



HOKKAIDO UNIVERSITY

Title	Natural disasters and migration choice in Vietnam : Estimating the impact of EL NIÑO using household data
Author(s)	Uyen, Huynh Thi Kim; SAITO, Yoko; Hoa, Nguyen Thi Minh
Citation	Journal of agricultural development studies, 32(3), 28-34
Issue Date	2022
Doc URL	https://hdl.handle.net/2115/86160
Type	journal article
File Information	JADS_32_28.pdf



Natural disasters and migration choice in Vietnam
— Estimating the impact of EL NIÑO using household data —

Huynh Thi Kim Uyen^{*1}•Yoko SAITO^{*2} and Nguyen Thi Minh Hoa^{*3}

Abstract

Global warming is expected to become stronger over time, and accelerate climate change at both local and global scales. Climate-related disasters are a major risk that households face and have to cope with, and migration is a popular choice among households' corresponding coping mechanisms. There have been an increasing number of studies on climate-induced migration, but the findings have been contradictory. Notably, along with migration, remittances are also a major concern with respect to disasters. However, research on the role of remittances during disasters is limited. This study contributes to the literature on the relationship between natural disasters and migration, and differentiates the role of remittances from household members and non-members. Using household data from the Vietnam Access to Resources Household Survey (VARHS) during the two periods of 2012-2014 and 2014-2016, when Vietnam was hit by the EL NIÑO, we analyze the household decision of sending additional migrants by applying a logistic function. The findings show that EL NIÑO pushed households to send more migrants. Furthermore, a household's connection with the migrant society and the financial ability to cover migration costs both significantly affect this decision. Households that received remittances from household members in the previous period are more likely to send more migrants in the following period when the EL NIÑO occurred. Regarding the connection to migrant society, private transfers also provided financial support for migration. Poor households that are constrained by financial resources face difficulty in sending migrants; this may expand the income gap between these households and those who can send migrants. Therefore, it is important to expand working opportunities and education as ex-ante risk-coping measures, especially for the poor.

Keywords: migration choice, natural disasters, private transfer, remittance, Vietnam Access to Resources Household Survey

^{*1} Graduate School of Global Food Resources, Hokkaido University, ^{*2} Research Faculty of Agriculture, Hokkaido University, ^{*3} University of Economics, Hue University.

Natural disasters and migration choice in Vietnam

— Estimating the impact of EL NIÑO using household data —

I . Introduction

During 2014 and 2016, Vietnam was hit by severe droughts and floods under the longest and strongest EL NIÑO the country had experienced since 1998. Initially, the impact was unremarkable; however, they became significant later in mid-2015. As reported by UNDP (2016), 52 provinces, accounting for more than 80% of the country, were affected by drought and saltwater intrusion; 659 thousand hectares of cropland, including 273 thousand hectares of rice, were damaged to various degrees. Under the EL NIÑO, there was no rain between January and March of 2016 in the Mekong River Delta regions and two South Central Coastal provinces, Ninh Thuan and Binh Thuan. 18 provinces located in those regions were affected most severely by the drought and salinity intrusion, damaging 53.2% of the rice crop area; this area accounted for more than 70% of Vietnam's total rice production. Moreover, among these provinces, 10 provinces in the Mekong River Delta experienced the most extensive saltwater intrusion (UNDP, 2016) up to 90 km inland, a peak higher than 30‰ salinity in May 2016. The total loss was \$674 million in the entire country (Sutton et al., 2019). The Vietnamese government declared a state of emergency and distributed 10 thousand tons of rice to these areas (FAO, 2016).

Since it is difficult to forecast such sudden environmental phenomena, household income becomes unstable, especially in agricultural households whose production depends on weather and natural climate. Therefore, diversifying income sources is important at the household level and migration is one of the major options. Kleemans (2015) showed that migration increases after contemporaneous negative income shocks. Jha et al. (2018) also clarified that income risk from climate change is one of the major drivers of farmers' migration. Dillon, Mueller, and Salau (2011) showed evidence that higher temperatures increase households' probability of sending migrants in northern Nigeria. Bohra-Mishra, Oppenheimer, and Hsiang (2014) also concluded that both temperature and precipitation had impacts on migration, but temperature affected the migration decision much more than precipitation. In contrast, Ezra and Kiros (2001) conducted a household survey on the major reasons for outmigration from drought-prone areas

in Ethiopia. The authors found that drought explained a very small fraction of the reasons for sending migrants. However, Koubi et al. (2016) found that sudden environmental events, such as floods, induce internal migration of household members; remittance is the major coping measure for households damaged by natural disasters (Halliday, 2006). Gröger and Zylberberg (2016) stated that following a decrease in income, households cope with risks mainly through labor migration to urban areas. In addition, households with settled migrants *ex-ante* receive higher remittances, while households with no migrants are induced to send the first migrant. Private transfer, which is the remittance from non-household members, is another important coping measure of ex-post risk management strategies, especially in cases of massive natural disasters (Mozumder et al., 2009; Sawada and Shimizutani, 2008).

Coping with risks from natural disasters, especially those with massive impacts on geographically proximate areas, is another challenge for agriculture-based economies such as Vietnam. Migration has been recognized as an important risk-coping mechanism; however, in the household decision of sending migrants, private transfer, as a temporary income, is expected to have a different function from the constant transfer of remittances from household members. Understanding the factors of sending migrants allows policymakers to incorporate policy options to cope with the risks from natural disasters. This study aims to investigate the impact of private transfers, that is, remittances from non-members, on households' migration decisions compared to that of remittances from household members.

The remainder of this study is organized as follows. Section 2 describes the data used in the analysis. Section 3 outlines our analytical framework. The results are discussed in section 4. Section 5 presents the conclusions and relevant policy implications of this study.

II. Impact of natural disasters in Vietnam

We employ data from the Vietnam Access to Resources Household Survey (VARHS) conducted in 12 provinces in the country; of these, 5 provinces were severely affected by the EL NIÑO in the 2016 survey. In this dataset, natural disasters are categorized into three types: floods, droughts, typhoons, and others. Disasters tend to occur seasonally at similar timings of the year, especially in specific areas. Therefore, farmers can anticipate their

occurrence in normal years, such as in 2014. However, because of the EL NIÑO in 2016, the impact of these disasters became more severe than in normal years (UNDP, 2016) and farmers could not anticipate their occurrence in advance.

Although fewer households¹ reported losses due to natural disasters in 2016 than in 2014 (288 versus 313 households, respectively) (Table 1), the income loss per disaster in 2016 was 5,711 thousand VND and greater than the 5,265 thousand VND reported in 2014 (Table 2). This shows the severity of natural disasters in 2016.

We constructed panel data consisting of 2,518 households. More than 12% of these households (12.7% in 2014 and 12.4% in 2016) either increased the number of migrants or sent migrants for the first time (Table 1). This indicates the risk diversification strategy of households in post-disaster periods.

The number of households that received private transfers rose from 1,362 in 2014 to 1,519 in 2016 (Table 1), or from 54.1% in 2014 to 60.3% households in 2016. However, 190 out of 313 households (60.7%) that declared losses from natural disasters received private transfers in 2014, while only 130 out of 288 such households (45.1%) did in 2016. This means that in the EL NIÑO period, the number of households that received private transfers increased generally; however, the percentage of households that should be helped (i.e., declared losses from natural disasters) decreased by 15.6 percentage points from 60.7% in 2014 to 45.1% in 2016. This means that the massive natural disasters were widely broadcasted and invited a large number of private transfers through donations to regions, rather than to specific victims.

III. Analytical framework and data

Following Halliday's (2006) analytical framework, we define the dependent variable of the migration model as binary, setting it to one if the household sent new migrants between periods t and $t-1$, and zero otherwise. This binary variable indicates the household's decision to send (additional) members to compensate for the income loss from natural disasters in these two years. Variable L_t in equation (1) indicates a household's exposure to natural disaster or private transfer in year t , while Z_{t-1} represents the demographic and economic condition of the household in year $t-1$. We estimated the parameters of empirical model (2) by assuming the following logistic function:

$$1(\Delta M > 0) = f(L_t, Z_{t-1}) \quad (1)$$

The empirical model of migration decision of household i is specified as follows.

$$1(\Delta M > 0)_i = \alpha + \beta_1 d_{loss}_t + \beta_2 d_{remit}_{t-1} + \beta_3 d_{ptrans}_t + \beta_4 d_{ptrans}_{t-nonmigr}_{t-1} + \beta_5 d_{poor}_{t-1} \\ + \beta_6 laborforce_{t-1} + \beta_7 schoolers_{t-1} + \beta_8 head_education_{t-1} + \beta_9 head_gender_{t-1} + e_i \quad (2)$$

In equation (2), α and β_j are the parameters to be estimated by the logistic model, and e_i is the error term. Estimation was performed independently for two different periods using the maximum likelihood estimator.

The variables and their definitions are listed in Table 3. The variable d_{loss}_t equals one if the household reported losses due to a natural disaster in year t , and zero otherwise. Based on previous literature, we argue that households that experienced loss send additional migrants. Thus, the coefficient of d_{loss}_t is expected to be positive. If a household received remittance from a household's members in year $t-1$, d_{remit}_{t-1} equals one and zero otherwise. Receiving remittances in year $t-1$ implies that households have connections with the migrant society and it is easier for them to send additional migrants. However, the coefficient of d_{remit}_{t-1} can be either positive or negative, since the decision to send migrants also depends on the household's financial capacity.

If the household received private transfers in year t , d_{ptrans}_t equals one and zero otherwise. In addition, $d_{ptrans}_{t-nonmigr}_{t-1}$ equals one if the household had no migrants in year $t-1$ but was helped by private transfers from non-members in year t , and zero otherwise. Temporary income, such as private transfers, is usually used to recover from damage. Therefore, temporary income helps people to continue to stay in their residences. Private transfers, however, can also ease additional migration by covering the migration cost, especially after massive disasters. Hence, private transfers can be expected to either positively or negatively affect migration decisions. Another constraint to sending migrants is a household's connection to the migrant society. We assume that for household with no connection are less likely to send migrants than those with a connection in the previous year; however, note that the probability of sending migrants may be greater if private transfers are available. Thus, the sign of the coefficient of $d_{ptrans}_{t-nonmigr}_{t-1}$ is ambiguous.

Based on the standard set by the Vietnamese government, if income per person in year $t-1$ is up to 6,240 (7,800) thousand VND in rural (urban) areas, households are considered poor or nearly poor. The variable d_{poor}_{t-1}

is a dummy variable used to categorize these households. These households are probably eager to send migrants to compensate for losses due to natural disasters. However, the financial constraints of covering migration expenditures may prevent them from leaving their homes. This means that the coefficient for d_poor_{t-1} may be either positive or negative.

The variable $laborforce_{t-1}$ indicates the number of household members in the working age from 15 to 60 years old in year $t-1$. A household is more likely to have surplus laborers with more members in their working age. Thus, a larger labor force has a positive effect on migration. The variable $schoolers_{t-1}$ represents the number of household members who were going to school in year $t-1$. Sending members to schools is a burden to households to some extent as they require money to afford school expenses. The higher the number of schoolers, the higher the expenditure. Therefore, this factor tends to push households to send migrants so that parameter is expected to be positive. The household head's education ($head_education_{t-1}$) in year $t-1$ is measured by the grade that the household head finished. Household heads with higher education may know the importance of income diversification and have a greater capability to do so. The greater the number of years of education, the easier it is to find a place of employment. Finally, if the household head in year $t-1$ is female, $head_gender_{t-1}$ equals one, and zero otherwise. In most Vietnamese households, the members who are responsible for caring for children and the elderly are usually female. If the household head is female, the head can manage these activities. Then, this household is likely to decide to send an additional migrant.

IV. Results and discussion

1. Impact on migration decision

The estimated parameters and marginal effects are listed in Table 4. Although the loss due to the natural disaster itself did not have a significant impact on pushing migration in 2014, the signs of all estimated parameters follow our expectations and are significant. Furthermore, we find that the loss induced by weather-related disasters in 2016 increased the number of migrants. The marginal effect of loss in 2016 was 0.037 and significant, which means that households which experienced losses due to disasters were 3.7% more likely to send additional migrants. Since

the impact of natural disasters, especially droughts, was very severe in 2014-2016, there was a greater impact than the 2012-2014 period. As shown in Table 1, the number of households reporting loss due to natural disasters in 2016 was lower than that in 2014; however, as shown in Table 2, the lost value per disaster was significantly large. Therefore, the natural disaster had a more severe impact on household income in 2016 than in 2014; thus, they were more likely to send migrants.

Indeed, households that received remittances in the previous year sent additional migrants in 2016 and the marginal effect was higher in 2016 than in 2014. This implies that a household's connection with the migrant network is important in households' decisions to send migrants. This also indicates that to ensure their consumption and income, sending laborers is an important coping method for those households which experienced a loss. Households that suffered losses from natural disasters may try to further diversify their income risk by sending additional migrants and raising the income share of remittances.

The coefficient of private transfers was positive and significant in both 2014 and 2016. Private transfers can be recognized as temporary income. These transfer did increase the likelihood by 7% by helping households afford migration costs. For households that had no migrants in the previous year, that is, those with no connections with the migrant society, the probability of sending additional migrants was lower. The marginal effect is smaller in 2016 (-0.044) than in 2014 (-0.080). This emphasizes the importance of a household's connection with the migrant society. Without connections, new migrants may find it difficult to obtain jobs or save costs for job-seeking and accommodation.

Together with the effect of private transfers and remittances, financial constraints are expected to be critical in households' decision to send migrants. This constraint was also observed in poor and near-poor households. Households categorized as poor or near-poor in the previous year showed a lower probability of sending additional migrants in both periods, but significantly in 2016 (-0.073); thus, the marginally lower in 2016. Migration can be recognized as an important *ex-post* risk-coping measure by stabilizing the income stream over the years; however, this is not an option for these poor and near-poor households. Moreover, it was marginally worse in 2016. Migration has associated costs in advance and poor households are not able to afford them. This implies that natural disasters

expand the income gap among households, especially worsening the situation of the poor. Hence, it is important to provide an *ex-ante* risk-coping program, especially for those in poverty.

2. Household demographic conditions

Most demographic variables were positive and significant, especially in 2016. They are also marginally higher in probability, except for the labor force. Households with a greater number of school goers, with longer years of education of household heads, and with female household heads, sent additional migrants. The effects of these factors were exaggerated in 2016 after the natural disasters. Households with these factors are relatively advantageous for coping with risk. Nevertheless, households without these factors suffered from natural disasters. Thus, expanding working opportunities or education is important as an *ex-ante* risk-coping measure.

V. Conclusion

This study analyzed the impact of massive natural disasters on households' decisions to send (additional) migrants. We find that climate-related disasters induce migration and push households to choose migration as an important measure to cope with risks with the aim of stabilizing their income, and thus, their consumption. Moreover, even households that decide to send migrant laborers are constrained by their financial capability to afford migration costs and their connection with the migrant society. Therefore, both remittances from (1) non-household members, and (2) household members before the disaster, which functions as a connection to migrant society, have a positive effect on migration when disaster occurs. In addition, low-income households had lower accessibility to migration opportunities, especially in 2016. This means that natural disasters may widen the income gap among households. Therefore, it is important for policymakers to support poor households by providing *ex-ante* risk-coping programs. Expanding education and working opportunities is an important measure.

Influenced by climate change, the EL NIÑO in 2016 had the most significant impact in recorded history. Although the severity of EL NIÑO is hard to predict, the phenomena itself is cyclical (Sutton et al., 2019). Therefore, it is reasonable to expect that similar or even more severe natural disasters will occur in the coming years. If households face a situation similar to that in 2016, they may send more migrants and even move to urban areas in

the future. Policy measures is an urgent matter to prevent further migration from rural Vietnam.

Footnote

1) The number of households employed for analysis was 2,518, of which 367 in 2014 (14.6%) and 479 (19.0%) in 2016 were non-agricultural households.

References

- Bohra-Mishra, P., Oppenheimer, M. and Hsiang, S. M. (2014) Nonlinear Permanent Migration Response to Climatic Variations but Minimal Response to Disasters, *Proceedings of the National Academy of Sciences of the United States of America*, **111**(27), pp.9780-9785.
- Dillon, A., Mueller, V. and Salau, S. (2011) Migratory Responses to Agricultural Risk in Northern Nigeria, *American Journal of Agricultural Economics*, **93**(4), pp.1048-1061.
- Ezra M. and Kiros, G. (2001) Rural Out-migration in the Drought Prone Areas of Ethiopia: A Multilevel Analysis, *The International Migration Review*, **35**, pp.749-771.
- FAO (2016) 2015-2016 EL NIÑO, Early Action and Response for Agriculture, Food Security and Nutrition, Working draft Update #10.
- Gröger, A. and Zylberberg, Y. (2016) Internal Labor Migration as a Shock Coping Strategy: Evidence from a Typhoon, *American Economic Journal: Applied Economics*, **8**(2), pp.123-153.
- Halliday, T. (2006) Migration, Risk, and Liquidity Constraints in El Salvador, *Economic Development and Cultural Change*, **54**(4), pp.893-925.
- Jha, C. K., Gupta, V., Chattopadhyay, U. and Amarayil Sreeraman, B. (2018) Migration as Adaptation Strategy to Cope with Climate Change: A Study of Farmers' Migration in Rural India, *International Journal of Climate Change Strategies and Management*, **10**(1), pp.121-141.
- Kleemans, M. (2015) Migration Choice under Risk and Liquidity Constraints, 2015 AAEA &WAEA Joint Annual

Meeting, July 26-28, San Francisco, California 200702, Agricultural and Applied Economics Association, pp.1-62.

Koubi, V., Spilker, G., Schaffer, L. and Bernauer, T. (2016) Environmental Stressors and Migration: Evidence from Vietnam, *World Development*, **79**, pp.197-210.

Mozumder, P., Bohara, A. K., Berrens, R. P. and Halim, N. (2009) Private Transfers to Cope with a Natural Disaster: Evidence from Bangladesh, *Environment and Development Economics*, **14**(2), pp.187-210.

Sawada, Y. and Shimizutani, S. (2008) How Do People Cope with Natural Disasters? Evidence from the Great Hanshin- Awaji (Kobe) Earthquake in 1995, *Journal of Money, Credit, and Banking*, **40**(2-3), pp.463-488.

Sutton, W. R., Srivastava, J. P., Rosegrant, M., Thurlow, J. and Sebastian, L. (2019) Striking a Balance: Managing El Niño and La Niña in Vietnam's Agriculture, Rep No.132068, World Bank, Washington, DC.

UNDP (2016) Vietnam Drought and Saltwater Intrusion: Transitioning from Emergency to Recovery -Analysis Report and Policy Implications.

Table 1. Descriptive statistics of VARHS

	Definition	2014	2016
Migrant	Number of households had migrants	432	381
	Number of households had more migrants in year t (a)	321	313
	(and had loss among a, b)	(42)	(49)
	Share in all households (% , a/2,518)	12.7	12.4
Loss	Number of households had loss from natural disasters (c)	313	288
	Share of households had loss and sent more migrants (% , b/c)	13.4	17.0
	Number of households received private transfers (d)	1,362	1,519
	(and had loss among d, e)	(190)	(130)
	Share in all households (% , d/2,518)	54.1	60.3
	Share of households had loss and received private transfers (% , e/c)	60.7	45.1

Source: Vietnam Access to Resources Household Survey, 2012, 2014, and 2016

Note: Number of households is 2,518 in both years.

Table 2. Descriptive Statistics of Vietnam Access to Resources Household Survey (VARHS), (thousand VND)

Year	Variables	Obs.	Mean	Std. Dev.	Min	Max
2012	Total Net Income	2,518	84,900	137,252	2,005	4,522,582
	Income per Person	2,518	21,620	28,791	1,003	584,000
	Remittance	118	18,186	36,166	500	240,000
	Share of Remittance in Income	118	0.214	0.228	0.005	0.929
2014	Total Net Income	2,518	102,178	139,588	-22,640	2,603,200
	Income per Person	2,518	26,236	35,746	-11,320	867,733
	Remittance	81	21,032	35,099	500	240,000
	Share of Remittance in Income	81	0.161	0.187	0.006	0.892
	Private Transfer	1,362	11,445	21,575	100	200,000
	Share of Private Transfer in Income	1,362	0.166	0.232	-1.209	1.467
	Loss of household income <i>per disaster</i>	273	5,265	20,894	100	316,000
2016	Total Net Income	2,518	112,099	119,509	-228,960	2,349,130
	Income per Person	2,518	29,148	30,536	-38,160	561,170
	Remittance	86	12,598	17,150	100	100,000
	Share of Remittance in Income	86	0.128	0.159	0.001	0.721
	Private Transfer	1,519	10,484	18,847	15	160,000
	Share of Private Transfer in Income	1,519	0.149	0.238	-2.725	1.883
	Loss of household income <i>per disaster</i>	264	5,711	13,034	100	120,000

Source: Vietnam Access to Resources Household Survey, 2012, 2014, and 2016

Table 3. Descriptive statistics of variables used in estimation

Variables	Definition	2014	2016	Difference
$1(AM>0)$	Sent new migrants between t and $t-1$	0.127 (0.33)	0.124 (0.33)	-0.003
d_loss_t	Experienced loss by natural disasters in t	0.124 (0.33)	0.114 (0.32)	-0.010
d_remit_{t-1}	Received remittances in year $t-1$	0.047 (0.21)	0.032 (0.18)	-0.015***
d_ptrans_t	Received private transfers in year t	0.541 (0.50)	0.603 (0.49)	0.062***
$d_ptrans_t_nonmigr_{t-1}$	Received private transfer in year t , no migrant in year $t-1$	0.429 (0.50)	0.506 (0.50)	0.077***
d_poor_{t-1}	Poor or near-poor	0.138 (0.35)	0.087 (0.28)	-0.051***
$laborforce_{t-1}$	Number of labor force in household in year $t-1$	2.79 (1.5)	2.75 (1.5)	-0.04***
$schoolers_{t-1}$	Number of household members in school in year $t-1$	0.97 (1.0)	0.90 (1.0)	-0.07***
$head_education_{t-1}$	Grade that household head finished in year $t-1$	8.16 (3.3)	7.33 (3.7)	-0.83***
$head_gender_{t-1}$	Female-headed household	0.202 (0.40)	0.222 (0.42)	0.020***

Note1: Number in parenthesis indicate standard deviation.

Note2: Number of households in this sample is 2,518 in both years.

Note3: *** indicates significance at 1%.

Table 4. Estimated parameters

	2014		2016	
	Coef.	Margins	Coef.	Margins
<i>d_loss_t</i>	-0.091 (0.104)	-0.017 (0.019)	0.207** (0.103)	0.037** (0.019)
<i>d_remit_{t-1}</i>	0.192 (0.158)	0.035 (0.029)	0.303* (0.178)	0.055* (0.032)
<i>d_ptrans_t</i>	0.391*** (0.103)	0.071*** (0.019)	0.400*** (0.114)	0.072*** (0.020)
<i>d_ptrans_{t-nonmigr_{t-1}}</i>	-0.439*** (0.109)	-0.080*** (0.020)	-0.245** (0.114)	-0.044** (0.021)
<i>d_poor_{t-1}</i>	-0.124 (0.103)	-0.023 (0.019)	-0.403*** (0.148)	-0.073*** (0.027)
<i>laborforce_{t-1}</i>	0.261*** (0.025)	0.048*** (0.005)	0.233*** (0.026)	0.042*** (0.005)
<i>schoolers_{t-1}</i>	0.191*** (0.033)	0.035*** (0.006)	0.223*** (0.034)	0.040*** (0.006)
<i>head_education_{t-1}</i>	0.018* (0.011)	0.003* (0.002)	0.053*** (0.010)	0.010*** (0.002)
<i>head_gender_{t-1}</i>	0.049 (0.094)	0.009 (0.017)	0.206** (0.090)	0.037** (0.016)
<i>cons</i>	-2.366*** (0.141)		-2.698*** (0.149)	
Log likelihood	-843.36		-832.91	
Observations	2,518		2,518	

Note1: *, **, *** indicate significant at 10%, 5% and 1%.

Note2: Inside parenthesis shows standard error.