

Household's subjective well-being and environmental vulnerability: A comparative study on rural Thailand and Vietnam*

Phu Nguyen-Van^{a#} Thi Kim Cuong Pham^a Thi Anh-Dao Tran^b
Huu Thanh-Tam Nguyen^b Kone Noukignon^b

^a *BETA, CNRS and Université de Strasbourg*

^b *CREAM, Université de Rouen*

Very preliminary & incomplete version

Abstract

This paper analyzes the determinants of the households' welfare perception using a survey database on rural areas of Thailand and Vietnam. Analyses focus on the interpersonal comparison (via relative income or relative wealth) and the households' self-assessment of general risk attitude as well as their vulnerability. Welfare perception corresponds to the households' subjective assessment about their general situation. Attitudes towards risks correspond to the household readiness in case of economic and environmental shocks. Vulnerability encompasses not only the households' economic circumstances but also their situation related to the natural and geographical environment. The analysis provides some guideline about policy implementation in presence of economic and environmental shocks on household's well-being in Vietnam and Thailand.

Key words: environmental shocks; risks; subjective well-being; vulnerability

JEL classification: I31; O12; Q56

* Financial support by the RFCC (under the IBCCS grant) is acknowledged. We are grateful to the participants at the 2nd Workshop "Sustainability" for comments and suggestions. All remaining errors are our own.

Corresponding author : P. Nguyen-Van, BETA, CNRS & Université de Strasbourg, 61 avenue de la Forêt Noire, F-67000 Strasbourg Cedex, France; Phone: +33 (0)3 68 85 20 39 ; E-mail: nguyen-van@unistra.fr.

1. Introduction

While standard economic theory assumes that individual utility is derived from the absolute level of consumption or income, numerous empirical investigations shed light on the phenomenon of relative standing (Frey and Stutzer, 2002, Frijters *et al.* 2004, Luttmer, 2005, Ferrer-i-Carbonelle, 2005, Clark *et al.* 2008, Fafchamps and Shilpi, 2008, Tsui, 2014, etc.). People derive satisfaction not only from their absolute position in terms of material conditions (consumption, income) but also from their relative position compared with their peers. Individuals have a tendency to compare their position to a reference, and the comparison behavior may be motivated by the desire to acquire a social status, which brings about social esteem, respect, admiration for individuals.

Empirical investigations underline that the relative income may matter differently following the groups of individuals. In particular, the rich might care more about the relative wealth than the poor. This asymmetry in individual preferences for relative income is shown for instance in Ravallion and Lokshin (2010). Using Malawian data, these authors found that the relative income has no effect on the poor's subjective well-being. The same result is observed in Akay and Martinsson (2011) using the data of rural Ethiopia.

The asymmetry in comparison is also reflected by the differentiated effect of the reference level. Reference income affects differently the individual preferences following the fact that the individual's income is higher or lower than the reference level (Ferrer-i-Carbonell, 2005, Tsui, 2014). The result of Ferrer-i-Carbonell (2005), using the data of German survey (GSOEP), shows that individuals compare their income with that of richer. This finding supports the Duesenberry (1949)'s idea that the comparison is upward. The poorer individuals compare their income to that of their richer peers, while the richer individuals do not get happier when their income is higher than that of their poorer peers. In the same vein, Tsui (2014) considers two different reference incomes for an individual: an average of other individuals' income higher than his income and an average of other individuals' income lower than his income. The result shows that an increase in the low average has a smaller effect on the subjective well-being than an increase in the high average.

It should be noticed that several papers in this literature focus only on the socio-economic aspect and ignores the concern on environmental quality or natural disasters. In the case of developing countries, households living conditions should be significantly affected by natural disasters and environmental vulnerability (Nguyen *et al.* 2015, Arouri *et al.* 2015). Disasters cause important losses in developing countries and the poor are likely the first victims of natural disasters (Ludwig *et al.* 2007). Rural and poor households are vulnerable to environmental shocks and suffer several consequences of natural disasters. Arouri *et al.* (2015) show that the natural disasters (storms, floods and droughts) have a negative effect on income and expenditure of rural households in Vietnam. Kurosaki (2014) investigate the household consumption response to natural disasters (floods and droughts) and health shocks using data from rural Pakistan. Results show that the consumption response differs across different types of households, in particular younger and more landed households are less vulnerable (in terms of a decline in consumption) to floods.

This paper fits in the literature of subjective well-being using the data from survey on rural households in Vietnam and Thailand, and focusing both on the impact of natural disasters and relative standing. Its goals are then double: first, this paper provides a test on the effect of relative income with a special attention on the asymmetric comparison hypothesis. Second, for the case of developing countries such as Vietnam and Thailand, the paper cares about some characteristics of the poor rural area such as environmental and economic vulnerability. It is about to analyze the nexus between households' welfare perception, self-assessment of general risk attitude. Welfare perception corresponds to the households' subjective assessment about their general situation. Attitudes towards risks correspond to the household readiness in case of economic and environmental shocks. Vulnerability encompasses not only the households' economic circumstances but also their situation related to the natural and geographical environment.

Findings derived from the analyses of subjective well-being and its determinants have important policy implications, in particular for Vietnam and Thailand, two developing countries where income inequality is high compared to the developed countries. If only absolute income matters, public policy should focus on the reduction of absolute poverty. If both relative and absolute income affect individuals' well-being, policy maker should pay attention on poverty and inequality reduction in order to improve the self-reported happiness of the population. Analyses on the effects of environmental shocks and natural disasters give some insights on environmental policies in both countries.

The remainder of the paper is organized as follows: Section 2 provides a survey on subjective well-being focusing on low income countries. Section 3 presents the data and some descriptive statistics. Econometric specification is presented in Section 4 and estimation results in Section 5. Section 6 concludes.

2. Subjective well-being and relative standing

Most studies in the literature on subjective well-being shed light on a phenomenon of relative standing, contrary to the absolute utility hypothesis, which is postulated in the standard economic modelling. However, the relative standing effects differ between developed and developing countries, as well as between rich and poor individuals in a same country with similar socio-economic circumstances. For the case of developed countries, there is a consensus that reference level exerts a negative effect on the individual subjective well-being or life satisfaction, which are considered as proxies of individual utility (Clark and Oswald, 1996, McBride, 2001, Frijters *et al.*, 2004, Luttmer, 2005, Ferrer-i-Carbonell, 2005, Clark *et al.*, 2008). For example, Luttmer (2005) uses the US data from the National Survey of Families and Households and considers the neighbors' earnings as a reference to which individuals compare their earnings. This study provides evidence that the reference level has a negative impact on the individuals' self-reported well-being. In particular, the magnitude of the effect on well-being of an increase in neighbors' earnings and that of a decrease in own income are roughly similar.

It is noticed that the reference level may refer to an external reference (others) but also to an internal reference (one past income or expected future income) (Clark, 2000, Clark et al., 2008, Alvarez-Cuadrado et al. 2012). Alvarez-Cuadrado et al. (2012), using the Spanish Continuous Family Expenditure Survey, estimate the importance of the interdependence of preferences and habit persistence. Their results suggest that households' preferences derive almost 25% of their consumption services from comparison between their consumption and that of their neighbors, and around 35% from comparison between their current and past consumption. This implies that around 60% of individual satisfaction is from relative consumption.

Contrary to a great number of studies using data in developed countries which underline a significant impact of relative income, a small number studies using data in developing and low income countries give a different conclusion. There is not systematically a meaningful effect of relative concern on the subjective well-being. Ravallion and Lokshin (2010), using Malawian data, found that the relative income has no effect on the poor's subjective well-being. The same result is observed in Akay and Martinsson (2011) using the data of rural Ethiopia. These studies show only a significant effect of absolute income. For the rural areas of northern Ethiopia, one of the poorest regions in the world, relative income does not matter at all.

It should be noticed that within a country, relative income matter differently between the rich and the poor. The effect of relative standing on the well-being is meaningful for the rich while it is not meaningful for the poor. For the latter, the effect of absolute income is often more significant (Clark et al., 2008, Akay and Martinsson, 2011, Asadullah and Chaudhury, 2012). For example, Asadullah and Chaudhury (2012), using data from rural Bangladesh, show that relative wealth effect is stronger for the rich. However, when compared the relative wealth effect to the absolute wealth effect, the result shows that the relative wealth effect is lower. Focusing on the effect of relative consumption for the case of Nepal, Fafchamps and Shilpi (2008) give two different findings following the type of the poor. The authors confirm the fact that the poor care less about relative consumption than the non-poor. However, when focusing on the poor households who are isolated from markets, the conclusion changes. Households in isolated areas are more sensitive to the standards of living of their neighbors. Moreover, controlling for a migration variable, Fafchamps and Shilpi show that household heads having migrated out of their birth district continue to compare their consumption with that of households in their district of origin.

3. Data

The data used in this paper come from a rich survey database on “Impact of Shocks on the Vulnerability to Poverty: Consequences for Development of Emerging Southeast Asian Economies” in Vietnam and Thailand, collected by the DFG (German Research Foundation) FOR 756. The survey was conducted in 2007, 2008, and 2010.¹ Our analysis covers the 2010

¹ The area of the survey is illustrated in Figure A1.

wave. Table A1 in Appendix summarizes the definition of variables, concerning socio-demographic and economic conditions of the sampled households. Descriptive statistics are reported in Table A2 for the Vietnamese data and in Table A3 for the Thai data.

Two measures of household’s subjective well-being are available in the data. They are defined in comparison with either the year before the survey or the previous five-year period. To the questions “do you think your household is better off than last year?” and “do you think your household is better off than 5 years ago?”, households are asked to report their answer on a decreasing scale: 1 (much better off), 2 (better off), 3 (same as), 4 (worse off), and 5 (much worse off). Given that for both measures, categories 1 and 5 have very few observations, we then merge categories 1 and 2 into one group, and categories 4 and 5 into another group to create two new variables. Each of them is a three-categories variable. The first one is subjective well-being compared to the previous year: $SWB = 1$ if the household’s well-being is worse off or much worse off than the previous year, $= 2$ if it is the same as the previous year, $= 3$ if it is better off or much better off. The other variable, subjective well-being compared to the previous five years, $SWB5$, is defined similarly. The final dataset obtained from the 2010 wave contains 1859 households (for both SWB and $SWB5$) from 199 villages in three Thai provinces (Buriram, Ubon Ratchathani, and Nakhon Phanom) and 1375 households (for SWB) and 1372 households (for $SWB5$) observed from 152 villages in three Vietnamese provinces (Ha Tinh, Dak Lak, and Thua Thien-Hue). Table 1 reports the distribution of these two subjective variables for Thailand and Vietnam. We remark that when comparing to the previous 5 years, a majority of households in both groups think that their situation is better or much better off. However, comparing to the previous year, the most frequent answer is the same as (the previous year).

Table 1: Distribution of household subjective well-being

	Vietnam		Thailand	
<i>Compared to the previous year (SWB)</i>	Frequency	Percent	Frequency	Percent
Much worse off or worse off ($SWB = 1$)	355	25.82	361	19.42
Same as ($SWB = 2$)	576	41.89	744	40.02
Better off or much better off ($SWB = 3$)	444	32.29	754	40.56
<i>Compared to the previous 5 year (SWB5)</i>				
Much worse off or worse off ($SWB5 = 1$)	278	20.26	402	21.62
Same as ($SWB5 = 2$)	312	22.74	475	25.55
Better off or much better off ($SWB5 = 3$)	782	57.00	982	52.82

Notes. Total number of observations: 1375 (SWB) and 1372 ($SWB5$) for Vietnam, 1859 for Thailand.

Table 2 describes the distribution of self-assessment of household wealth, compared to the village and to the country. Households are asked to estimate whether their wealth is better off than that of their village and that of the country. Compared to the village, the most frequent answer is “the same as” other households with 66.29 % for Thai households and 48.25% for Vietnamese households. The most frequent answer regarding the comparison with the country

is more pessimistic as 58.98% of the sampled Vietnamese households and 49.33 of the sampled Thai households think that their wealth if much worse or worse off than that of other households.

Table 2: Distribution of household subjective wealth

	Vietnam		Thailand	
	Frequency	Percent	Frequency	Percent
<i>Compared to the village</i>				
Much worse off or worse off	483	35.31	368	19.72
Same as	667	48.25	1237	66.29
Better off or much better off	225	16.45	261	13.99
<i>Compared to country</i>				
Much worse off or worse off	811	58.98	917	49.33
Same as	461	33.53	787	42.33
Better off or much better off	103	7.49	155	8.34

Notes. Total number of observations: 1375 for Vietnam, 1859 for Thailand.

Variable regarding the risk attitude is also subjective and represents the self-assessment of general risk attitudes. People are asked to respond, on an 11-point Likert scale, to the question “Are you generally a person who is fully prepared to take risks (10) or do you try to avoid taking risks (0)?”.

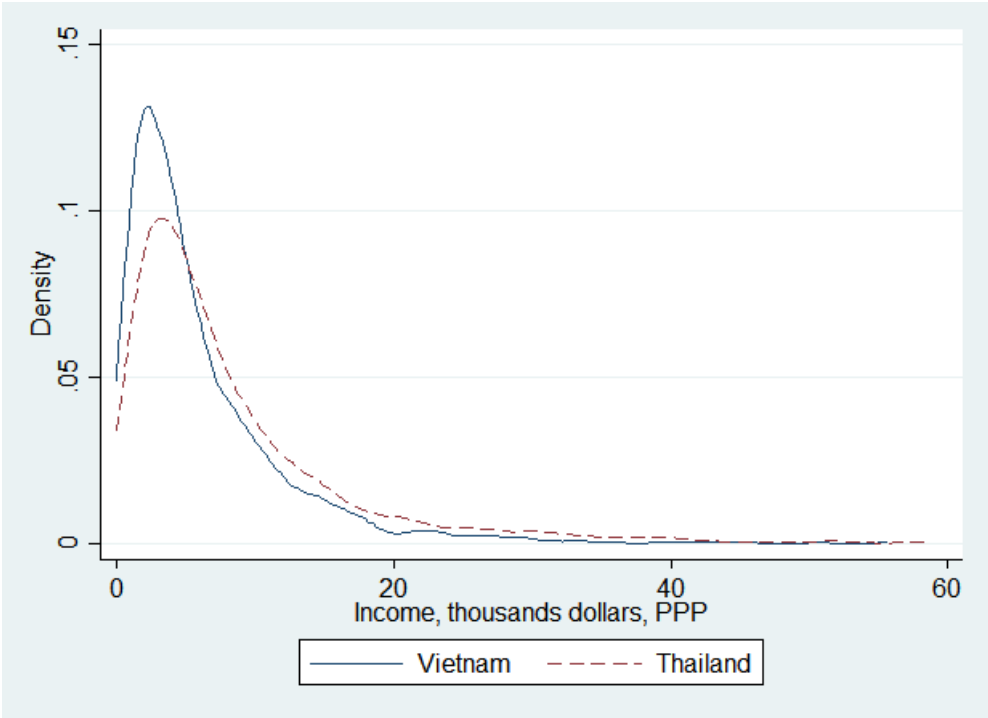


Figure 1: Distribution of household total annual income, in thousands dollars, PPP.

Figure 1 displays the distribution of total household income. We observe that Thai households are slightly richer than Vietnamese counterparts as the Thai income distribution is on the right of the Vietnamese income distribution. Table A1 also describes other variables regarding the households' characteristics (log house value, mean village income, household size, average age, share of male members, ethnic minority), living conditions (public water supply availability, access to facilities such as electricity, sanitation, internet, telephone, etc), village characteristics (such as mountain, slope, valley, lake, coast, dirt road) and province characteristics. We remark that ethnic minority is a dummy variable with 0 if household belongs to Kinh majority group and 1 if he belongs to an ethnic minority. Given that the majority of Vietnamese belong to Kinh ethnic (one of 54 ethnics) with around 85% of the total population, this variable contains a majority of 0.

4. Econometric specification

Let us consider the following household's utility function:

$$U_i = U(y_i, \bar{y}, w_i, \bar{w}, x_i),$$

where y_i is the household income, \bar{y} a reference income level used for comparison purpose (for example, the average income of the household i 's village, region or country), w_i the household wealth, \bar{w} a reference wealth (e.g. the average wealth of the household i 's village), and x_i the set of other observed determinants. The choice of this households' utility function depending on the average level of wealth and average level of income refers to the comparison phenomenon concerning individual well-being (Clark and Oswald, 1996, Frey and Stutzer, 2002, Luttmer, 2005; Clark *et al.*, 2008, Akay and Martisson, 2011, etc.). People derive satisfaction not only from their absolute position in terms of material conditions (consumption, income) but also from their relative position compared with their peers. In this specification, the average level of income \bar{y} and that of wealth \bar{w} are considered as reference levels to which households compare their absolute level. A negative impact of the reference level on the households' well-being implies that there exists an interpersonal comparison. The higher the reference level, the lower the households' utility, all other things remaining equal.

The household i 's well-being, noted as U_i^* , is unobserved (or latent). It can be proxied by an observed subjective measure and augmented by an unobserved error term ε_i . If we note U_i as the observed households' responses concerning their well-being, we can specify the following ordered probit model:

$$\begin{aligned} U_i^* &= z_i' \beta + \varepsilon_i \\ U_i &= 1 \text{ if } U_i^* \leq c_1 \\ &= 2 \text{ if } c_1 < U_i^* \leq c_2 \\ &= 3 \text{ if } c_2 < U_i^* \end{aligned}$$

where U_i corresponds to the observed subjective well-being reported by household i (either SWB or $SWB5$), and ε_i is assumed to be independent and identically distributed. In this specification, parameters to be estimated are β (the intercept is normalized to zero) and the thresholds c_1 and c_2 . The set of explanatory variables z encompasses all the variables included in the arguments of the utility function, i.e. y_i , \bar{y} , w_i , \bar{w} , x_i . More precisely, they correspond to household total annual income, average household income at the village level, logarithm of the house value (if sold, which can be used as a proxy for household wealth), subjective household wealth compared to other village residents (or subjective household wealth compared to other country residents). The set x_i includes control variables for household behavior facing risks, household size, average age in the household, share of male members, dummy for ethnic minority, dummy for public water supply availability, percentages to access to several facilities (electricity, public water supply, sanitation, public waste disposal, fixed line telephone, internet), dummies for geographical characteristics of household i 's village (on a mountain, on slope, in a valley, near a river, near a lake, on the coast, access limited to dirt roads), and dummies for provinces (provinces Dak Lak and Nakhon Phanom are used as the reference for the Vietnamese and Thai data, respectively).

Estimation of the model is performed by maximum likelihood using village-clustered robust standard errors. In this specification, household income can be endogenous as unobserved factors can determine this variable. In order to account for this endogeneity in the ordered probit model, we use the ‘variable addition test’ based on the control function approach proposed by Wooldridge (2014) to test for endogeneity of explanatory variables in nonlinear models. It can be implemented by using the following two-step procedure: First, we make a linear regression of household income on the whole set of the model’s explanatory variables and additional instruments (which are excluded from the model). The latter correspond to two measures about the health status of the household head (compared to the previous year and the last previous five years), a dummy indicating the household head suffering a serious disease, a dummy indicating the household head’s ability of reading and writing, two dummies for the main occupation of the household head (agriculture and non-agriculture, other activities being the reference category), and a dummy for membership of a political association (communist Party, professional association, etc). This step provides the estimated residuals \hat{u}_i . Second, we perform the usual ordered probit regression with \hat{u}_i as an additional explanatory variable. This allows us to compute a (village clustered) robust Wald test for the null hypothesis that the coefficient of \hat{u}_i is zero. The null hypothesis corresponds to the exogeneity of income. The test is called ‘robust’ because it is based on robust standard errors. In the context of our model, the test statistic corresponds to a chi-squared distribution of 1 degree of freedom.

5. Estimation results

The computed chi-squared statistic of the variable addition test for endogeneity of income is equal to 1.40 (for the model with SWB) and 0.01 (for $SWB5$) in the case of Vietnam and 0.88 (SWB) and 1.95 ($SWB5$) in the case of Thailand. This result indicates that the exogeneity of income is not rejected. Estimation results with exogenous income are reported in Table 3.

In both cases, Vietnam and Thailand, households' income exerts a positive and significant effect on their subjective well-being while the average income at both the village and country level has no effect. This implies that there is no comparison phenomenon regarding the households' income. This result corroborates with the main findings in different analyses using the data from low income countries (Ravallion and Lokshin, 2010), Akay and Martinsson, 2011, Asadullah and Chaudhury, 2012). Clearer observations should be found when we calculate the marginal effects of explanatory variables.² Notice that the marginal effect of an explanatory variable is calculated by maintaining other variables at their average values. Tables 4 and 5 present the marginal effects of different explanatory variables for both subsamples, Vietnam and Thailand. We observe that income has a negative effect on the probabilities to give a low level of well-being ($SWB = 1$ or $= 2$) while it has a positive effect on the probability to give a high level of well-being ($SWB = 3$) corresponding to the response following that household think that comparing to the previous year or to the 5 previous year, their well-being is better or much better off. This observation regarding the marginal effect is compatible with a positive effect of income on households' well-being, as presented in Table 3.

Nevertheless, observations differ regarding the subjective self-assessment of household wealth. Results reported in Table 3 indicate that if households in both sub-samples estimate that their wealth better off than that of other country residents, they would feel happier. Table 4 supports this result as a higher subjective wealth increases the probability of giving a high value of subjective well-being ($SWB = 3$) and decreases that of giving a low value of subjective well-being ($SWB = 1, SWB = 2$), all things remain unchanged.

Apart from the similarity in income and subjective wealth effects between Vietnam and Thailand households, there is a divergence in the impact of other explanatory variables. Let us consider risk attitude. This variable has no effect on the Thai subjective well-being while it exerts a positive effect on the Vietnam subjective well-being. For the case of Vietnam, households proceeding to preventive actions and preparing to take risk think that their well-being is better or much better off than the previous year or the 5 previous years. Regarding the living conditions, happiness of Vietnamese households in a village is increasing with the proportion of village's households having access to electricity. Other living conditions such as access to public water supply, to sanitation, to internet, etc. have no impact on both Thailand and Vietnam households' well-being.

Another divergence is observed regarding the geographic conditions. While people living in mountain or in village with dirt road are happier for the case of Vietnam, they are less happy for the case of Thailand.

² Notice that marginal effects of a variable on different probabilities, $\partial P(U_i = l) / \partial z_{ij}$ where $l = 1, 2, 3$, sum up to 0, i.e. $\sum_{l=1}^3 \partial P(U_i = l) / \partial z_{ij} = 0$.

Table 3: Estimation results.

Variable	Vietnam				Thailand			
	<i>SWB</i>		<i>SWB5</i>		<i>SWB</i>		<i>SWB5</i>	
	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.
Income	0.016***	0.005	0.033***	0.008	0.009***	0.003	0.008**	0.004
Mean village income	-0.0003	0.011	-0.016	0.015	-0.001	0.006	-0.005	0.005
Log house value	-0.036	0.032	0.033	0.030	0.024	0.027	0.031	0.028
Subjective wealth, wrt village	-0.022	0.060	0.027	0.065	-0.000	0.052	0.063	0.052
Subjective wealth, wrt country	0.144**	0.067	0.038	0.067	0.157***	0.049	0.133***	0.047
Risk attitude	0.106***	0.012	0.107***	0.013	0.014	0.010	0.010	0.011
Household size	-0.015	0.018	0.002	0.018	0.004	0.013	0.005	0.013
Average age	0.001	0.003	0.004	0.003	0.004	0.003	0.005	0.003
Share of male members	0.265	0.161	0.095	0.183	0.027	0.157	-0.140	0.155
Ethnic minority	0.153	0.098	-0.195**	0.098	-0.948	0.585	-0.695	0.517
Public water supply availability	0.042	0.147	0.042	0.164	-0.123	0.086	-0.183*	0.106
Access to electricity	0.004**	0.002	0.009***	0.002	-0.003	0.007	-0.003	0.010
Access to public water supply	-0.002	0.002	-0.003	0.002	-0.0003	0.001	-0.001	0.001
Access to sanitation	0.001	0.001	0.001	0.001	0.0003	0.001	0.001	0.001
Access to public waste disposal	-0.001	0.002	-0.002	0.002	0.0003	0.001	0.0001	0.001
Access to fixed line telephone	-0.001	0.002	-0.003	0.002	0.0001	0.001	0.0001	0.001
Access to internet	0.011	0.009	0.004	0.008	0.0005	0.003	-0.0001	0.002
Mountain	0.130*	0.074	0.183**	0.075	-0.660***	0.151	-0.560***	0.162
Slope	-0.065	0.090	-0.103	0.081	-0.129	0.104	0.019	0.117
Valley	0.092	0.127	-0.015	0.106	-0.301***	0.052	-0.396***	0.055
River	0.051	0.098	-0.091	0.083	0.148*	0.078	0.080	0.102
Lake	0.000	0.086	0.074	0.088	na	na	na	na
Coast	-0.151	0.118	0.014	0.138	na	na	na	na
Dirt road	0.026	0.155	0.236*	0.129	0.003	0.077	0.013	0.107
Ha Tinh province	0.386**	0.161	0.039	0.148	--	--	--	--
Thua Thien – Hue province	0.091	0.199	-0.095	0.156	--	--	--	--
Buriram province	--	--	--	--	-0.156*	0.089	-0.229**	0.092
Ubon Ratchathan province	--	--	--	--	0.167*	0.087	0.073	0.105
c_1	0.354	0.419	0.891**	0.379	-1.416	0.885	-1.235	1.124
c_2	1.555***	0.419	1.613***	0.380	-0.284	0.884	-0.502	1.126
Log-likelihood	-1395.449		-1248.327		-1912.549		-1853.248	
# observations	1375		1372		1859		1859	

Notes. Estimations based on ordered probit regression with village-clustered robust standard errors. Dependent variable: subjective well-being compared to previous year (*SWB*) and to previous five years (*SWB5*). Significant level: *** 1%, ** 5%, * 10%.

Table 4: Marginal effects, Vietnam

Variable	$P(SWB = 1)$	$P(SWB = 2)$	$P(SWB = 3)$	$P(SWB5 = 1)$	$P(SWB5 = 2)$	$P(SWB5 = 3)$
Income	-0.005*** (0.002)	-0.0005** (0.0002)	0.005*** (0.002)	-0.008*** (0.002)	-0.003*** (0.001)	0.012*** (0.003)
Mean village income	0.0001 (0.004)	0.0000 (0.0004)	-0.0001 (0.004)	0.004 (0.004)	0.002 (0.001)	-0.006 (0.005)
Log house value	0.011 (0.009)	0.001 (0.001)	-0.012 (0.010)	-0.008 (0.008)	-0.003 (0.003)	0.012 (0.011)
Subjective wealth, wrt village	0.007 (0.018)	0.001 (0.002)	-0.007 (0.020)	-0.007 (0.017)	-0.003 (0.006)	0.009 (0.023)
Subjective wealth, wrt country	-0.043** (0.020)	-0.005* (0.003)	0.048** (0.022)	-0.010 (0.017)	-0.004 (0.007)	0.014 (0.024)
Risk attitude	-0.032*** (0.003)	-0.003*** (0.001)	0.035*** (0.004)	-0.027*** (0.003)	-0.011*** (0.001)	0.038*** (0.004)
Household size	0.004 (0.005)	0.0005 (0.001)	-0.005 (0.006)	-0.001 (0.005)	-0.0002 (0.002)	0.001 (0.006)
Average age	-0.0004 (0.001)	-0.0001 (0.0001)	0.0005 (0.001)	-0.001 (0.001)	-0.0004 (0.0003)	0.001 (0.001)
Share of male members	-0.079 (0.048)	-0.008 (0.006)	0.088* (0.053)	-0.024 (0.047)	-0.009 (0.018)	0.034 (0.065)
Ethnic minority	-0.046 (0.029)	-0.005 (0.004)	0.051 (0.032)	0.050** (0.025)	0.019* (0.010)	-0.069** (0.035)
Public water supply availability	-0.013 (0.044)	-0.001 (0.005)	0.014 (0.049)	-0.011 (0.042)	-0.004 (0.016)	0.015 (0.058)
Access to electricity	-0.001** (0.001)	-0.0001* (0.0001)	0.001** (0.001)	-0.002*** (0.001)	-0.001*** (0.0002)	0.003*** (0.001)
Access to public water supply	0.0004 (0.001)	0.0001 (0.0001)	-0.001 (0.001)	0.001 (0.001)	0.0003 (0.0002)	-0.001 (0.001)
Access to sanitation	-0.0002 (0.0004)	-0.0000 (0.0000)	0.0002 (0.0004)	-0.0002 (0.0004)	-0.0001 (0.0001)	0.0003 (0.001)
Access to public waste disposal	0.0004 (0.001)	0.0000 (0.0001)	-0.0004 (0.001)	0.0005 (0.0005)	0.0002 (0.0002)	-0.001 (0.001)
Access to fixed line telephone	0.0004 (0.001)	0.0000 (0.0001)	-0.0004 (0.001)	0.001 (0.001)	0.0003 (0.0002)	-0.001 (0.001)
Access to internet	-0.003 (0.003)	-0.0003 (0.0003)	0.004 (0.003)	-0.001 (0.002)	-0.0004 (0.001)	0.001 (0.003)
Mountain	-0.039* (0.022)	-0.004 (0.003)	0.043* (0.025)	-0.047** (0.019)	-0.018** (0.007)	0.065** (0.027)
Slope	0.019 (0.027)	0.002 (0.003)	-0.022 (0.030)	0.026 (0.021)	0.010 (0.008)	-0.037 (0.029)
Valley	-0.028 (0.038)	-0.003 (0.004)	0.030 (0.042)	0.004 (0.027)	0.001 (0.011)	-0.005 (0.038)
River	-0.015 (0.029)	-0.002 (0.003)	0.017 (0.032)	0.023 (0.021)	0.009 (0.008)	-0.032 (0.030)
Lake	-0.00004 (0.026)	-0.0000 (0.003)	0.00005 (0.028)	-0.019 (0.023)	-0.007 (0.009)	0.026 (0.031)
Coast	0.045 (0.035)	0.005 (0.004)	-0.050 (0.039)	-0.004 (0.035)	-0.001 (0.014)	0.005 (0.049)
Dirt road	-0.008 (0.046)	-0.001 (0.005)	0.008 (0.051)	-0.061* (0.033)	-0.023* (0.013)	0.084* (0.046)
Ha Tinh province	-0.115** (0.048)	-0.012** (0.006)	0.127** (0.053)	-0.010 (0.038)	-0.004 (0.015)	0.014 (0.053)
Thua Thien – Hue province	-0.027 (0.060)	-0.003 (0.006)	0.030 (0.066)	0.024 (0.040)	0.009 (0.016)	-0.034 (0.055)

Notes. Estimations based on ordered probit regression. Dependent variable: subjective well-being compared to previous year (SWB) and to previous five years ($SWB5$). Standard errors, obtained by delta method, are in parentheses. Significant level: *** 1%, ** 5%, * 10%.

Table 4: Marginal effects, Thailand

Variable	$P(SWB = 1)$	$P(SWB = 2)$	$P(SWB = 3)$	$P(SWB5 = 1)$	$P(SWB5 = 2)$	$P(SWB5 = 3)$
Income	-0.003*** (0.001)	-0.001*** (0.0003)	0.003*** (0.001)	-0.002** (0.001)	-0.001** (0.0004)	0.003*** (0.001)
Mean village income	0.0004 (0.002)	0.0002 (0.001)	-0.001 (0.002)	0.001 (0.001)	0.0005 (0.0005)	-0.002 (0.002)
Log house value	-0.007 (0.007)	-0.003 (0.003)	0.009 (0.010)	-0.009 (0.008)	-0.003 (0.003)	0.012 (0.011)
Subjective wealth, wrt village	0.0001 (0.014)	0.0001 (0.006)	-0.0002 (0.020)	-0.018 (0.015)	-0.006 (0.005)	0.024 (0.020)
Subjective wealth, wrt country	-0.042*** (0.013)	-0.017*** (0.006)	0.059*** (0.018)	-0.038*** (0.014)	-0.014*** (0.005)	0.052*** (0.018)
Risk attitude	-0.004 (0.003)	-0.002 (0.001)	0.005 (0.004)	-0.003 (0.003)	-0.001 (0.001)	0.004 (0.004)
Household size	-0.001 (0.003)	-0.0004 (0.001)	0.001 (0.005)	-0.001 (0.004)	-0.0005 (0.001)	0.002 (0.005)
Average age	-0.001 (0.001)	-0.0004 (0.0003)	0.001 (0.001)	-0.001 (0.001)	-0.0005 (0.0003)	0.002 (0.001)
Share of male members	-0.007 (0.042)	-0.003 (0.017)	0.010 (0.059)	0.040 (0.044)	0.014 (0.016)	-0.054 (0.060)
Ethnic minority	0.254 (0.157)	0.103 (0.064)	-0.357 (0.220)	0.198 (0.147)	0.071 (0.053)	-0.269 (0.200)
Public water supply availability	0.033 (0.023)	0.013 (0.009)	-0.047 (0.032)	0.052* (0.030)	0.019* (0.011)	-0.071* (0.041)
Access to electricity	0.001 (0.002)	0.0003 (0.001)	-0.001 (0.003)	0.001 (0.003)	0.0003 (0.001)	-0.001 (0.004)
Access to public water supply	0.0001 (0.0002)	0.0000 (0.0001)	-0.0001 (0.0003)	0.0002 (0.0003)	0.0001 (0.0001)	-0.0003 (0.0004)
Access to sanitation	-0.0001 (0.0003)	-0.000 (0.0001)	0.0001 (0.0005)	-0.0003 (0.0004)	-0.0001 (0.0001)	0.0003 (0.001)
Access to public waste disposal	-0.0001 (0.0002)	-0.000 (0.0001)	0.0001 (0.0003)	-0.000 (0.0002)	-0.0001 (0.0001)	0.0001 (0.0003)
Access to fixed line telephone	-0.000 (0.0002)	-0.000 (0.0001)	0.0001 (0.0003)	-0.000 (0.0003)	-0.000 (0.0001)	0.000 (0.0005)
Access to internet	-0.0001 (0.001)	-0.0001 (0.0003)	0.0002 (0.001)	0.000 (0.001)	0.000 (0.0002)	-0.0001 (0.001)
Mountain	0.177*** (0.040)	0.072*** (0.018)	-0.249*** (0.057)	0.160*** (0.045)	0.057*** (0.017)	-0.217*** (0.062)
Slope	0.035 (0.028)	0.014 (0.011)	-0.049 (0.039)	-0.006 (0.034)	-0.002 (0.012)	0.007 (0.046)
Valley	0.081*** (0.013)	0.033*** (0.007)	-0.113*** (0.020)	0.113*** (0.015)	0.040*** (0.007)	-0.153*** (0.022)
River	-0.040* (0.021)	-0.016* (0.008)	0.056* (0.029)	-0.023 (0.029)	-0.008 (0.011)	0.031 (0.040)
Dirt road	-0.001 (0.021)	-0.0003 (0.008)	0.001 (0.029)	-0.004 (0.031)	-0.001 (0.011)	0.005 (0.042)
Buriram province	0.042* (0.024)	0.017* (0.010)	-0.059* (0.034)	0.065** (0.026)	0.023** (0.010)	-0.089** (0.036)
Ubon Ratchathan province	-0.045* (0.024)	-0.018* (0.009)	0.063* (0.033)	-0.021 (0.030)	-0.007 (0.011)	0.028 (0.041)

Notes. Estimations based on ordered probit regression. Dependent variable: subjective well-being compared to previous year (SWB) and to previous five years ($SWB5$). Standard errors, obtained by delta method, are in parentheses. Significant level: *** 1%, ** 5%, * 10%.

6. Conclusion

To be completed

References

- Akay A. and Martinsson P. (2011), “Does relative income matter for the very poor? Evidence from rural Ethiopia”, *Economics Letters*, 110, pp. 213-215.
- Alvarez-Cuadrado, F., Casado J.M., Labeaga J.M. (2015), “Envy and Habits: Panel Data Estimates of Interdependent Preferences”, *Oxford Bulletin of Economics and Statistics*, 0305-9049doi: 10.1111/obes.12111.
- Arouri M., Nguyen C. and Youssef A.B. (2015), “Natural disasters, household welfare, and resilience: evidence from rural Vietnam”, *World Development*, 70, pp.59-77.
- Asadullah M. N., and Chaudhury N. (2012), “Subjective well-being and relative poverty in rural Bangladesh”, *Journal of Economic Psychology*, 33, pp. 940-950.
- Brekke K.A. and R. Howarth (2002). *Status, Growth and the Environment*. Edward Elgar, Northampton.
- Clark A.E. (2000), «Utilité Absolue ou Utilité Relative», *Revue économique*, 51, pp. 459-471.
- Clark A.E., and Oswald A. J. (1996), “Satisfaction and Comparison Income”, *Journal of Public Economics*, 61, pp. 359-381.
- Clark A., Frijters P., and Shields M. (2008), “Relative income, happiness and utility: An explanation for Easterlin paradox and other puzzles,” *Journal of Economic Literature*, 46, 95-144.
- Fafchamps M. and F. Shilpi (2008), “Subjective welfare, isolation, and relative consumption,” *Journal of Development Economics*, 86(1), p. 43-60.
- Ferrer-i-Carbonell A. and Gowdy J.M. (2007), “Environmental degradation and happiness,” *Ecological Economics*, 60, 509-516.
- Hardeweg B. and Waibel, H. (2009), “Collecting data to measure vulnerability to poverty: an overview.” Paper presented at the Workshop of Research Unit 756 of the Deutsche Forschungsgemeinschaft (DFG).
- Hardeweg B., Wagener A., and Waibel H. (2013), “A distributional approach to comparing vulnerability, applied to rural provinces in Thailand and Vietnam”, *Journal of Asian Economics*, 25, pp. 53-65.
- Hardeweg B., Wagener A., and Waibel H. (2010), “Towards Comparative and Aggregate Vulnerability: Analysis of Welfare Distributions in Rural Areas in Thailand and Viet Nam,” Paper presented at Jahrestagung des Vereins für Socialpolitik. September 7-10, Kiel, Germany.
- Klasen S. and H. Waibel (2015), “Vulnerability to poverty in South-East Asia: Drivers, measurement, responses, and policy issues,” *World Development*, 71, 1-3.
- Kurosaki, T. (2014), “Vulnerability of household consumption to floods and droughts in developing countries: evidence from Pakistan”, *Environmental and Development Economics*, vol. 20(2), pp. 209-235.
- Ludwig, F., van Scheltinga, C., Verhagen, J., Kruijt, B., Van Ierland, E., Dellink, R., et al. (2007). *Climate change impacts on developing countries-EU accountability*. IP/A/ENVI/ST/2007-04, the European Parliament’s Committee on the Environment, Public Health and Food Safety, European Parliament.
- Luttmer, E.F. (2005), “Neighbors as negatives: Relative earnings and well-being”, *Quarterly Journal of Economics*, vol. 120(3), pp. 963-1002.
- Markussen T., Fibaek M., Tarp F. and Nguyen D.A.T. (2014), “Self-employment and subjective well-being in rural Vietnam”, *WIDER Working Paper* 2014/108.
- Nguyen L. D., Raabe K., and Grote U. (2013), “Rural-urban migration, household vulnerability, and welfare in Vietnam”, *World Development*, 71, pp.79-93.

- Nguyen M.D. (2009), "Contribution of fish production to farmers' subjective well-being in Vietnam-a logistic model", *Journal of the World Aquaculture Society*, 40, pp. 417-423.
- Nguyen-Van P., T.K.C. Pham (2013), "Endogenous fiscal policies, environmental quality, and status-seeking behavior," *Ecological Economics*, 88, 32-40.
- Norcia M. and Rissotto A. (2015), "Subjective perception and causal attributions for poverty in Italy", *Journal of Social Sciences*, 11, pp. 49-54.
- Ravallion, M. and Lokshin M. (2010), "Who care about relative deprivation?", *Journal of Economic Behavior & Organization* 73(2), pp. 171-185.
- Rehdanz K. and D. Maddison (2008), "Local environmental quality and life-satisfaction in Germany," *Ecological Economics*, 64(4), 787-797.
- Tran T.Q., Nguyen T.Q., Vu V.H., and Doan T.T. (2016), "Religiosity and subjective well-being among old people: evidence from a transitional country", *Applied Research Quality Life*, DOI 10.1007/s11482-016-9500-9.
- Venkatachalam L. (2008), "Behavioral economics for environmental policy," *Ecological Economics*, 67, 640-645.
- Wooldridge J. M. (2014): "Quasi-maximum likelihood estimation and testing for nonlinear models with endogenous explanatory variables," *Journal of Econometrics* 182, 226-234.

Appendix



Figure A1: Area of survey. Source: Hardeweg (2009) based on ESRI World Map.

Table A1: Definition of variables

Variable	Definition	Type
SWB	Household subjective well-being, compared to previous year (=1 if much worse/worse off, 2 same as, 3 if much better/better off)	Discrete
SWB5	Household subjective well-being, compared to previous 5 year (=1 if much worse/worse off, 2 same as, 3 if much better/better off)	Discrete
Income	Household income, in thousands dollars, PPP	Continuous
Mean village income	Mean household income, computed at the village level	Continuous
Log house value	Logarithm of house value if sold	Continuous
Subjective wealth, wrt village	Subjective wealth, compared to other village residents (=1 if much worse/worse off, 2 same as, 3 if much better/better off)	Discrete
Subjective wealth, wrt country	Subjective wealth, compared to other country residents (=1 if much worse/worse off, 2 same as, 3 if much better/better off)	Discrete
Risk attitude	Self-assessment of general risk attitude (=1 if unwilling to take risks, ..., 10 if fully prepared to take risks)	Discrete
Household size	Number of household members	Discrete
Average age	Average age of household members	Continuous
Share of male members	Share of male members in household size	Continuous
Ethnic minority	Belonging to an ethnic minority (=1 if belonging to an ethnic minority, 0 if belonging to Kinh majority group)	Dummy
Public water supply availability	Availability of public water supply (=1 if available, 0 otherwise)	Dummy
<i>Access to facilities</i>		
Access to electricity	Percentage of village households having access to electricity	Continuous
Access to public water supply	Percentage of village households having access to public water supply	Continuous
Access to sanitation	Percentage of village households having access to sanitation	Continuous
Access to public waste disposal	Percentage of village households having access to public waste disposal	Continuous
Access to fixed line telephone	Percentage of village households having a fixed line telephone	Continuous
Access to internet	Percentage of village households having access to internet	Continuous
<i>Village characteristics</i>		
Mountain	=1 if located on a mountain, 0 otherwise	Dummy
Slope	=1 if located on slope, 0 otherwise	Dummy
Valley	=1 if located in a valley, 0 otherwise	Dummy
River	=1 if located near a river, 0 otherwise	Dummy
Lake	=1 if located near a lake, 0 otherwise	Dummy
Coast	=1 if located near the coast, 0 otherwise	Dummy
Dirt road	=1 if access to the village is limited to dirt roads, 0 otherwise	Dummy
<i>Provinces</i>		
Ha Tinh	=1 if belonging to the province, 0 otherwise	Dummy
Thua Thien – Hue	=1 if belonging to the province, 0 otherwise	Dummy
Dak Lak	=1 if belonging to the province, 0 otherwise	Dummy
Buriram	=1 if belonging to the province, 0 otherwise	Dummy
Ubon Ratchathani	=1 if belonging to the province, 0 otherwise	Dummy
Nakhon Phanom	=1 if belonging to the province, 0 otherwise	Dummy

Tableau A1: Descriptive statistics, Vietnam

Variable	Obs	Mean	Std. Dev.	Min	Max
SWB	1375	2.065	0.760	1	3
SWB5	1372	2.367	0.799	1	3
Income	1375	6.356	7.015	0.047	93.959
Mean village income	1375	6.352	2.720	2.441	20.679
Log house value	1375	8.691	1.237	1.288	16.975
Subjective wealth, wrt village	1375	1.812	0.693	1	3
Subjective wealth, wrt country	1375	1.485	0.632	1	3
Risk attitude	1375	3.904	2.796	0	10
Household size	1375	5.248	1.982	1	15
Average age	1375	32.858	13.743	11.6	90
Share of male members	1375	0.480	0.186	0	1
Ethnic minority	1375	0.157	0.364	0	1
Public water supply availability	1375	0.253	0.435	0	1
Access to electricity	1375	97.990	8.628	0	100
Access to public water supply	1375	15.818	32.633	0	100
Access to sanitation	1375	46.369	37.018	0	100
Access to public waste disposal	1375	3.703	15.688	0	100
Access to fixed line telephone	1375	82.72	16.823	30	100
Access to internet	1375	1.888	3.965	0	20
Mountain	1375	0.471	0.499	0	1
Slope	1375	0.287	0.453	0	1
Valley	1375	0.084	0.277	0	1
River	1375	0.203	0.402	0	1
Lake	1375	0.163	0.369	0	1
Coast	1375	0.053	0.224	0	1
Dirt road	1375	0.376	0.485	0	1
Ha Tinh province	1375	0.397	0.489	0	1
Thua Thien – Hue province	1375	0.191	0.393	0	1
Dak Lak province	1375	0.412	0.492	0	1

Tableau A2: Descriptive statistics, Thailand

Variable	Obs	Mean	Std. Dev.	Min	Max
SWB	1859	2.211	0.745	1	3
SWB5	1859	2.312	0.805	1	3
Income	1859	9.294	16.560	0.035	512.165
Mean village income	1859	9.314	5.261	2.656	57.349
Log house value	1859	8.976	1.092	2.454	12.453
Subjective wealth, wrt village	1859	1.942	0.579	1	3
Subjective wealth, wrt country	1859	1.590	0.639	1	3
Risk attitude	1859	4.633	2.547	0	10
Household size	1859	5.514	2.230	1	20
Average age	1859	35.567	10.480	15.333	85
Share of male members	1859	0.494	0.181	0	1
Ethnic minority	1859	0.998	0.040	0	1
Public water supply availability	1859	0.944	0.230	0	1
Access to electricity	1859	98.872	3.898	70	100
Access to public water supply	1859	84.916	28.804	0	100
Access to sanitation	1859	82.402	29.289	0	100
Access to public waste disposal	1859	14.914	34.786	0	100
Access to fixed line telephone	1859	36.899	46.194	0	100
Access to internet	1859	2.897	10.010	0	100
Mountain	1859	0.010	0.098	0	1
Slope	1859	0.051	0.219	0	1
Valley	1859	0.005	0.073	0	1
River	1859	0.171	0.377	0	1
Dirt road	1859	0.118	0.322	0	1
Buriram province	1859	0.399	0.490	0	1
Ubon Ratchathani province	1859	0.425	0.495	0	1
Nakhon Phanom province	1859	0.175	0.380	0	1