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Impact of shocks on Vietnamese farm household income

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Abstract

This research uses the "Viet Nam Access to Resources Household Survey" (VARHS) data set in 2018 to analyze the impact of shocks on rural household income in Vietnam. In addition, ArcGIS software is applied to illustrate income differentiation and the impact of natural disaster shocks on localities throughout the country. The results indicate a household average monthly income difference between economic sectors. Households affected by natural shocks and epidemic shocks have an average income lower than unaffected households. In contrast, households experiencing an economic shock have an average income higher than unaffected households.

Keywords: household income, economic shocks, epidemic shocks, natural shocks.

JEL classification: D13, I32, O15, Q12, Q54.

1. Introduction

Vietnam is located in the tropical monsoon region, often exposed to many types of extreme weather. Vietnam is one of the countries most severely affected by climate change, especially in agricultural production (World Bank, 2009; Trinh *et al.*, 2021). Deep international integration creates a fast and strong transmission channel of shocks to the domestic economy. The shock caused by the COVID-19 pandemic has left extremely serious

consequences for the Vietnamese economy. At the same time, a fundamental challenge that rural households in Vietnam face is how to maintain consumption levels when faced with shocks that affect income. These shocks can affect the welfare of farming households through negative impacts on farm income, on farm assets, and on the health of farm household members. Therefore, it is really necessary to assess the impact of shocks on the income of Vietnamese farming households.

Shocks are not only defined differently based on their magnitude but also depend on the resources and insurance mechanisms of the household as well as the severity and frequency of the shock (Gaiha and Imai, 2004). Shocks are defined as events that are beyond the control of an individual and often occur with unexpected responses (Shehu and Sidique, 2015). Moreover, they are adverse events that lead to loss of household income, reduction in consumption or loss of productive assets (Dercon *et al*., 2005). In terms of scope and scale of impact, shocks are classified into two types: a) shocks that affect the entire community and its members to varying degrees such as: war, drought, storm, flood, fire, famine, epidemic or collapse of a market...; b) shocks affecting individuals and households such as: accidents, death of family members or valuable livestock, disasters, job loss, etc. (Chambers *et al*., 1992). In terms of sectors, shocks are divided into three types: economic (hyperinflation, recession, price instability, crop failure, supply shocks, etc.); natural (natural disasters such as floods, earthquakes, tsunamis, droughts, etc.); and epidemics (Khai and Nguyet, 2024).

Vulnerability reflects the lack of resilience to these shocks, leading to welfare losses that exceed socially acceptable standards (Narayan *et al*., 2001). Fisher *et al*. (2021) pointed out that climate shocks can reorganize socio-ecological linkages in food production, leading to sudden loss of key products in the food system. Indeed, households often experience shocks under specific conditions, leading to a particular decline in income. Without sufficient assets or mechanisms to help a household mitigate the impact of income shocks, their welfare may be irreparably damaged, leading to permanent poverty. Albert and Ramos (2010) found that changes in income and consumption can be considered as proxy indicators of vulnerability. FANRPAN (2011) also found that shocks to human capital (natural assets, physical assets, human assets, financial assets, and social assets) increase vulnerability and reduce household income. Low vulnerability can be understood as households being able to adapt to shocks and maintain their livelihoods with minimal changes. As a result, they need less external support to cope with these changes. Moderately vulnerable households are those that are severely affected and need emergency but only temporary support to cope and recover from the shock. Highly vulnerable households are those that are considered to be in an emergency situation and are in a state of irrecoverability and can only recover with long-term, specialist support.

2. Research methodology

To examine the factors influencing the income of farm households in Vietnam, regression analysis was conducted. This approach allows for the identification of relationships between the dependent variable (household income) and various independent variables, representing demographic, socio-economic, and shock-related factors. The regression model is based on a linear regression framework and is represented by the following equation:

$$ln(Income_i) = \beta_0 + \beta_1 NaturalShock_i + \beta_2 EpidemicShock_i + \beta_3 EconomicShock_i + \beta_4 Age_i + \beta_5 Gender_i + \beta_6 Ethnicity_i + \beta_7 Single_i + \beta_8 Widowed_i + \beta_9 Divorced_i + \beta_{10} HouseholdSize_i + \beta_{11} Dependent_i + \beta_{12} Education_i + \beta_{13} WageEarner_i + \beta_{14} AgriWorker_i + \beta_{15} NonAgriWorker_i + \beta_{16} Extractor_i + \beta_{17} Houseworker_i + \beta_{18} Social_i + \beta_{19} Credit_i + \epsilon_i$$

where $Income_i$ denotes the average per capita monthly income of Vietnamese farm household i, measured in 1,000 VND; β_0 is the regression constant, and $\beta_1, \beta_2, ..., \beta_{19}$ are the regression coefficients associated with each of the explanatory variables (detailed in Table 1). ϵ_i denotes the error term, which accounts for unobserved factors affecting household income.

TABLE 1: **Basis for variable selection in the research model**

Variables	Description	Basis for selection	Expected sign
NaturalShock	Equals 1 if the household is affected by a natural disaster shock; 0 otherwise	Khai and Nguyet (2024)	–
EpidemicShock	Equals 1 if the household is affected by an epidemic shock; 0 otherwise	Khai and Nguyet (2024)	–
EconomicShock	Equals 1 if the household is affected by an economic shock; 0 otherwise	Khai and Nguyet (2024)	–
Age	Age of the household head (years)	Okurut (2006); Nguyen and Bui (2011); Mai (2016); Tran *et al*. (2022)	+
Gender	Gender of the household head. Equals 1 if female, 0 otherwise	Mai (2016)	–
Ethnicity	Ethnicity of the household head. Equals 1 if Kinh, 0 otherwise	Tran *et al*. (2022)	+
Single	Equals 1 if the household head is single, 0 otherwise	Khai and Nguyet (2024)	–
Widowed	Equals 1 if the household head is widowed, 0 otherwise	Khai and Nguyet (2024)	–
Divorced	Equals 1 if the household head is divorced, 0 otherwise	Khai and Nguyet (2024)	–
HouseholdSize	Number of household members	Nguyen and Bui (2011); Tran *et al*. (2022)	–
Dependent	Number of dependents in the household	Nguyen *et al*. (2011)	–

Variables	Description	Basis for selection	Expected sign
Education	Educational attainment of the household head (0-12 years)	Nguyen and Bui (2011); Tran *et al*. (2022)	+
WageEarner	Number of salaried workers in the household	Khai and Nguyet (2024)	+
AgriWorker	Number of household members engaged in agricultural work	Khai and Nguyet (2024)	–
NonAgriWorker	Number of household members engaged in non-agricultural business	Khai and Nguyet (2024)	+
Extractors	Number of household members exploiting common resources	Khai and Nguyet (2024)	+
Houseworker	Number of household members doing housework	Khai and Nguyet (2024)	+
Social	Equals 1 if the household participates in social activities; 0 otherwise	Nguyen *et al*. (2011)	+
Credit	Equals 1 if the household has taken a loan; 0 otherwise	Nguyen and Bui (2011); Tran *et al*. (2022)	+

Secondary data were sourced from the 2018 Vietnam Rural Household Access to Resources Survey (VARHS), which provides comprehensive insights into rural households in Vietnam. Specifically, the 2018 VARHS encompasses a sample of 2,965 rural households distributed across five distinct regions of Vietnam (Table 2). These regions include twelve provinces: the Hong River Delta (Ha Tay); the Northern Uplands, which comprises four provinces - Dien Bien, Lai Chau, former Lao Cai, and former Phu Tho; the Central Coast, represented by three provinces - former Khanh Hoa, Nghe An, and Quang Nam; the Central Highlands, including the provinces of former Dak Lak, Dak Nong, and former Lam Dong; and the Mekong River Delta, represented by Long An province. Among these regions, the Northern Uplands had the largest proportion of the surveyed sample, with 1,361 households, accounting for 45.9 percent of the total sample size. In contrast, the Mekong River Delta had the smallest representation, with 191 households, making up 6.44 percent of the total surveyed population.

The dataset encompasses a wide range of variables critical for the study, including demographic factors such as age, ethnicity, gender, and education level of household members. Additionally, it includes household-specific attributes like family size, access to credit, and the occurrence of various shocks. These shocks are categorized into several types: natural shocks (e.g., floods, droughts), epidemic-related shocks (e.g., outbreaks of disease affecting livestock or crops), and economic shocks (e.g., market fluctuations, price volatility). This rich set of data provides a valuable foundation for understanding the complex relationship between different shock events and their effects on the income levels of rural households in Vietnam.

TABLE 2: **Survey sample distribution by province in VARHS 2018**

Province	Frequency (Households)	Percentage (%)
Hong River Delta (Ha Tay)	357	12.04
Northern Uplands	1,361	45.90
Dien Bien	383	12.92
Lai Chau	385	12.98
Former Lao Cai	341	11.50
Former Phu Tho	252	8.50
Central Coast	432	14.57
Former Khanh Hoa	47	1.59
Nghe An	175	5.90
Quang Nam	210	7.08
Central Highlands	624	21.05
Former Dak Lak	300	10.12
Dak Nong	262	8.84
Former Lam Dong	62	2.09
Mekong Delta (Long An)	191	6.44
Total	**2,965**	**100.00**

Source: VARHS, 2018.

3. Results and discussion

The average monthly income of rural households nationwide was approximately 11,514 thousand VND (Table 3). However, the data reveals a wide disparity in income levels, with the minimum reported income being just 86.67 thousand VND and the maximum reaching as high as 2,318,810 thousand VND. This significant range indicates a high degree of income inequality among rural households. The Hong River Delta stands out as the region with the highest average monthly income, reaching nearly 24,954 thousand VND. This figure is more than double the national average, reflecting the region's strong economic performance and higher levels of rural development. In contrast, the Northern Uplands and the Central Coast recorded considerably lower averages, at 7,827.49 and 8,805.13 thousand VND, respectively. These figures are well below the national mean, emphasizing the economic challenges that persist in these areas. The Central Highlands reported an average income of 11,741.86 thousand VND, which is slightly above the national average. Meanwhile, the Mekong River Delta showed relatively high-income levels at 18,042.42 thousand VND, second only to the Hong River Delta.

TABLE 3: **Average monthly income of rural households in VARHS 2018**

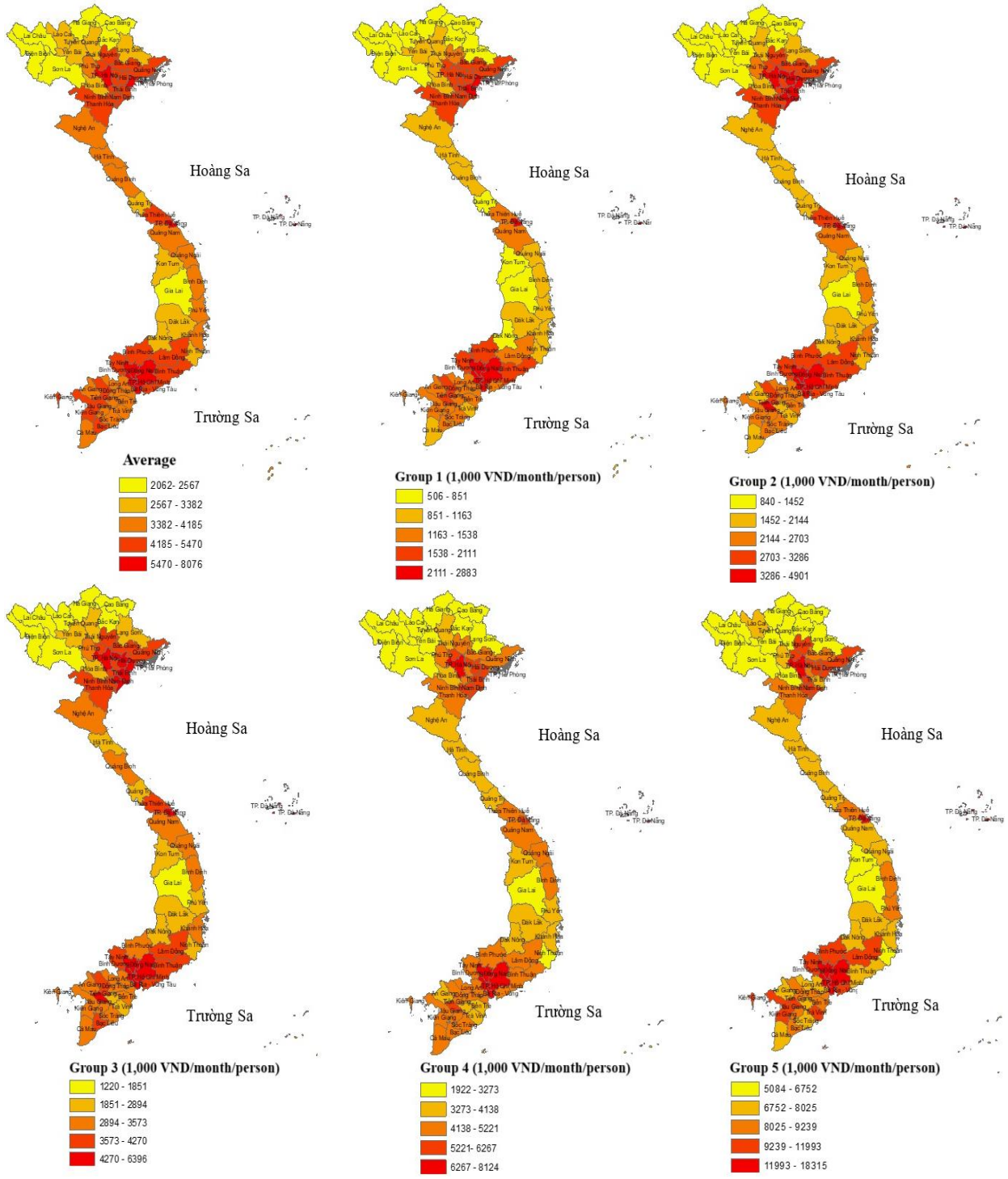
Unit: 1,000 VND

Region	Average	Min	Max
Vietnam	11,513.84	86.67	2,318,810
Northern Uplands	7,827.49	286.25	1,513,210
Hong River Delta	24,953.71	86.67	2,318,810
Central Coast	8,805.13	358.33	190,074
Central Highlands	11,741.86	88.50	166,958
Mekong River Delta	18,042.42	1,976.67	96,483

Source: VARHS, 2018.

The disparity in average per capita monthly income across different localities in Vietnam is clearly demonstrated in Figure 1. In 2022, both the overall average income and the incomes across all five quintiles were significantly higher in the Hong River Delta, the Mekong River Delta, and the Southeast region. In contrast, income levels showed a gradual decline in the Northern Uplands, the Central Highlands, and the Central Coast. Notably, the provinces and cities with the highest average per capita monthly incomes were Binh Duong, Hanoi, and former Ho Chi Minh City, with figures of 8,076 thousand VND, 6,423 thousand VND, and 6,392 thousand VND, respectively. These localities reflect the concentration of economic activity and urban development, particularly in the industrial and service sectors. On the opposite end of the spectrum, Son La (2,141 thousand VND), Dien Bien (2,080 thousand VND), and Ha Giang (2,062 thousand VND) - all located in the Northern Uplands - recorded the lowest average per capita incomes in the country. This regional variation highlights persistent economic inequalities and underscores the need for targeted development strategies to enhance income levels in less developed and geographically disadvantaged provinces.

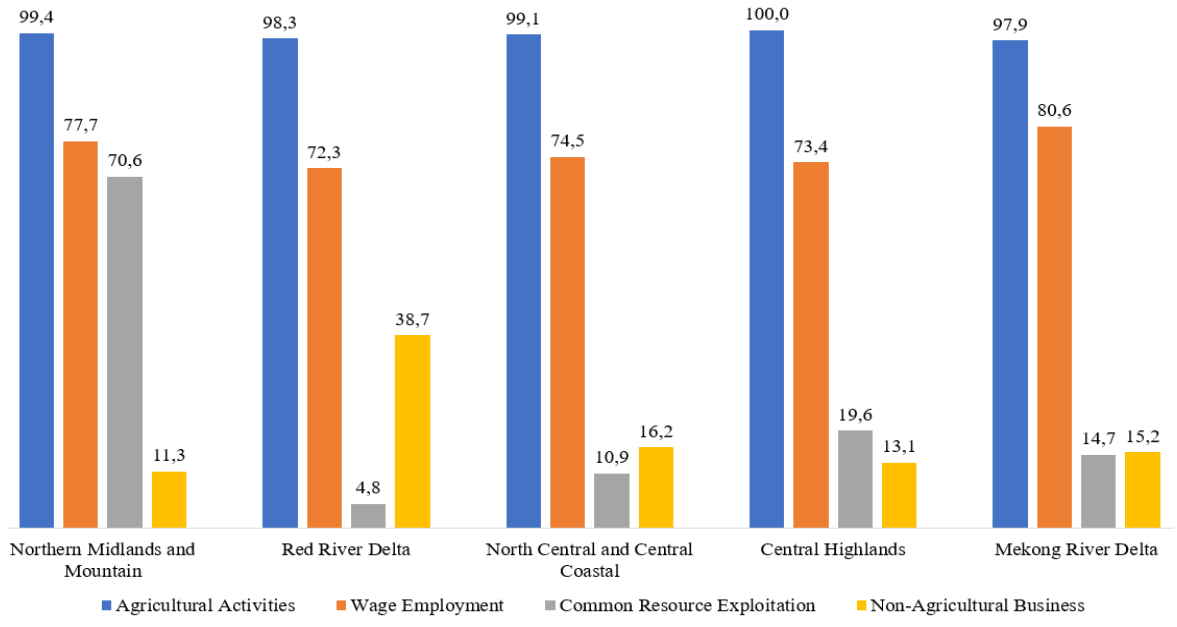
FIGURE 1: **Average monthly income per capita at current prices by five income groups and by locality in 2022**



Source: Vietnam's General Statistics Office (2023).

Figure 2 illustrates the distribution of household livelihood activities across five regions in Vietnam. These activities were classified into four categories: agricultural activities, wage employment, exploitation of common resources, and non-agricultural business activities. Agricultural activities were the primary source of income in all surveyed regions, with participation rates ranging from 97.9 percent to 100 percent. Nevertheless, notable regional variations were observed in the diversification of livelihoods beyond agriculture. The Hong River Delta and Mekong River Delta exhibited greater structural transformation, characterized by higher levels of engagement in wage employment and household business activities. Wage employment served as a key indicator of labor market development. The Mekong River Delta displayed the highest rate of wage employment (80.6 percent), suggesting a higher degree of integration into industrial and service sectors. The exploitation of common resources was most prevalent in the Northern Midlands (70.6 percent) and the Central Highlands (19.6 percent), indicating potentially limited access to alternative livelihood options and sustained pressure on natural resources. In contrast, the Hong River Delta reported the lowest reliance on common resources (4.8 percent), suggesting a more diversified and sustainable economic foundation. Non-agricultural business activity, often considered an indicator of household entrepreneurial capacity, was most prominent in the Hong River Delta (38.7 percent).

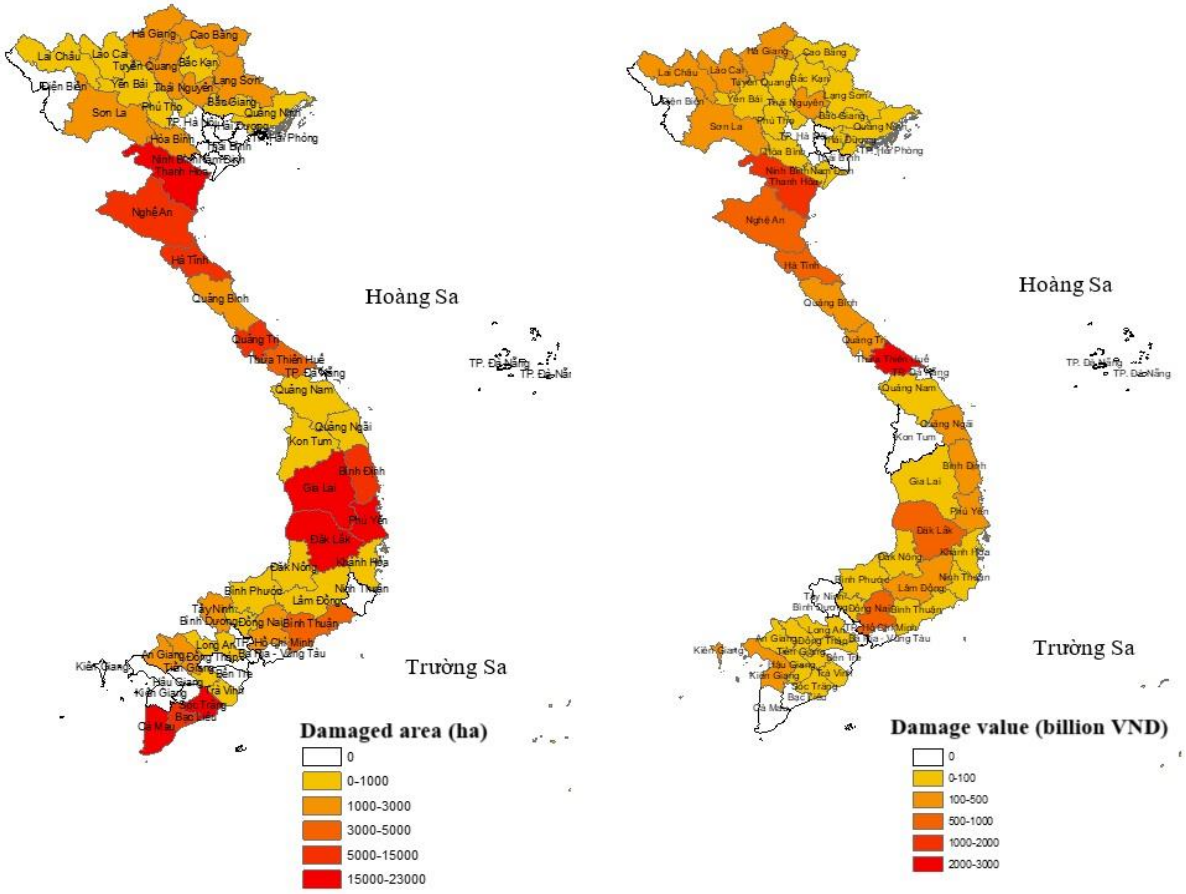
FIGURE 2: **Household income-generating activities**



Source: VARHS 2018.

Natural disasters exerted a substantial impact on agricultural production nationwide, affecting 44 out of 63 provinces and municipalities. The most severely affected agricultural land was concentrated in the Central Highlands and the South Central Coast provinces. Specifically, former Gia Lai and former Dak Lak provinces experienced the most extensive agricultural damage, with 22,656.85 hectares and 22,346 hectares affected, respectively. Within the Mekong River Delta region, former Ca Mau, Soc Trang, and Bac Lieu provinces sustained significant agricultural damage, as depicted in Figure 4. The total estimated value of damage resulting from natural disasters across most provinces and cities in Vietnam, with the aggregate estimated damage exceeding 10,966 billion VND. Households in the Central Coast experienced the most severe impacts in terms of economic value, including Hue (2,566 billion VND), Thanh Hoa (1,499 billion VND), Nghe An (811.5 billion VND), and Ha Tinh (757 billion VND).

FIGURE 3: **Area and value of agricultural damage caused by natural disasters in 2019**



Source: Vietnam's General Statistics Office (2020).

Table 4 presents the frequency, proportion, and estimated financial losses associated with various shock types experienced by rural households in Vietnam. A majority of surveyed households, 65.83 percent, reported no exposure to shocks, indicating a relatively stable livelihood situation for a substantial portion of the rural population in 2018. However, 34.17 percent of households experienced at least one form of shock, with varying economic consequences. Epidemic shocks were the most frequently reported, affecting 15.85 percent of households, with an average estimated loss of 992,440 VND per affected household. This suggests a considerable economic disruption resulting from health-related crises, even before the COVID-19 pandemic. Natural shocks, including floods or droughts, affected 6.54 percent of households, with an average damage value of 917,220 VND. Although less frequent than epidemic shocks, natural shocks represent a recurring vulnerability for rural livelihoods, particularly in susceptible agro-ecological regions. Economic shocks, encompassing price fluctuations, job loss, or reduced remittances, were experienced by 11.77 percent of households and resulted in the highest average loss at 1,931,540 VND. Despite affecting fewer households than pandemic shocks, the significantly greater average loss indicates that economic instability imposes a more substantial financial burden on affected households.

TABLE 4: **Frequency and estimated damage value of shocks**

Shock Type	Frequency (households)	Percentage (%)	Loss value (1,000 VND)
Not affected	1,952	65.83	-
Epidemic shock	470	15.85	992.44
Natural shock	194	6.54	917.22
Economic shock	349	11.77	1,931.54

Source: VARHS 2018.

The regression results presented in Table 5 are statistically robust, with an R-squared value of 0.3811, indicating that approximately 38.11 percent of the variation in household income is explained by the model. The F-statistic is highly significant (Prob > F = 0.0000), confirming the overall fit of the model. Moreover, the average Variance Inflation Factor (VIF) of 1.73 suggests that multicollinearity is not a serious concern among the explanatory variables, ensuring the reliability of the estimated coefficients.

The analysis reveals that natural shocks are significantly and negatively associated with household income. The coefficient for natural shock is -0.1216 ($p < 0.01$), suggesting that households affected by natural disasters earn, on average, 12.16 percent less than unaffected

households, holding other factors constant. This result is consistent with existing literature. For instance, Nguyen K.H. (2020) found that natural disasters reduce per capita income by 4.3 percent and increase the poverty rate by 1.9 percent in affected provinces. Similarly, Phung and Nguyen (2021) demonstrated that under various climate change scenarios, households engaged in agricultural and aquaculture production experience income reductions ranging from 0.982 percent to 17.06 percent, with agricultural producers suffering more substantial losses. The increasing frequency and severity of natural disasters, especially in regions such as the Mekong River Delta where drought and saline intrusion are becoming more frequent (Loc *et al*., 2021), have severely disrupted agricultural productivity and reduced rural household income (Khong *et al*., 2020).

Epidemic shocks are also found to have a statistically significant and negative effect on income. The coefficient for this variable is -0.1968 ($p < 0.01$), indicating that affected households earn 19.68 percent less than their unaffected counterparts. This aligns with findings from Dũng (2020), who, during the African Swine Fever outbreak, reported that 43.3 percent of farm households were severely impacted, with delayed information dissemination contributing to a sharp drop in live pig prices and, consequently, household income. The outbreak, which began in late 2018, led to a 20 - 30 percent decline in the pig population in several Mekong Delta provinces. By 2019, the epidemic had spread across most of Vietnam, significantly reducing livestock income in key agricultural regions such as the Mekong River Delta, Hong River Delta, and North Central Coast (Khai and Nguyet, 2024).

In contrast to natural and pandemic shocks, economic shocks show a statistically significant and positive association with income. The coefficient of 0.1710 ($p < 0.01$) indicates that households reporting economic shocks had incomes 17.1 percent higher than unaffected households. This counterintuitive finding may be explained by the dual nature of economic shocks, which can be either negative (e.g., job loss) or positive (e.g., favorable market conditions). For example, Nguyen T.N. (2020) found that oil price fluctuations positively affected Vietnam's crude oil revenue during 1990-2019. The global drop in oil prices in 2018 led to five domestic fuel price reductions and a reallocation of funds to the petroleum price stabilization fund (Mộc Lan, 2018), which helped boost household welfare, particularly among rural and urban non-agricultural households (Nguyen and Nguyen, 2018). Additionally, inflation has been found to have a long-term positive effect on the VN-Index stock market, potentially increasing resource allocation efficiency and contributing to improved household income (Nguyen and Vo, 2020).

Participation in agricultural activities is negatively associated with household income. The regression results indicate that, on average, each additional household member engaged in agriculture is associated with a 9.03 percent decrease in per capita income, holding all other factors constant. This reflects the ongoing challenges facing the agricultural sector in Vietnam, particularly in the context of climate change. Droughts, storms, and flooding have disrupted farming systems, reduced crop yields, and constrained household earnings, especially in environmentally sensitive regions.

In contrast, engagement in non-farm business activities has a positive and statistically significant effect on income. Households with more members participating in non-agricultural enterprises see an 18.79 percent increase in per capita income. This reflects the broader transformation of rural Vietnam amid industrialization and urbanization, which has led to land use changes, declining agricultural employment, and the expansion of rural non-farm sectors. These dynamics create new employment opportunities, reduce underemployment, and contribute to higher and more stable household incomes in rural areas.

Engagement in common resource extraction is negatively associated with household income, with a coefficient of -0.1154 ($p < 0.01$). This suggests that each additional household member engaged in such activities - such as fishing, hunting, or gathering -reduces household income by 11.54 percent. These forms of livelihood, while essential for subsistence, are generally low-return and often pursued by economically vulnerable households. They reflect a lack of access to higher-income alternatives and a reliance on natural resources for basic consumption rather than market-based income generation.

In addition to the variables discussed, several other factors significantly affect household income. Age, ethnicity, the number of household members, and education level are all positively associated with income, implying that older, more educated individuals from ethnic majority groups, and those living in larger households, tend to earn more. Conversely, the number of dependents, being single, and having access to credit are negatively associated with income. The negative effect of credit access may suggest that loans are often used for coping rather than investment purposes, thereby placing a financial burden on already vulnerable households.

TABLE 5: **Factors affecting household income in Vietnam**

Variables	Estimated coefficient	Standard error	VIF
Constant	76.436	0.0864	
Natural shock	-0.1216***	0.0445	1.05
Epidemic shock	-0.1968***	0.0382	1.09
Economic shock	0.1710***	0.0553	1.03
Age	0.0040***	0.0012	1.34
Gender	-0.0526	0.0562	2.68
Ethnicity	0.3023***	0.0369	2.01
Single	-0.3514**	0.1757	1.04
Widowed	-0.0332	0.0633	2.81
Divorced	-0.0314	0.1110	1.09
Number of household members	0.2728***	0.0142	3.94
Number of dependents	-0.1922***	0.0141	2.17
Education	0.0341***	0.0040	1.48
Wage employment	0.1120***	0.0130	1.37
Agricultural worker	-0.0903***	0.0151	2.32
Non-agricultural worker	0.1879***	0.0205	1.14
Extractors	-0.1154***	0.0133	2.06
Household worker	-0.0096	0.0120	2.16
Participation in social activities	-0.0396	0.0400	1.06
Access to credit	-0.0806***	0.0283	1.04
No of obs = 2,965			
Prob > F = 0.0000			
R-squared (R^2) = 0.3811			
Mean VIF = 1.73			

Note: *** and ** correspond to the significance levels of 1% and 5%, respectively.

Source: Authors' calculations.

4. Conclusion and policy implications

This study, using data from the 2018 VARHS, provides detailed evidence on how different types of shocks influence the income of Vietnamese farm households. Specifically, natural disaster shocks are associated with a 12.16 percent decrease in income, and epidemic shocks are linked to a larger reduction of 19.68 percent, compared to households not exposed to such events. In contrast, households experiencing economic shocks saw a 17.1 percent increase in income. These findings emphasize the significant vulnerability of rural livelihoods to unpredictable natural and health-related events, especially considering the average monthly income of 11,513.84 thousand VND and the high level of income inequality in rural areas. To address these challenges, several policy measures are necessary.

Firstly, local authorities should strengthen public awareness of natural disasters and their consequences through various communication channels, including newspapers, radio, television, and the internet. Educational campaigns can help inform rural communities about preventive measures and response strategies, enhancing their ability to cope with future events. Alongside this, early warning systems should be improved to provide timely and accurate information, allowing households to take proactive steps to reduce losses caused by extreme weather events.

Secondly, the resilience of agricultural infrastructure, particularly irrigation systems, must be prioritized. The current irrigation networks are increasingly threatened by climate variability, including droughts, floods, and saline intrusion due to climate change and rising sea levels. In the short and medium term, it is critical for local governments to invest in strengthening irrigation infrastructure to ensure timely responses to environmental challenges. Such investments will also support the transition toward a more modern, diversified, and sustainable agricultural sector.

Thirdly, there is a need to support farmers with technical training related to crop and livestock management in the context of changing climate conditions. Guidance on production techniques, water-saving methods, and adaptive strategies for saline-affected or drought-prone areas will be essential to maintain productivity and ensure long-term food security.

Fourthly, local governments should also promote farmer capacity-building in business and market-related skills. This includes improving access to market information, training in financial literacy, and enhancing the ability to respond to market fluctuations. By doing so, farmers will be better equipped to diversify their income sources and reduce their dependency on climate-sensitive activities.

Finally, investment in social infrastructure, particularly healthcare systems, is vital. Strengthening healthcare facilities, improving the training and availability of medical professionals, and providing communities with information on nutrition, hygiene, and disease prevention are essential to reduce vulnerability to future epidemics. Enhancing health services in rural areas will not only protect lives but also reduce the economic burden that health shocks impose on farm households.

In conclusion, the findings highlight the importance of a multi-dimensional policy response that addresses both the immediate impacts of shocks and the structural weaknesses that make rural households vulnerable. Integrated efforts across infrastructure, health, education, and agricultural development are needed to build resilience and promote sustainable income stability for Vietnamese farm households.

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