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Egamberdiev, Bekhzod; Qodirov, Sukhrob

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### Remittance and household resilience capacity in Georgia

### Bekhzod Egamberdiev\* and Sukhrob Qodirov\*\*

\* Department Agricultural Market, Marketing and World Agricultural Trade, Leibniz Institute of Agricultural Development in Transition Economies (IAMO), Theodor Lieser Street 2, 06120 Halle (Saale), Germany, <u>egamberdiev@iamo.de</u>

\* Center for Policy Research and Outreach (CPRO), Westminster International University in Tashkent (WIUT), 12 Istiqbol street, 100047 Tashkent, Uzbekistan

\* German-Uzbek Chair on Central Asian Agricultural Economics (GUCAE), International Agriculture University (IAU), Tashkent, Uzbekistan

\*\* International Agriculture University (IAU), Tashkent, Uzbekistan, <u>Suxrob.Qodirov@student.rau.ac.uk</u>

## Abstract

Climate resilience, which confirms a household's ability to withstand shocks, is an intrinsic element of adapting despite socioeconomic and environmental disturbances or shocks. Climate change and other socio-economic disturbances have given unprecedented "vertigo" to the food sector. In this context, households, as a decision-making unit, are expected to increase their resilience capacity to withstand shocks. Using the "COVID-19 High Frequency Survey 2020-2022" dataset for Georgia by the World Bank, the manuscript aims to measure household resilience capacity to climate change and analyse the effect of remittance on household resilience capacity. The measurement of resilience capacity or Resilience Capacity Index (RCI) is based on the Resilience Index Measurement Analysis (RIMA II) methodology proposed by FAO. Accordingly, RCI is constructed through RIMA proposed pillars: Access to Basic Services (ABS), Assets (AST), Social Safety Nets (SSN), Adaptive Capacity (AC), and Sensitivity (S). Structural Equation Modelling (SEM) is applied to associate pillars with resilience. Using the SEM approach, the findings confirm that ABS, AST and AC pillars have a significant and positive association with RCI. The estimations confirm that remittance-receiving households are likely to experience higher levels of ABS, AC, and RCI. The findings are particularly important for enhancing the resilience thinking approach to formulating policy objectives and interventions that should inevitably improve or strengthen household resilience capacity.

Keywords: Resilience capacity, climate change, remittance, propensity score matching

### 1. Introduction

Climate change, socio-economic challenges, and political disability have reached unprecedented intensity and complexity. Many developing countries, including the post-Soviet Caucasus region, have been experiencing adverse consequences affecting household well-being (Elizbarashvili et al., 2017; Shatberashvili et al., 2024; Tashilova, Ashabokov, Kesheva, & Teunova, 2023; Vinogradova, Gracheva, & Belonovskaya, 2018). Moreover, post-Soviet countries are facing with the different climate change scenarios, political instability, and sociocultural changes (Ferenčuhová, 2020; Matiiuk, Poškus, & Liobikienė, 2020; Newell & Henry, 2016; Salahodjaev & Isaeva, 2024). In addition, the regions actively continue to deplete available natural resources, changing the natural, economic, social, and political environment in the region. The situation has also created formidable obstacles, exacerbating many households in rural areas. Socioeconomic and political discourse and research have given impetus to the importance of resilience in post-Soviet countries. Climate resilience, confirming a household's ability to withstand shocks, is an intrinsic element to adapt despite socioeconomic and environmental disturbances or shocks.

Georgia, experiencing the growing picture of regional variations, is facing socioeconomic, political, and environmental dynamics (Loveluck et al., 2024). In this context, many findings reaffirmed the importance of climate-resilient development in handling climate change problems (Großmann, Flaute, Lutz, Hohmann, & Banning, 2023). The situation has given unprecedented "vertigo" to the food sector in the context of climate change and the post-pandemic regime. In this context, households, as decisionmaking units, are expected to increase their resilience capacity to withstand shocks. The adverse consequences of shocks and stresses should not deteriorate the worsened food security conditions. For example, evidence from 35 developing countries unequivocally confirmed that resilience is an intrinsic element of achieving stable food security conditions (d'Errico, Pinay, Jumbe, & Luu, 2023). In the response, there is a strong belief that resilience-building mechanisms are pronouncedly efficacious in mitigating the adverse effects of shocks (Bekhzod Egamberdiev, 2021; Sunday, Kahunde, Atwine, Adelaja, & George, 2023). Therefore, the concept has been prominently applied to climate change scenarios referring to climate resilience (Hussain, Islam, Ahmed, Haq, & Islam, 2021). Discussions analysing climate change and food insecurity resilience in post-Soviet countries accentuate the importance of agriculture, non-farm income or income diversification, migration, and improved safety nets (Ambros & Granvik, 2020; Barrett, Feola, Khusnitdinova, & Krylova, 2017; Wegren, Nikulin, & Trotsuk, 2023; Wheeler, 2018).

This study aims to analyse the relationship between remittance and household resilience since there are many unknowns about the mechanism of remittance in building or strengthening household resilience capacity. In this case, the manuscript makes several contributions to the existing literature. For example, it explains the role of remittance for enhancing or building household resilience capacity in the context of Georgia, which largely depends on the level of remittance for economic well-being. In addition to this, the manuscript aims to explain the mechanism how remittance changes the level of resilience. In other words, the manuscript focuses on the role of remittance for improving resilience indicator or pillars. Since the whole country witnessed COVID-19 pandemic regime, many households suffered from the income decline and other socio-economic challenges. Since there are limited attempts analysing household resilience in the scenario of COVID-19 pandemic regime, our findings might be useful for the intervention program and policy decisions to make resilience enhancement more rigor.

Georgia is a country in the South Caucasus. In recent years, it has been facing significant problems related to climate change. Air pollution, heat waves and other extreme weather conditions affect not only the health of the individuals but also the economy and agriculture. The concentration of PM2.5 is four times higher than the WHO's annual recommended limit, as provided by Sandra (2023). Georgia's poor socioeconomic conditions have led to households relying on remittances for generations (Sandra, 2023). Remittances have a growing impact on Georgia's economy each year. The findings confirmed that

remittances reached 2.3 billion USD in 2022, accounting for around 9% of Georgia's GDP (UNDP, 2023). During the COVID-19 pandemic, remittances became the primary source of foreign currency inflows, surpassing exports (Abidi, Akhbari, Hlayhel, & Sakha, 2023). Findings indicate that a majority of remittances are used in rural areas of Georgia (Gerber & Torosyan, 2013). Given unprecedented climate change scenarios, households should maintain livelihood through improved resilience capacity in Georgia (Loveluck et al., 2024).

### 1.1. Remittance and resilience mechanism

Most of the findings gave prominence to the importance of remittance for household adaptive capacity in the presence of climate change (Ali, Khan, Khan, & Ali, 2023; Musah-Surugu, Ahenkan, Bawole, & Darkwah, 2018; Ober, 2019; Yograj, 2017). A more fervent attempt to explain the importance of remittance is noticeable in strengthening or building social resilience (Adger, Kelly, Alexandra, Luong Quang, & Catherine, 2002; Sikder & Higgins, 2017). A plausible explanation is that remittance-receiving households can reconfigure household settings by encouraging education, networking, and other social aspects of livelihood. Another major channel to improve household resilience is explained by the fact that households receiving remittances may spend on education and competitiveness (Acharya & Leon-Gonzalez, 2014; Gyimah-Brempong & Asiedu, 2015; Hristev, Mincu, Sandu, & Walewski, 2009). Such circumstances may inevitably create a condition that is veritable to achieve human development in the long-term (Contreras, 2013). Moreover, the role of remittance as a coping strategy to improve household resilience is not trivial because the findings by Giannelli and Canessa (2022) confirmed that household experiencing shocks intensity activate migration option to compensate for the incurred losses. Therefore, increased resilience in the presence of intensified shocks is likely to moderate the effect of chocks (Sodokin & Nyatefe, 2021). Although the contribution of remittance is intricately linked to resilience, findings by Dey, Ahmed, Tareque, and Moniruzzaman (2024) concluded that remittance positively effects land position and financial stability. Balanced intrahousehold resource allocation between males and females even may provide more efficacious outcomes in achieving human capital development (Pickbourn, 2016). Therefore, gender dynamics in remittance use is of particular importance to using remittance effectively (Lopez-Ekra, Aghazarm, Kötter, & Mollard, 2011; Teye, Awumbila, & Keseboa Darkwah, 2024). However, the findings confirmed that remittance is indispensable, with the caveat that it may not be effective in increasing vulnerability (Le De, Gaillard, & Friesen, 2013).

In Eastern Europe, remittance is one of the household instruments used to mitigate the adverse effects of shocks (Incaltarau & Pascariu, 2019). For example, findings from the former Soviet Union countries confirmed that the ubiquity of remittance-supporting policies in the countries is due to its ability to decrease poverty (Gurbanov, Mammadrzayev, & Isgandar, 2021; Ur Rehman & Hysa, 2021; Valiyev & Valehli, 2022), indicating remittance-growth relationship in developing countries (Eggoh, Bangake, & Semedo, 2019; Feeny, Jamsiraroj, & McGillivray, 2014; Siddique, Selvanathan, & Selvanathan, 2012). However, remittances in the region, particularly in the Russian Federation, are very susceptible to socioeconomic shocks and stresses (Mack, Henebry, & Mongeon, 2021). Studying from the context of Central Asia, Bekhzod Egamberdiev (2024) confirmed that remittance stimulates both household resilience capacity and social capital. Similarly, other studies from the context of Central Asian countries confirmed that remittance and migration are the determinants of income diversification and household resilience capacity (Bekhzod Egamberdiev, Bobojonov, Kuhn, & Glauben, 2023; Bekhzod Egamberdiev, Bobojonov, Kuhn, Glauben, & Akramov, 2024a). Findings from Moldova also confirmed a weak but positive relationship between remittance and resilience, moderated by the improvement of agriculture (Piras, Vittuari, Möllers, & Herzfeld, 2018); therefore, a relationship between remittance and resilience can be strengthened through diversification in farming operations (Piras, Botnarenco, Masotti, & Vittuari, 2021).

The study, analysing the "Georgia on the Move" survey, confirmed that remittance from the migration is likely to amplify household economic performance and well-being (Gerber & Torosyan, 2013). A channel to improve economic performance is mostly due to increased income and consumption smoothing (Abduvaliev & Bustillo, 2020). However, another study confirmed a negative relationship between remittance and economic growth (Uzagalieva & Menezes, 2009). This negative relationship may create a formidable obstacle against left-behind females from participating in the labour market (Berulava, 2019; Torosyan, Gerber, & Goñalons-Pons, 2016). In addition, remittance in rural areas is indispensably important to increase agricultural productivity linked with household resilience capacity (Chandio et al., 2023; Li, Wang, Segarra, & Nan, 2013; Liu, Amin, Rasool, & Zaman, 2020; Mack et al., 2023; Maharjan, Bauer, & Knerr, 2013; Paudel, Nguyen, & Grote, 2025; Wonyra & Ametoglo, 2020). The findings by Ali et al. (2023) clearly delineate how migration and remittance improve household adaptive capacity and climate change resilience. A focal point to strengthen the relationship between remittance and agricultural development is explained by the adoption of agricultural intensification technologies (Karki Nepal, Nepal, & Bluffstone, 2023). This is especially true for households to invest a part of savings from remittance as a mitigating strategy in the face of shocks (Banerjee, Hussain, Tuladhar, & Mishra, 2019). The extent of the effect depends on the socio-economic conditions in the country. For example, Incaltarau and Pascariu (2019) confirmed that remittance has a mitigating effect when political conflicts negatively affect resilience. In addition, households enduring the shocks and stresses may diversify livelihood through remittance (Abdelali-Martini & Hamza, 2014; Biswas & Mallick, 2021; Davis & Lopez-Carr, 2014; Habib, Ariyawardana, & Aziz, 2023; Salam & Bauer, 2022; Sikder, Higgins, & Ballis, 2017).

# 2. Data and Methods

### 2.1 Data

The World Bank together with the Swedish International Development Cooperation Agency (Sida) and Caucasus Research Resource Centers (CRRC) initiated the "COVID-19 High Frequency Survey 2020-2022" survey for several years (CRRC, 2021). This manuscript uses the Wave 8 collected in December 2022. The survey includes around 2000 respondents who participate in the survey based on phone-interview with application of Computer Assisted Telephone Interview (CATI) and random digit dialling (RDD). Data includes 11 regions (Map-1).



Mape-1: Response rate across the regions of Georgia

### 2.2 Household Resilience Capacity Measurement

Resilience as household capacity is measured through the methodology proposed by Alinovi, Mane, and Romano (2008). This methodology was later known as Resilience Index Measurement Analysis (RIMA) by FAO. According to the RIMA approach, resilience or Resilience Capacity Index (RCI) is constructed from different household response alternatives or pillars (determinants of resilience): Access to Basic Services (ABS), Assets (AST), Social Safety Nets (SSN), Adaptive Capacity (AC), and Sensitivity (S) (FAO, 2016). According to the study, the measurement of RCI is done through a two-stage factor analysis in which the pillars are measured in the first stage. Therefore, each pillar was predicted through Bartlett's scoring method (Bartlett, 1937):

$$\Gamma^{-1}\Lambda'\Psi^{-1}X$$

$$\Gamma = \Lambda' \Psi^{-1} \Lambda$$

In the second stage, the manuscript applied Structural Equation Modelling (SEM):

$$R_h = f(ABS_h, AST_h, SSN_h, AC_h, S_h) + \varepsilon_h$$
3

Since obtained pillar and resilience scores are not standardized, min-max scaling approach is applied:

$$RCI^* = (RCI - RCI_{min})/(RCI_{max} - RCI_{min})$$
4

#### 2.3 Estimation Strategy

It is obvious that the randomized experimental method is helpful in detecting causal inferences by randomly assigning observations to different groups (Imbens & Wooldridge, 2009). However, a randomized experimental method is not always possible due to ethical concerns, reproducibility, and other factors. However, observational studies suffer from the lack of controlling confounding variables that can affect independent and dependent variables (Cochran & Rubin, 1973). In this case, the propensity score matching (PSM) analysis is useful because it allows estimating the probability that observations receive the treatment by controlling cofounding variables. Various PSM approaches are suggested to overcome causal effect problems (Rosenbaum & Rubin, 1983). One such method is the treatment-effect estimation that is based on observational data (Abadie & Imbens, 2016). Initially, the PSM method for the effect of remittance was applied to control the self-selection bias. PSM was proposed to reduce the bias with observational study, which mainly compares the object of the outcome with and without treatment. In the estimation strategy, the potential outcome is expressed by  $y_{\tau}$  with  $\tau \in \{0, 1, ..., K\}$ . In the strategy,  $y_{oh}$  is the outcome of household h when it does not receive the treatment (remittance). Alternatively,  $y_{kh}$  represents the potential outcome for the household h if it receives the treatment (remittance receiving households). In the estimation, the manuscript also aims to receive, the Potential Outcome Mean (POM):

$$POM = E(y_{\tau})$$
 5

In the following stage, another preferred parameter used is the *Average Treatment Effect (ATE)*, defined by:

$$ATE = E(y_{kh} - y_{oh}) \tag{6}$$

According to Equation-6, ATE represents the average difference between treated households or remittance receiving households and the non-treated ones (those who did not receive remittance). However, omitted variable bias may exist due to the possibility of having a correlation between unobserved heterogeneity and treatment or outcome variables. The manuscript also includes two main assumptions: overlapping and conditional independence. In the linear function, the outcome model is defined through:

$$y_0 = x\beta_0 + \varepsilon_0 \tag{7}$$

$$y_1 = x\beta_1 + \varepsilon_1 \tag{8}$$

$$y = \tau y_1 + 1 - \tau y_0$$
 9

$$\tau = \begin{cases} 1 \text{ if } w\delta + \eta > 0 \\ 0 \text{ otherwise} \end{cases}$$
10

where w represents covariates to determine treatment. While  $y_0$  and  $y_1$  are not observed, y, x, w, and  $\tau$  are observed. The random disturbances are defined by  $\varepsilon_0$  and  $\varepsilon_1$ .

For the estimation, the manuscript uses three multivalued estimations for the treatment effect: Regression adjusted estimator (RA), Inverse probability weighting (IPW), and Inverse-probability weighted regression adjustment (IPWRA). In this case, IPW creates a synthetic population by assigning the treatment independently. IPW uses the three-step approach to obtain the treatment effect estimations. The first step is to estimate the propensity score model in which the likelihood of receiving treatment with the given observed covariates is estimated. The second step is used to estimate the outcome by using separate regression models for the treatment level that allows estimating the treatment-specific predicted outcomes. The last step is used to obtain the outcome model and the IPW, in which the step augments the inverse probability weighting estimator. IPWRA also uses a three-step approach for the estimation. The first step is used to estimate the propensity scores by computing the IPW. The second step is used to estimate the treatment-specific predicted outcomes by using the weights measured in the first step; therefore, this step allows to account for covariate differences between the treatment and control groups. The last step is used to estimate the ATE. In this case, both AIPW and IPWRA are considered "double robust" methods because of their consistent estimation of treatment effect (Bang & Robins, 2005; Imbens & Wooldridge, 2009). These methods successfully combine inverse probability weighting (IPW) and regression adjustment (RA) components; therefore, the methods are double robust with correctly specified models to obtain unbiased estimator. In this case, I consider that both AIPW and IPWRA estimators are "double robust" since the overlap assumptions are satisfied (Figure 1).



Figure-1: Kernel density for overlapping assumption

### 3. Results

Table 1 shows the descriptive analysis, including variables, definitions, and a t-test to determine the difference in observed variables between remittance receivers and non-receivers. The table shows that RCI is relatively higher among remittance receivers (0.818), and the association is statistically significant. The data also reveals that remittance receivers have higher levels of AST and ABS, making up 0.913 and 0.825 at their mean level, respectively. However, the extent of the relationship between remittance and AST is not statistically significant. Interestingly, the extent of relationship between remittance and SSN is negative and statistically significant. This result might be due to the role of social capital affecting household resilience capacity (Carmen et al., 2022; Bekhzod Egamberdiev, 2024). Another finding shows that AC among remittance receivers is relatively higher (0.465 at its mean level) compared to non-receiving households. The extent of the relationship is statistically significant mean differences. Generally, the results are congruent with other studies from post-Soviet regions (Bekhzod Egamberdiev et al., 2023; Bekhzod Egamberdiev, Bobojonov, Kuhn, Glauben, & Akramov, 2024b).



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Figure-2: Resilience Capacity Index (RCI)
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Findings in Figure 2 indicate that ABS is the most relevant pillar in improving RCI. ABS, defined by the availability of water, heating, and internet facilities in the household, shows the significance of the contribution to improving household resilience. Another significant pillar is related to assets or AST. AST, including different types of household (unproductive) belongings, generally represent unproductive assets in Georgian households. AC, including income diversification, education, and the number of adult members in the family, has also positive and significant contribution to improve household resilience (RCI). However, SSN is found to be negatively associated with RCI. This finding is similar to other results found in the context of Central Asia (Bekhzod Egamberdiev et al., 2023). According to the authors, this negative relationship might be due to contradictory relationship between the pillars. For example, improving RCI through ABS might be at the cost of SSN (moving to the city centre for a better household infrastructure facility might be at the cost of losing a bond in the community).

Variable Definition		Pooled Sample		Remittance receivers		Remittance non-receivers		Diff.(t-stat.)
Dependent		Mean	Std.Dev	Mean	Std.Dev	Mean	Std.Dev	
variables								
AC	Adaptive	0.428	0.312	0.465	0.016	0.421	0.007	0.044***
	Capacity							
ABS	Access to Basic	0.735	0.266	0.825	0.010	0.716	0.006	0.108***
	Services							
AST	Assets	0.903	0.179	0.913	0.008	0.901	0.004	0.012
SSN	Social Safety	0.700	0.606	0.606	0.032	0.720	0.014	-0.114***
	Nets							
S	Sensitivity	0.128	0.183	0.117	0.009	0.131	0.004	-0.013
RCI	Resilience	0.738	0.238	0.818	0.009	0.722	0.005	0.096***
	Capacity Index							

Table-1: Resilience difference between remittance receiver and non-reliever groups

The estimates of ATEs for all outcomes are provided in Table 2. According to the findings, the significance and magnitude of effects are generally consistent across models. The most noteworthy difference is found for the ABS and SSN pillars. The results indicate that remittance has a positive effect on ABS, indicating the highest change in the percentage of ATE. The extent of the effect is consistent across other propensity models. However, the extent of the effect on the outcome of SSN is negative. Similar to the above-discussed arguments, the negative relationship between remittance and SSN is mostly due to the structure of safety nets and social capital in households and communities. As expected, the remittance positively affects AC and RCI, and the extent of the effect is statistically significant.

		RA		IF	PW	IPWRA	
Pillar	Treatment	ATE	ATE in	ATE	ATE in	ATE	ATE in
			percentage		percentage		percentage
ABS	Remittance receiver	0.089***	0.118***	0.082***	0.114***	0.085***	0.118***
		(0.012)	(0.019)	(0.013)	(0.019)	(0.013)	(0.019)
AC	Remittance receiver	0.033*	0.079***	0.031*	0.075***	0.034*	0.080***
		(0.018)	(0.043)	(0.018)	(0.044)	(0.018)	(0.043)
AST	Remittance receiver	0.007	0.008	0.009	0.010	0.009	0.010
		(0.010)	(0.011)	(0.009)	(0.010)	(0.009)	(0.010)
SSN	Remittance receiver	-0.084**	-0.118**	-0.038	-0.053	-0.043	-0.060
		(0.037)	(0.051)	(0.036)	(0.051)	(0.036)	().051)
S	Remittance receiver	0.007	0.058	0.012	0.096	0.012	0.096
		(0.011)	(0.087)	(0.012)	(0.094)	(0.012)	(0.095)
RCI	Remittance receiver	0.073***	0.101***	0.071***	0.098***	0.074***	0.102***
		(0.011)	(0.016)	(0.012)	(0.017)	(0.011)	(0.016)

Table-2: Causal relationship between remittance and household resilience

Note. \*p < 0.10; \*\*p < 0.05; \*\*\*P < 0.001; Standard errors in parentheses

### 4. Conclusions

The analysis is based on the data which is aimed for the socio-economic situations of the household in the case of COVID-19 shocks by the World Bank. As for the construction of resilience capacity, the manuscript applied the RIMA approach to measuring household resilience capacity or RCI through the ABS, AST, AC, SSN, and S pillars. Using the SEM approach, the findings confirmed that ABS, AST and AC pillars have a significant and positive association with RCI. The manuscript also includes an analysis of the effect of remittance on RCI. As for the econometric approaches, the treatment-effect models, RA, AIPW and IPWRA, are used to obtain robust estimations. The estimations confirmed that remittance-receiving households are likely to experience higher levels of ABS, AC, and RCI.

Although the manuscript proposes a positive relationship between remittance and resilience, the intervention policies should focus on education in Western countries (Chankseliani, 2018); therefore, such educational integration might be a genuine integration process in the post-Soviet or Caucasian region. The findings generally confirmed that migration remittance can significantly improve household resilience to climate change shocks. It is also indispensably necessary that remittance should also improve household shock readiness through early warning systems (Ali et al., 2023).

The results confirm a positive relationship between remittance and resilience and are helpful for policy implications. First, a positive relationship between resilience capacity or RCI and the ABS and AC pillars indicates that Georgian interventions should consider improving infrastructure and income diversity sources. Further implementations of migration policy should consider that child-parent separation may cause extraordinary family circumstances affecting the education and health of children who stay behind (Cebotari, Siegel, & Mazzucato, 2016, 2018). Although the manuscript has not analysed social capital that can be enriched through remittance, migration and remittance may change social capital structure of the individuals and community (Fomina, 2021). Further studies should consider women's empowerment or gender equality perspectives shaping both household remittance and resilience. For example, findings from the context of Central Asia confirmed that there are interlinkages between resilience, gender inequality and household coping mechanisms (Bekhzod Egamberdiev et al., 2024b; Nazridod, Pereira, & Guerreiro, 2021). There has been increasing attention on the security and stability of Eastern Europe, Caucasus, and other post-Soviet countries; therefore, findings on stability and security may corroborate the discussions about remittance (Pascariu & Rouet, 2019). Moreover, there have been limited attempts to discuss migration policies. For example, Heleniak (2016) found that there were different evolutions to implement the migration policies. Further studies also should consider the inclusion of financial services in the context of increasing remittance. For example, discussions delineated the mechanism of inclusive financial services to enhance resilience capacity (Appavoo, 2024; Hussain et al., 2021). As for the econometric challenge to deal with the problem of endogeneity, it is recommended to control the effect of unobserved variables. For example, instrumental variables with unobserved heterogeneity in treatment effects might be a solution to circumvent the problem of endogeneity in the observational data (Appavoo, 2024).

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