

Does government or private support matter during crises? Panel data evidence from household response during the COVID-19 lockdown restrictions.

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Abstract

Social protection policies are critical public policy measures to reduce livelihood vulnerability and enhance resilience amidst shocks. In this study, we exploit nationally representative panel data from Nigeria, the National Longitudinal Phone Survey (NLPS) on COVID-19, to assess the heterogeneous impact of different sources of support on households' response to lockdown restrictions during the COVID-19 pandemic. We employed a Correlated random effect (CRE) model with cluster-robust standard errors for binary outcomes to examine the impacts of government support, remittance and private rental income on the probability of stopping work following the lockdown restrictions across different employment sectors - agricultural, informal and formal. We find mixed results across the three support sources and employment categories. Chiefly, government support and private rental income are positively associated with the probability of stopping work in the agricultural sector. However, these effects are negative and significant if working in the informal sector. Remittance appears not to play a significant role if working in the informal and formal sectors but has a significant negative association among households working in the agricultural sector. We also found heterogeneous effects of these sources of support depending on whether the households are in rural or urban areas. Our findings have important implications for social protection policies that target building resilience amidst shocks and risks to household livelihoods.

Keywords: Shocks; household response; government support; remittance; private income

1. Introduction

The COVID-19 pandemic brought unprecedented changes in households' livelihoods, globally. The literature on the impacts of the pandemic on households' livelihoods has shown worrying outcomes. Early analyses of the effects of the pandemic in Nigeria showed that it had a negative impact at the macro- and micro-levels. For example, nationally, it negatively affected the agri-food system GDP and total GDP, and at the micro level, it reduced household incomes, reduced labour market participation and inflows of remittances, and at the same time, exacerbated household poverty and food insecurity levels (Munonye et al., 2022; Amare et al., 2021; Andam et al., 2020; Schwettmann, 2020). With the stringent lockdown measures imposed by several governments globally, including Nigeria, household livelihood resilience was tested. People had to adapt to new ways of sustaining livelihoods with disruptions in business activities, including but not limited to temporary and permanent closures (Liverpool-Tasie et al., 2022). In addition, anecdotal evidence suggests that the disruptions associated with the lockdown measures unevenly affected labour market participation and business activities depending on location, business type, and nature of measures. At the same time, responses to government measures were asynchronously influenced mainly by people's attitudes driven by the need to sustain their livelihoods (Bentkowska, 2021; Gottlieb et al., 2020). For example, while the majority of large businesses within the formal sector in Nigeria had to close for a considerable period (but employees were assured of their wages), among small businesses, particularly in the informal sectors, evidence revealed that households were finding ways to pivot and stay afloat to meet consumer demands and sustain a living despite the lockdown measures (Liverpool-Tasie et al., 2022; Itanyi and Obuka, 2022; Aladejebi, 2020; Gottlieb et al., 2020). Thus, while workers in formal government jobs had to adhere to public health policy without loss of livelihood income, private sector employment and the informal economy were not accorded that luxury. It was a choice between the coronavirus and an impending hunger (Djoumessi, 2021; Maity et al., 2020). In Nigeria, workers within the informal sector, who are mainly baseline poor in the first place, perceived that COVID-19 was a disease of the rich, and would rather prefer that than to

starve (Omobowale et al., 2020).

Nonetheless, to cushion the effect of the disruptions on livelihoods and well-being of households resulting from the lockdown measures aimed at reducing the spread of the virus, many governments provided support to households and businesses as a way to incentive people to adhere to the stipulated lockdown measures (Liverpool-Tasie et al., 2022). In Nigeria, the support was in the form of monetary and non-monetary transfers to poor households and economic stimulus measures for small businesses across different geographical zones (World-Bank, 2020). In addition, households also had to leverage other forms of support such as intermittent remittance inflows both nationally and internationally as well as from their enterprises and investments to boost their resilience capacity against the negative impact of the pandemic (Akim et al., 2024; Kpodar et al., 2023; Amare et al., 2021). However, it is not clear what effect these sources of support had on the response of households adhering to the government-declared lockdown restrictions arising from the employment shocks during the COVID-19 pandemic. A household's response is measured as the probability of household members stopping working following the lockdown restrictions. The aim of this paper, therefore, is to assess the heterogeneous impact of the source of support on households' response to lockdown restrictions imposed during the COVID-19 pandemic in Nigeria. In particular, we are interested in understanding if the source of support during the global public health shock influenced the propensity of households to stop or continue their means of livelihood. We leverage pre-pandemic face-to-face survey data with 12 rounds of monthly follow-up phone surveys to examine if the type of support households received during the pandemic influenced their propensity to stop work or continue despite the government's lockdown measures. We also examined if this effect differs across geographical locations (rural and urban). This is because, for some households, particularly in the poor rural areas, the popular notion at the height of the pandemic was that survival trumps the public health challenge (Liverpool-Tasie et al., 2022; Gottlieb et al., 2020). So, while some households, particularly in the urban areas adhered to the measures and could cope, for others in the rural areas, this was not the case as their household survival depended on the

ability to sustain their livelihoods. Importantly, nationally representative studies such as Maredia et al. (2022) showed that households' income were disproportionately affected by the lockdown restrictions depending on whether they were located in the urban or rural areas. The knowledge of the impact of the type and source of support available to households during crisis times in helping to support livelihood and manage public health emergencies would be invaluable in the current debate on revamping current social protection policies. Thus, the importance of this paper to social protection policies amid shocks such as the COVID-19 pandemic is two-fold. First, the result provides further evidence of the potential for government responses during shocks (e.g., support to cushion the effect of mobility restrictions during the pandemic) to disproportionately impact different sub-groups of the population if the policies underpinning those supports have not been adequately targeted (Ravallion, 2020; Bargain and Aminjonov, 2020). Secondly, it provides new evidence for social protection policies arguing that during crises, social protection measures should not be a straight-jacketed support but measures should be diverse recognising the inherently heterogeneous impact of shocks on livelihoods in different settings and populations.

The remainder of this paper is organized as follows. The next section describes methods and data sources. This is followed by a discussion of our empirical strategy and robustness checks in the current empirical setting. In Section 3, we report and discuss our main results. Finally, in Section 4, we conclude with some suggested policy recommendations.

2. Data and method

2.1. Survey and sampling method

We draw our data from the Nigeria National Longitudinal Phone Survey (NLPS) on COVID-19 collected by the Living Standards Measurement Study (LSMS) team in Nigeria (NBS/WB, 2020). The LSMS is a collaboration effort between the Nigeria Bureau of Statistics (NBS) and The World Bank. The Nigeria National Longitudinal Phone Survey (NLPS) is a high-frequency phone survey of households. Phone surveys are becoming ubiquitous in agricultural surveys as a low-cost data collection method with treatment effect estimations from

data collected via phone surveys found not to be significantly different from those from in-person surveys (Anderson et al., 2024). The survey on COVID-19 has multiple rounds of data collection, which was initially designed to follow the same households over time making it a powerful data source for studying and understanding the socio-economic impact of the COVID-19 pandemic in Nigeria. Between April 2020 and April 2021, the NBS successfully implemented the Nigeria COVID-19 NLPS Phase 1 with technical support from a World Bank team from the Development Data Group (DECDG) and the Poverty and Equity Global Practice. In Phase 1, the NBS conducted monthly phone interviews with an initial sample of 3,000 households selected from the General Household Survey-Panel (GHS-Panel) 2018/19, Wave 4. The extensive information collected in the GHS-Panel just over a year before the pandemic provided a rich set of background information on the Nigeria NLPS households. Some of the information collected during the monthly phone survey, among others, included lockdown-related information such as household members who stopped working due to the COVID-19 pandemic across different employment sectors. Figure 1 shows the distribution of households across different employment sectors who stopped working resulting from the COVID-19 shock (our outcomes of interest). As observed, there was heterogeneity in how different households responded to the government lockdown measures as a response to the COVID-19 shock depending on the employment sector across the different survey rounds. We exploit this variation in our empirical analyses to provide some understanding of what was driving these responses at the household level.

In addition to this information, the survey also collected data on different supports for households during the pandemic. Information such as government assistance, remittances to households as well as other sources of income were also collected. During the pandemic, households and businesses were potentially targeted through cash and in-kind support as well as the offer of stimulus packages to cushion the short-term effect of the lockdown restrictions (Andam et al., 2020; Liverpool-Tasie et al., 2022). But, it is not clear if these support systems influenced the likelihood that households will stop work despite the government's stringent lockdown restrictions on movement. Thus, our outcome variables are household self-reported



Figure 1: Share of households that stopped working as a result of COVID-19.

stoppage of work across three broad employment categories. A description and summary statistics of our main outcome measures are reported in Table 1.

To provide context, we are interested in examining the impact of the support systems available to households during the COVID-19 lockdown measures on households' responses to the lockdown measures measured by the probability of households stopping working despite the lockdown restrictions. We are particularly interested in the role that government, remittances and private income support played in mediating this action. This is particularly important because, despite the lockdown restrictions in place, some households across both rural and urban areas were observed to have ignored some of these measures (Omobowale et al., 2020). Table 2 provides summary statistics of some of these factors. We measure government support if households self-reported receiving any form of monetary or non-monetary assistance from the government. Likewise, we measure private support with two variables - households' self-reported receipt of rental income (either of owned land or house) and in-

Table 1: Definition of outcomes and associated descriptive statistics

Variable	Description	Rural	Urban	Full sample
			Mean (SD)	
Stop work	HH member stopped working due to COVID (1=yes, 0=otherwise)	0.050 (0.22)	0.040 (0.19)	0.044 (0.20)
Stop work - agriculture	HH member stopped working due to COVID - Agriculture (1=yes, 0=otherwise)	0.265 (0.44)	0.617 (0.49)	0.477 (0.50)
Stop work - informal sector	HH member stopped working due to COVID - Buying and selling (1=yes, 0=otherwise)	0.181 (0.39)	0.112 (0.31)	0.139 (0.35)
Stop work - formal sector	HH member stopped working due to COVID - Other wage work (1=yes, 0=otherwise)	0.303 (0.46)	0.165 (0.37)	0.220 (0.41)
Observation		967	2033	3000

Note: Data is from the High-Frequency Phone Surveys on COVID-19 collected by the Living Standards Measurement Study (LSMS) Team; Informal sector includes households involved in informal trading activities; Formal sector includes households involved in public or private sector employment.

Abbreviation: SD = Standard deviation

come from non-farm jobs. Finally, we also differentiated support in the form of domestic or international remittance support.

2.2. Empirical strategy

This study aims to assess the heterogeneous impact of the support source on households' resilience capacity during the COVID-19 pandemic. Specifically, we are interested in understanding if the source of support during the pandemic influenced the propensity of households to stop work or otherwise. The sources of assistance available to households during the pandemic included support from the government (Assistance), remittances to households (Remittance) and private income from rent (Rent) as shown in Table 2. As previously noted in Table 1, our outcome variables measured as binary variables reflect whether or

Table 2: Pre-COVID (2019) and phone survey sample characteristics

Variable	Description	Rural		Urban	
		Original sample	Phone survey	Original sample	Phone survey
		Mean (SD)		Mean (SD)	
Assistance	HH received assistance from government or other institutions (1=yes, 0=otherwise)	0.057 (0.23)	0.057 (0.23)	0.115 (0.32)	0.113 (0.32)
Remittance	HH received remittances (international and/or domestic) (1=yes, 0=otherwise)	0.351 (0.48)	0.348 (0.48)	.312 (0.46)	0.312 (0.46)
Rent	HH has private income from rent - land and house (1=yes, 0=otherwise)	0.432 (0.49)	0.430 (0.49)	0.805 (0.40)	0.805 (0.40)
Account	HH has account from financial institutions (1=yes, 0=otherwise)	0.792 (0.40)	0.795 (0.40)	0.474 (0.50)	0.484 (0.50)
Sex	Gender of HH head (1=female, 0=otherwise)	0.198 (0.40)	0.197 (0.40)	0.167 (0.37)	0.165 (0.37)
Age	Age of HH head	48.75 (14.37)	48.67 (14.37)	49.50 (14.78)	49.41 (14.68)
Age_p	Age of HH head at rounds+1	50.32 (14.58)	50.32 (14.58)	50.62 (14.77)	50.62 (14.77)
HH size	HH size	5.43 (3.28)	5.48 (3.30)	6.76 (3.96)	6.88 (3.99)
Married	HH head currently married (1=yes, 0=otherwise)	0.722 (0.45)	0.721 (0.45)	0.789 (0.41)	0.794 (0.40)
Disability	HH has disability (1=yes, 0=otherwise)	0.020 (0.14)	0.019 (0.14)	0.042 (0.20)	0.040 (0.20)
Education of HH head	Educational level of HH head				
	None	0.172 (0.38)	0.170 (0.37)	0.355 (0.48)	0.345 (0.47)
	Primary	0.217 (0.41)	0.217 (0.41)	0.267 (0.44)	0.269 (0.44)
	Secondary	0.298 (0.46)	0.299 (0.46)	0.222 (0.415)	0.226 (0.42)
	Tertiary	0.312 (0.46)	0.313 (0.46)	0.156 (0.36)	0.161 (0.37)
Literacy	HH head literate (1=yes, 0=otherwise)	0.864 (0.34)	0.865 (0.34)	0.742 (0.44)	0.750 (0.43)
TV	Ownership of television (1=yes, 0=otherwise)	0.768 (0.42)	0.771 (0.42)	0.399 (0.49)	0.409 (0.49)
Mobile	Ownership of mobile phone (1=yes, 0=otherwise)	0.920 (0.27)	0.921 (0.30)	0.770 (0.42)	0.777 (0.42)
Internet	HH has access to internet (1=yes, 0=otherwise)	0.633 (0.48)	0.634 (0.48)	0.346 (0.47)	0.351 (0.48)
Covid threat	HH perceives COVID as a public threat (1=yes, 0=otherwise)	0.765 (0.42)	0.765 (0.42)	0.814 (0.40)	0.814 (0.40)
Observation		1592	967	3384	2033

Note: Data are from the High-Frequency Phone Surveys on COVID-19 collected by the Living Standards Measurement Study (LSMS)

Abbreviation: SD = Standard deviation

not households stopped working across different employment sectors (agriculture, informal and formal sectors) due to the COVID-19 lockdown restrictions. That is, the dependent variable is nonlinear and equal to one indicating a positive outcome, whereas zero indicates a negative outcome following Equation 1:

$$Y_{it} = A_{it}\delta + X_{it}\beta + d_t + c_{i1} + \mu_{it}; \quad \text{with} \quad Y_{it} = \begin{cases} 1=Y_{it}>0 \\ 0=otherwise \end{cases} \quad (1)$$

Y_{it} represents the various outcomes of interest, stopped work in different sectors (agriculture, informal and formal sectors). Our covariate of interest is A_{it} ; its parameter estimate δ shows the relationship between the type of assistance provided to households and the probability of the occurrence of the various outcomes. d_t captures household and time fixed-effects, and c_{i1} are time-invariant unobservables while X_{it} is a vector of household-level and geographical location control variables. μ_{it} is the stochastic error term. Therefore, our panel data allows us to effectively control for time-invariant unobservables such as preferences and motivations which may drive the household decisions to stop work despite the lockdown restrictions. We exploit the panel structure of our data to address any time-varying observed factors using the Mundlak-Chamberlain device, aka CRE (Correlated Random Effect) model that relaxes the strict exogeneity (no correlation) assumption of the typical random effect model¹ (Mundlak, 1978). That is, our model allows us to control for unobserved heterogeneity and possible endogeneity for time-varying unobservables allowing for a joint distribution of covariates and unobserved heterogeneity (Abrevaya and Hsu, 2021). The CRE model is different from the RE models as it includes the time averages of all time-varying covariates to address the correlation issue (Bates et al., 2022; Lin and Wooldridge, 2019; Wooldridge, 2019). We

¹The RE estimator is commonly used in experimental studies because of its restrictive nature. It assumes no correlation between the unobserved heterogeneity and the observed characteristics. However, the CRE model relaxes this assumption and avoids the usual incidental parameters problem, particularly for nonlinear models such as we have in our study. For example, see Bates et al. (2022); Lin and Wooldridge (2019); Wooldridge (2019); Mundlak (1978)

then estimated the average partial effects (APEs) of our main explanatory variables, A_{it} (Abrevaya and Hsu, 2021).

Equation 1 can be naively estimated using the ordinary least square (OLS) estimator for linear models with continuous outcomes. However, since our dependent variable is discrete, panel data models with continuous dependent variables are not adequate (Semykina and Wooldridge, 2010; Chesher, 2010; Chesher and Rosen, 2017). Therefore, following Lin and Wooldridge (2019) and Wooldridge (2019), we estimated a CRE model with cluster-robust standard errors for binary outcomes with panels nested at the household level to correct for the potential endogeneity. As noted previously, CRE models allow for the explanatory variables to be correlated with the unobserved heterogeneity, c_{i1} (Bates et al., 2022; Lin and Wooldridge, 2019). The model assumes that the correlation is a linear function of the average across time of the time-varying covariates which are added to Equation 1. With the addition of the time averages of all time-varying covariates \bar{X}_i , the new equation is shown in Equation 2:

$$Y_{it} = A_{it}\delta + X_{it}\beta + \bar{X}_i\gamma + d_t + c_{i1} + \mu_{it}; \quad (2)$$

As a robustness check, we also estimated a pooled probit model. The results are provided in the supplementary information. All descriptive statistics and econometric analyses were performed using STATA 16.1.

3. Results and Discussion

3.1. Effects of support on the probability of stopping work during COVID-19

Tables 3 show the results of the marginal effects estimates of the CRE models for the three main predictors of interest - government assistance, remittance and private income from rent across the three different employment sectors. In subsequent sections, we examined the heterogeneous effect of these different support systems disaggregated by household heads'

location - Urban and Rural. We find mixed results but the findings appear to shed some light on the importance of government assistance, remittances and private income support (proxied as extra-income sources from rents - land and house) on the probability of households adhering to government recommendations to restrict movement and stop working due to public health crises. We examined these supports across three main occupational groups- agriculture, informal and formal sectors of employment.

Table 3: Average partial effect estimates of support sources on the probability of stopping work

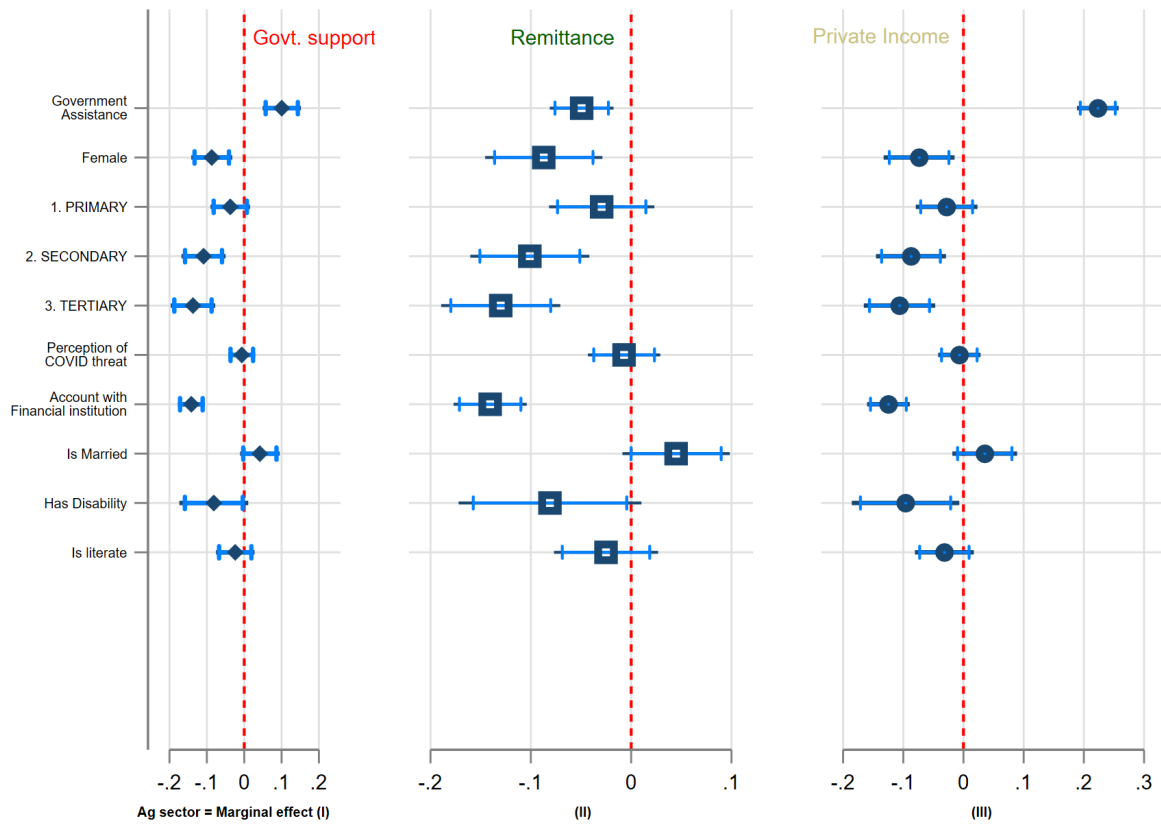
VARIABLES	Agricultural Sector			Informal Sector			Formal Sector		
	(1) Govt. Support	(2) Remittance	(3) Rent	(4) Govt. Support	(5) Remittance	(6) Rent	(7) Govt. Support	(8) Remittance	(9) Rent
Government support	0.10*** (0.03)			-0.03** (0.01)			0.01 (0.02)		
Remittance		-0.05*** (0.02)			0.01 (0.01)			0.01 (0.01)	
Private income from rent			0.22*** (0.02)			-0.06*** (0.01)			-0.07*** (0.01)
Female	-0.09*** (0.03)	-0.09*** (0.03)	-0.07** (0.03)	0.14*** (0.02)	0.14*** (0.03)	0.13*** (0.03)	-0.07*** (0.02)	-0.06*** (0.02)	-0.06*** (0.02)
Primary	-0.04 (0.03)	-0.03 (0.03)	-0.03 (0.03)	-0.00 (0.01)	-0.00 (0.01)	-0.02 (0.02)	0.02 (0.02)	0.02 (0.02)	0.03 (0.02)
Secondary	-0.11*** (0.03)	-0.10*** (0.03)	-0.09*** (0.03)	-0.00 (0.02)	-0.01 (0.02)	-0.02 (0.02)	0.03 (0.02)	0.03 (0.02)	0.03 (0.02)
Tertiary	-0.14*** (0.03)	-0.13*** (0.03)	-0.11*** (0.03)	-0.06*** (0.02)	-0.06*** (0.02)	-0.08*** (0.02)	0.11*** (0.02)	0.11*** (0.02)	0.11*** (0.03)
Perception of COVID-19 threat	-0.01 (0.02)	-0.01 (0.02)	-0.01 (0.02)	0.02* (0.01)	0.02* (0.01)	0.02 (0.01)	0.00 (0.01)	0.01 (0.01)	0.01 (0.01)
Account	-0.14*** (0.02)	-0.14*** (0.02)	-0.12*** (0.02)	0.03*** (0.01)	0.03*** (0.01)	0.03*** (0.01)	0.10*** (0.01)	0.09*** (0.01)	0.08*** (0.01)
Interaction effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,885	1,885	1,885	1,885	1,885	1,885	1,885	1,885	1,885

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

3.1.1. Effect of support sources on responses of household working in the agricultural sector

Results showed that receiving government assistance increases the likelihood of stopping work in the agricultural sector by 10% as shown in Figure 2. If household heads are female, highly educated, and have an account with a financial institution, they are less likely to

stop work. However, suppose the household heads are male and have received government assistance. In that case, they are three times more likely to adhere to the lockdown restrictions and stop work compared to female-headed households. This heterogeneity in the outcome between male- and female-headed households is not surprising. Females are mainly household keepers (Olonade et al., 2021) and when they are the head of the households, providing for the family trumps other priorities thus increasing the importance of government support that recognises gender differences in social protection policies (Denford et al. (2021). However, the support may not be sufficient enough to allow them to stop working in totality. On the other hand, remittance is significantly negatively associated with the probability that households working in the agricultural sector will stop working during the COVID-19 lockdown restrictions. This implies that when households can access income from remittances (either locally or internationally), it does not positively influence their chances of following public order which restricts their ability to continue their livelihood activities amidst public health crises. The literature on the effects of remittances on labour participation is mixed. In a study by Ayalew and Mohanty (2022) in Ethiopia, while remittances increased the likelihood of a positive decision for labour participation in rural households, they reduced the likelihood among urban residents. The fact that a large proportion of rural occupation is agriculturally based is revealed in this effect, and the heterogeneity from the type of occupation is explored further in this study. In their study, Vadean et al. (2019) also found that remittances did not reduce the propensity for self-employed work; but did for paid employment in Tajikistan. In contrast, similar to the effect of government assistance, receiving private income from rent is positively significantly associated with the probability of stopping work during the pandemic. This effect is over two times larger (just over 22%) for households compared to government assistance (10%). This result is plausible because households that have access to income from rents are likely to be within the middle class in terms of wealth quartiles and the opportunity cost of discounting the government lockdown restrictions to continue with their source of livelihood would likely be higher.



Note: All predictors 0 to 1

Figure 2: Average partial effects of supports on the probability of stopping work during COVID-19 (Agricultural sector)

3.1.2. Effect of support sources on responses of household working in the informal sector

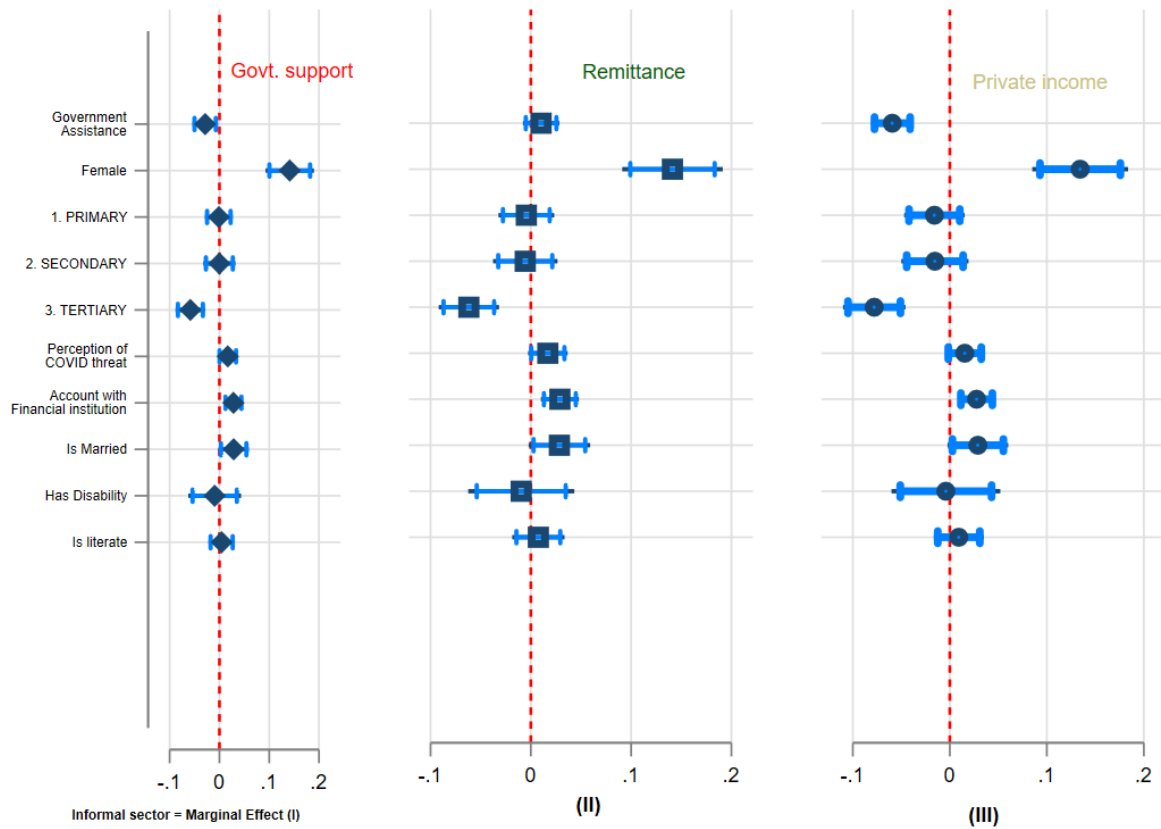
The informal work sector comprises activities that involve trading (buying and selling), usually on a small scale (Williams and Nadin, 2012; De Paula and Scheinkman, 2007). Our results (presented in graphical form and shown in Figure 3) show that government assistance is significantly negatively associated with the probability of households stopping work due to lockdown restrictions. However, being female (compared to male), married, having an account with financial institutions and perceiving COVID-19 as a public health threat are positively associated with the probability of the respondent stopping work as a response to government restriction during a crisis. In contrast to government support, remittance

(though positive) is not significantly associated with the probability of stopping work but being a female, perception of COVID-19 as a public health threat and having an account with a financial institution are positively associated with the probability of stopping work if working in the informal sector. Although, remittances have been found to positively influence household food security situations in the short term (Akim et al., 2024), the dynamic nature of the shock both from the remittance-receiving and sending countries may imply that households may not find remittances a veritable means to cope with the unemployment shock, particularly if working in the informal sector. Women form a significant proportion of the Nigerian informal sector (Arum and Eze, 2022; Enfield, 2019), if this group are the household heads and perceive COVID-19 as a threat, they are more likely to adhere to the lockdown restrictions; but it is unclear if this response is mainly driven by households' level of awareness of the crises rather than by monetary reasons. It has been shown that women are usually denied the opportunity for higher valued activities in the informal sector, and thus are placed in positions with lower remunerations compared to men (Fapohunda, 2012). Hence, the incentive to continue working might be lower for them when the perceived risk of COVID-19 virus is weighed against the potential remuneration (Linnemayr et al., 2017). Government support, while important appears not to positively influence household responses in the informal sector. Lastly, the result also shows a negative association between receiving private rental income and the probability of stopping work. Within the context of smallholding informal sector occupation, private income may be the last resort of such households who are contextually highly vulnerable to shocks (Balde et al., 2020). Thus, the incentive to protect the flow of such private income at the expense of a public health advisory may be higher (Sacchetto et al., 2020). In summary, with an insignificant effect of remittance on the probability of households who work in the informal sector stopping work, it would appear that remittances from hitherto vulnerable informal households may not be sufficient enough to reduce vulnerabilities in periods of crises. The study by Bonnet et al. (2019) showed that vulnerability within the informal sector might be perpetuated across household members and over time; thus limiting future labour opportunities.

We find interesting results concerning household heads with tertiary education. There is a negative and significant influence of having a tertiary education on the probability of stopping work during the COVID-19 pandemic. One would wonder why educated individuals who should understand the public health risks would likely not stop working. However, the fact that such households are highly educated may reflect them as entrepreneurs with the possibility that they might have introduced some form of innovative marketing activities (Dumitraşciuc et al., 2019). These innovations may preclude daily/regular physical activities with some level of automation and safety measures. Thus, such household heads in principle may not have stopped working during the pandemic. But, we have no way of verifying this with our current data.

3.1.3. Effect of support sources on responses of household working in the formal sector

The formal work sector comprises work in the public or private sector wage employment categories. The marginal effect of support sources on the responses of households working in the formal sector is presented in Figure 4. Government assistance and remittance, though positive, have no significant effect on the probability of households stopping work. However, higher education and having an account with a financial institution have positive effects. Household heads who are female are less likely to stop work compared to males if working in the formal sector. The positive but insignificant results of the effects of government support and remittances on the responses of households working in the formal sector are not unusual as they ensure that welfare outcomes are sustained despite the negative economic situation engendered by the pandemic (Georgieva et al., 2021). This is because households working in the formal sector would likely be individuals predominantly living and working in more metropolitan areas of the country, be highly diverse and have a higher level of awareness of the potential threat of COVID-19. The study by Nwakasi et al. (2022) showed that the perceived threat of the risk of stigmatization from contracting COVID-19 was a factor that supported compliance with government restrictions during the pandemic in Nigeria. Moreover, the possibility of continuous salaries despite the restriction precludes other forms of risky work-related behaviours when compared with those working in the

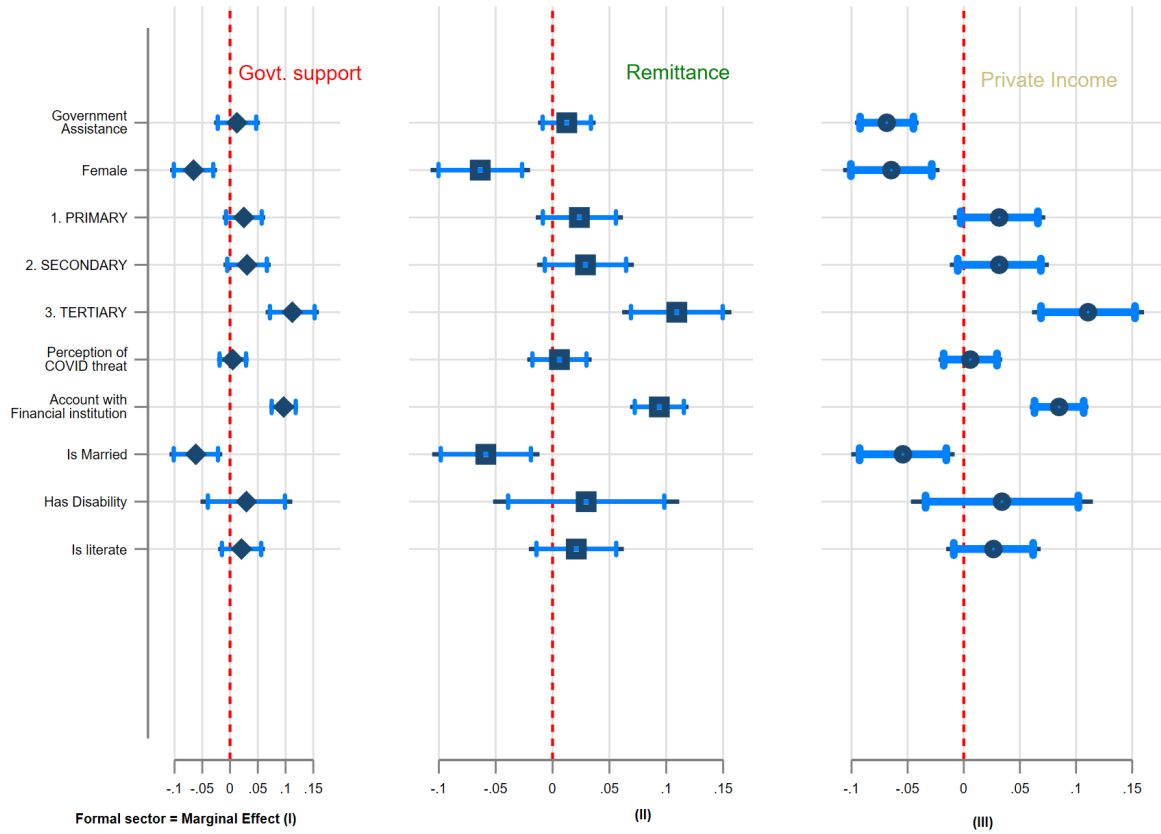


Note: All predictors 0 to 1

Figure 3: Average partial effects of supports on the probability of stopping work during COVID-19 (Informal sector)

less formal sectors (Abeya et al., 2021). Their level of awareness may mean that they are likely to adhere to the stipulated lockdown measures. This level of awareness may have been enhanced by their higher educational status which would have conferred some form of knowledge-seeking and understanding of scientific phenomena (Raghupathi and Raghupathi, 2020). Further exploration of this effect in terms of the location of the households (see Section 3.2.3) validates this assertion. For example, government assistance was significantly associated with the probability of households working in the formal sectors in the urban areas stopping work compared to those living in the rural areas. The higher incidences of the disease were noticed in the urban centres; and thus may inform greater levels of

compliance as compared to those in the rural areas (Greteman et al., 2022; Huang et al., 2021).



Note: All predictors 0 to 1

Figure 4: Average partial effects of supports on the probability of stopping work during COVID-19 (Formal sector)

3.2. Heterogeneous (location) effect of supports on the probability of stopping work during COVID-19

Next, we examined if these effects differ depending on the geographical location of the households. That is, does the source of support matter if the household is located and works in either rural or urban areas? Results are provided in Table 4.

Table 4: Heterogeneous effect (APEs) of support on the probability of stopping work

VARIABLES	Government support						Remittance						Private rental income						
	Agriculture		Informal		Formal		Agriculture		Informal		Formal		Agriculture		Informal		Formal		
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	
Government support	0.12**	0.06**	0.03	-0.04***	-0.06	0.04**													
	(0.06)	(0.03)	(0.04)	(0.01)	(0.05)	(0.02)													
Remittance							-0.04***	-0.06**	0.03	0.00	-0.02	0.04**							
							(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)							
Private rental income													0.19***	0.15***	-0.07***	-0.02	-0.05**	-0.06***	
													(0.02)	(0.03)	(0.02)	(0.01)	(0.02)	(0.02)	
Female	-0.03	-0.16***	0.18***	0.12***	-0.17***	0.02	-0.01	-0.18***	0.18***	0.12***	-0.17***	0.02	-0.02	-0.15***	0.18***	0.11***	-0.18***	0.03	
	(0.03)	(0.04)	(0.04)	(0.04)	(0.03)	(0.03)	(0.03)	(0.05)	(0.04)	(0.04)	(0.04)	(0.03)	(0.03)	(0.05)	(0.04)	(0.04)	(0.03)	(0.03)	
Primary	-0.06	-0.01	0.03	-0.02	-0.03	0.03*	-0.05	-0.01	0.02	-0.02	-0.03	0.03*	-0.06*	-0.01	0.02	-0.03*	-0.03	0.04**	
	(0.04)	(0.03)	(0.04)	(0.02)	(0.05)	(0.02)	(0.04)	(0.03)	(0.03)	(0.01)	(0.05)	(0.02)	(0.03)	(0.03)	(0.04)	(0.02)	(0.05)	(0.02)	
Secondary	-0.07*	-0.10**	0.00	-0.01	-0.06	0.06**	-0.06	-0.09**	-0.00	-0.01	-0.06	0.06**	-0.05	-0.09**	-0.00	-0.02	-0.07	0.07***	
	(0.04)	(0.04)	(0.04)	(0.02)	(0.05)	(0.02)	(0.04)	(0.04)	(0.03)	(0.02)	(0.05)	(0.02)	(0.04)	(0.04)	(0.04)	(0.02)	(0.05)	(0.02)	
Tertiary	-0.08*	-0.12***	-0.07**	-0.05***	0.01	0.14***	-0.08*	-0.12***	-0.07**	-0.06***	0.01	0.13***	-0.07*	-0.11***	-0.07**	-0.06***	0.00	0.14***	
	(0.04)	(0.04)	(0.03)	(0.02)	(0.06)	(0.03)	(0.04)	(0.04)	(0.03)	(0.02)	(0.06)	(0.03)	(0.04)	(0.04)	(0.03)	(0.02)	(0.06)	(0.03)	
Perception of COVID-19 threat	-0.04*	0.02	0.04***	0.00	-0.00	0.01	-0.04*	0.02	0.04***	0.00	-0.01	0.01	-0.04*	0.02	0.04**	0.00	-0.01	0.01	
	(0.02)	(0.03)	(0.02)	(0.01)	(0.03)	(0.02)	(0.02)	(0.03)	(0.02)	(0.01)	(0.03)	(0.02)	(0.02)	(0.03)	(0.02)	(0.01)	(0.03)	(0.02)	
Account	-0.09***	-0.08***	0.02	0.01	0.11***	0.05***	-0.09***	-0.07***	0.02	0.01	0.11***	0.05***	-0.10***	-0.07***	0.03	0.01	0.11***	0.05***	
	(0.03)	(0.02)	(0.02)	(0.01)	(0.03)	(0.02)	(0.03)	(0.02)	(0.02)	(0.01)	(0.03)	(0.01)	(0.03)	(0.02)	(0.02)	(0.01)	(0.03)	(0.01)	
Observations	739	1146	739	1146	739	1146	739	1146	739	1146	739	1146	739	1146	739	1146	739	1146	

Standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

3.2.1. Work sector: Agriculture

Table 4 reveals that access to government support increases the chance of households stopping work when working in the agricultural sector. The effect of government support on stopping work during the COVID-19 pandemic was higher in magnitude for rural residents in the agricultural sector than for urban residents. For example, in rural areas, receiving government support during the lockdown restriction of movement increases the probability of stopping work by 12% compared to 6% in urban areas. Rural agricultural workers were more likely to stop working since there was a break in the supply chain which provided their employment. The health safety guidelines and restrictions meant reduced access to production inputs, supply chain logistics and output markets (Liverpool-Tasie et al., 2022). However, many rural agricultural workers in Nigeria are subsistence in nature and would not likely be open to stop work, except if offered some sort of assistance, e.g., from the government. Disaggregated by gender of household head, results showed that household heads who are female are less likely to stop work if working in the agricultural sector irrespective of their location despite the lockdown restrictions. However, they are significantly more likely to stop work if they have access to government assistance and are in urban areas compared to being in rural areas.

3.2.2. Work sector: Informal

Government assistance, though positive, was found not to be significantly associated with the probability of stopping work for households working in the informal sector in rural areas. In contrast, receiving assistance from the government is significantly negatively associated with the likelihood of stopping work among households in urban areas. These households are 4% less likely to stop working when working in the informal sector. Besides, among workers in the informal sector, household heads were more likely to adhere to the restriction and stop work if they were female, perceived COVID-19 as a threat to human beings and reside in rural areas. Being female and receiving support from the government does not influence the likelihood of stopping work. They are less likely to stop work if they have higher education (tertiary). Contrariwise, being a female household head is significantly positively

associated with the probability (12%) of stopping work in urban areas. These contrasting results appear to show the wide-ranging impact that government public policy can have depending on location and household demography. The informal work sector in Nigeria is mainly dominated by females (Fapohunda, 2012). The negative relationship between government assistance and the probability of stopping work in urban areas is surprising. This is likely because, in the urban areas, the lockdown restrictions meant people had very limited access to essential materials for living and the “artificial” high demands might have triggered informal workers to bypass the lockdown restrictions and continue to supply these essential products and services albeit against the government’s orders.

3.2.3. Work sector: Formal

We find mixed results on the effect of government assistance depending on the location of the household. The effect of government assistance was positively associated with the probability of stopping work for households working in the formal sector in urban areas but there was no significant association if they were in rural areas. However, gender and being married were significantly negatively associated with the probability of stopping work if located in rural areas. At the same time, we observed a positive significant association if the household has an account with a financial institution. A similar result is obtained if the households were located in urban areas, albeit with a lower marginal effect. Government support, for those who received them was credited to recipients’ bank accounts. The positive effect of receiving government assistance and the probability of stopping work is understandable as it is easy to track those transfers more so in urban areas. Moreover, it might have helped to diffuse the usual fear or doubt that often characterises citizen-government relationships in times when the government fails to effectively execute public policies in a way that can engender public trust and credibility. Thus, the positive effect of government assistance on the probability of stopping work in urban areas is not unusual. As expected, education plays a significant role in the likelihood that households adhere to government restrictions imposed during COVID-19. The higher the household heads are educated, the more likely they are to follow the government-stipulated lockdown restriction to stop work when working in the

formal sector in urban areas.

4. Conclusion

In this study, we are interested in examining the impact of the support systems available to households during the COVID-19 lockdown measures on households' responses to the lockdown measures imposed by the government. A household's response is measured as the probability of household members stopping working following the lockdown restrictions. In particular, our interest is in the role that government support, remittances and private rental income played in mediating the responses of households, that is, whether or not to adhere to government-stipulated lockdown measures and stop work. We estimated the marginal effects of the CRE models for the three main predictors of interest - government assistance, remittance and private income from rent across the three different employment sectors. We find mixed results but show evidence that confirms that government support during public crises is vital to supporting household livelihood resilience. Although, this depends on geographical location and the sector of employment. Results showed that receiving government assistance increases the likelihood that households working in the agricultural sector will stop work by 10 percentage points and are 3 percentage points less likely if working in the informal sector. However, this had no significant (though positive) effect among households working in the formal sector. In contrast, remittance was negatively associated with the probability of stopping work in the agricultural sector but positively influenced the chance that households would stop working in the formal sector. Receiving remittances during the COVID-19 lockdown measures had no significant effect on the responses of household members working in the informal sector. Finally, and similar to government support, receiving private rental income increases the likelihood of stopping work for households working in the agricultural sector by 22%. If working in the informal sector, they are 6% less likely to stop work. There was no significant (though positive) effect of access to private rental income among those working in the formal sector. Our results of the role of available support sources across the different employment sectors and locations, though mixed, provide some indications that measures that are available (or not) to households to mitigate livelihood

vulnerability amidst exogenous risks and shocks can hinder or foster the speed of progress towards achieving a global public good where individual actions can have either positive or negative externalities. To be effective, social protection measures during crisis times must recognise the inherently heterogeneous influence of government support and the role that non-government support sources play in enhancing resilience against the shocks and risks that deepen household livelihood vulnerability. Recognising this complexity will support targeted measures that achieve optimal social protection policy outcomes.

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