei (18.1%), followed by Shaanxi (16.1%) and Sichuan (15.7%) in turn. It is about 12% in the other five provinces. The rest 79.3% of never poor reported it is impossible that their households will fall back into poverty. As the flip side of the proportions of feeling possible or unsure of falling back into poverty, this percentage is the lowest in Hubei (68.8%), followed by Shaanxi (71.0%) and Sichuan (76.1%) in turn. It ranges from 79.9% (Guangdong) to 85.0% (Zhejiang) in the rest five provinces.

When we compare results from the descriptive analyses above about the perception about falling back into or falling into poverty, our data show that poverty graduates are more vulnerable than never poor to this COVID-19 pandemic. Poverty graduates are more than three times likely to perceive that they are possible to fall back into poverty than never poor's perception about their falling into poverty (23.0% *vs*. 7.1%) due to this COVID-19 pandemic, more likely to self-report of feeling unsure about whether they would fall back into poverty (19.3% *vs*. 13.6%), and correspondingly, less likely to perceive of being impossible for them to fall back into poverty (57.8% *vs*. 79.3%). The contrast is even more obvious in some provinces. In Jiangxi for example, poverty graduates are almost five times more likely to perceive that they are possible to fall back into poverty than never poor perceive their falling into poverty (25.8% *vs*. 5.3%) due to this COVID-19 pandemic, more than twice likely to self-report of feeling unsure about whether they would fall back into poverty (25.8% *vs*. 12.1%), and correspondingly, much less likely to perceive of being impossible for them to fall back into poverty (48.5% *vs*. 82.6%).

3.4. Correlates of perception about falling back into or falling into poverty due to the COVID-19 pandemic

To gain a better understanding of the nature of poverty and identify those subsets of households that are at the risk of falling back into or falling into poverty during this COVID-19 pandemic, we investigate the correlates of household perception about poverty by conducting both descriptive statistics and multivariate analyses.

3.5. Descriptive analysis

Results from descriptive statistics show that exposure to COVID-19 shock and income status are correlated with household's perception of falling back into or falling into poverty. Specifically, households from villages with any suspected or confirmed cases by the time of the telephone survey in February 2020 or Hubei Province are more likely to perceive that they may fall back into (for poverty graduates) or into (for never poor) poverty (Figs. 1 and 2). When examining the relationship between per capita income and household perception poverty, there seems to be some pattern to the data. As households move from the poorest quantile when ranked in terms of household income per capita to the richest quantile, the proportion of poverty graduates (never poor) that perceive it is impossible for them to fall back into or fall into poverty decreased from 52.0 (75.4) percent to 83.3 (85.3) percent (Fig. 3).

In addition to exposure and income, results from our descriptive analysis also provide evidence that interruptions caused by the pandemic matter. When we examine the relationship between interruptions in off-farm employment and household perception about poverty, results show that whether a household has any family member who has returned to off-farm work by the time of the telephone survey on February 12, 2020, is negatively correlated with their perceived likelihood of falling back into (for poverty

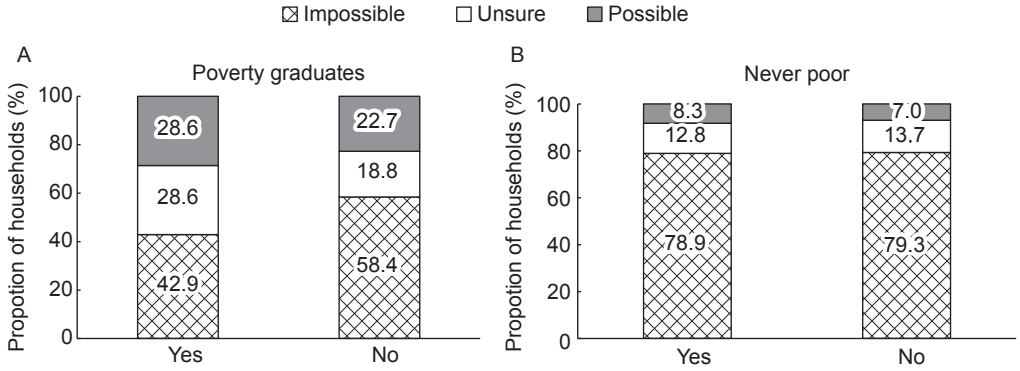

Fig. 1 Households' perception of falling back into or falling into poverty on February 12, 2020, by the presence of suspected or confirmed COVID-19 cases in the village. Source: Authors' survey.

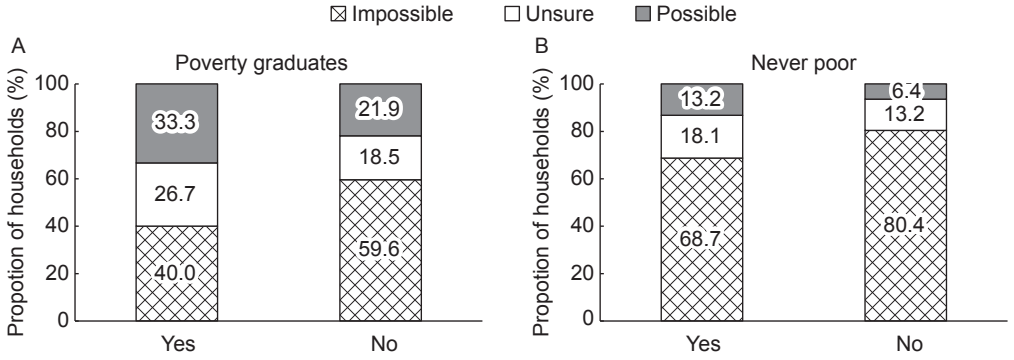

Fig. 2 Households' perception of falling back into or falling into poverty on February 12, 2020 by being from Hubei Province or not. Source: Authors' survey.

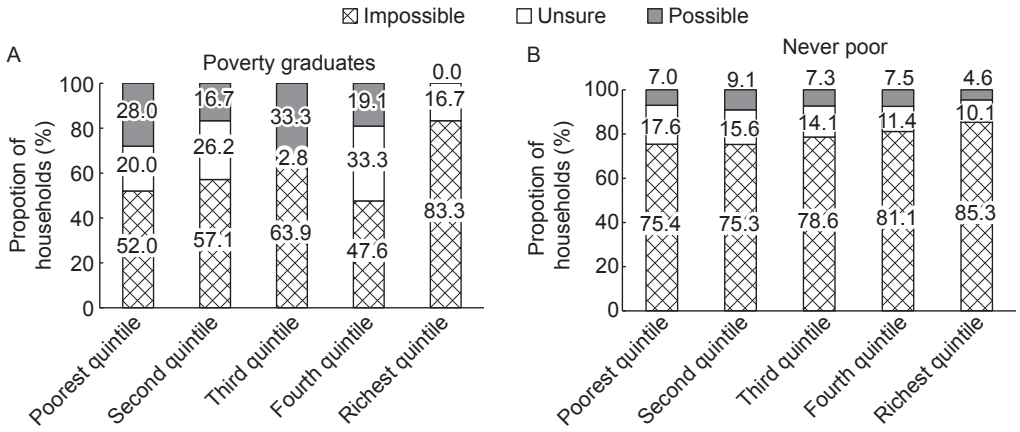

Fig. 3 Households' perception of falling back into or falling into poverty on February 12, 2020, by household income per capita quintiles. Source: Authors' survey.

graduates) or into (for never poor) poverty (Table 5, Row 1).

Descriptive analyses also show different correlating factors. For poverty graduates, two other factors also come out significantly in the descriptive analysis. Specifically, poverty graduates that have more arable land and produced and sold vegetables are less likely to perceive they would fall back into poverty during this pandemic (Table 5, Row 5 and 9, Columns 1–3). For never poor, there is also two but different variable comes out significant. Specifically, never poor households whose household heads got at least

junior high school education are less likely to perceive they would fall into poverty during this pandemic (Table 5, Row 7, Columns 4–6). Apart from these variables, there is little apparent relationship between other explanatory variables when we look at the results from the cross tabulation.

3.6. Multivariate analysis

To further examine the correlates of household perception about falling back into or falling into poverty, we use a series of regressions to examine what might be the protection or risk factors. Because of the nature of the ordered categorical dependent variables, we use an ordered logit estimator (Winship 2003). We run the model first for poverty graduates to examine their perceived likelihood of falling back into poverty, and then for never poor to examine their perceived likelihood of falling into poverty. All the standard errors are clustered at the township level.

Table 5 Cross tabulations between households' perceptions of falling back into or falling into poverty on February 12, 2020, and household characteristics

Variables	Poverty graduates: Proportions of households by their perceptions of falling back into poverty (%)			Never poor: Proportions of households by their perceptions of falling into poverty (%)		
	Impossible (1)	Unsure (2)	Possible (3)	Impossible (4)	Unsure (5)	Possible (6)
A. Interruptions in off-farm employment						
(1) Any family member has returned to off-farm work by February 12, 2020						
No	54.9	20.1	25.0	78.0	14.5	7.5
Yes	82.4	11.8	5.9	85.1	9.7	5.2
P-value		0.08			0.01	
(2) At least one family member worked off-farm outside the county but within his/her home province in 2019						
No	58.0	21.7	20.3	79.5	13.6	6.9
Yes	55.6	0.0	44.4	78.0	14.1	7.93
P-value		0.33			0.68	
(3) At least one family member worked off-farm outside his/her home province in 2019						
No	57.1	18.5	24.4	79.0	14.0	7.0
Yes	59.5	21.4	19.1	80.5	12.3	7.3
P-value		0.97			0.48	
B. Produced and sold the following products in 2019						
(4) Fresh fruits						
No	58.1	18.9	23.0	78.9	14.1	7.0
Yes	53.9	23.1	23.1	84.1	7.5	8.4
P-value		0.71			0.10	
(5) Vegetables						
No	55.9	20.4	23.68	79.2	13.4	7.4
Yes	88.9	0.0	11.1	80.0	17.0	3.0
P-value		0.05		0.70		
(6) Pig						
No	57.6	19.2	23.2	79.4	13.7	7.0
Yes	60.0	20.0	20.0	77.8	12.5	9.7
P-value		0.95			0.96	
C. Other characteristics vector						
(7) Household head got at least junior high school education						
No	59.1	17.3	23.6	77.3	15.7	7.1
Yes	54.9	23.5	21.6	82.2	10.7	7.1
P-value		0.23			0.01	
(8) Age of household head						
<60 years old	52.6	18.4	29.0	78.8	13.2	8.0
≥60 years old	62.4	20.0	17.7	79.8	14.0	6.2
P-value		0.20			0.94	
(9) Area of arable land						
<2.50 mu[1)]	47.4	25.6	26.9	81.1	13.3	5.6
≥2.50 mu[1)]	67.5	13.	19.3	77.5	14.0	8.6
P-value		0.00			0.25	

[1)] 1 mu=1/15 ha.
Source: Authors' survey.

Although there are several exceptions, the results of multivariate analysis of the correlates of perceived likelihood of falling back into or falling into poverty are consistent with descriptive statistics. For example, in the ordered logit regressions, we find supporting evidence for the interruption hypothesis. For households with any member who has returned to off-farm work by the time of the telephone survey on February 12, 2020, *ceteris paribus*, the odds of perceiving that they would possibly fall back into or fall into poverty due to this COVID-19 pandemic are lower for poverty graduates or never poor (Table 6, Rows 3 and 4b, Columns 1–2). In terms of marginal impact, our results show that for poverty graduates that did have any member who had returned to off-farm work by the time of the telephone survey in 2020, holding everything else constant, the odds of perceiving it is impossible for them to fall back into poverty would be higher by 37.8 percentage points (pp), and the odds of perceiving possible or unsure for them to fall back into poverty would be decreased by 23.3 pp and 14.5 pp, respectively (Table 7, Row 3, Columns 1–3). Similarly, for never poor households that did have any member who had returned to off-farm work by the time of the telephone survey in 2020, ceteris paribus, the odds of perceiving it is impossible for them to fall back into poverty would be increased by 5.6 pp, and the odds of perceiving it is possible or unsure for them to fall back into poverty would be decreased by 2.2 pp and 3.4 pp, respectively (Table 7, Row 3, Columns 4–6). However, off-farm employment location variables do not come out significant, being poverty graduates or never poor.

The results of interruption in off-farm employment are robust to the use of alternative measures. When we use the alternative measure of the village of households' proportion of labors with joint off-farm employment status by January 19 of 2019 and 2020 according to the lunar calendar, our data consistently show that having any household members who had returned to off-farm work by the time of the telephone survey would help reduce the household perception of falling back into or falling into poverty (Table 6, Row 4b, Columns 3–4; Table 8, Row 3b, Columns 4–6). In comparison, no matter which measures of interruptions we use, our regression results indicate the impact of interruption in off-farm employment that the COVID-19 pandemic had on household perception about poverty is stronger for poverty graduates than for never poor. These results are consistent with the fact that off-farm employment has been a major source of income for households in rural China (Luo 2010; Liu *et al.* 2018), and a major contributing factor for poverty reduction (Glauben *et al.* 2012; Ge 2014).

In addition to the exposure hypothesis, we also find evidence for the income hypothesis. For both poverty graduates and never poor, for households whose household income per capita in 2019 is ranked in the lowest four quintiles, the odds of perceiving that they would possibly fall back into or fall into poverty due to this COVID-19 pandemic are higher than households in the richest quintile (Table 6, Rows 6a–6d, Columns 1–4). In terms of marginal impact, our results show that for poverty graduates whose household income per capita in 2019 in the poorest quintile, compared with their peers in the richest quintile, holding everything else constant, the odds of perceiving it is impossible for them to fall back into poverty would be lower by 57.9 pp, and the odds of perceiving it is possible or unsure for them to fall back into poverty would be increased by 35.8 pp and 22.1 pp, respectively (Table 7, Row 5a, Columns 1–3). This pattern holds when we examine the results for those poverty graduates in the second, third, and fourth quintiles (Rows 5b–5d, Columns 1–3).

When we examine the marginal impacts of income variables for never poor households, the results are consistent with those for the poverty graduates. Specifically, our results show that for never poor households whose household income per capita in 2019 in the poorest quintile, compared with their peers in the richest quintile, holding everything else constant, the odds of perceiving it is impossible for them to fall back into poverty would be lower by 8.0 pp, and the odds of perceived it is possible or unsure for them to fall back into poverty would be increased by 3.2 pp and 4.8 pp, respectively (Table 7, Row 5a, Columns 4–6). This pattern holds when we examine the results for those never poor households in the second, third, and fourth quintiles (Rows 5b–5d, Columns 4–6).

A couple of observations need to be noted about the impact of household income on household perception about falling back into or falling into poverty during the COVID-19 pandemic. One is that the results on the household income per capita quintiles are robust to the choice of measurement of interruption in off-farm employment caused by the pandemic (Table 8, Rows 5a–5d, Columns 1–6). The other observation is that the impact of household income on household perception about poverty during the COVID-19 pandemic tends to be stronger for poverty graduates than for never poor.

In addition to the evidence for the interruption and income hypotheses, several other results are also consistent with the cross-tabulation analysis for a certain group of households, specifically for never poor households. Our regression results show that ceteris paribus, for never poor from Hubei, the odds of perceiving it is impossible for them to fall into poverty would be decreased by 12.1 pp, and the odds of perceiving it is possible or unsure for them to fall into poverty would be increased by 4.8 pp and 7.3 pp, respectively (Table 6, Row 2, Columns 2 and

Table 6 Results of ordered logit model analysis of households' perception of falling back into or falling into poverty on February 12, 2020

Variables	Poverty graduates: Falling back into poverty	Never poor: Falling into poverty	Poverty graduates: Falling back into poverty	Never poor: Falling into poverty
	(1)	(2)	(3)	(4)
A. Exposure and responses to the COVID-19 shock				
(1) Any suspected or confirmed cases in your village	0.724	–0.053	0.894	–0.048
	(0.841)	(0.297)	(0.977)	(0.299)
(2) Hubei Province	1.559	0.733**	1.270	0.698**
	(1.208)	(0.323)	(1.283)	(0.336)
B. Interruptions in off-farm employment				
(3) Any family member has left the village for off-farm work so far	–1.684**	–0.341**	No	No
	(0.706)	(0.219)		
(4) Village average of households' proportion of labors with the following joint status of off-farm employment				
(4a) Yes in 2019, No in 2020	No	No	0.822	0.261
			(0.544)	(0.231)
(4b) Yes/No in 2019, Yes in 2020	No	No	–0.953**	–0.133**
			(0.525)	(0.208)
(5) Households' proportion of labors' off-farm employment location in 2019				
(5a) Outside the county but within his/her home province	–0.135	0.088	–0.551	0.028
	(0.642)	(0.216)	(0.792)	(0.208)
(5b) Outside his/her home province	–0.394	–0.093	–0.939	–0.128
	(0.626)	(0.219)	(0.751)	(0.238)
C. Quintiles of household income per capita in 2019				
(6a) Poorest quintile	2.579**	0.489**	2.711**	0.523**
	(1.065)	(0.238)	(1.235)	(0.240)
(6b) Second quintile	2.317**	0.632***	2.483**	0.650***
	(1.027)	(0.245)	(1.224)	(0.249)
(6c) Third quintile	2.566**	0.433*	2.649**	0.454*
	(1.138)	(0.251)	(1.306)	(0.253)
(6d) Fourth quintile	2.370**	0.410*	2.528**	0.407
	(1.064)	(0.248)	(1.182)	(0.248)
D. Produced and sold the following products in 2019				
(7) Fresh fruits	1.268	–0.421	1.512	–0.400
	(0.811)	(0.311)	(0.875)	(0.315)
(8) Vegetables	–2.273**	–0.192	–2.229*	–0.187
	(1.101)	(0.306)	(1.151)	(0.303)
(9) Pigs	–0.445	0.094	–0.331	0.080
	(0.761)	(0.311)	(0.832)	(0.314)
E. Other characteristics				
(10) Household head got at least junior high school education	0.108	–0.362**	0.014	–0.374**
	(0.428)	(0.157)	(0.436)	(0.158)
(11) Age of household head	–0.033	–0.015*	–0.034	–0.015*
	(0.024)	(0.009)	(0.023)	(0.009)
(12) Area of arable land	–0.026	0.002	–0.020	0.002
	(0.040)	(0.001)	(0.030)	(0.001)
(13) Province	Yes	Yes	Yes	Yes
Number of observations	161	1526	161	1526
Wald chi2	39.20	51.97	41.96	61.51
Prob>chi2	0.00	0.00	0.00	0.00

Robust standard errors in parentheses; ***, $P<0.01$; **, $P<0.05$; *, $P<0.1$. Source: Authors' survey.

4; Table 7, Row 2, Columns 4–6). For poverty graduates who produced and sold vegetables in 2019, the odds of perceiving it is impossible for them to fall into poverty would be decreased by 51.0 pp, and the odds of perceiving it is possible or unsure for them to fall into poverty would be increased by 31.5 pp and 19.5 pp, respectively (Table 6, Row 8, Columns 1 and 3; Table 7, Row 7, Columns 1–3). Moreover, for never poor whose household heads got at least junior high school education, the odds of perceiving it is impossible for them to fall into poverty would be increased

Table 7 The marginal effect of independent variables of Columns 1 and 2 in Table 6

Variables	Poverty graduates: Falling back into poverty			Never poor: Falling into poverty		
	Impossible	Unsure	Possible	Impossible	Unsure	Possible
	(1)	(2)	(3)	(4)	(5)	(6)
Prediction of possibility (at means of all independent variables)	0.660***	0.174***	0.166***	0.793***	0.137***	0.070***
	(0.052)	(0.035)	(0.034)	(0.013)	(0.011)	(0.009)
A. Exposure to the COVID-19 shock						
(1) Any suspected or confirmed cases in your village	–0.163	0.062	0.101	0.009	–0.005	–0.004
	(0.187)	(0.074)	(0.115)	(0.049)	(0.029)	(0.020)
(2) Hubei Province	–0.350	0.134	0.216	–0.121***	0.073***	0.048***
	(0.266)	(0.109)	(0.162)	(0.052)	(0.033)	(0.021)
B. Interruptions in off-farm employment						
(3) Any family member has returned to off-farm work by February 12, 2020	0.378**	–0.145**	–0.233**	0.056**	–0.034**	–0.022**
	(0.153)	(0.063)	(0.100)	(0.036)	(0.022)	(0.014)
(4) Households' proportion of labors' off-farm employment location in 2019						
(4a) Outside the county but within his/her home province	0.031	–0.012	–0.019	–0.015	0.009	0.006
	(0.144)	(0.055)	(0.089)	(0.036)	(0.021)	(0.014)
(4b) Outside his/her home province	0.088	–0.034	–0.054	–0.080	0.048	0.032
	(0.140)	(0.055)	(0.086)	(0.039)	(0.024)	(0.016)
C. Quintiles of household income per capita in 2019						
(5a) Poorest quintile	–0.579**	0.221**	0.358**	–0.080**	0.048**	0.032**
	(0.236)	(0.099)	(0.153)	(0.039)	(0.024)	(0.016)
(5b) Second quintile	–0.520**	0.199**	0.321**	–0.104**	0.063*	0.041**
	(0.225)	(0.097)	(0.141)	(0.041)	(0.025)	(0.016)
(5c) Third quintile	–0.576**	0.220**	0.356**	–0.071*	0.043*	0.028*
	(0.255)	(0.101)	(0.168)	(0.042)	(0.025)	(0.017)
(5d) Fourth quintile	–0.532**	0.203**	0.329**	–0.067*	0.040*	0.027
	(0.233)	(0.100)	(0.146)	(0.041)	(0.025)	(0.016)
D. Produced and sold the following products in 2019						
(6) Fresh fruits	–0.285	0.109	0.176	0.069	–0.042	–0.027
	(0.185)	(0.077)	(0.113)	(0.051)	(0.031)	(0.020)
(7) Vegetables	0.510**	–0.195**	–0.315**	0.032	–0.019	–0.013
	(0.236)	(0.102)	(0.146)	(0.050)	(0.030)	(0.020)
(8) Pigs	0.100	–0.038	–0.062	–0.015	0.009	0.006
	(0.171)	(0.065)	(0.106)	(0.051)	(0.031)	(0.020)
E. Other characteristics						
(9) Household head got at least junior high school education	–0.024	0.009	0.015	0.060**	–0.036**	–0.024**
	(0.096)	(0.037)	(0.060)	(0.026)	(0.016)	(0.011)
(10) Age of household head	0.008	–0.003	–0.005	0.002*	–0.001*	–0.001
	(0.005)	(0.002)	(0.003)	(0.001)	(0.001)	(0.001)
(11) Area of arable land	0.006	–0.002	–0.004	–0.003	0.002	0.001
	(0.009)	(0.004)	(0.005)	(0.002)	(0.001)	(0.001)

Robust standard errors in parentheses; ***, $P<0.01$; **, $P<0.05$; *, $P<0.1$. Source: Authors' survey.

by 6.0 pp, and the odds of perceiving it is possible or unsure for them to fall into poverty would be decreased by 2.4 pp and 3.6 pp, respectively (Table 6, Row 10, Columns 2 and 4; Table 7, Row 9, Columns 4–6). Similarly, the elder the household head of never poor households, the lower their perceived likelihood of falling into poverty (Table 6, Row 11, Columns 2 and 4). In terms of marginal impact, with one year increase in the age of household head, ceteris paribus, the odds of perceiving it is impossible for them to fall into poverty would be increased by 0.2 pp, and the odds of perceiving it is possible or unsure for them to fall into poverty would be increased by 0.1 pp and 0.1 pp (Table 7, Row 10, Columns 4–6).

3.7. Robustness checks

We conduct several checks to assess the robustness of our findings. First, the statistics described above weighted each sample household by the inverse of the product of eight times the number of sample households in the sample province under discussion. When the results are re-estimated without any weights, the results remain substantially the same. Secondly, to examine the robustness of our findings to estimation method, we assess the robustness of our

Table 8 The marginal effect of independent variables of Columns 3 and 4 in Table 6

Variables	Poverty graduates: Falling back into poverty			Never poor: Falling into poverty		
	Impossible	Unsure	Possible	Impossible	Unsure	Possible
	(1)	(2)	(3)	(4)	(5)	(6)
Prediction of possibility (at means of all independent variables)	0.656***	0.174***	0.166***	0.793***	0.137***	0.070***
	(0.053)	(0.035)	(0.034)	(0.014)	(0.012)	(0.009)
A. Exposure to the COVID-19 shock						
(1) Any suspected or confirmed cases in your village	–0.202	0.077	0.125	0.008	–0.005	–0.003
	(0.219)	(0.086)	(0.136)	(0.049)	(0.029)	(0.020)
(2) Hubei Province	–0.287	0.110	0.177	–0.115***	0.069***	0.046***
	(0.284)	(0.116)	(0.171)	(0.055)	(0.034)	(0.021)
B. Interruptions in off-farm employment						
(3) Village average of households' proportion of labors with the following joint status of off-farm employment by January 19 in lunar calendar						
(3a) Yes in 2019, No in 2020	–0.185	0.071	0.114	–0.043	0.026	0.017
	(0.123)	(0.047)	(0.079)	(0.038)	(0.023)	(0.015)
(3b) Yes/No in 2019, Yes in 2020	0.215	–0.082	–0.133	0.022**	–0.013**	–0.009**
	(0.118)	(0.049)	(0.073)	(0.034)	(0.020)	(0.014)
(4) Households' proportion of labors' off-farm employment location in 2019						
(4a) Outside the county but within his/her home province	0.125	–0.048	–0.077	–0.005	0.003	0.002
	(0.178)	(0.068)	(0.111)	(0.034)	(0.021)	(0.014)
(4b) Outside his/her home province	0.212**	–0.081**	–0.131**	0.021	–0.013	–0.008
	(0.168)	(0.070)	(0.101)	(0.039)	(0.024)	(0.016)
C. Quintiles of household income per capita in 2019						
(5a) Poorest quintile	–0.612**	0.235**	0.377**	–0.086**	0.052**	0.034**
	(0.277)	(0.115)	(0.177)	(0.040)	(0.024)	(0.016)
(5b) Second quintile	–0.561**	0.215*	0.346**	–0.107**	0.064**	0.043**
	(0.271)	(0.116)	(0.168)	(0.041)	(0.026)	(0.017)
(5c) Third quintile	–0.598**	0.229**	0.369**	–0.075*	0.045*	0.030*
	(0.293)	(0.118)	(0.188)	(0.041)	(0.025)	(0.017)
(5d) Fourth quintile	–0.571**	0.219**	0.352**	–0.067	0.040	0.027
	(0.258)	(0.112)	(0.161)	(0.041)	(0.025)	(0.016)
D. Produced and sold the following products in 2019						
(6) Fresh fruits	–0.341	0.131	0.210	0.066	–0.040	–0.026
	(0.200)	(0.085)	(0.121)	(0.052)	(0.032)	(0.020)
(7) Vegetables	0.503**	–0.193*	–0.310**	0.031	–0.018	–0.012
	(0.250)	(0.107)	(0.154)	(0.050)	(0.030)	(0.020)
(8) Pigs	0.075	–0.029	–0.046	–0.013	0.008	0.005
	(0.187)	(0.072)	(0.116)	(0.051)	(0.031)	(0.020)
E. Other characteristics						
(9) Household head got at least junior high school education	–0.003	0.001	0.002	0.061**	–0.037**	–0.024**
	(0.099)	(0.038)	(0.061)	(0.026)	(0.016)	(0.011)
(10) Age of household head	0.008	–0.003	–0.005	0.002*	–0.001*	–0.001
	(0.005)	(0.002)	(0.003)	(0.001)	(0.001)	(0.001)
(11) Area of arable land	0.005	–0.002	–0.003	–0.003	0.002	0.001
	(0.007)	(0.003)	(0.004)	(0.002)	(0.001)	(0.001)

Robust standard errors in parentheses; ***, $P<0.01$; **, $P<0.05$; *, $P<0.1$. Source: Authors' survey.

findings to the construction of the dependent variable by combining "feeling unsure" with "possible" to make the perceived likelihood of falling back into or falling into poverty a binary dependent variable and run logit models. And the results from logit models are generally consistent with the result from Ologit[2].

3.8. Policy responses taken by China to mitigate the impact of COVID-19 on rural poverty

Given the unprecedented shocks and challenges that the COVID-19 pandemic has brought to China, and the fact that it has been affecting all countries and regions, China has

[2] Results for these robustness checks are available upon request to the corresponding author of the paper.

responded rapidly and strongly to mitigate them. Although almost all responses that China has taken so far are related to poverty alleviation to some degree, a complete review of them is beyond the scope of this paper. In this section, we will give a quick review of the major categories of policy responses that are either directly targeted at poverty, or that might affect poverty reduction in a more direct way. Most of these policies are issued by The State Council Leading Group Office of Poverty Alleviation and Development (SCLGOPAD), the Ministry of Finance (MOF), the Ministry of Human Resources and Social Security (MHRSS), the Ministry of Agriculture and Rural Affairs (MARA), China Banking and Insurance Regulatory Commission (CBIRC) or other line ministries.

A close examination reveals the policy responses that China has taken to mitigate the impact of COVID-19 pandemic on poverty are consistent with the research findings of this paper. They target those factors that come out significant in explaining rural households' perception about falling back into or falling into poverty during this pandemic. Based on the main purposes of these policy responses, they can be classified into three overlapping categories as follows.

Off-farm employment policies The first set of policies is designed to help poor people in rural areas to get employed in the off-farm sectors. Between February 11 and early April in 2020, more than ten notices/suggestions have been issued by the SCLGOPAD and/or the MOF and the MHRSS. One of their main policy goals is to help poor people get employed off-farm during store and factory closures and travel restrictions, to mitigate income losses and prevent them from falling into deeper poverty. These notices/suggestions also propose some key measures to promote off-farm employment of the rural poor people. For example, in the notice issued on February 12, the SCLGOPAD urges that governments at all levels as well as village committees should give priority to helping the rural poor laborers, especially those from officially registered poor households (ORPHs), get employed off-farm during their fight against COVID-19 pandemic (SCLGOPAD 2020a).

These policies call for concerted efforts to help poor people get off-farm employment during the COVID-19 pandemic. On the one hand, efforts should be made to help the factories in more developed areas or construction projects resume production in an orderly way so that rural poor people in less developed areas could migrate out to those places for off-farm jobs. Throughout the process, governments in the migrant-sending areas should work closely with their counterparts in the migrant-receiving areas to make sure that migrants could return to off-farm jobs in a timely, safe, and sound way. On the other hand, for the rural poor who are not able to migrate outside, local governments should make concerted efforts to help them get employed in local poverty alleviation factories or public welfare positions, such as working as street cleaners or sanitizers (SCLGOPAD 2020b). Moreover, poverty alleviation factories or organizations that provide job opportunities to rural poor people could enjoy a set of preferential policies, such as a lumpsum production subsidy, extension in paying insurances for their workers by as long as six months, subsidized interests for loans for less than one year.

In the meantime, the government also urges state-owned enterprises to provide job opportunities to rural poor laborers by organizing job fairs on-line or on the site (SCLGOPAD and MOF 2020). Last but not the least, officials sent by various levels of governments to live and work in villages as well as the first village party secretaries are requested to report to their work on the front line of fighting against poverty and the COVID-19 pandemic. They should clearly understand the needs and challenges, especially in off-farm employment, faced by the villages that they are working in and take timely and targeted measures to help them in their fight against poverty and the pandemic (SCLGOPAD 2020a; SCLGOPAD and MHRSS 2020).

It has been reported that these off-farm employment policies are helping people, especially those poor in rural areas, to get employed in the off-farm sectors during the COVID-19 pandemic. According to The State Council (2020b), by March 19, 2020, about 80% (or 100 million) of migrant workers have returned to their off-farm jobs. For example, in Shaanxi Province, 86 000 migrant workers have returned to their jobs in Jiangsu or Zhejiang provinces by taking the chartered airplanes, trains, or buses offered by local governments. Of whom, 12 000 are from poor households. In the meantime, 85% of poverty alleviation enterprises in Shaanxi have resumed production timely to provide off-farm jobs to those who choose to stay (SCLGOPAD 2020d).

Income policies In response to shocks related to the COVID-19, on the one hand, the government provides basic life support to those ORPHs or households who fall back into or fall into poverty if they suffer major income loss during the pandemic. For those poor households who are not able to pay back their micro-credit loans on time, they get an extension as long as six months. For those poor households who have credit needs, innovative measures will be taken to expedite the review and approval of their loan applications (SCLGOPAD and CBIRC 2020). On the other hand, the government also took measures to mitigate the impact of COVID-19 pandemic on those who remain engaged in the production and marketing of agricultural products. Organizations and people from all

walks of life are encouraged to buy agricultural products from poor areas. Measures were taken to ensure the logistics and marketing channels for poverty alleviation products, such as cleaning up all the unauthorized checkpoints or roadblocks along the passage of poverty alleviation products, and a better coordinated "Express Passage" for fresh and perishable agricultural products. Logistics companies, farmer cooperatives, as well as e-commercial companies are organized to help with the marketing of poverty alleviation products by taking advantage of the e-commerce platform and the Internet Plus technology. For those poverty alleviation projects that were severely hit during the COVID-19 pandemic, the special fiscal fund will be provided to support their production, storage, transportation, or marketing (MARA 2020).

Statistics show that by April 2020, the central government of China has earmarked 139.6 billion CNY as a poverty relief fund in 2020 to cope with the impacts that the COVID-19 outbreak has imposed on the poverty alleviation (SCLGOPAD 2020e). In the meantime, local governments in many provinces also took active measures to help farmers with income generation. For example, local governments in Hubei, Jiangxi and Hebei, among others, took advantage of various e-commerce platforms to promote the sales of agricultural products (SCLGOPAD 2020c, f, g, h, i). Some local government leaders themselves even worked on live streaming as sales ambassador for agricultural products that have encountered poor sales due to the COVID-19 pandemic (SCLGOPAD 2020g, j).

Human capital building policies An important step to get rural people better prepared for a post-COVID-19 era is to build up their human capital. On March 18, 2020, the State Council issued a notice urging efforts to be strengthened to organize on-line vocational training for poor laborers. The training can be prolonged whenever necessary. The government provides subsidies to the training, and the poor laborers get a stipend for participating in the training (The State Council 2020c).

According to the Ministry of Human Resources and Social Security, between 2020 and 2021, at least seven million migrant workers will be trained to build up their professional skills for better employment, job stability, or be able to start their businesses (MHRSS 2020a). For example, in many places in Hebei, Shaanxi or Sichuan provinces, farmers could take classes online using cellphones to learn farm or off-farm skills (SCLGOPAD 2020i, k, l).

4. Discussion

In this article, we have used a new, nationally representative household dataset to create a profile of household perception about falling back into or falling into poverty due to the COVID-19 pandemic in rural China. In doing so, we have consistently found that having any family member who has returned to off-farm work by February 12, 2020 (the time of the telephone survey) is negatively correlated with their perception about falling into or back into poverty. This protective role is shown to be stronger for poverty graduates than for never poor. Prior studies have also shown that off-farm employment has an important contribution to the poverty alleviation of farmers, especially for the poor whose local earning capacity is relatively insufficient (Haggblade *et al.* 2010; Luo 2010; Glauben *et al.* 2012; Ge 2014; Liu and Liu 2018). We also found that at least in terms of the household perception about falling back into or falling into poverty, the COVID-19 pandemic might thrust the poorest and the poorer households deeper into poverty. According to our results, we know that being poverty graduates or never poor, households in the poorest, the second, the third and the fourth quintile when ranked in terms of household income per capita are much more likely to perceive themselves of falling back into or falling into poverty during this pandemic than those in the richest quintile. Meanwhile, our results show that the education and age of household head, being from Hubei, and the area of arable land matter in explaining household perception about falling back into or falling into poverty in some cases but not all.

Although our household survey in 2020 was conducted in a period when the pandemic turned out to be the most severe, we do not think our results have exaggerated the actual impact. In the survey, we asked each household the following question, "Considering the current status of COVID-19 disease, when do you think you will be able to return to your off-farm job?" Results based on their responses show that on average, farmers think they would be able to return to an off-farm job in 25 days. As our survey was conducted on February 12, 2020, this means that farmers think they would be able to return to an off-farm job in early March. In other words, farmers think the COVID-19 pandemic would last until early March. Moreover, it has been widely reported that work resumption has started gradually since mid-February. By mid-March, 80% of migrant workers have returned to their off-farm jobs (MHRSS 2020a). Taken together, results based on these data could be interpreted as the upper bound of farmers' perceived impact of the pandemic on their likelihood of falling back into or falling into poverty. But we do not think our results have exaggerated the actual impact. Nonetheless, an examination of the impact of this pandemic on the observed likelihood of falling back into or falling into poverty would make an important topic for future studies.

In fact, our data also show that off-farm employment is an important factor in predicting household poverty status (graduation from poverty). When we ran a regression with

a dummy variable indicating whether a household was poor in February 2020 (a dummy variable indicating whether a poor household has escaped poverty by December 2019) as the dependent variable, and with another dummy variable indicating whether a household had at least one member employed off-farm in 2019 as the key explanatory variable, plus other control variables as we used in Table 6, the regression results show that households with at least one member employed off-farm are significantly less likely to be poor (more likely to escape poverty). The results remained substantially the same when we replaced the at least one member employed off-farm dummy with a variable indicating the number of household members employed off-farm in 2019. These findings are consistent with many previous studies in that off-farm employment plays a very important role in poverty alleviation in rural China (Haggblade *et al.* 2010; Luo 2010; Glauben *et al.* 2012; Ge 2014; Hoang *et al.* 2014; Liu and Liu 2018; Zhang *et al.* 2018; NBSC 2019).

If this is true, then China should be praised for having responded quickly and strongly in the right direction to mitigate the impact of the COVID-19 pandemic on poverty. Our review of the policy responses that China has taken so far reveals that these policies are well in line with the findings of this study, as can be seen from their clear targets at off-farm employment, income, and building up human capital. However, the impacts of those policy responses on poverty reduction as well as their cost-effectiveness remain to be rigorously evaluated.

We acknowledge at least three limitations of the study. The first drawback of this study is the survey we conducted in February 2020 had to take the form of one-on-one telephone interviews. Some people may be concerned that the quality of a telephone survey is not as good as a face-to-face survey. We were well aware of this so we took great care when designing the questionnaire, training our enumerators, and survey implementation to ensure the quality of our survey throughout the process. Second, what we examined is the household perception about falling back into or falling into poverty due to the COVID-19 pandemic rather than their observed poverty status. But still, we think understanding their perception of poverty is important as perceptions are key components of decisions and behavior change. Finally, although we have a household panel, this paper draws on data from the latest round of the survey. So the cross-sectional nature of perceived poverty data means that cause-effect relationships should not be inferred from our findings.

5. Conclusion

Our results show that the interruptions on off-farm employment is an important channel that led households to perceive of falling back into or falling into poverty, and relatively poor households in terms of household income per capita are much more likely to perceive themselves of falling back into or falling into poverty during the pandemic. Public health and socio-economic concerns about the COVID-19 pandemic are deeply intertwined all over the world, especially in the least developed rural places in developing countries, we believe that the findings in this study would help inform policymaking in mitigating the impacts that COVID-19 have exerted on overty alleviation.

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References

Ahmed F, Ahmed N E, Pissarides C, Stiglitz J. 2020. Why inequality could spread COVID-19. *The Lancet Public Health*, **5**, E240.

Berg M M V D, Hengsdijk H, Wolf J, Ittersum M K V, Wang G, Roetter R P. 2007. The impact of increasing farm size and mechanization on rural income and rice production in Zhejiang Province, China. *Agricultural Systems*, **94**, 841–850.

Brandt L, Guo L, Huang J, Rozelle S. 2004. Land tenure and transfer rights in China: An assessment of the issues. *China Economic Quarterly*, **3**, 952–982.

de Brauw A, Huang J, Rozelle S, Zhang L, Zhang Y. 2002. China's rural labor markets. *The China Business Review*, **March–April**, 2–8.

Cai J, Yu Y, Qiu J. 2019. Evaluation on effect of national accurate poverty alleviation policy on rural poor households: Based on double difference mode. *Human Geography*, **34**, 96–102.

Cai Y, Huang T, Liu X, Xu G. 2020. The effects of "Fangcang, Huoshenshan, and Leishenshan" makeshift hospitals and temperature on the mortality of COVID-19. *medRxiv*, doi: 10.1101/2020.02.26.20028472.

Callander E J, Schofield D J. 2015. Multidimensional poverty and health status as a predictor of chronic income poverty. *Health Economics*, **24**, 1638–1643.

Gao L. 2019. What has Chinese practice of poverty reduction contributed to the world? — from the perspective of actualizing the United Nations MDGs and SDGs. *Journal of China Executive Leadership Academy Jinggangshan*, **12**, 120–129. (in Chinese)

Ge T. 2014. A study on the pathways out of poverty for poor

farmers — an empirical analysis based on CGSS2010. *Inquiry into Economic Issues*, **35**, 96–102. (in Chinese)

Glauben T, Herzfeld T, Rozelle S, Wang X. 2012. Persistent poverty in rural China: Where, why, and how to escape? *World Development*, **40**, 784–795.

Haggblade S, Hazell P, Reardon T. 2010. The rural non-farm economy: Prospects for growth and poverty reduction. *World Development*, **38**, 1429–1441.

Hoang T X, Pham C S, A.Ulubaşoğlub M. 2014. Non-farm activity, household expenditure, and poverty reduction in rural Vietnam: 2002–2008. *World Development*, **64**, 554–568.

Hoang X T, Dinh T P, Nguyen T H. 2008. *Urbanization and Rural Development in Vietnam's Mekong Delta*: *Livelihood Transformations in Three Fruit-growing Settlements*. International Institute for Environment and Development, United Kingdom.

Huang J, Li K, Wang X, Ding Y. 2019. Reform of property rights of rural collective-operated assets: Situation, process, and its impact. *Rural Economy*, **37**, 1–10. (in Chinese)

Katagame A, Nugroho B A. 2017. Income contribution of pig livestock toward poverty reduction and factors influencing pig farming in Mimika Papua. *Journal of Agriculture and Veterinary Science*, **10**, 11–15.

Kurosaki T, Khan H. 2006. Human capital, productivity, and stratification in rural Pakistan. *Review of Development Economics*, **10**, 116–134.

Li M S, Fu Q, Luo T. 2020. The hospital response to COVID-19 in China. *Journal of Health Care Finance*, **46**, 61–67.

Liu J, Liu M, Wang X. 2018. Analysis on the micro-effect of rural labor's non-agricultural employment for poverty villages, Gansu Province. *Journal of Arid Land Resources and Environment*, **32**, 50–56.

Liu J, Liu W. 2018. How education help shaking off poverty?: Based on the role of labor career choice. *Population & Economics*, **39**, 61–68. (in Chinese)

Liu M, Feng X, Wang S, Qiu H. 2019. China's poverty alleviation over the last 40 years: Successes and challenges. *Australian Journal of Agricultural & Resource Economics*, **64**, 209–228.

Luo C. 2010. Poverty dynamics in Rural China. *Economic Research Journal*, **56**, 124–139. (in Chinese)

MARA (Ministry of Agriculture and Rural Affairs of China). 2020. Requiring localities implement well in selling agricultural products in poor areas during the period of pandemic prevention and control. [2020-05-15]. http://www.gov.cn/xinwen/2020-02/11/content_5477508.htm (in Chinese)

MHRSS (Ministry of Human Resources and Social Security of China). 2020a. Notice of the ministry of human resources and social security on printing and distributing the vocational skill training plan for stable employment of migrant workers in 100 days. [2020-07-31]. http://www.mohrss.gov.cn/gkml/zcfg/gfxwj/202006/t20200601_370724.html (in Chinese)

MHRSS (Ministry of Human Resources and Social Security of China). 2020b. The ministry of human resources and social security held a press conference to introduce the progress of human resources and social security departments in response to the pandemic situation. [2020-07-30]. http://www.gov.cn/xinwen/2020-03/19/content_5493239.htm (in Chinese)

NBSC (National Bureau of Statistics of China). 2019. *China Statistical Yearbook*, *2018*. China Statistical Publishing House, Beijing. (in Chinese)

NHC (National Health Commission of China). 2020a. Coronavirus disease 2019 (COVID-19) situation report — up to January 29th. [2020-05-15]. http://www.nhc.gov.cn/xcs/yqtb/202001/e71bd2e7a0824ca69f87bbf1bef2a3c9.shtml (in Chinese)

NHC (National Health Commission of China). 2020b. Coronavirus disease 2019 (COVID-19) situation report — up to February 12th. [2020-05-15]. http://www.nhc.gov.cn/xcs/yqtb/202002/26fb16805f024382bff1de80c918368f.shtml (in Chinese)

Neo H, Chen L H. 2009. Household income diversification and the production of local meat: The prospect of small-scale pig farming in Southern Yunnan, China. *Area*, **41**, 300–309.

Pan A, Liu L, Wang C, Guo H, Hao X, Wang Q, Huang J, He N, Yu H, Lin X, Wei S, Wu T. 2020. Association of public health interventions with the epidemiology of the COVID-19 outbreak in Wuhan, China. *JAMA*, **323**, 1915–1923.

Rozelle S. 1990. *Economics of Village Leaders in Rural China*, *Department of Agricultural Economics*. Cornell University, New York.

Rozelle S. 1996. Stagnation without equity: Patterns of growth and inequality in China's rural economy. *China Journal*, **35**, 63–92.

Schreckenberg K, Awono A, Degrande A, Mbosso C, Ndoye O, Tchoundjeu Z. 2006. Domesticating indigenous fruit trees as a contribution to poverty reduction. *International Tree Crops Journal*, **16**, 35–51.

SCLGOPAD (The State Council Leading Group Office of Poverty Alleviation and Development). 2014. Notice on issue the implementation plan of establishing targeted poverty alleviation mechanism. [2020-5-15]. http://www.cpad.gov.cn/art/2014/5/26/art_50_23765.html (in Chinese)

SCLGOPAD (The State Council Leading Group Office of Poverty Alleviation and Development). 2020a. Notice on doing a good job of poverty alleviation work in central units during the prevention and control of COVID-19 pandemic. [2020-05-15]. http://www.cpad.gov.cn/art/2020/3/2/art_50_113461.html (in Chinese)

SCLGOPAD (The State Council Leading Group Office of Poverty Alleviation and Development). 2020b. The State Council Leading Group Office of Poverty Alleviation Development hold a teleconference of the directors of poverty alleviation offices of all provinces. [2020-05-16]. http://www.cpad.gov.cn/art/2020/2/18/art_105_111883.html (in Chinese)

SCLGOPAD (The State Council Leading Group Office of Poverty Alleviation and Development). 2020c. Fighting

anainst pandemic and fighting against poverty in Qin-ba Mountainous Area of Hubei Province. [2020-07-31]. http://www.cpad.gov.cn/art/2020/3/12/art_3125_114864.html (in Chinese)

SCLGOPAD (The State Council Leading Group Office of Poverty Alleviation and Development). 2020d. Shaanxi Province: Fighting against the pandemic while fighting against poverty. [2020-07-31]. http://www.cpad.gov.cn/art/2020/3/24/art_5_116361.html?from=groupmessage&isappinstalled=0 (in Chinese)

SCLGOPAD (The State Council Leading Group Office of Poverty Alleviation and Development). 2020e. The Ministry of Finance gives priority to ensuring the funds for poverty alleviation: a total of 139.6 billion yuan of special poverty alleviation funds from the central government have been allocated. [2020-07-31]. http://www.cpad.gov.cn/art/2020/3/31/art_22_117182.html (in Chinese)

SCLGOPAD (The State Council Leading Group Office of Poverty Alleviation and Development). 2020f. Thirteen measures taken by hebei province to promote employment and entrepreneurship of poor labor force. As of April 2, over 601.4 thousand poor people had found jobs. [2020-07-31]. http://www.cpad.gov.cn/art/2020/4/9/art_5_118244.html (in Chinese)

SCLGOPAD (The State Council Leading Group Office of Poverty Alleviation and Development). 2020g. Jiangxi Province lauches “one hundred counties and one thousand products” to alleviate poverty through consumption. [2020-07-31]. http://www.cpad.gov.cn/art/2020/3/19/art_5_115969.html (in Chinese)

SCLGOPAD (The State Council Leading Group Office of Poverty Alleviation and Development). 2020h. Jiangxi Province pushes forward poverty alleviation with stronger efforts. [2020-07-31]. http://www.cpad.gov.cn/art/2020/3/17/art_5_115681.html (in Chinese)

SCLGOPAD (The State Council Leading Group Office of Poverty Alleviation and Development). 2020i. Epidemic prevention and poverty alleviation in Hebei province. [2020-07-31]. http://www.cpad.gov.cn/art/2020/3/11/art_5_114802.html (in Chinese)

SCLGOPAD (The State Council Leading Group Office of Poverty Alleviation and Development). 2020j. County magistrates organizes farmers to sell goods online-new motivation for poverty alleviation. [2020-07-31]. http://www.cpad.gov.cn/art/2020/4/10/art_3125_118381.html (in Chinese)

SCLGOPAD (The State Council Leading Group Office of Poverty Alleviation and Development). 2020k. Life restarts: “Poverty alleviation class” in Sichuan Zhongjiang County, Sichuan Province enable poor households to master a skill. [2020-07-31]. http://www.cpad.gov.cn/art/2020/4/23/art_23_119841.html (in Chinese)

SCLGOPAD (The State Council Leading Group Office of Poverty Alleviation and Development). 2020. 100 thousand farmers learn to surf the internet. [2020-07-31]. http://www.cpad.gov.cn/art/2020/4/3/art_5_117643.html (in Chinese)

SCLGOPAD (The State Council Leading Group Office of Poverty Alleviation and Development), CBIRC (China Banking and Insurance Regulatory Commission). 2020. Notice on actively responding to the impact of the COVID-19 pandemic and doing a good job in poverty alleviation micro-credit. [2020-05-15]. http://www.gov.cn/xinwen/2020-02/13/content_5478076.htm (in Chinese)

SCLGOPAD (The State Council Leading Group Office of Poverty Alleviation and Development), MOF (Ministry of Finance of China). 2020. Notice on actively responding to the influence of the COVID-19 pandemic and strengthening the management of financial special poverty alleviation fund projects to ensure the completion of the target for poverty alleviation. [2020-05-15]. http://www.cpad.gov.cn/art/2020/2/18/art_50_111821.html (in Chinese)

Shrestha R B. 2016. Determinants of inefficiency in vegetable farms: Implications for improving rural household income in Nepal. *Farm Wealth Inequality Within & Across States in the United States Agricultural & Resource Economics Review*, **50**, 407–437.

The State Council. 2020a. No.1 central document. [2020-05-25]. http://www.gov.cn/zhengce/2020-02/05/content_5474884.htm (in Chinese)

The State Council. 2020b. Measures taken by Department of Human Resources and Social Security to boost the resumption of work and production — 100 million migrant workers have gone out to work. [2020-07-31]. http://www.gov.cn/xinwen/2020-03/20/content_5493382.htm (in Chinese)

The State Council. 2020c. Suggestions on the implementation of measures to strengthen the stable employment in response to the impact of the COVID-19 pandemic. [2020-05-15]. http://www.gov.cn/zhengce/content/2020-03/20/content_5493574.htm (in Chinese)

Tian H, Liu Y, Li Y, Wu C H, Chen B, Kraemer M U, Li B, Cai J, Xu B, Yang Q. 2020. An investigation of transmission control measures during the first 50 days of the COVID-19 epidemic in China. *Science*, **368**, 638–642.

United Nations. 2015. *The Millennium Development Goals Report 2015*. [2020-07-31]. http://mdgs.un.org/unsd/mdg/Resources/Static/Products/Progress2015/English2015.pdf

Wang D, Huang J. 2018. Impact of grassland ecological compensation policy on household. *Resources Science*, **40**, 1344–1353.

Wang J, Zhu Y, Sun T, Huang J, Huang Q. 2019. Forty years of irrigation development and reform in China. *Australian Journal of Agricultural and Resource Economics*, **64**, 1–24.

WHO (World Health Organization). 2020. *Coronavirus Disease 2019 (COVID-19) Situation Report* — 81. [2020-05-16]. https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200410-sitrep-81-covid-19.pdf?sfvrsn=ca96eb84_2

Winship C. 2003. Logit and probit: Ordered and multinomial models. *Journal of the American Statistical Association*, **98**, 775–776.

Wodon Q T. 2000. Microdeterminants of consumption, poverty, growth, and inequality in Bangladesh. *Applied Economics*, **32**, 1337–1352.

World Bank. 2020. *East Asia and Pacific in the Time of COVID-19 East Asia and Pacific Economic Update* (April). Washington, D.C. doi: 10.1596/978-1-4648-1565-2.

Wu Z, McGoogan J M. 2020. Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: Summary of a report of 72 314 cases from the Chinese center for disease control and prevention. *JAMA*, **323**, 1239–1242.

Xu X. 2011. The influencing factors on the differentiation of the rural impoverished households — based on an investigation in a northern county of Jiangsu. *Journal of Nanjing College for Population Programme Management*, **27**, 32–35, 69.

Zhang L, Dong Y, Liu C, Bai Y. 2018. Off-farm employment over the past four decades in rural China. *China Agricultural Economic Review*, **10**, 190–214.

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