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Subjective well-being and social comparison: A comparative study on rural Thailand and Vietnam[*]

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Abstract

This paper analyzes the determinants of the households' welfare perception using the data from surveys on rural households in Thailand and Vietnam. Welfare perception corresponds to the households' subjective assessment of their general situations. We focus on the social comparison and take into account relative poverty, harsh living conditions, economic and natural risks as well as the households' degree of risk acceptance. Our study shows that households, in both countries, are sensitive to income and relative poverty, but only Thai households appear to care about social comparison regarding their wealth. In particular, this comparison is asymmetric. Natural risks as well as households' attitude to risks affect households' well-being differently in the two countries, while we observe a similarity in the impact of economic shocks.

Key words: Economic risks, natural risks, rural area, social comparison; subjective well-being

JEL classification: I31; O12; Q56

Bien-être subjectif et comparaison sociale: une étude comparative entre les zones rurales de la Thailand et du Vietnam

Résumé

Cet article analyse les déterminants du bien-être subjectif des ménages en utilisant une base de données d'enquêtes auprès des ménages habitant dans les zones rurales en Thailand et Vietnam. Le bien-être subjectif des ménages correspond à leur évaluation subjective de la situation générale au moment présent comparé au passé. Nous mettons l'accent sur la comparaison sociale en prenant en compte la pauvreté relative, les conditions de vie, les

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risques naturels ainsi que l'attitude des ménages face aux risques. Notre étude montre un effet significatif du revenu et de la pauvreté relative. Seuls les ménages Thaïlandais sont concernés par la comparaison en termes de richesse, qui est asymétrique. Les effets des risques naturels ainsi que ceux de l'attitude des ménages face aux risques sont différents entre deux pays, alors que ceux des risques économiques sur le bien-être subjectif sont plutôt similaires.

Mots clés: Risques économiques, risques naturels, zone rurale ; comparaison sociale; bien-être subjectif

1. Introduction

While standard economic theory assumes that individual utility is derived from absolute level of consumption or income, numerous empirical and experimental investigations have attempted to shed light on the aspect of relative standing (Luttmer, 2005, Alpizar et al. 2005, Carlsson et al. 2007, Clark et al. 2008, Fafchamps and Shilpi, 2008, etc.). This finding corroborates the idea of a social comparison already present in *The Theory of Moral Sentiment* (Smith, 1759) and more recently in *The Social Limits to Growth* (Hirsch, 1976). According to this idea, people derive satisfaction not only from their absolute position in terms of material conditions (consumption, income) but also from their relative position compared to their peers. Individuals have a tendency to compare their position to a reference point. This comparison behavior may be motivated by the desire to acquire social status, which induces social esteem, respect and admiration for individuals. Empirical investigations also show that relative income may matter differently according to the group of individuals. In particular, the rich might care more about their relative wealth than the poor (Ravallion and Lokshin, 2010, Ferrer-i-Carbonell, 2005).

Overall, we can observe that papers in this body of literature mainly focus on socio-economic aspects and ignore issues of environmental quality or natural disasters. In the case of developing countries, households' living conditions are significantly affected by natural disasters and environmental vulnerability. Rural and poor households in particular are vulnerable to environmental shocks, and natural disasters (storms, floods and droughts) have a negative effect on income and expenditure in rural households (Nguyen et al. 2013, Kurosaki 2014, Arouri et al. 2015).

This paper fits into the literature of subjective well-being using the data from surveys on rural households in Vietnam and Thailand. It focuses on the effects of economic and environmental risks as well as on relative standing. First, we provide a test for relative standing with special attention to the asymmetric comparison hypothesis. Second, for the case of developing countries such as Vietnam and Thailand, this paper examines some characteristics of poor rural areas such as environmental and economic risks, vulnerability and harsh living conditions. Vulnerability encompasses not only the households' economic circumstances but also their situation in relation to the natural and geographical environment. Finally, we also analyze the nexus between households' welfare perception and self-assessment of general risk attitude. Welfare perception corresponds to the households' subjective assessment of their general situation. A households' attitude towards risk corresponds to their readiness in the event of economic and environmental risks.

Our study shows a significant effect of income on households' subjective well-being for two countries. Moreover, households are sensitive to relative poverty, i.e. earning an income lower than the village average makes households feel worse off than the previous year or the 5 previous years. However, we observe a divergence between the two countries in terms of social comparison, natural or economic shocks, and risk attitude. Only Thai households appear to care about social comparison regarding their wealth. They are asked to estimate if their wealth is better than the average of their village and of their country. Results

show that Thai households feel happier compared to the past, when estimating that their wealth is better than the national average. This means that people do not compare themselves to their peers in the same village, but rather to others at national level. Given that this data concerns 3 poor and rural provinces in Thailand, this result may be interpreted as an upward comparison, and the national level with which people compare their wealth may be considered as a strong reference. Our results also show that natural risks (drought, flooding, heavy ice rain) affect households' well-being differently in the two countries, while we observe a similarity in the impact of economic shocks (pests or livestock disease). Concerning the effect of risk attitude, our results for Vietnam indicate that those who are more ready to accept risks feel better off in the present compared to the previous or the 5 previous years.

The present study contributes to the subjective well-being literature in the following ways. First, while the literature on this topic only focuses on the socio-economic aspect, we also consider environmental vulnerability and risk attitude. However, taking such factors into account is of great importance, particularly in the case of developing countries. On the one hand, poor households are likely to be more vulnerable in terms of natural shocks. On the other hand, with regard to subjective well-being, it seems that those with high risk acceptance are less affected by either natural or economic shocks than their risk avoidance counterparts. As for the empirical methodology, we carefully controlled for the endogeneity bias linked to some important explanatory variables (resulting from a reverse causality or measurement errors). Second, the comparison between Vietnamese and Thai households is also interesting since, to the best of our knowledge, this has not previously been studied in the literature. Third, findings derived from an analysis of subjective well-being and its determinants can have important policy implications, in particular for developing countries where income inequality is high compared to developed countries. If only absolute income matters, public policy should focus on reducing absolute poverty. If relative poverty affects individuals' well-being, policy-makers should pay attention to reducing poverty and inequality in order to improve the population's happiness. Moreover, the findings concerning the effects of natural disasters give some insights into environmental policies in both countries, in particular in terms of preventive policies.

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 descriptive statistics. The econometric model and estimation results are presented in Sections 4 and 5 respectively. Section 6 concludes.

2. Subjective well-being and social comparison

Most studies on subjective well-being underscore a phenomenon of relative standing, contrary to the absolute utility hypothesis which is usually postulated in standard economic modelling. Relative standing effects differ between developed and developing countries, as well as between rich and poor individuals in a same country. In the case of developed countries, there is a consensus that a reference level exerts a negative effect on an individual's subjective well-being or life satisfaction, which is considered as a proxy of individual utility (McBride, 2001, Frijters et al., 2004, Luttmer, 2005, Ferrer-i-Carbonell, 2005, Clark et al., 2008, etc.).

For example, Luttmer (2005) used US data from the National Survey of Families and Households and considered the neighbors' earnings as a reference to which individuals compare their earnings. The study suggests that the reference level has a negative impact on 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 one's own income are roughly the same.

Individuals may compare their situation to an external reference (others) as well as an internal reference (one's past income or expected future income). Using the Spanish Continuous Family Expenditure Survey, Alvarez-Cuadrado et al. (2012) estimated 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 comes from relative consumption.

Contrary to a large number of studies containing data on developed countries which suggest a significant impact of relative income, some research using data on developing and low-income countries paints a different picture. In the latter, there is no systematically meaningful effect of relative concern on subjective well-being. Within a country, relative income matters differently for rich and poor people. The effect of relative standing on well-being is noticeable for the rich, while it may be absent 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). In particular, Asadullah and Chaudhury (2012) used data from rural Bangladesh to show that the relative wealth effect is stronger for the rich. However, when comparing the relative wealth effect to the absolute wealth effect, the results indicate that the relative wealth effect is lower. Using Malawian data, Ravallion and Lokshin (2010) found that relative income has no effect on the poor's subjective well-being. The same result was observed by Akay and Martinsson (2011) based on data from Ethiopia. For the rural areas of northern Ethiopia, one of the poorest regions in the world, relative income does not appear to matter at all. These studies using data on poor countries only show a significant effect of absolute income.

Focusing on the effect of relative consumption in the case of Nepal, Fafchamps and Shilpi (2008) gave two different findings based on the type of poor population. The authors concluded that the poor care less about relative consumption than the non-poor. However, when focusing on poor households that are isolated from markets, this conclusion changes. Households in isolated areas are more sensitive to their neighbors' standards of living. Moreover, controlling for a migration variable, the authors showed that household heads who have migrated from their birth district continue to compare their consumption with that of households in their district of origin.

Our study concerns 3 rural provinces in Vietnam and 3 rural provinces in Thailand. The next section provides some insights into the data about these two developing countries.

3. Data

The data used in this paper comes 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. Begun in 2007, the survey attempted to find a consensus on poverty and associated indicators that could affect poverty likelihood such as vulnerability, shocks and risks. The target population was poor rural households with a per capita income near the poverty line. To this end, we selected three peripheral provinces in Northeast Thailand (Buriam, Unbon Ratchathani, and Nakhon Phanom) and three provinces from the Central Highlands (Dak Lak) and the North Central and Central coastal area (Ha Tinh, Thua Thien Hue) in Vietnam.[1,2]

The three provinces in Thailand selected for our study are among the poorest in terms of infrastructure and access to essential services (e.g. electricity, public water, sanitation and public waste disposal). There is also high income inequality between the provinces of Thailand. This inequality is caused in particular by obstacles (e.g. poor transport links) that prevent goods and production output from circulating between regions (Limpanonda, 2012). As for Vietnam, the two regions mentioned are among the three poorest in the country. In 2010, the poverty rate was respectively 22.2% for Central Highland and 20.4% for the other region. It should be noted that these values are even higher than the average rural areas poverty rate of 17.5% and the whole country poverty rate of 14.2%. As for the three provinces concerned, the poverty rate is 26.1% in Ha Tinh, 12.8% in Thua Thien Hue, and 21.9% in Dak Lak. These provinces also have a low population density and a low level of infrastructures and public services.[3]

Our analysis covers the 2010 wave of this survey. Table A1 in the Appendix summarizes the definition of variables concerning the socio-demographic and economic conditions of the households as well as environmental and economic events which occur during 2 years before the survey. 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 were available in the data. They were defined in comparison to either the year before the survey or the 5 previous years. In response 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 were asked to report their answer on an increasing 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 merged categories 1 and 2 into one group, and categories 4 and 5 into

[1] The survey area is illustrated in Figure A1.

[2] For a more in-depth description of the sample, please refer to: https://www.vulnerability-asia.uni-hannover.de/6362.html

[3] E.g. In 2010, the density was 204 persons/km² in Ha Tinh, 215 in Thua Thien Hue, and 134 in Dak Lak, compared to 263 for the whole country. Accessibility to telephones was 7 persons per telephone in Ha Tinh, 5 in Thua Thien Hue, and 7 in Dak Lak compared to 0.7 for the whole country. For accessibility to public services such as health care, 601 persons shared a patient bed in Thua Thien Hue, 510 in Dak Lak, compared to 392 for the whole country. Source: Vietnam statistics yearbook 2010.

another group to create two new 3-category variables.[4] The first was subjective well-being compared to the previous year: SWB = 1 if the household's well-being is worse or much worse than the previous year, = 2 if it is the same as the previous year, = 3 if it is better or much better. The other variable, subjective well-being compared to the 5 previous years, $SWB5$, was defined similarly. The final dataset obtained from the 2010 wave included 1390 households (for both SWB and $SWB5$) from 199 villages in 3 Thai provinces (Buriram, Ubon Ratchathani and Nakhon Phanom) and 1201 households (for SWB) and 1198 households (for $SWB5$) observed in 152 villages in three Vietnamese provinces (Ha Tinh, Dak Lak and Thua Thien-Hue).

Table 1: Distribution of household subjective well-being

	Vietnam		Thailand	
Compared to the previous year (SWB)	Frequency	Percent	Frequency	Percent
Much worse or worse (*SWB=1*)	336	27.98	292	21.01
Same (*SWB=2*)	494	41.13	537	38.63
Better or much better *SWB=3*)	371	30.89	561	40.36
Compared to 5 previous years (SWB5)				
Much worse or worse (*SWB5=1*)	269	22.45	323	23.34
Same (*SWB5=2*)	257	21.45	320	23.02
Better or much better (*SWB5=3*)	672	56.10	747	53.74

Note. Number of observations: 1201 (*SWB*) and 1198 (*SWB5*) for Vietnam, 1390 (both SWB and SWB5) for Thailand.

Table 1 reports the distribution of these two subjective variables *SWB* and *SWB5*. We note that when compared to the 5 previous years, a majority of households in both countries think that their situation is better or much better. However, compared to the previous year, the most frequent answer is "the same" (as the previous year) for Vietnamese households and "better or much better" for Thai households. Moreover, both in Vietnam and Thailand, Tables 3 and 4 show that households who feel "better or much better" than the previous year, also feel "better or much better" than the last five years (331 households in Vietnam and 490 in Thailand). This was also true for the "same" and the "worse/much worse" categories.

Table 3: Distribution of *SWB* and *SWB5*. Vietnam

Subjective well-being compared to the previous years (SWB)	*Subjective well-being compared to the 5 previous years (SWB5)*			
	Worse/much worse	Same	Better/much better	Total
Worse/much worse	189	65	81	335
Same	66	167	260	493
Better/much better	14	25	331	370
Total	269	257	672	1198

[4] In Vietnam, only 3 households (0.25% of the sample said that their situation was "much better" compared to that of the previous year, and only 9 (0.75%) said that the situation was "much worse", while only 66 Thai households (5% of the sample) declared that their situation was "much better", and 20 (1.4%) "much worse". When it came to comparison with the last five years, 42 Vietnamese households (4% of the sample) said that their actual situation was 'much better" and 17 (1.4%) "much worse". The statistics are respectively 131 (9%) and 28 (2%) in Thailand.

Table 4: Distribution of *SWB* and *SWB 5*. Thailand

Subjective well-being compared to the previous years (SWB)	*Subjective well-being compared to the 5 previous years (SWB5)*			
	Worse/much worse	Same	Better/much better	Total
Worse/much worse	212	38	42	292
Same	88	234	215	537
Better/much better	23	48	490	561
Total	323	320	747	1390

Table 5: Distribution of household subjective wealth

	Vietnam		Thailand	
Compared to the village	Frequency	Percent	Frequency	Percent
Much worse or worse	447	37.22	289	20.79
Same	577	48.04	915	65.83
Better or much better	177	14.74	186	13.38
Compared to country				
Much worse or worse	731	60.87	719	51.73
Same	387	32.22	557	40.07
Better or much better	83	6. 91	114	8.20

Note. Number of observations: 1201 for Vietnam, 1390 for Thailand.

Table 5 describes the distribution of self-assessment of household wealth, compared to the village and to the country. Households were asked to estimate whether their wealth was better than the average of their village and then of their country. Compared to the village, the most frequent answer was "the same" as other households with 65.83% for Thai households and 48.04% for Vietnamese households. The most frequent answer in the comparison with the country was more pessimistic as 60.87% of the sampled Vietnamese households and 51.73% of the Thai households felt that their wealth was much worse or worse than that of other households. Interestingly, Table A6 in the Appendix indicates that among 177 Vietnamese households who felt "better/much better" at village level, only 71 also felt "better/much better" compared to country level, 47 of them even felt that their situation was "worse/much worse" and 59 "the same" compared to other Vietnamese residents outside of their village. The picture appears to be the same for Thai households (see A7 in the Appendix): only 57 of 186 households who felt "better/much better" at village level also felt "better/much better" at country level, while most of them thought their wealth was "worse/much worse" or "the same" compared to other country's resident categories.

Another subjective variable concerns the degree of risk acceptance. This concerns the self-assessment of general risk attitude. On an 11-point Likert scale, people were asked to respond 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)?" A higher value in the answer corresponds to a higher degree of risk acceptance or a lower degree of risk aversion. In order to eliminate cases with an insufficient number of observations induced by the 11-point Likert scale, and to increase the variability of the risk variable, we referred to three levels of risk attitude: low risk acceptance (or risk avoidance), intermediate risk acceptance and high risk acceptance. We

then created three dummies corresponding to three levels of risk attitude: Risk_Avoidance = 1 if the answer is 0,1, 2 or 3, Risk_Neutrality = 1 if the answer is 4, 5, 6 or 7, and Risk_Acceptance = 1 if the answer is 8, 9 or 10.

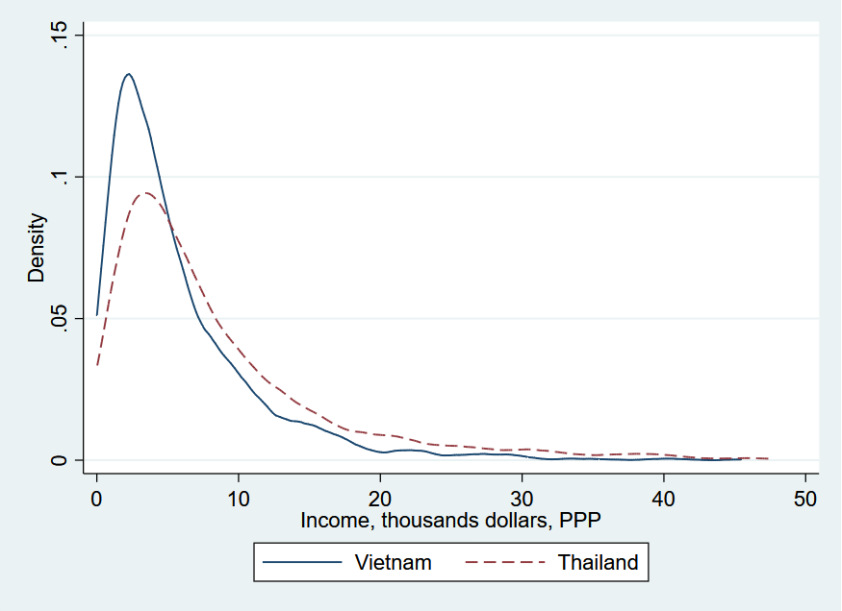


Figure 2: Distribution of total annual household income, in thousand dollars, PPP.

Figure 2 displays the distribution of total household income in 2010. We observe that Thai households are slightly richer than their Vietnamese counterparts as the Thai income distribution is on the right of the Vietnamese income distribution. Table A1 gives us 6.04 and 9.21 (in thousand dollars, PPP) for the average income of Vietnamese and Thai households, respectively. We created a dummy variable (Poor) to account for the relative poverty of households in the village: Poor is equal to 1 if household income is lower than the mean village level.

Table A1 also describes other variables regarding the households' characteristics (Mean village income, Average age in the household, Ethnic minority, health), living conditions (Access to electricity, Public water, Sanitation, Public waste disposal, Fixed phone line, and Internet), village characteristics (Mountain, Slope, Valley, Lake, Coast, Travel distance to district town) and province dummies. For Vietnam, the ethnic minority variable is a dummy variable with 0 if the household belongs to the Kinh majority group and 1 if it belongs to an ethnic minority. Given that the majority of Vietnamese belong to the Kinh ethnic group (one of 54 ethnics) with around 85% of the total population, this variable contains a majority of 0, and about 15% of households belong to a minority ethnic. In the case of Thailand, Thai ethnicity accounts for 92% of the population, while the remaining 8% of the population belong to the other ethnic minorities. The dummy variable Minority contains a majority of 0 as only about 5.6% of Thai households in our data belong to an ethnic

minority. Environmental risks (Drought, Flooding of land, Heavy ice rain, Storm) and economic shocks (Business collapse, Pests or livestock disease) are represented by dummies. These events occurred between May 2008 and April 2010, two years before the survey.

Focusing now on statistics at province level, Table A4 in the Appendix offers some important insights. On the one hand, natural shocks appear not to be equally distributed between the three provinces. In Vietnam, Dak Lak's villages are considered to be the most affected by *Flooding of land*, and Thua Thien Hue by *Storm, landslide*, while in Thailand, Buriam's villages and Nakhon Phanom's villages are the most vulnerable to *Flooding of land*.[5] In terms of subjective well-being comparison with the previous year, Dak Lak and Thua Thien Hue households were more pessimistic since most of them declared that their situation was "worse/much worse", leading to an average index below 2 (i.e. "the same"). In contrast, Ha Tinh's households were more optimistic about their situation, and the same was true for the three Thai province households.

To gain deeper insights into Vietnamese and Thai villages, it is useful to see how these villages have evolved. To this end, we referred to the 2007 wave: the statistics are displayed in Table A5 in the Appendix. By comparing Table A4 with Table A5, we first observe that the poverty rate increased in both countries. In three Vietnamese provinces, 51% of households had an annual income lower than the average village income in 2007, and this statistic increased to 61% in 2010. In three Thai provinces, the poverty rate was 58% in 2007 and 61% in 2010. Note that the picture remains the same when it comes to province levels. For example, in Ha Tinh in Vietnam, the poverty ratio increased from 54% in 2007 to 62% in 2010. Second, in terms of subjective well-being, Vietnamese village households were less pessimistic in 2010 than in 2007, while the reverse was true for Thai village households.

4. Econometric specifications

4.1. Relative utility function

Let us consider the general utility function of households i, $i = 1, \dots, N$:

$$U_i = U(y_i, \bar{y}, w_i, \bar{w}, X_i) \quad (1)$$

where y_i is household income, $\bar{y}$ is a reference income level used for comparative purposes (e.g., average income of household i's village, region or country), w_i household wealth, $\bar{w}$ a wealth reference (e.g., average wealth of household i's village), and X_i the set of other observed determinants. The components of X_i will be discussed below. The choice of this households' utility function depending on the average level of wealth and average level of

[5] Note that the Vietnamese declaration is likely to be consistent with objective sources and other research. For example, Arouri et al. (2015) claim that the incidence of households affected by storms and flooding is highest in the Central Highland and the North Central and Central coastal area. Likewise, according to the Vietnamese statistics yearbook 2010, total annual rainfall in Hue (a commune of Thua Thien Hue) and Pleiku (a rain gauge of the Central Highland and about 100km from Dak Lak) is among the highest in the country. In contrast, the Thai household's declaration appears to differ from the country's meteorological statistics. For example, the Thailand 2013 statistics yearbook reports that in 2010, the three provinces mentioned had high annual rainfall as well as a high number of rainy day, while in this study, a very small proportion of households (less than 1%) declared that they suffered from undue rainfall.

income reflects the comparison situation (Clark and Oswald, 1996, Frey and Stutzer, 2002, Luttmer, 2005, Akay and Martisson, 2011, etc.). People derive satisfaction not only from their absolute position in terms of material conditions but also from their relative position compared with their peers. In this case, 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 a reference level on a households' well-being implies that there is an interpersonal comparison. The higher the reference level, the lower the households' utility, all other things being equal.

This general form of the utility function can be modified to fit in with the available data. Indeed, working with data on rural Vietnam and Thailand, information on household wealth w_i and reference wealth $\bar{w}$ are not provided separately. The only information available is a subjective assessment of wealth, corresponding to the households' subjective estimation of their wealth in comparison with other residents at village level or with other residents at country level. This results in a binary indicator expressing whether the household is wealthier or not compared to the average village or country level. Hence, we adapt the utility function in (1) to account for this information from our data as follows:

$$U_i = U(y_i, \bar{y}, v(w_i, \bar{w}), X_i) \tag{2}$$

where the indicator component $v(w_i, \bar{w}) = 1(w_i < \bar{w})$ states whether household *i* is poorer compared to the average wealth level $\bar{w}$ (either at village or country level).

We can also use a binary indicator for income comparison as follows:

$$U_i = U(u(y_i, \bar{y}), v(w_i, \bar{w}), X_i) \tag{3}$$

where $u(y_i, \bar{y}) = 1(y_i < \bar{y})$ gives the information that household *i* has an income level lower or higher than the reference income $\bar{y}$. In the next section, we employ the dummy variable Poor, which defines whether a household is poor or not (when its income is lower or higher than the average village income $\bar{y}$).

It should be noted that subjective well-being is reported in our data as a variation compared to the previous year or the 5 previous years (SWB or $SWB5$). Therefore, we should interpret the utility accordingly. Let U_{i1}^* denote household i's unobserved (or latent) well-being at the time of the survey. We assume that U_{i1}^* is described by the following dynamic conditional model:

$$U_{i1}^* = z_{i1}'\beta + \lambda U_{i0}^* + \varepsilon_{i1}, \tag{4}$$

where U_{i0}^* is the household's unobserved well-being in the past and parameter λ measures the persistent impact of past well-being. Note that data on U_{i0}^* are not available due to the survey design which does not contain any questions on the level of well-being at the current period. Indeed, the survey only contains questions about changes in well-being relative to the past (previous year or 5 previous years).

By taking the difference between the current and past levels of well-being into the equation (4), we can express changes in well-being as follows:

$$\Delta U_i^* \equiv U_{i1}^* - U_{i0}^* = z_{i1}'\beta + (\lambda - 1)U_{i0}^* + \varepsilon_{i1}. \quad (5)$$

This equation states that the variation in well-being (ΔU_i^*) depends on a set of observed variables at the current period (z_{i1}), the past level of well-being (U_{i0}^*) and an unobserved error term (ε_{i1}, assumed normally distributed $\mathcal{N}(0,\sigma_\varepsilon^2)$). Remember that ΔU_i^* is what we want to measure but it is not observed. We can link ΔU_i^* to the observed measures of variation in subjective well-being with respect to the past (i.e. SWB and $SWB5$) by using the following ordered probit model

$$DU_i = \begin{cases} 1 \text{ if } \Delta U_i^* \leq c_1 \\ 2 \text{ if } c_1 < \Delta U_i^* \leq c_2 \\ 3 \text{ if } c_2 < \Delta U_i^* \end{cases} \quad (6)$$

where DU_i corresponds to the observed changes in subjective well-being reported by household i (either SWB or $SWB5$) and ΔU_i^* is defined by equation (5).

Because of the presence of an unobserved variable (U_{i0}^*) on the right-hand side of equation (5) besides the error term ε_{i1} (which is assumed to be independent and identically distributed and independent of z_{i1}), the model estimation cannot be directly performed using the standard ordered probit model. Some additional assumptions need to be included for identification purposes. Indeed, as U_{i0}^* is unobserved, we need to make an assumption about its distribution. A reasonable assumption is a conditional form for U_{i0}^* (similar to correlated random effects in a panel data framework):

$$U_{i0}^* = x_i'\gamma + v_i, \quad (7)$$

where x_i includes a set of individual characteristics (time-invariant regressors) and v_i an error term which can either be independent or correlated with ε_{i1} (assumed to be normally distributed $\mathcal{N}(0,\sigma_v^2)$).[6] In order to work with changes in well-being, we combine equations (5) and (7):

$$\Delta U_i^* = z_{i1}'\beta + x_i'\gamma(\lambda - 1) + (\lambda - 1)v_i + \varepsilon_{i1}. \quad (8)$$

This is the same ordered probit model as in equation (5) but with the new error term $(\lambda - 1)v_i + \varepsilon_{i1}$. Using a normalization for the variance, $Var[(\lambda - 1)v_i + \varepsilon_{i1}] = 1$ (whether v_i and ε_{i1} are independent or not), this model is reduced to the *standard ordered probit* applied to equations (6) and (8): we regress changes in well-being on two sets of variables, current-period variables z_{i1} and time invariant variables x_i. Note that these explanatory variables correspond to X_i in equations (1) - (3). This estimation delivers parameters β (the intercept is

[6] If we substitute (7) in (4), we obtain the regression model corresponding to the utility function in (3), where z_{i1} includes variables relative to comparisons (the first two arguments of the utility function) and x_i the third argument.

normalized to zero), $\tilde{\gamma}$ ($\equiv \gamma(\lambda - 1)$, for γ and $\lambda - 1$ are not separately identified), and the thresholds (c_1 and c_2).

Alternatively, we can add the independence between v_i and ε_{i1}, leading to another estimation procedure which corresponds to an ordered probit model with *unobserved heterogeneity* v_i. The model's log-likelihood in this case is

$$lnL = \sum_{i=1}^{N} ln \int \left[\prod_{j=1}^{3} \Pr(DU_i = j | z_{i1}, w_i, v_i)^{1(DU_i = j)}\right] f(v_i) dv_i \quad (9)$$

where $1(.)$ is the indicator function for the state of variation in well-being ($DU_i = j$) and $f(.)$ is the density of unobserved heterogeneity for v_i. The latter is integrated out before maximization. In practice, we compute this integration by simulation (using a high number of replications, e.g. 50 or 100). Note that, besides β and the thresholds c_1 and c_2, this model allows us to separately identify $\lambda - 1$ and γ.

In estimations, the set of explanatory variables z_{i1} encompasses all the variables included in the arguments of the utility function, i.e., y_i, $\bar{y}$, $1(w_i, \overline{w})$. More precisely, y_i, corresponds to total annual household income and $\bar{y}$ corresponds to average household income at village level. Estimations also include the case where y_i and $\bar{y}$ are replaced by the income comparison binary indicator $u(y_i, \bar{y}) = 1(y_i < \bar{y})$, denoted Poor as above. The regression with Poor also includes its interaction with Income (i.e. Poor*Income) to account for the asymmetric effect of Income on households' subjective well-being. The set x_i includes time-invariant variables like economic and environmental risks, degree of risk acceptance, a dummy indicating the household head suffers from a serious disease, average age in the household, a dummy for ethnic minority, percentages for access to various facilities (electricity, public water supply, sanitation, public waste disposal, fixed phone line and internet), dummies for geographical characteristics of household i's village (on a mountain, on a slope, in a valley, near a river, near a lake, on the coast and travel distance to district town), and dummies for provinces (Dak Lak and Nakhon Phanom provinces are used as references for the Vietnamese and Thai data, respectively).

4.2. Endogenous regressors

Let us recall that we can estimate both alternative specifications above -- (i) the standard ordered probit model in equations (6) and (8), and (ii) the ordered probit model with unobserved heterogeneity, of which the log-likelihood function given in equation (9) -- by maximum likelihood using village-clustered robust standard errors. Before going further, the issue of endogenous regressors needs to be discussed as its existence can bias the results. More precisely, household income, income comparison indicators (i.e. Poor), interaction between Poor and Income, and Risk Attitude (Risk Avoiding and Risk Acceptance) are potentially endogenous as they can be affected by unobserved factors.[7] In order to fix this issue in the ordered probit model, we use the 'variable addition test' based on the control function approach proposed by Wooldridge (2014) to test for exogeneity of explanatory

[7] Risk neutrality is used as a reference.

variables in nonlinear models. This can be implemented using the following two-step procedure:

First, for the regression with income (y_i) and mean village income ($\bar{y}$), denoted Model 1, we made: (i) a linear regression of Income (as it is a continuous variable), and (ii) a probit regression of Risk avoidance on the one hand, and Risk acceptance on the other, for the whole set of the model's explanatory variables and additional instruments (that are excluded from the model). For the Income regression, excluded instruments correspond to a dummy indicating the household head's ability to read and write, a dummy for the main occupation as agriculture, a dummy for membership of a political association (Communist Party, professional association, etc.), a continuous variable for the house value, and finally a variable for the proportion of males in the household.[8] These excluded instruments are also considered in the probit regressions of household risk attitude (i.e. Risk avoidance and Risk acceptance). Indeed, the household head's ability to read and write can be considered as his/her human capital while the dummy for membership of a political association reflects the household's social networks. These variables are assumed to be correlated with the endogenous variables. Likewise, the main occupation of the household head, the house value or the proportion of males in the household may affect household income or risk attitude. They are assumed not to be correlated with the observed changes in subjective well-being reported by household i (either SWB or $SWB5$).

For the regression with income comparison indicator (i.e. Poor), denoted Model 2, we applied a probit regression to Poor (as it is a binary variable), Risk avoidance and Risk acceptance. The interaction term between poor and income was also instrumented by a linear regression. The set of explanatory variables and excluded instruments for Poor, Income, Poor*Income, Risk avoidance, and Risk acceptance were similarly defined as above.

Second, we computed the generalized residuals for these regressions of the first step and performed the ordered probit regression using these generalized residuals as additional explanatory variables. More precisely, we included generalized residuals corresponding to Income, Risk avoidance and Risk acceptance in Model 1, on the one hand, and those corresponding to Income, Poor, Poor*Income, Risk avoidance and Risk acceptance in Model 2, on the other.

Finally, as recommended by Wooldridge (2014), a (village clustered) robust *t*-test for the null hypothesis showed that the coefficient of residuals was zero. The null hypothesis corresponds to the exogeneity of Income, Poor, Poor*Income, Risk avoidance and Risk acceptance. The test is termed 'robust' as it is based on robust standard errors.

5. Estimation results

It should be recalled that we used two different models to represent the social comparison: Model 1 with mean village income as a reference level to which households compare their income and Model 2 with a relative poverty binary indicator. Regressions were performed

[8] Communist Party concerns only Vietnamese households.

with two measures of subjective well-being: *SWB* is the household subjective well-being compared to the previous year, and *SWB5* is the household subjective well-being compared to the 5 previous years.

For each subjective well-being measure, we estimated two variants of the ordered probit model (the standard ordered probit model and the model with unobserved heterogeneity v_i as discussed in Section 4.1). A likelihood ratio test (following a $\chi^2(1)$ distribution) was computed to choose the best specification. Table A8 shows that the standard ordered probit model is preferred to the model with unobserved heterogeneity (the test statistic is always lower than the 5% critical value, 3.84). Therefore, in the following, we only discuss estimations of the standard ordered probit model.

Furthermore, almost none of the computed robust *t*-statistics of the variable addition test for exogeneity of Income, Poor, interaction term Poor*Income, and risk attitude (Risk avoidance and Risk acceptance) reject exogeneity in Models 1 and 2 for the two measures *SWB* and *SWB5* or for the two countries. There are only two exceptions: the exogeneity of Poor is rejected at the 5% level for *SWB5* in Vietnam and that of Risk acceptance for SWB in Thailand is rejected at the 10% level. If we perform the joint significance test (following a chi-squared distribution) for these regressors, no test passes the 5% level. Thus, for simplicity's sake, we report the estimation results for the model with exogenous explanatory variables (even for the case of Poor in the regression of *SWB5* with Vietnamese data.

All the estimated coefficients of the models are provided in Tables A10-A11 in the Appendix, where we also report the results of the first step regressions (Tables A12-A15). The marginal effects of some significant explanatory variables are reported in Tables 3-6. Note that the marginal effect of an explanatory variable is calculated by maintaining other variables at their average values.[9] The results show that income is one of the key determinants of household happiness in both countries. A higher income is conducive to a higher probability of feeling better off or much better off (*SWB*=3 or *SWB5*=3) compared to the past (1 or 5 previous years). More specifically, if household income increases by 1 thousand dollars (in either country), the chance of attaining higher satisfaction increases by 0.5% to 1.8% (compared to the previous year) or by 0.6% to 2% (compared to the previous 5 years). However, the income of other households living in the same village does not matter for both countries (Model 1). Moreover, when observing the results of Model 2, the interaction term Poor*Income is positive and significant, reflecting an asymmetric effect of income, i.e. the income effect is higher for the poor than for the rich.

When analyzing the effects of relative poverty (Model 2), we observe a phenomenon of social comparison in terms of income. The estimation results reported in Tables A11-A12 show that households in both countries are sensitive to relative poverty as this variable exerts a negative and significant effect on their subjective well-being compared to the previous year (*SWB*) and the 5 previous years (*SWB5)*. This result is confirmed when analyzing the marginal

[9] Note that marginal effects of a variable on different probabilities, $\partial P(DU_i = l)/\partial z_{ij}$ where l = 1, 2, 3 add up to 0, i.e. $\sum_{l=1}^{3} \partial P(DU_i = l)/\partial z_{ij} = 0$.

effects of these two variables. For example, Table 5 (Model 2) indicates that for Vietnam, relative poverty (earning an income lower than the mean village level) makes households feel worse off than in the 5 previous years. More precisely, it has a negative effect on the probability of inducing a high level of subjective well-being, *SWB5* = 3 (better or much better), while it has a positive effect on the probability of inducing a lower level of well-being, *SWB5* = 1 (worse or much worse off), *SWB5* = 2 (same). Likewise, Table 6 gives us the same observation regarding the marginal effects of relative poverty for Thailand.

Observations regarding the subjective self-assessment of household wealth showed considerable disparity between the two countries. We found that Thai households were concerned by wealth comparison while Vietnamese households are not. Indeed, the effect of self-assessment of wealth comparison at country level was meaningful for both measures of well-being, i.e., *SWB* and *SWB5*, in the Thailand case. This implies that households feel happier if they estimate their wealth is better than that of other residents at country level. Tables 4 and 6 indicate that a higher self-assessment of wealth increases the probability of giving a high value of subjective well-being ($SWB = 3$ or $SWB5 = 3$) and decreases the probability of giving a lower value of subjective well-being ($SWB = 1$, $SWB = 2$ or $SWB5 = 1$, $SWB5 = 2$), all other things being equal.

The estimation also shows that comparison at village level does not exist. This difference between village and country level might be interpreted as an asymmetry of social comparison in terms of wealth and, in particular, the comparison is upward. Indeed, we noted that since our data is composed of rural and poor provinces in Thailand, a comparison with other residents at country level may be viewed as a comparison with a high reference.[10] In this sense, considering themselves as wealthier than others at country level may increase the households' subjective well-being.

Let us now consider variables concerning environmental risks such as drought, flooding, heavy ice rain and storms,[11] events that occurred in the past, 2 years before the survey. Analyses indicate that drought, flooding and heavy ice rain in the past increase good feelings in the present for Vietnamese households, while drought in the past increases good feelings in the present for Thai households. It is not surprising to find that environmental risks in the past have a positive effect on the fact that households feel better off than one year ago or in the 5 previous years. In other words, when looking at natural disasters in the past, households feel better off in the present. In addition, when considering two economic shocks, pests or livestock disease and collapse of business 2 years before the survey, only the pests or livestock disease appear meaningful for the Thai households' subjective well-being.

Linked to these environmental and economic events, we are interested in the effect of households' risk attitude. This variable measures the degree of risk acceptance: a higher value implies a higher degree of acceptance and lower risk aversion. The estimated coefficient shows a difference between the two countries in this variable's effect. In the Vietnam case, we

[10] This result may be refereed to Tsui (2014) which proposes 2 reference levels, a high level and a low one. Tsui (2004) showed that individuals compare their income to the high reference rather to the low one.
[11] For Thailand, we do not take into account "heavy ice rain" as this variable has few observations.

observe that that those who are less risk averse feel better off in the present than in the previous year or 5 previous years, *ceteris paribus*. For Thailand, this variable has no effect.

We also observe a difference in the effects of other variables on households' subjective well-being in both countries. Regarding living conditions, we find that the subjective well-being of Vietnamese households in a village increases with the proportion of households having access to electricity. Other living conditions such as access to a public water supply, sanitation, internet, etc. have no impact on either Thai or Vietnamese households' well-being. Households living in different geographic conditions may feel their happiness differently. While people living on a mountain are happier in the case of Vietnam, they are less happy in the case of Thailand. However, living near a river can decrease good feelings for Vietnamese households, while it tends to have no effect on good feelings for Thai households.

Concerning the different provinces in our data, for Vietnam, households in Ha Tinh province may feel better off than the previous year compared to those living in the Dak Lak province (all other things being equal). For Thailand, households in the Buriram province are less happy compared to the past (1 or 5 previous years), while households in Ubon Ratchathan are happier compared to the previous year (with Nakhon Phanom province as a reference).

Table 3: Marginal effects, the case of *SWB*, Vietnam.

	Model 1			Model 2		
Variable	*P(SWB=1)*	*P(SWB=2)*	*P(SWB=3)*	*P(SWB=1)*	*P(SWB=2)*	*P(SWB=3)*
Income	-0.0076***	-0.0005	0.0081***	-0.0149***	-0.0033**	0.0183***
	(0.0022)	(0.0004)	(0.0024)	(0.0037)	(0.0017)	(0.0052)
Mean village income	0.0009	0.0000	-0.0010	--	--	--
	(0.0050)	(0.0003)	(0.0053)			
Poor	--	--		0.00641	0.00147	-0.0079
				(0.0298)	(0.0068)	(0.0366)
Subjective wealth, wrt	0.0123	0.0007	-0.0130	0.0178	0.0040	-0.0218
village	(0.0195)	(0.0013)	(0.0206)	(0.0179)	(0.0041)	(0.0219)
Subjective wealth, wrt	-0.0332	-0.0019	0.0351	-0.0264	-0.0059	0.0324
country	(0.0231)	(0.002)	(0.0245)	(0.0215)	(0.00500)	(0.0262)
Drought	-0.0687*	-0.004	0.0728*	-0.0686*	-0.0154*	0.0840**
	(0.0383)	(0.0035)	(0.0405)	(0.0353)	(0.0086)	(0.0426)
Flooding	-0.101***	-0.0059	0.107***	-0.0877***	-0.0197**	0.107***
	(0.0356)	(0.0045)	(0.0375)	(0.0334)	(0.0092)	(0.0405)
Heavy rain	-0.105**	-0.0062	0.111**	-0.0885*	-0.0199*	0.108*
	(0.0526)	(0.0052)	(0.0556)	(0.0487)	(0.0121)	(0.0592)
Storm, landslide	0.0546	0.0032	-0.0579	0.0420	0.00945	-0.0515
	(0.0402)	(0.0032)	(0.0425)	(0.0375)	(0.0088)	(0.0458)
Pests or livestock disease	-0.0492*	-0.0029	0.0521*	-0.0471*	-0.0106	0.0576*
	(0.0295)	(0.0025)	(0.0310)	(0.0272)	(0.0065)	(0.0328)
Collapse of business	-0.0633	-0.0038	0.0671	-0.0427	-0.0096	0.0523
	(0.0966)	(0.0061)	(0.102)	(0.0837)	(0.0185)	(0.102)
Risk avoidance	0.102***	0.0061	-0.108***	0.0898***	0.0202***	-0.110***
	(0.0223)	(0.0042)	(0.023)	(0.0208)	(0.0068)	(0.0242)
Risk acceptance	-0.180***	-0.0107	0.190***	-0.169***	-0.0381**	0.207***
	(0.0378)	(0.008)	(0.0412)	(0.0343)	(0.0153)	(0.0448)
Suffering from serious	0.0380*	0.0022	-0.0402*	0.0358*	0.0081*	-0.0439*
	(0.0204)	(0.0019)	(0.0216)	(0.0189)	(0.0046)	(0.0228)
Access to electricity	-0.263***	-0.0156	0.279***	-0.224***	-0.0503**	0.274***
	(0.0735)	(0.0118)	(0.0782)	(0.0687)	(0.0208)	(0.0831)
Travel distance to district	-0.0011	-0.000	0.0011	-0.0008	-0.0002	0.001
	(0.0012)	(0.000	(0.0012)	(0.001)	(0.0002)	(0.0013)
Mountain	-0.064**	-0.0038	0.0678**	-0.0589**	-0.0132**	0.0721**
	(0.0265)	(0.0028)	(0.0276)	(0.0247)	(0.0062)	(0.0296)

Note: Model 1 corresponds to regressions with Income and Mean village income. Model 2 corresponds to regressions with Income and Poor (including their interaction). All explanatory variables are exogenous. Significance levels: ** 5%, *** 1%. Number of observations: 1201.

Table 4: Marginal effects, the case of *SWB*, Thailand.

	Model 1			Model 2		
Variable	*P(SWB=1)*	*P(SWB=2)*	*P(SWB=3)*	*P(SWB=1)*	*P(SWB=2)*	*P(SWB=3)*
Income	-0.0040***	-0.0015***	0.0054***	-0.0080***	-0.0043***	0.0124***
	(0.0013)	(0.0005)	(0.0017)	(0.0020)	(0.0015)	(0.0035)
Mean village income	-0.0008	-0.0003	0.0011	--	--	--
	(0.0012)	(0.0004)	(0.0017)			
Poor	--	--	--	-0.0034	-0.0018	0.0052
				(0.0226)	(0.0122)	(0.0349)
Subjective wealth, wrt	0.0022	0.0008	-0.0030	0.0054	0.0029	-0.0084
village	(0.0157)	(0.0058)	(0.0215)	(0.0142)	(0.0078)	(0.0220)
Subjective wealth, wrt	-0.0389**	-0.0143**	0.0533**	-0.0347**	-0.0188**	0.0535**
country	(0.0151)	(0.0058)	(0.0208)	(0.0139)	(0.0077)	(0.0212)
Drought	-0.0575**	-0.0212**	0.0787**	-0.0476**	-0.0258**	0.0735**
	(0.0232)	(0.0084)	(0.0313)	(0.0211)	(0.0114)	(0.0321)
Flooding	0.0054	0.0020	-0.0075	0.0072	0.0039	-0.0111
	(0.0305)	(0.0112)	(0.0417)	(0.0278)	(0.0151)	(0.0428)
Storm, landslide	-0.1079	-0.0398	0.1477	-0.0991	-0.0538	0.1529
	(0.0929)	(0.0343)	(0.1270)	(0.0867)	(0.0476)	(0.1338)
Pests or livestock disease	-0.0607	-0.0224	0.0831	-0.0524	-0.0284	0.0808
	(0.0428)	(0.0161)	(0.0587)	(0.0382)	(0.0213)	(0.0592)
Collapse of business	0.0380	0.0140	-0.0520	0.0369	0.0200	-0.0568
	(0.0756)	(0.0277)	(0.1033)	(0.0691)	(0.0374)	(0.1064)
Risk avoidance	0.0265	0.0098	-0.0363	0.0218	0.0118	-0.0337
	(0.0191)	(0.0070)	(0.0260)	(0.0178)	(0.0094)	(0.0270)
Risk acceptance	-0.0201	-0.0074	0.0274	-0.0158	-0.0086	0.0243
	(0.0260)	(0.0095)	(0.0354)	(0.0234)	(0.0127)	(0.0360)
Suffering from serious	-0.0099	-0.0036	0.0135	-0.0067	-0.0037	0.0104
	(0.0216)	(0.0080)	(0.0296)	(0.0197)	(0.0107)	(0.0304)
Access to public water	0.0451*	0.0166*	-0.0617*	0.0440*	0.0238*	-0.0678*
	(0.0260)	(0.0095)	(0.0354)	(0.0234)	(0.0126)	(0.0357)
Mountain	0.2229***	0.0822***	-0.3051***	0.1960***	0.1063***	-0.3023***
	(0.0308)	(0.0144)	(0.0423)	(0.0321)	(0.0198)	(0.0468)
Valley	0.1190***	0.0439***	-0.1629***	0.0969***	0.0525***	-0.1494***
	(0.0225)	(0.0111)	(0.0327)	(0.0208)	(0.0136)	(0.0326)
River	-0.0435*	-0.0160*	0.0596*	-0.0370*	-0.0201*	0.0571*
	(0.0236)	(0.0085)	(0.0319)	(0.0221)	(0.0117)	(0.0335)

Note: Model 1 corresponds to regressions with Income and Mean village income. Model 2 corresponds to regressions with Income and Poor (including their interaction). All explanatory variables are exogenous. Significance levels: * 10% ** 5%, *** 1%. Number of observations: 1390.

Table 5: Marginal effects, the case of *SWB5*, Vietnam.

	Model 1			Model 2		
Variable	*P(SWB5=1)*	*P(SWB5=2)*	*P(SWB5=3)*	*P(SWB5=1)*	*P(SWB5=2)*	*P(SWB5=3)*
Income	-0.0117***	-0.0049***	0.0166***	-0.0132***	-0.0073***	0.0207***
	(0.0023)	(0.0012)	(0.0036)	(0.0033)	(0.0025)	(0.0056)
Mean village income	0.0097*	0.004*	-0.0137*	--	--	--
	(0.005)	(0.0021)	(0.0071)			
Poor	--	--	--	0.0336**	-0.0898**	0.0336**
				(0.017)	(0.0447)	(0.017)
Subjective wealth, wrt	-0.00308	-0.0013	0.0044	0.0051	0.0033	-0.0079
	(0.0179)	(0.0074)	(0.0253)	(0.0157)	(0.0089)	(0.0246)
Subjective wealth, wrt	-0.0084	-0.0035	0.0118	0.0004	0.0008	-0.0006
	(0.0207)	(0.0085)	(0.0292)	(0.0182)	(0.0103)	(0.0285)
Flooding	-0.133***	-0.0547***	0.187***	-0.114***	-0.0657***	0.179***
	(0.0361)	(0.0152)	(0.0503)	(0.0322)	(0.0183)	(0.0485)
Heavy ice rain	-0.162***	-0.067***	0.229***	-0.131**	-0.0707**	0.205***
	(0.0561)	(0.0229)	(0.0781)	(0.0522)	(0.0289)	(0.079)
Storm, landslide	-0.0107	-0.00442	0.0151	-0.0214	-0.0115	0.0335
	(0.0350)	(0.0144)	(0.0494)	(0.0307)	(0.0172)	(0.0478)
Pests or livestock disease	-0.0583*	-0.0241*	0.0824*	-0.0546**	-0.0307**	0.0854**
	(0.0312)	(0.0125)	(0.0435)	(0.0278)	(0.0147)	(0.042)
Collapse of business	-0.0645	-0.0266	0.0912	-0.0382	-0.0179	0.0598
	(0.0896)	(0.0366)	(0.126)	(0.073)	(0.0407)	(0.113)
Risk avoidance	0.119***	0.0491***	-0.168***	0.100***	0.0567***	-0.157***
	(0.0208)	(0.0105)	(0.0302)	(0.0188)	(0.012)	(0.0287)
Risk acceptence	-0.107**	-0.0442**	0.151**	-0.100**	-0.0538**	0.157**
	(0.0464)	(0.0194)	(0.0653)	(0.0409)	(0.0235)	(0.0633)
Access to electricity	-0.293***	-0.121***	0.413***	-0.217***	-0.120***	0.339***
	(0.0863)	(0.0367)	(0.121)	(0.0772)	(0.0429)	(0.118)
Mountain	-0.0704***	-0.029***	0.0994***	-0.0635***	-0.0359***	0.0994***
	(0.0235)	(0.0098)	(0.0329)	(0.0207)	(0.0116)	(0.0314)
River	0.0517*	0.0213*	-0.073*	0.0460*	0.0252	-0.0719*
	(0.0284)	(0.0121)	(0.0403)	(0.0277)	(0.016)	(0.0435)

Note: Model 1 corresponds to regressions with Income and Mean village income. Model 2 corresponds to regressions with Income and Poor (including their interaction). All explanatory variables are exogenous. Significance levels: * 10% ** 5%, *** 1%. Number of observations: 1198.

Table 6: Marginal effects, the case of *SWB5*, Thailand.

	Model 1			Model 2		
Variable	*P(SWB5=1)*	*P(SWB5=2)*	*P(SWB5=3)*	*P(SWB5=1)*	*P(SWB5=2)*	*P(SWB5=3)*
Income	-0.0047***	-0.0015***	0.0063***	-0.0106***	-0.0054***	0.016***
	(0.0014)	(0.0005)	(0.0019)	(0.0022)	(0.0016)	(0.0037)
Mean village income	-0.0002	-0.0000	0.0003	--	--	--
	(0.001)	(0.0003)	(0.0014)			
Poor	--	--	--	0.0105	0.0054	-0.0159
				(0.0245)	(0.0125)	(0.037)
Subjective wealth, wrt village	-0.0246	-0.008	0.0326	-0.0145	-0.0073	0.0218
village	(0.0167)	(0.0055)	(0.0221)	(0.0142)	(0.0072)	(0.0213)
Subjective wealth, wrt country	-0.0355**	-0.0115**	0.047**	-0.0291**	-0.0148**	0.0439**
country	(0.0157)	(0.0051)	(0.0207)	(0.0135)	(0.006785)	(0.020)
Drought	-0.0431*	-0.0140*	0.0572*	-0.0301	-0.0153	0.0454
	(0.0252)	(0.0079)	(0.033)	(0.0216)	(0.0107)	(0.0322)
Pests or livestock disease	-0.136**	-0.0443**	0.181**	-0.114**	-0.0577**	0.172**
	(0.0548)	(0.0188)	(0.0731)	(0.0465)	(0.0244)	(0.070)
Collapse of business	0.0855	0.0278	-0.113	0.0787	0.0399	-0.119
	(0.0837)	(0.0275)	(0.111)	(0.0706)	(0.0364)	(0.107)
Risk avoidance	0.0252	0.0082	-0.0334	0.0174	0.0088	-0.0263
	(0.0209)	(0.0068)	(0.0277)	(0.0185)	(0.0092)	(0.0276)
Risk acceptence	0.0227	0.0073	-0.030	0.0253	0.0128	-0.0381
	(0.0302)	(0.0099)	(0.040)	(0.0258)	(0.0131)	(0.0388)
Suffering from serious disease	-0.0299	-0.0097	0.0396	-0.0224	-0.0114	0.0337
	(0.0231)	(0.0075)	(0.0307)	(0.0198)	(0.0101)	(0.0298)
Average age	-0.0011	-0.0003	0.0015	-0.0011	-0.0005	0.0017
	(0.0009)	(0.0003)	(0.0013)	(0.0008)	(0.0004)	(0.0013)
Ethnic minority	0.0035	0.0011	-0.0047	-0.0037	-0.0019	0.0056
	(0.0522)	(0.017)	(0.0692)	(0.0461)	(0.0234)	(0.0694)
Mountain	0.216***	0.0702***	-0.286***	0.169***	0.0855***	-0.254***
	(0.0608)	(0.0211)	(0.0808)	(0.0564)	(0.0291)	(0.0839)
Slope	-0.006	-0.0019	0.0079	-0.0022	-0.0011	0.0032
	(0.0454)	(0.0148)	(0.0602)	(0.0376)	(0.0191)	(0.0567)
Valley	0.151***	0.0492***	-0.200***	0.111***	0.0563***	-0.167***
	(0.0247)	(0.0106)	(0.0342)	(0.0224)	(0.0123)	(0.0329)

Note: Model 1 corresponds to regressions with Income and Mean village income. Model 2 corresponds to regressions with Income and Poor (including their interaction). All explanatory variables are exogenous. Significance levels: * 10% ** 5%, *** 1%. Number of observations: 1390.

6. Conclusion

This paper set out to analyze households' subjective well-being using data on rural areas of Vietnam and Thailand. Our findings show that income is one of the key determinants of households' subjective well-being. Moreover, households are sensitive to relative poverty. This finding is not surprising in the case of developing countries and can be interpreted as an income comparison in household preferences. Earning an income lower than the mean village level makes households feel worse off compared to the previous year or the 5 previous years. These results constitute a common point for both countries.

For the rest, there is a significant difference in the impact of other factors such as geographic conditions, wealth effect, environmental risks, etc. In particular, we observed that Thai households are concerned with wealth comparison, while the Vietnamese are not. This implies that for households in 3 rural provinces of Thailand, their wealth is also subject to social comparison. In addition, this comparison may be upward, i.e. households compare their wealth to a wealth level higher than their own.

Environmental risks affect households' well-being differently in the two countries. Moreover, households' attitude to risk acceptance affects their subjective well-being in the Vietnamese case. We found that households that are more willing to accept risk (lower risk aversion) feel better off in the present compared to the previous year or the 5 previous years.

The estimation results show that households' preferences in the two countries are not identical and may be explained by different factors. This paper provides some policy implications for households' happiness, in particular for people in poor and rural areas with a high poverty rate, harsh living conditions and often suffering from environmental risks. The relativeness regarding poverty and wealth means there is a need for policymakers in Vietnam and Thailand to implement measures to reduce poverty and inequality. Moreover, the results on the effects of natural disasters provide some insights into environmental policies in both countries, in particular in terms of prevention policies.

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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, 2 if same, 3 if much better/better)	Discrete
SWB5	Household subjective well-being, compared to previous 5 year (=1 if much worse/worse, 2 if same, 3 if much better/better)	Discrete
Income	Household income, in thousands dollars, PPP	Continuous
Mean village income	Mean household income, computed at village level	Continuous
Poor	= 1 if household income lower than the mean village income	Dummy
Subjective wealth, wrt village	Subjective wealth, compared to other village residents (=1 if much worse/worse, 2 if same, 3 if much better/better)	Discrete
Subjective wealth, wrt country	Subjective wealth, compared to other countries' residents (=1 if much worse/worse, 2 if same, 3 if much better/better)	Discrete
Suffering from serious disease	= 1 if serious disease	Dummy
Average age	Average age of household members	Continuous
Ethnic minority	Belonging to an ethnic minority (=1 if belonging to an ethnic minority, 0 if belonging to Kinh majority group for Vietnam, and if belonging to Thai ethnic for Thailand)	Dummy
Access to facilities		
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 phone line	Percentage of village households having access to a fixed phone line	Continuous
Access to internet	Percentage of village households having access to internet	Continuous
Village characteristics		
Travel distance to district town	Travel distance between village and district town	Continuous
Mountain	=1 if located on a mountain, 0 otherwise	Dummy
Slope	=1 if located on a 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 (only Vietnam)	Dummy
Coast	=1 if located near the coast, 0 otherwise (only Vietnam)	Dummy
Provinces		
Ha Tinh	=1 if belonging to the province, 0 otherwise (Vietnam)	Dummy
Thua Thien – Hue	=1 if belonging to the province, 0 otherwise (Vietnam)	Dummy
Dak Lak	=1 if belonging to the province, 0 otherwise (Vietnam)	Dummy
Buriram	=1 if belonging to the province, 0 otherwise (Thailand)	Dummy
Ubon Ratchathani	=1 if belonging to the province, 0 otherwise (Thailand)	Dummy
Nakhon Phanom	=1 if belonging to the province, 0 otherwise (Thailand)	Dummy

Table A2: Descriptive statistics, Vietnam

Variable	Mean	Std. Dev.	Min	Max
SWB	2.03	0.77	1	3
SWB5	2.34	0.82	1	3
Income (thousand dollars)	5.93	5.69	0.05	45.46
Poor	0.64	0.48	0	1
Mean village income (thousand dollars PPP)	6.04	2.46	1.91	17.89
Subjective wealth, wrt village	1.78	0.69	1	3
Subjective wealth, wrt country	1.46	0.62	1	3
Drought	0.07	0.26	0	1
Flooding of land	0.09	0.29	0	1
Heavy ice rain	0.04	0.20	0	1
Storm, landslide	0.10	0.30	0	1
Pests or livestock disease	0.13	0.34	0	1
Collapse of business	0.02	0.12	0	1
Average age	32.66	13.58	11.6	90
Risk avoidance	0.46	0.50	0	1
Risk neutrality	0.45	0.497	0	1
Risk acceptance	0.09	0.29	0	1
Serious disease	0.37	0.48	0	1
Ethnic minority	0.17	0.38	0	1
Access to electricity (percentage)	98.12	8.11	0	100
Access to public water supply (percentage)	18.99	52.3	0	100
Access to sanitation (percentage)	45.19	37.18	0	100
Access to public waste disposal (percentage)	4.10	15.98	0	100
Access to fixed phone line (percentage)	85.00	26.67	30	100
Access to internet (percentage)	1.88	3.93	0	20
Travel distance to district town	13.07	10.10	0.7	70
Slope	0.29	0.46	0	1
Mountain	0.47	0.50	0	1
Valley	0.09	0.28	0	1
River	0.19	0.39	0	1
Lake	0.17	0.38	0	1
Coast	0.05	0.22	0	1
Ha Tinh province	0.39	0.49	0	1
Thua Thien – Hue province	0.19	0.39	0	1
Dak Lak province	0.42	0.49	0	1

Note: number of observations 1198.

Table A3: Descriptive statistics, Thailand

Variable	Mean	Std. Dev.	Min	Max
SWB	2.19	0.76	1	3
SWB5	2.31	0.82	1	3
Income (thousand dollars PPP)	8.32	7.80	0.04	46.58
Poor	0.63	0.48	0	1
Mean village income (thousand dollars PPP)	9.22	6.32	2.01	79.16
Subjective wealth, wrt village	1.92	0.58	1	3
Subjective wealth, wrt country	1.56	0.64	1	3
Drought	0.22	0.11	0	1
Flooding of land	0.09	0.28	0	1
Heavy ice rain	0.003	0.059	0	1
Storm, landslide	0.005	0.071	0	1
Pests or livestock disease	0.04	0.20	0	1
Collapse of business	0.01	0.12	0	1
Average age	35.25	10.20	15.33	85
Risk avoidance	0.28	0.45	0	1
Risk acceptance	0.12	0.33	0	1
Serious disease	0.23	0.42	0	1
Ethnic minority	0.06	0.23	0	1
Access to electricity (in percentage)	98.79	4.13	70	100
Access to public water supply (in percentage)	84.47	29.25	0	100
Access to sanitation (in percentage)	83.57	29.06	0	100
Access to public waste disposal (in percentage)	15.31	35.16	0	100
Access to fixed phone line (in percentage)	34.55	45.41	0	100
Access to internet (in percentage)	2.79	10.11	0	100
Travel distance to district town	13.38	8.42	0.1	46
Mountain	0.009	0.093	0	1
Slope	0.05	0.22	0	1
Valley	0.004	0.066	0	1
River	0.18	0.39	0	1
Buriram province	0.40	0.49	0	1
Ubon Ratchathani province	0.40	0.49	0	1
Nakhon Phanom province	0.20	0.40	0	1

Note: number of observations 1390

Table A4: Descriptive statistics at province level in Vietnam and Thailand in 2010

	Vietnam				Thailand			
	Ha Tinh	Thua Thien Hue	Dak Lak	Average	Buriram	Unbon Ratchat hani	Nakhon Phanom	Average
SWB	2.19	1.97	1.9	2.02	2.11	2.29	2.18	2.2
SWB5	2.43	2.17	2.32	2.34	2.23	2.38	2.32	2.3
Subjective wealth, wrt village	1.74	1.82	1.78	1.77	1.93	1.92	1.94	1.93
Subjective wealth, wrt country	1.31	1.47	1.59	1.46	1.56	1.59	1.53	1.56
Income (thousand $ PPP)	5.36	5.94	6.46	5.93	8.81	8.47	7.05	8.32
Village Average Income (thousand $ PPP)	5.34	6.28	6.59	6.04	10.55	8.92	7.20	9.23
Poor	0.62	0.61	0.59	0.61	0.63	0.59	0.61	0.61
Serious disease	0.44	0.28	0.36	0.37	0.28	0.17	0.26	0.23
Risk avoidance	0.37	0.40	0.57	0.46	0.24	0.24	0.48	0.28
Risk acceptance	0.11	0.10	0.07	0.09	0.13	0.14	0.09	0.13
Risk neutrality	0.52	0.50	0.36	0.45	0.64	0.32	0.43	0.59
Drought	0.05	0.02	0.13	0.08	0.26	0.17	0.2	0.22
Flooding of land	0.09	0.05	0.11	0.09	0.1	0.07	0.1	0.09
Rain	0.04	0.04	0.04	0.04	0.002	0.002	0.01	0.03
Storm, landslide	0.05	0.3	0.06	0.1	0.003	0.005	0.007	0.005
Pest	0.16	0.11	0.12	0.14	0.04	0.05	0.04	0.04
Collapse	0.01	0.02	0.01	0.01	0.01	0.02	0.01	0.01

Table A5: Descriptive statistics at province level in Vietnam and Thailand in 2007.

	Vietnam				Thailand			
	Ha Tinh	Thua Thien Hue	Dak Lak	Average	Buriram	Unbon Ratchathani	Nakhon Phanom	Average
SWB	2.19	2.27	2.41	2.3	2.09	2.1	2.01	2.08
SWB5	2.48	2.53	2.6	2.05	2.04	2.24	2.06	2.13
Subjective wealth, wrt village	1.68	1.70	1.69	1.69	1.75	1.80	1.81	1.78
Subjective wealth, wrt country	1.23	1.31	1.47	1.34	1.38	1.36	1.47	1.39
Income	4.82	4.23	9.56	6.52	8.83	8.15	13.17	9.44
Village average income	4.72	4.28	9.18	6.42	8.95	8.00	13.05	9.38
Poor	0.54	0.53	0.48	0.51	0.59	0.56	0.6	0.58
Serious disease	0.27	0.32	0.50	0.37	0.22	0.29	0.25	0.25
Drought	0.05	0.04	0.34	0.16	0.35	0.24	0.26	0.28
Flooding of land	0.13	0.2	0.07	0.12	0.11	0.09	0.21	0.12
Rain	0.12	0.18	0.01	0.09	0.004	0.031	0.018	0.017
Storm, landslide	0.002	0.034	0	0.008	0	0.002	0	0.01
Pest	0.17	0.12	0.15	0.15	0.03	0.11	0.02	0.06
Collapse	0.015	0	0.008	0.009	0.04	0.03	0.03	0.03

Note: Information about risk attitude is not available for 2007.

Table A6: Distribution of *Subjective wealth compared to the previous year* and *subjective wealth compared to the 5 previous years*, Vietnam.

Subjective wealth compared to the village	*Subjective wealth compared to country*			Total
	Worse/much worse	Same	Better/much better	
Worse/much worse	431	12	2	445
Same	251	315	10	576
Better/much better	47	59	71	177
Total	729	386	83	1198

Table A7: Distribution of *Subjective wealth compared to the previous year* and *subjective wealth compared to the 5 previous years*, Thailand

Subjective wealth compared to the village	*Subjective wealth compared to country*			Total
	Worse/much worse	Same	Better/much better	
Worse/much worse	234	39	16	289
Same as	435	439	41	915
Better/Much better	50	79	57	186
Total	719	557	114	1390

Table A8: Likelihood-ratio test (H0: standard ordered probit model *vs* H1: ordered probit model with unobserved heterogeneity v_i)

	Vietnam		Thailand	
	SWB	*SWB5*	*SWB*	*SWB5*
Model 1 (with mean village income)	2.073	0.309	0.959	2.259
Model 2 (with Poor)	1.946	0.387	1.354	3.238

Table A9: Robust t-statistics of regressor exogeneity test (variable addition test)

	Vietnam				Thailand			
	Model 1		Model 2		Model 1		Model 2	
Variable	*SWB*	*SWB5*	*SWB*	*SWB5*	*SWB*	*SWB5*	*SWB*	*SWB5*
Income	1.26	-0.24	1.31	1.23	-0.94	-0.07	-1.04	-0.90
Poor	--	--	1.10	2.05**	--	--	-0.14	-0.71
Poor*Income	--	--	-0.99	0.01	--	--	-1.62	-0.66
Risk avoidance	1.10	-1.22	0.91	-1.37	0.39	-0.55	0.45	-0.38
Risk acceptance	0.57	-1.09	0.17	-1.44	1.48	0.28	1.77*	0.57

Notes. Significance levels: *10%, ** 5%.

Table A10: Estimation results for *SWB*.

	Vietnam				Thailand			
	Model 1		Model 2		Model 1		Model 2	
Variable	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.
Income	0.023****	0.007	0.0073	0.009	0.014***	0.005	0.004	0.006
Mean village income	-0.0028	0.015	--	--	0.003	0.004	--	--
Poor	--	--	-.4203***	0.122	--	--	-0.350***	0.127
Poor=1#Income	--	--	0.0672***	0.019			0.044***	0.015
Subjective wealth, wrt village	-0.0377	0.060	-0.0597	0.060	-0.007	0.056	-0.021	0.056
Subjective wealth, wrt country	0.1018	0.071	0.0887	0.072	0.138**	0.054	0.136**	0.054
Drought	0.2110*	0.118	0.2301*	0.118	0.203**	0.081	0.186**	0.081
Flooding	0.309***	0.109	0.2943***	0.111	-0.019	0.108	-0.028	0.108
Heavy ice rain	0.3229**	0.161	0.2968*	0.162	--	--	--	--
Storm, landslide	-0.1678	0.123	-0.1410	0.125	0.382	0.328	0.387	0.339
Pests or livestock disease	0.1511*	0.090	0.1579*	0.090	0.215	0.152	0.205	0.149
Collapse of business	0.1945	0.296	0.1432	0.280	-0.135	0.267	-0.144	0.269
Risk avoidance	-0.314***	0.067	-0.3011***	0.067	-0.094	0.067	-0.085	0.069
Risk acceptance	0.552***	0.117	0.5682***	0.119	0.071	0.092	0.062	0.091
Serious disease	-0.1166*	0.063	-0.1202*	0.063	0.035	0.077	0.026	0.077
Average age	0.0015	0.002	0.0016	0.002	0.004	0.003	0.004	0.003
Ethnic minority	0.1102	0.104	0.0988	0.105	0.144	0.170	0.156	0.173
Access to electricity	0.808***	0.226	0.751***	0.228	-0.982	0.654	-0.917	0.668
Access to public water supply	-0.0214	0.094	-0.0370	0.095	-0.159*	0.092	-0.172*	0.090
Access to sanitation	0.0607	0.147	0.0336	0.147	0.055	0.145	0.067	0.144
Access to public waste disposal	-0.2393	0.255	-0.2250	0.254	0.053	0.092	0.056	0.094
Access to fixed phone line	-0.0971	0.165	-0.1003	0.171	-0.026	0.096	-0.029	0.098
Access to internet	1.1243	0.987	1.0266	0.976	0.163	0.307	0.195	0.341
Travel distance to district town	0.0032	0.004	0.0028	0.004	0.001	0.004	0.001	0.004
Mountain	0.1967**	0.080	0.1975**	0.081	-0.789***	0.109	-0.766***	0.119
Slope	-0.1097	0.109	-0.0804	0.109	-0.126	0.135	-0.129	0.136
Valley	0.1819	0.147	0.1749	0.150	-0.421***	0.083	-0.378***	0.082
River	-0.0393	0.117	-0.0359	0.120	0.154*	0.083	0.145*	0.085
Lake	-0.0148	0.099	-0.0213	0.098	--	--	--	--
Coast	-0.0795	0.126	-0.0752	0.124	--	--	--	--
Ha Tinh	0.425***	0.118	0.4626***	0.123	--	--	--	--
Thua Thien-Hue	0.2006	0.147	0.2311	0.145	--	--	--	--
Buriram	--	--	--	--	-0.111	0.119	-0.119	0.119
Ubon Ratchathani	--	--	--	--	0.231**	0.111	0.229**	0.113
c_1	0.6134*	0.322	0.2938	0.340	-1.288*	0.673	-1.456**	0.690
c_2	1.791***	0.323	1.478***	0.341	-0.207	0.675	-0.370	0.691
Log-likelihood	-1223.13		-1217.63		-1442.99		-1438.04	
Number of observations	1201		1201		1390		1390	

Note: Model 1 corresponds to regressions with Income and Mean village income. Model 2 corresponds to regressions with Poor. All explanatory variables are exogenous based on variable addition test (Wooldridge, 2014). Significance levels: *10%, ** 5%, *** 1%.

Table A11: Estimation results for *SWB5*.

	Vietnam				Thailand			
	Model 1		Model 2		Model 1		Model 2	
Variable	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.
Income	0.0423***	0.008	0.005	0.009	0.016***	0.005	-0.004	0.006
Mean village income	-0.035*	0.018	--	--	0.001	0.003	--	--
Poor	--	--	-0.699***	0.153	--	--	-0.650***	0.137
Poor=1#Income	--	--	0.075***	0.025	--	--	0.073***	0.017
Subjective wealth wrt village	0.011	0.068	-0.021	0.065	0.082	0.055	0.057	0.055
Subjective wealth wrt country	0.030	0.076	-0.001	0.075	0.118**	0.052	0.114**	0.052
Drought	0.078	0.135	0.110	0.136	0.144*	0.083	0.119	0.084
Flooding	0.477***	0.128	0.472***	0.128	0.094	0.107	0.081	0.108
Heavy ice rain	0.584***	0.199	0.541***	0.207	--	--	--	--
Storm, landslide	0.038	0.126	0.088	0.126	0.259	0.407	0.304	0.389
Pests or livestock disease	0.210*	0.111	0.226**	0.110	0.455**	0.184	0.447**	0.182
Collapse of business	0.232	0.321	0.158	0.298	-0.285	0.280	-0.309	0.278
Risk avoidance	-0.428***	0.077	-0.415***	0.075	-0.084	0.069	-0.068	0.072
Risk acceptance	0.385**	0.167	0.414**	0.167	-0.076	0.101	-0.099	0.101
Serious disease	-0.014	0.078	-0.011	0.077	0.100	0.077	0.088	0.078
Average age	0.002	0.003	0.002	0.002	0.004	0.003	0.004	0.003
Ethnic minority	-0.165	0.103	-0.192*	0.105	-0.012	0.174	0.014	0.181
Access to electricity	1.053***	0.308	0.895***	0.308	-1.012	0.978	-0.901	0.974
Access to public water supply	-0.066	0.110	-0.069	0.114	-0.210	0.132	-0.229*	0.131
Access to sanitation	0.0408	0.142	-0.007	0.140	0.139	0.170	0.164	0.170
Access to public waste disposal	-0.126	0.287	-0.086	0.296	0.057	0.098	0.068	0.101
Access to fixed phone line	-0.132	0.173	-0.162	0.187	0.002	0.137	-0.000	0.140
Access to internet	0.396	0.934	0.117	0.942	-0.278	0.216	-0.255	0.259
Travel distance to district town	-0.003	0.003	-0.004	0.003	0.001	0.004	0.0013	0.005
Mountain	0.253***	0.084	0.262***	0.083	-0.720***	0.204	-0.663***	0.219
Slope	-0.155	0.105	-0.092	0.105	0.020	0.152	0.008	0.148
Valley	0.074	0.131	0.070	0.135	-0.505***	0.087	-0.436***	0.086
River	-0.186*	0.103	-0.190*	0.114	0.099	0.104	0.087	0.108
Lake	-0.017	0.098	-0.017	0.096	--	--	--	--
Coast	0.156	0.167	0.172	0.169	--	--	--	--
Ha Tinh	-0.111	0.131	-0.020	0.124	--	--	--	--
Thua Thien-Hue	-0.237	0.154	-0.191	0.159	--	--	--	--
Buriram	--	--	--	--	-0.182	0.111	-0.199*	0.115
Ubon Ratchathani	--	--	--	--	0.119	0.118	0.116	0.118
c_1	0.066	0.387	-0.476	0.424	-1.157	0.990	-1.476	0.985
c_2	0.736*	0.385	0.201	0.419	-0.499	0.990	-0.809	0.985
Log-likelihood	-1095.99		-1087.13		-1372.24		-1358.16	
#observations	1198		1198		1390		1390	

Note: Model 1 corresponds to regressions with Income and Mean village income. Model 2 corresponds to regressions with Poor. All explanatory variables are exogenous based on variable addition test (Wooldridge, 2014). Significance levels: *10%, ** 5%, *** 1%.

Table A12: First-step estimation for *Income*.

	Vietnam				Thailand			
	Model 1		Model 2		Model 1		Model 2	
Variable	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.
Mean village income	0.6838***	0.0846	--	--	0.2038	0.1257	--	--
Subjective wealth, wrt village	1.9606***	0.3005	1.9966***	0.3227	1.9295***	0.3757	1.9260***	0.3791
Subjective wealth wrt country	1.1506***	0.3225	1.3955***	0.3523	0.3771	0.3654	0.4408	0.3685
Drought	-0.7407	0.5660	-0.8694	0.6022	-0.7558	0.4697	-0.8405*	0.4870
Flooding	-0.1312	0.4767	-0.1505	0.4950	-0.8827	0.6747	-1.0674	0.6877
Heavy ice rain	-0.6728	0.6369	-0.3352	0.6593	--	--	--	--
Storm, landslide	-1.1287**	0.5594	-1.1972*	0.6377	-0.5972	3.5312	-0.8166	3.5312
Pests or livestock disease	-0.5449	0.4349	-0.8089*	0.4543	-1.5101**	0.7564	-1.7416**	0.7613
Collapse of business	-1.5253	1.0734	-0.1303	1.0423	-1.0094	1.1370	-1.0847	1.1405
Serious disease	0.1443	0.2921	0.1505	0.3124	-0.8062	0.4902	-0.9167*	0.4927
Average age	0.0032	0.0098	-0.0022	0.0104	0.0143	0.0217	0.0200	0.0222
Ethnic minority	-0.0723	0.4103	-0.3217	0.4904	-2.2510***	0.7937	-2.5136***	0.8262
Access to electricity	1.4504	0.9290	4.1648**	1.8416	-2.3564	4.4704	-4.1736	5.1468
Access to public water supply	-0.3415	0.2876	-0.4698	0.5008	0.1942	0.5467	0.2014	0.6696
Access to sanitation	0.2936	0.3744	1.2837**	0.6276	0.7381	0.6702	0.8373	0.7732
Access to public waste disposal	-0.9742	0.6693	-1.8037*	1.0448	0.1514	0.5254	0.0268	0.6282
Access to fixed phone line	0.8671*	0.4890	1.0140	0.7466	-0.6991	0.5809	-0.9633	0.7040
Access to internet	-3.0981	2.8907	3.2754	4.8138	4.2075*	2.2365	6.1073**	2.5157
Travel distance to district town	0.0121	0.0089	0.0239*	0.0135	-0.0004	0.0202	-0.0086	0.0235
Mountain	0.3136	0.2020	0.3254	0.3679	-2.6330**	1.1599	-3.1634***	1.1637
Slope	0.5874**	0.2734	-0.1924	0.5075	-0.0040	0.7684	-0.0750	0.9951
Valley	-0.1502	0.4169	0.4198	0.8545	0.6137	0.4964	0.5614	0.5661
River	0.2540	0.3869	-0.0586	0.4850	-0.6549	0.5108	-0.8433	0.5919
Lake	0.6199**	0.2627	0.4885	0.4545	--	--	--	--
Coast	0.1506	0.3443	0.3574	0.5037	--	--	--	--
Ha Tinh	0.5995	0.3943	-1.2655**	0.5899	--	--	--	--
Thua Thien-Hue	0.0593	0.4756	-0.5340	0.9550	--	--	--	--
Buriram	--	--	--	--	0.2035	0.6122	0.7303	0.6910
Ubon Ratchathani	--	--	--	--	1.2896*	0.6714	1.6764**	0.7490
Constant	-13.2492***	1.8648	-11.9438***	2.7054	-9.5150*	5.2466	-7.1664	5.6822
Read & write	0.7896	0.4944	0.3638	0.5235	-0.5238	0.6268	-0.3667	0.6073
Member of association	0.0483	0.3820	-0.0967	0.4154	0.7317	0.7112	0.9271	0.7389
Main occupation (Agriculture)	0.2813	0.3210	0.4423	0.3408	-0.3676	0.4282	-0.3754	0.4334
House value (in log)	0.6818***	0.1518	0.7701***	0.1602	1.4450***	0.2298	1.4726***	0.2287
Share of males	0.0555	0.7923	0.1463	0.8162	-1.2773	1.0614	-1.1190	1.0781
# observations	1176		1176		1386		1386	
R-squared	0.2885		0.2199		0.1413		0.1163	

Note: Dependent variable is Income. The last five variables are excluded instruments. Model 1 corresponds to regressions with Income and Mean village income. Model 2 corresponds to regressions with Poor. Significance levels: *10%, ** 5%, *** 1%.

Table A13: First-step estimation for *Risk_Avoidance*.

	Vietnam				Thailand			
	Model 1		Model 2		Model 1		Model 2	
Variable	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.
Mean village income	0.0072	0.0191	--	--	-0.0063	0.0070	--	--
Subjective wealth, wrt village	-.2567***	0.0728	-0.2563***	0.0727	-0.0927	0.0760	-0.0935	0.0761
Subjective wealth, wrt country	-.2394***	0.0813	-0.2367***	0.0814	-0.0749	0.0683	-0.0779	0.0682
Drought	-0.2914*	0.1582	-0.2925*	0.1584	0.2112**	0.0881	0.2128**	0.0877
Flooding	-0.1141	0.1401	-0.1140	0.1399	-0.0976	0.1313	-0.0931	0.1312
Heavy ice rain	-0.1578	0.1768	-0.1539	0.1763	--	--	--	--
Storm, landslide	-0.0278	0.1479	-0.0286	0.1479	0.3295	0.5196	0.3355	0.5195
Pests or livestock disease	0.0554	0.1156	0.0529	0.1157	-0.4086**	0.1970	-0.4040**	0.1974
Collapse of business	0.0021	0.3229	0.0180	0.3281	-0.1750	0.3449	-0.1745	0.3449
Serious disease	0.0936	0.0773	0.0938	0.0773	-0.0548	0.0900	-0.0516	0.0898
Average age	-0.0030	0.0032	-0.0031	0.0032	0.0031	0.0035	0.0029	0.0035
Ethnic minority	-0.0002	0.1301	-0.0025	0.1304	0.0800	0.1480	0.0882	0.1486
Access to electricity	0.6457*	0.3626	0.6734**	0.3429	-0.1828	0.8646	-0.1374	0.8762
Access to public water supply	0.0530	0.0895	0.0517	0.0900	-0.0740	0.1457	-0.0747	0.1472
Access to sanitation	-0.1288	0.1670	-0.1183	0.1673	0.2108	0.1829	0.2085	0.1828
Access to public waste disposal	-0.1340	0.2613	-0.1427	0.2612	0.1378	0.1088	0.1408	0.1106
Access to fixed phone line	0.0515	0.1688	0.0526	0.1709	-0.4999***	0.1276	-0.4922***	0.1282
Access to internet	0.5240	1.1313	0.5893	1.0809	-0.0758	0.3513	-0.1336	0.3460
Travel distance to district town	0.0035	0.0043	0.0036	0.0043	0.0001	0.0050	0.0003	0.0051
Mountain	-0.0196	0.0890	-0.0195	0.0886	-0.0611	0.1274	-0.0465	0.1255
Slope	0.1161	0.1279	0.1081	0.1242	-0.0301	0.1303	-0.0293	0.1332
Valley	-0.0640	0.1769	-0.0586	0.1741	0.1076	0.1135	0.1088	0.1141
River	0.0420	0.1220	0.0387	0.1239	0.1784	0.1130	0.1837	0.1123
Lake	-0.1232	0.1232	-0.1248	0.1234	--	--	--	--
Coast	0.1227	0.1079	0.1248	0.1086	--	--	--	--
Ha Tinh	-0.5554***	0.1651	-0.5750***	0.1663	--	--	--	--
Thua Thien-Hue	-0.4029**	0.1574	-0.4088***	0.1585	--	--	--	--
Buriram	--	--	--	--	-0.6748***	0.1167	-0.6899***	0.1151
Ubon Ratchathani	--	--	--	--	-0.2427*	0.1442	-0.2539*	0.1434
Constant	1.4534***	0.5597	1.4673***	0.5600	-0.4205	1.0497	-0.4813	1.0522
Read & write	-0.0457	0.1332	-0.0495	0.1318	-0.2022	0.1585	-0.2073	0.1577
Member of association	0.0649	0.0903	0.0630	0.0904	0.0844	0.1641	0.0797	0.1636
Main occupation (Agriculture)	-0.0375	0.0832	-0.0357	0.0830	-0.0769	0.0897	-0.0761	0.0898
House value (in log)	-0.1387***	0.0379	-0.1379***	0.0376	0.0875**	0.0394	0.0866**	0.0393
Share of males	0.1706	0.2175	0.1722	0.2182	-0.1580	0.2136	-0.1602	0.2140
# observations	1175		1175		1384		1384	
Log-likelihood	-730.3648		-730.4475		-766.6347		-767.095	

Note: Dependent variable is Risk_Avoidance. The last five variables are excluded instruments. Model 1 corresponds to regressions with Income and Mean village income. Model 2 corresponds to regressions with Poor. Significance levels: *10%, ** 5%, *** 1%.

Table A14: First-step estimation for *Risk_Acceptance*.

	Vietnam				Thailand			
	Model 1		Model 2		Model 1		Model 2	
Variable	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.
Mean village income	0.0172	0.0224	--	--	0.0098**	0.0040	--	--
Subjective wealth, wrt village	0.2398**	0.0991	0.2391**	0.0984	0.0514	0.0787	0.0494	0.0789
Subjective wealth, wrt country	0.1373	0.1000	0.1429	0.0984	-0.0938	0.0823	-0.0919	0.0820
Drought	-0.2122	0.2422	-0.2125	0.2417	-0.0414	0.1102	-0.0491	0.1103
Flooding	0.0966	0.1941	0.0946	0.1942	0.0087	0.1541	-0.0019	0.1533
Heavy ice rain	0.2606	0.2813	0.2668	0.2812	--	--	--	--
Storm, landslide	-0.1217	0.1975	-0.1222	0.1973	0.2458	0.6378	0.2290	0.6390
Pests or livestock disease	-0.0825	0.1909	-0.0902	0.1906	-0.6645**	0.3253	-0.6716**	0.3259
Collapse of business	-0.1577	0.4082	-0.1170	0.3969	0.1052	0.3368	0.0970	0.3361
Serious disease	-0.0524	0.1172	-0.0500	0.1173	-0.0001	0.1101	-0.0078	0.1098
Average age	0.0030	0.0042	0.0028	0.0041	-0.0102**	0.0042	-0.0099**	0.0042
Ethnic minority	-0.0947	0.2232	-0.0963	0.2230	-0.1973	0.2428	-0.2067	0.2436
Access to electricity	-0.9143***	0.3457	-0.8665**	0.3384	-0.7690	0.6947	-0.8549	0.6830
Access to public water supply	-0.0727	0.1452	-0.0726	0.1450	-0.0215	0.1624	-0.0206	0.1614
Access to sanitation	-0.0389	0.2249	-0.0153	0.2255	-0.2645	0.1679	-0.2620	0.1659
Access to public waste disposal	0.0302	0.2894	0.0077	0.2898	0.1968*	0.1157	0.1891	0.1162
Access to fixed phone line	0.2195	0.2481	0.2139	0.2475	0.3786***	0.1458	0.3607**	0.1446
Access to internet	0.9612	1.2255	1.0826	1.2303	-1.1285**	0.4787	-0.9784**	0.4609
Travel distance to district town	-0.0147**	0.0074	-0.0138*	0.0073	0.0010	0.0048	0.0006	0.0047
Mountain	-0.1697	0.1241	-0.1701	0.1243	0.1733	0.2571	0.1477	0.2567
Slope	0.0698	0.1834	0.0534	0.1831	0.0722	0.2116	0.0673	0.2049
Valley	0.5117**	0.2123	0.5214**	0.2094	0.3071**	0.1198	0.3011**	0.1183
River	-0.2039	0.1820	-0.2148	0.1797	-0.0336	0.1166	-0.0462	0.1162
Lake	-0.2107	0.1832	-0.2188	0.1807	--	--	--	--
Coast	-0.0356	0.2169	-0.0355	0.2149	--	--	--	--
Ha Tinh	0.4504**	0.2266	0.4058*	0.2191	--	--	--	--
Thua Thien-Hue	0.4486**	0.2097	0.4356**	0.2090	--	--	--	--
Buriram	--	--	--	--	0.1930	0.1259	0.2206*	0.1254
Ubon Ratchathani	--	--	--	--	0.0005	0.1351	0.0199	0.1357
Constant	-1.8554***	0.6632	-1.8035***	0.6611	-0.4107	0.9273	-0.2864	0.9190
Read & write	-0.2508	0.2303	-0.2627	0.2314	0.4720***	0.1421	0.4778***	0.1404
Member of association	-0.0442	0.1522	-0.0454	0.1524	-0.1502	0.1744	-0.1441	0.1745
Main occupation (Agriculture)	-0.1455	0.1304	-0.1438	0.1297	-0.1170	0.0985	-0.1178	0.0985
House value (in log)	0.1205**	0.0540	0.1238**	0.0540	0.0102	0.0430	0.0121	0.0432
Share of males	-0.6309**	0.2801	-0.6286**	0.2815	0.1866	0.2633	0.1945	0.2625
# observations	1175		1175		1384		1384	
Log-likelihood	-315.581		-315.813		-492.388		-493.636	

Note: Dependent variable is Risk_Acceptance. The last five variables are excluded instruments. Model 1 corresponds to regressions with Income and Mean village income. Model 2 corresponds to regressions with Poor. Significance levels: *10%, ** 5%, *** 1%.

Table A15: First-step estimation for *Poor* and *Poor*Income*

	Vietnam				Thailand			
	Poor		Poor*Income		Poor		Poor*Income	
Variable	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.	Coef.	Std.Err.
Subjective wealth, wrt village	-0.4986***	0.0823	-0.1978*	0.1126	-0.3055***	0.0611	-0.1962	0.1522
Subjective wealth, wrt country	-0.3351***	0.0884	-0.2131	0.1433	-0.0499	0.0602	0.0209	0.1434
Drought	0.2517*	0.1486	0.0295	0.1983	0.0041	0.0850	0.2176	0.2585
Flooding	0.0814	0.1369	0.3926*	0.2077	-0.0985	0.1295	-0.3889	0.2678
Heavy ice rain	0.0682	0.1951	0.5617	0.4173	--	--	1.2327	1.1252
Storm, landslide	0.4644***	0.1343	0.2292	0.2288	-0.0321	0.5194	-0.8237	0.8783
Pests or livestock disease	0.0704	0.1242	-0.1097	0.1772	0.0661	0.1756	-0.0040	0.3214
Collapse of business	0.5721*	0.3324	1.8408**	0.8408	-0.1477	0.2844	-0.5640	0.5730
Serious disease	0.0043	0.0804	0.0111	0.1501	0.0789	0.0892	0.1623	0.2138
Average age	-0.0013	0.0032	-0.0029	0.0047	0.0008	0.0036	-0.0023	0.0091
Ethnic minority	-0.1650	0.1291	-0.1510	0.2801	0.4257**	0.1734	0.2220	0.3809
Access to electricity	-0.8137***	0.2854	0.4923	0.6471	0.3830	0.5334	-2.0072	2.4980
Access to public water supply	0.1014	0.0905	0.4124	0.2733	-0.0079	0.0982	0.3197	0.3977
Access to sanitation	0.0389	0.1228	0.7468***	0.2795	-0.0326	0.1399	-0.1210	0.6083
Access to public waste disposal	0.2435	0.2201	-0.1155	0.6135	-0.0231	0.0911	-0.1460	0.2875
Access to fixed phone line	-0.2639*	0.1562	-0.4265	0.5141	-0.0509	0.0922	-0.1669	0.3216
Access to internet	1.2586	0.8827	4.0962**	1.6319	0.2289	0.1662	1.4708	1.0807
Travel distance to district town	-0.0020	0.0038	0.0104	0.0082	-0.0057*	0.0032	-0.0281**	0.0120
Mountain	-0.1067	0.0708	-0.1222	0.1746	0.4433**	0.1930	-0.2699	0.2955
Slope	-0.1379	0.1178	-0.7022***	0.2460	-0.1431	0.0891	-0.4023	0.3255
Valley	0.5457***	0.1500	1.1081***	0.3491	0.0923	0.0778	-0.6597**	0.3201
River	-0.2469**	0.1026	-0.4763*	0.2641	-0.0428	0.0811	-0.1768	0.2780
Lake	-0.1974**	0.0991	-0.1052	0.2543	--	--	--	--
Coast	0.1300	0.1763	0.3319	0.3316	--	--	--	--
Ha Tinh	-0.2556*	0.1368	-1.2527***	0.3181	--	--	--	--
Thua Thien-Hue	-0.0460	0.1428	-0.7781**	0.3799	--	--	--	--
Buriram	--	--	--	--	0.1297	0.0930	0.9837***	0.3005
Ubon Ratchathani	--	--	--	--	-0.0030	0.1073	0.5818*	0.3401
Constant	4.3610***	0.5249	3.5909***	1.0570	2.0584***	0.7003	4.8151*	2.6480
Read & write	-0.2322	0.1549	-0.4358**	0.2040	0.0391	0.1130	0.0386	0.2648
Member of association	0.1056	0.1019	-0.0218	0.1609	0.1059	0.1559	0.4335	0.3588
Main occupation (Agriculture)	-0.0510	0.0966	0.0491	0.1425	-0.0571	0.0774	-0.0714	0.2177
House value (in log)	-0.1380***	0.0367	-0.0552	0.0541	-0.1804***	0.0364	-0.1034	0.0798
Share of males	-0.1321	0.2182	0.2960	0.3669	0.0022	0.1976	0.1024	0.4737
# observations	1176		1176		1386		1386	
R-squared			0.0721				0.0317	

Note: Dependent variable is Poor or Poor*Income. The last five variables are excluded instruments. Model 1 corresponds to regressions with Income and Mean village income. Model 2 corresponds to regressions with Poor. Significance levels: *10%, ** 5%, *** 1%.