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Natural Disasters and Poverty in Latin America
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EFFECT OF NATURAL DISASTERS ON POVERTY TRANSITIONS AND CONSUMPTION GROWTH. EVIDENCE FOR RURAL PERU*

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Abstract

Natural hazards, an increasingly important phenomenon, have a direct impact at regional and household level. The growing incidence and persistence of natural events are strongly linked to increasing vulnerability of households and communities in developing countries. Previous socioeconomic vulnerabilities may exacerbate the impact of a specific event, making more difficult the process of recovery. Using a five wave panel data set with information on natural disasters we explore the relationship between natural hazard and poverty in Peruvian context. We find that the probability of being "Always Poor" is 21 times the probability of being "Never poor", given that the household experienced a natural disaster. In addition, natural disasters have a negative impact over monthly per capita consumption growth. Furthermore, this negative effect is higher for households located at the bottom of the income distribution.

Keywords: Natural disasters, poverty, consumption, assets.
JEL classification: O15, I32, Q54, D30.

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Introduction

Natural hazards, an increasingly important phenomenon, have a direct impact at regional and household level. The growing incidence and persistence of natural events are strongly linked to increasing vulnerability of households and communities in developing countries. Previous socioeconomic vulnerabilities may exacerbate the impact of a specific event, making more difficult the process of recovery (Vatsa and Krimgold 2000). Consequently, the realization of those events could result in an immediate increase in poverty and deprivation, but also in a long-term, permanent, impoverishment (Carter et al. 2007).

Vulnerability to natural disasters is a complex issue, given that this outcome is determined by several conditions like economic structure, the stage of development, coping mechanisms available, risk assessment, and frequency as well as intensity of disasters. In this sense, the impact on the poor could be multidimensional.

Lindell and Prater (2003) outline the policy relevance of the issue. First, policy makers can better understand the kind of external assistance that is more effective; second, specific population groups can be identified as more vulnerable; and third, it may be also useful for planning fast response-assistance for natural disasters to avoid long term consequences on welfare. For example, De Janvry, et al. (2006) show that pre-existing conditional cash transfer schemes function as a safety net for those exposed to natural disasters. Alpizar (2007) also finds that access to formal financial services mitigates the negatives effects of natural disaster shocks for farmers in El Salvador, as it leads to more efficient production.

Latin America is a region prone to natural disasters and the consequences are still to be understood. Auffret (2003) found that the impact of natural disasters in Latin America and the Caribbean is very significant, especially for the Caribbean, where the volatility of consumption is higher than the one observed in other regions of the world, mainly due to inadequate risk-management mechanisms. The geographical conditions of the continent make it prone to the occurrence of severe intensity events. Yet, part of the impact derives from the vulnerability implied by low levels of socioeconomic development and inadequate risk management (Charveriat 2000). Such double-causality is extensively discussed in De la Fuente, et al. (2008). Thus, in addition to the fact that the region has been constantly hit by several natural disasters, as hurricanes, drought, floods and earthquakes,[1] the unfortunate fact that poverty and inequality are high and persistent make this area an interesting field for the analysis of welfare related issues and their relation to disaster shocks.

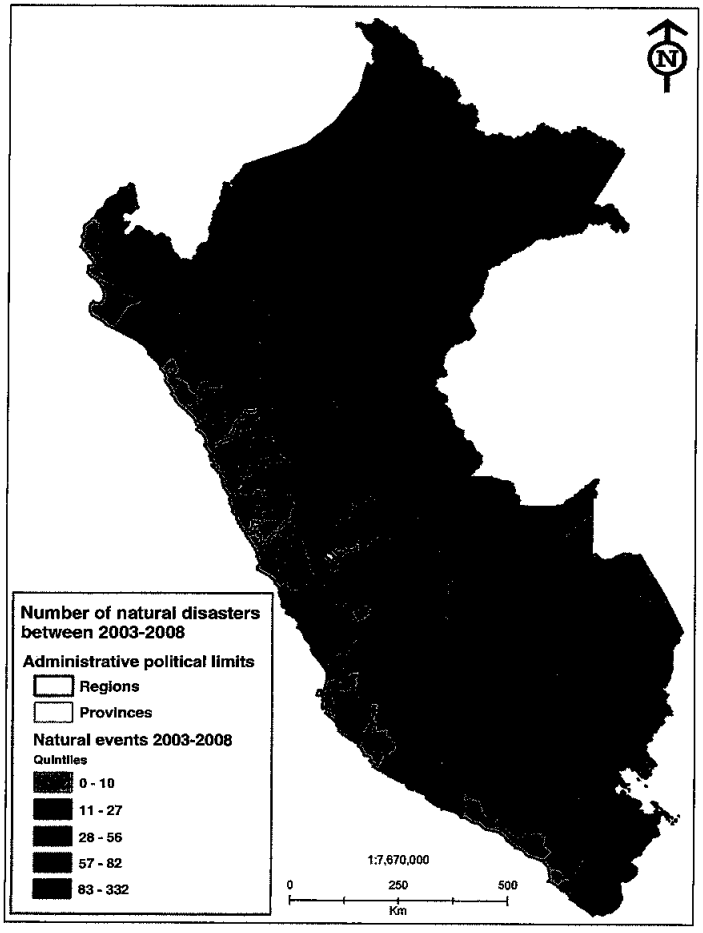
The main objective of this paper is to explore the relationship between natural hazard and poverty in Peruvian context. It is well known that Peru is a country characterized by a high incidence of natural hazards and disasters, apart from being one of the main El Niño-Southern Oscillation (ENSO) centers in the region. Moreover, the lack of formal insurance mechanisms for natural disasters in many areas of the country, particularly in the poorest, as well as the tendency

[1] For example Charveriat (2000) reports an average of 32.4 disasters per year in Latin America and the Caribbean for the decade of nineties.

to establish new settlements in high-risk areas, increases the probability of households constantly falling into poverty traps.

The most frequent natural hazards reported in rural areas of Peru are strong rains, freezes, floods, landslides, and droughts, which together account for 90% of reported occurrences in the period 2003-2008 according to the National Information System for the Prevention for and Attention to Disasters (SINPAD). As we can see in Figure 1, the provinces more affected by these events are located in the southern and central Andean regions, in the Piura region in the north coast, and in some provinces on top of the north Andean region.

Figure 1
Number of Events Reported by Province, 2003-2008



Source: SINPAD, 2003-2008. Elaboration GRADE.

Freezes and strong rains are the events more reported in the Andean region, followed closely by landslides. In the southern part of this region, freeze reports constitute 35% of the total number of events reported in this period, while in the northern part reports of strong rains account for more than half. In a similar way, 52% of events reported in the north coast are due to strong rains. Also in this region, droughts and floods account for 15 and 13% of the reports respectively, evidencing extreme climate variability within the same area. In the rainforest region, floods (39%) and rains (31%) represent more than two thirds of the reported events. This type of events mainly affects agricultural and livestock activities, but also can cause damages to basic and productive infrastructure.

To analyze the impact of natural hazard on poverty we follow a threefold strategy. First, we estimate poverty transitions with the aim to capture the dynamics of poverty. This analysis allows indentifying different categories of poverty (e.g. always poor, one episode of poverty). Using a multinomial logit model, we estimate the probability of belonging to each poverty status given that the household suffered some kind of natural disasters. In addition, we control for a set of household and community characteristics. We find that the probability of being "Always Poor" is 21 times the probability of being "Never poor", given that the household experienced a natural disaster. It is also important to stress that the probability of being "Always Poor" is 5 times the probability of being "Never poor", given a unit increase in the proportion of member of the household that have agriculture as its main activity.

The first approach puts special emphasis on household's exits and entries to poverty. To keep on digging on the effects of natural disasters on household welfare we follow the evolution of income, conditional on the number of shocks suffered in different years of the period analyzed. To explore this we use a System GMM (General Method of Moments) model that allows us to obtain unbiased estimators when a lag of the dependent variable is used as a regressor. Natural disasters have a negative impact over the growth of monthly per capita consumption. The results are consistent if we analyze different subsamples: agrarian households (households that perceived income from agricultural activities), and households living in one of the three Peruvian geographical domains (Coast, Andes, Rainforest).

Finally, the third part of our analysis is focus on understanding how the natural disasters affect the households belonging to different sections of the income distribution. We perform this analysis using a quantile regressions model. We find that to suffer a natural disaster in 2002 reduces the monthly per capita consumption of the bottom 25th of the distribution in 3.85%. It also reduces the monthly per capita consumption of the 50th of the distribution, but in a lower percentage (2.68%).

The paper is organized as follows. Section 1 provides explanations on the database used for the analysis. Section 2 explains the methodology use to measure the impact of natural disasters on poverty transitions, consumption growth and on consumption at different sections of the wealth distribution. Section 3 shows our main results and Section 4 concludes.

1. Data and Descriptive Statistics

The quantitative analysis at household level is based on the National Household Survey (*ENAHO*), conducted by the National Institute of Statistics (*INEI*). *ENAHO* provides a five-wave unbalanced panel database for the period 2002-2006 with information for 2,091 households at rural level. The unbalanced nature of this panel results in gaps in the observations, since we do not count with information for the five waves for every household in the sample. Some households were not encountered again, while others were not included in one wave, but appear again in a posterior wave. Due to these changes, the balanced panel database just includes 831 households. A problem may arise if the sub sample of 831 households has some particular characteristics that could biases our results. In particular, households that were more compromised by a natural disaster could have disappeared from the sample. However, according to the statistics presented in Tables 1 and 2 of the annex (which corresponds to the overall five waves) the balanced and unbalanced panel seems to have similar characteristics. The differences are, in most of the cases, not statistically significant (see Table 2 of the annex). Furthermore, the probability of leaving the sample at any of the waves (i.e., not be part of the balanced sample) given that the household reported a natural shock in the baseline is 30% which is relatively low.

The questionnaire also includes a question to inquiry whether or not a household experienced a negative shock during the last 12 months (death of an income's provider, unemployment, natural hazard). Furthermore, it asks about the economic consequences of the shock, as well as, the strategies undertaken by the household to deal with those adverse circumstances (depletion of assets, borrow money, etc.). Table 1, Panel A, shows the household report for 2002. The table shows the percentage of households that report having experience a shock in 2002, given their poverty status. The most commonly reported shocks are natural disasters, robbery and assault and sickness or accident of a household member. In general, the reports are similar for non-poor and poor households. The percentage of households that report suffering a natural disaster in 2002 is slightly higher among poor households, however, it is not statistically significant. Table 1 also shows the evolution of the "natural disaster" report over time. It is possible to observe that there is an increase in the report of natural disasters towards 2004. This trend will be picked up in the year by year analysis show in Table 5.

Table 1
Type of Shocks Reported in ENAHO, 2002

Type of shock	Non-poor	Poor	Total	Diff	t-statistic
Panel A					
Loss of job	0.89	0.54	0.67	0.35	0.48
Bankruptcy of family business	1.48	0.21	0.66	1.27	1.70*
Death of an income perceiver	0.63	0.74	0.7	-0.11	-0.15
Sickness or accident of a household member	3.77	2.64	3.04	1.13	0.76
Abandonment of the head of the household	0.00	0.19	0.12	-0.19	-0.99
Fire housing/business	0.00	0.19	0.12	-0.19	-0.99
Robbery, assault	5.53	5.49	5.51	0.04	0.02
Natural disaster	4.11	6.90	5.91	-2.79	-1.22
Other	0.82	0.53	0.63	0.29	0.56
None	84.17	82.58	83.14	1.59	0.50
Panel B					
	2002	2003	2004	2005	2006
Natural Disaster	5.91	12.98	18.43	17.77	13.73

Note: ***, **, and * indicates significance at the level 1%, 5%, and 10% respectively.
Source: ENAHO 2002-2006. Balanced panel.

We use the dichotomy variable "Experience a natural disaster" for our analysis. The variable takes the value of 1 if the household have experienced any natural disaster in the last 12 months prior to the interview, and 0 otherwise. This is the only variable regarding natural disasters that is included in *ENAHO* and reflects the subjective perception of the households on what they regard as a natural disaster.[2] It would be useful to compare this individual perception with national reports on natural disasters, not only to contrast both records but also to disaggregate the data according to type of natural disasters. In fact, there are official records of natural disasters at district level for Peru. However, if we are to use these records, we will have to use the district as our unit of analysis, since natural disasters such as floods or droughts could have occurred in a district without affecting all the households in the district. Unfortunately, the sampling of *ENAHO* does not permit to draw conclusions at district level.

[2] The enumerator gives some examples of natural disasters during the interview, such as, drought and earthquakes.

ENAHO is used to calculate and monitor poverty in the country, consequently it allows calculating household' consumption levels as well as income. Furthermore, it includes valuable information regarding durable and productive assets and access to public services.

Table 2 shows the average of the most important variables use in our analysis for the year 2002. Those are the "initial conditions" that characterized the households of our sample (see Tables 1 and 2 of the annex for a full report of the descriptive variables for the unbalanced and balanced panel, respectively). There are statistically significant differences between the households that report having experienced a natural disaster in 2002 and the ones that did not. The human capital variables show more positive results for the households that experienced a shock. By contrast, households that experienced a shock in 2002 had less access to piped water, electricity and fixed telephone. A lower percentage of those households received income from renting private properties, in comparison with the households that did not experience a shock. Furthermore, households that experienced a shock in 2002 were less integrated to the market, since a lower percentage of their total income came from monetary sources. This is consistent with the fact they had a higher percentage of income that came from agricultural activities. These results could be signaling some bias in the report of natural disasters by households more involve in traditional agriculture and with less access to market and services. Notice that, those households were poorer in 2002, but the result is not statistically different from the poor rate of the households that did not experience a shock. In general, we can conclude that the report of natural disasters in the database is not biased toward poorest households. It is important to rule out this bias since our econometric analysis could end up explaining poverty rather than the negatives effects of shocks.

Table 2
Profile of Households, Whether They Suffered a Natural Disaster Shock, 2002

Variable	Natural disaster (No)	Natural disaster (Yes)	Difference (p-value)
Panel A: Human capital			
Gender of the hh (woman) (%)	14.13	7.01	**
HH is literate (%)	54.52	82.68	***
At least one child don't go to school (%)	4.27	0.00	***
Age of the hh	48.11	46.30	
Average years of education of the members of the household	4.32	4.41	
Total years of education of the members of the household	20.00	21.24	
Average years of education of the hh	4.46	5.04	
Panel B: Characteristics of the dwellings			
Low quality of dwelling's materials (%)	22.38	19.68	
Owner of house (%)	84.39	92.59	
Water: access to public network (%)	42.21	18.08	***
Sewerage connected to public network (%)	57.07	47.49	
Electricity as lightning source (%)	37.07	20.56	*
Telephone (fixed) (%)	0.36	0.00	*
Panel C: Welfare indicator			
Number of members per worker	2.95	3.19	
Poor [consumption] (%)	63.97	75.44	
Livestock (on sheep equivalences)	18.30	30.23	**
Vector of assets	769.51	511.30	
Poor [assets] (%)	40.69	28.56	
Panel D: Risk management and coping indicators			
Receive income from renting private properties (%)	9.86	2.58	**
Remittances			
Receive local remittances (%)	27.58	18.38	
Receive international remittances (%)	0.62	1.31	
Remittances (from at least one source) (%)	28.14	19.69	
Local Remittances (Yearly amount in US$)	223.96	358.07	
International Remittances (Yearly amount)	8.56	9.67	
Food assistance (at least one member)			

Table 2 (continued)

Variable	Natural disaster (No)	Natural disaster (Yes)	Difference (p-value)
Glass of milk (%)	42.20	58.37	
Popular dinning room (%)	7.22	1.53	**
Scholar breakfast (%)	20.39	52.74	***
Other program (%)	7.00	19.95	
Proportion of beneficiaries (as a proportion of total members) (%)	24.97	40.43	***
Panel E: Welfare indicators			
Monetary expenses (as % of total expenses)	59.10	57.38	
Monetary income (as % of total income)	59.39	48.70	***
Panel F: Participation in agricultural activities			
Percentage of members that have as main activity agriculture	42.78	48.94	
Percentage of members that have as secondary activity agriculture	8.31	12.09	
Percentage of income from agricultural activities	34.89	42.15	*

Note: ***, **, and * indicates significance at the level 1%, 5%, and 10% respectively.
Source: ENAHO 2002-2006. Balanced panel.

2. Methodology

2.1 Natural disaster and poverty transitions

Poverty rates provide a static picture of the state of poverty in a given period. However, when it is possible to observe the same household in at least two different periods, a more rich analysis can be obtained. A panel data set permit to analyze the dynamic of poverty since it is possible to identify if a household has become poor, remain poor or even escape from poverty for one period to another. Thus, we first estimate the probabilities of entering; exiting, remaining or staying out of poverty based on the information contained in our five-waved dataset. Then we establish whether a natural disaster may have a differentiated impact for households that belong to each poverty transition status. The underlying assumption for identification is that each group presents a similar trend on consumption over time. If that is the case, then a casual effect of natural disaster over poverty can be identified.

We estimate poverty transitions using two different measures. First, we rely on the official estimates of poverty, following the *INEI* methodology that compares the real monthly per capita consumption of each household with a predetermined poverty line that is calculated valuating a basket of goods. Second, we measure a vector of assets by adding the different number of durable goods (e.g. radio, TV, car, trunk) that households possess. We use the median of the reported price of each item—in 2006—as a weight to be able to sum these different items. In addition, a factor of depreciation is included to account for the age of the objects, information that is also reported in the survey. A household is considered poor by assets if the value of this vector is below the median value for all the rural households included in the *ENAHO* in 2006 (not just the panel observations).

We obtain four categories from analyzing poverty transitions from 2002 to 2006. A household is classified as "Never Poor" if it has never fallen under the poverty line in the five periods of the survey. Conversely, it is classified as "Always Poor" if it has been poor in every wave of the survey. Households can be also classified as "Several episodes" if it has been poor more than two times but less than five times, between 2002 and 2006. Finally, a household that has fallen under the poverty line just once is classified in the category "One episode".

To estimate the impact of natural disasters on poverty transitions we use a multinomial logit model that permits to estimate the probability that certain event will be true (1–never poor, 2–one episode of poverty, 3–several episodes, and 4–always poor) after controlling by a set of household and community characteristics. This model would be interested in estimating the probability that the *ith* household belongs to the poverty transition state *j* (*j*= one episode of poverty, several episodes, and always poor) relative to one category left out and use as a comparison category.

The four categories obtained from the construction of the poverty matrix are used in Table 3 to draw a new profile of the households in the sample. Notice that this table presents the transition categories estimated based on poverty measure by consumption. In addition, a mean analysis has been included to show if the differences between the households classified as "Never poor" and "Always poor" are statistically different. As expected, the households that never experienced an episode of poverty were better endowed than the households classified as "Always poor" in terms of human capital, assets and access to services. The former are also more integrated to the market, which is reflected in their higher percentage of monetary income and expenses. Notice that there seems to be a positive correlation between the proportion of income generated from agricultural activities and the number of poverty episodes experienced by a household in the rural area. This reflects the presence of a more traditional agriculture in this area. Since chronically poor households heavily rely in agricultural income—that in turns is heavily affected by natural hazard—a higher impact of natural disasters is expected for them.

Table 3
Profile of Households, According to Poverty Status
Consumption, 2002-2006
(percentages)

Variable	Never poor (1)	One episode (2)	Several episodes (3)	Always poor (4)	Diff[1/] (p- value) (1) vs (4)
Panel A: Human capital					
Gender of the hh (woman)	13.36	22.02	15.01	9.57	**
Hh is literate	64.70	56.26	56.16	53.22	
At least one children don't go to school	0.00	1.00	4.15	6.64	***
Panel B: Characteristics of the dwellings					
Low quality of dwelling's materials	15.48	21.52	26.37	19.88	
Owner of house	82.38	86.80	82.79	86.76	***
Water: access to public network	58.48	55.28	34.73	34.16	**
Sewerage connected to public network	66.23	58.87	61.28	44.81	**
Electricity as lightning source	68.83	61.58	30.21	18.19	***
Telephone (fixed)	0.60	0.00	0.31	0.36	*
Panel C: Welfare indicator					
Poor [assets]	26.24	33.70	38.36	51.29	***
Monetary expenses (as % of total expen ses)	70.85	64.17	56.94	53.86	***
Monetary income (as % of total income)	74.36	66.72	56.39	51.56	***
Panel D: Risk management and coping indicators					
Receive income from renting private properties	18.05	11.81	10.11	3.40	**
Remittances					
Receive local remittances	23.65	27.11	31.87	24.55	
Receive international remittances	0.34	0.00	1.46	0.00	
Remittances (from at least one source)	23.65	27.11	33.33	24.55	
Food assistance (at least one member)	0.00	0.00	0.00	0.00	
Glass of milk	20.38	30.18	43.69	58.58	***
Popular dinning room	4.40	7.98	6.34	9.89	
Scholar breakfast	6.18	16.05	20.14	34.67	***
Other program	4.14	2.76	7.65	13.09	***
Proportion of beneficiaries (as a proportion of total members)	14.49	21.30	26.30	33.68	***

Table 3 (continued)

Variable	Never poor (1)	One episode (2)	Several episodes (3)	Always poor (4)	Diff[1/] (p- value) (1) vs (4)
Panel E: Participation in agricultural activities					
Percentage of members that have as main activity agriculture	40.97	41.96	45.06	41.34	
Percentage of members that have as secondary activity agriculture	5.97	8.07	9.87	8.65	***
Percentage of income from agricultural activities	25.15	26.54	36.09	41.06	

Note: ***, **, and * indicates significance at the level 1%, 5%, and 10% respectively; 1/ Mean differences are calculated by comparing column (1) with column (4).
Source: ENAHO 2002-2006. Balanced panel.

Subsequently, we estimate the probability of belonging to any of the three categories of poverty transitions (one episode, several episodes, always poor) and use the category never poor as a base for comparison. In order to control for initial conditions we use estimate the poverty transitions from 2003 to 2006, and use the household and community characteristics reported in 2002 as controls for initial conditions. Additionally, we also include in the estimation interaction variables in order to capture heterogeneity effects on households that live in less favorable or riskier conditions such as low level of assets (e.g.quantity of animals), deficient housing conditions and high dependence on agricultural income. Finally, we also control for coping strategies available to the households, in order to estimate how important it is to have access to those strategies in alleviating the negative effects of a natural disaster.

2.2 Natural disaster and per capita consumption

The methodology explained above sets special emphasis on households exist and entries to poverty. To keep on digging on the effects of natural disasters on household income we conduct an additional exercise. Our main objective is to take advantage of the panel data set and follow the evolution of income, given shock suffered in different years of the period analyzed. We estimate the following equation:

$$\Delta \ln pccons_{it} = \alpha_o + \alpha_1 \ln pccons_{it-1} + \alpha_2 X_{it} + u_{it} \qquad (1)$$

where *pccons* is the monthly per capita consumption and X is a set of characteristics of the household. Since the lag of the dependent variable is used as a regressor, OLS and Within Group estimators provide biased estimators. This is mostly because of the existence of unobserved individual (household) fixed effects. To circumvent this bias, a system GMM estimator has been used to estimate this equation.

Equation (1) will be estimated using a dynamic panel model using GMM estimators following the work of Jalan and Ravallion (2002) and De Vreyer et al. (2005). In general, a dynamic panel model has the following structure:

$$\begin{aligned} y_{it} &= \alpha y_{it-1} + \beta x_{it} + u_{it} \\ u_{it} &= v_i + \varepsilon_{it} \\ E[\varepsilon_{it}] &= E[v_t] = E[\varepsilon_{it} v_i] = 0 \end{aligned} \qquad (2)$$

where $u_{it} = v_i + \varepsilon_{it}$ is a composite error term that includes the unobserved individual fixed (v_i) and the idiosyncratic shocks (ε_{it}). Estimate Equation (2) using an OLS specification will lead to biased parameter, first, because of the unobserved individual effects captured in the composite error term and, second, because of simultaneity problems generated by using endogenous variables, or lag of endogenous variables, as regressors. Both violate the exogeneity condition for robust and unbiased parameters under OLS specifications. For instance, a large negative shock in period *t* will be captured in the composite error term. Additionally, in the next period, the lagged value of the dependent variable will be lower. This bias the coefficient of the lagged dependent variable upwards, by attributing to it predictive power that actually belongs to the composite error term.

To overcome these problems, Arellano-Bond (1991) Blundell-Bond (1998) propose dynamic panel estimators by using General Method of Moments (GMM). In particular the estimators developed by these authors have five features that make them adequate for estimating Equation (1) (Roodman 2006). First, it is suitable for dynamic equations that use the lag of the dependent

variable as a regressor. Second, it allows including other independent variables that are not completely exogenous (correlated with current or past realizations of the error term), and that can become endogenous in a first-differenced specification. Third, it allows working with autocorrelation and heteroskedasticity within individuals, but not across them. Fourth, it is possible to control for individual fixed effects. Finally, these estimators are suitable for panel data with large number of observations and small periods of times.

In particular, the System GMM model builds a system of two equations by combining the GMM model in first-differenced with the GMM model in levels (Blundell and Bond 1998). Here, the lagged first differences (e.g. Δy_{it-2}) are used as instruments for the equation in level—assuming that they are uncorrelated with fixed effects—while lagged levels are used as instruments for the first-differenced equation (e.g. y_{it-2}) (Blundell and Bond 1998). In addition to all the advantages mentioned above, the system GMM estimator reduces the gaps produced in an unbalanced panel when using the first-differenced GMM method, a feature that is particularly relevant given our sample.

The correct choice of instruments can be tested by using the standard Sargan/Hansen test of over-identifying restrictions and the Arellano-Bond test of serial autocorrelation. Additionally, Bond (2002) suggests estimation of the model using OLS and Within Groups estimator, and using the predicted coefficients as upper and lower bounds of the expected value of more efficient parameters to be obtained through system GMM estimators.

2.3 Analysis at the bottom of the distribution

Finally, in our third approach we analyze the impact of natural disasters at different points of the income distribution. This is particularly relevant since the estimation of an average effect could be hidden important heterogeneity in the impact of natural disaster on household's consumption. This can reinforce the argument that natural disasters can generate poverty traps, whenever households at the bottom of the distribution are unevenly affect by natural disasters. This further impoverishment may lead to a less conducive environment for coping with future shocks. There is still relatively little evidence in the literature on the distributional impact of natural disasters. Quisumbing (2007) estimates the impact of shocks according to poverty transitions categories using a longitudinal data set for Bangladesh. He finds that the impact of shocks cannot be predicted, since there is not a clear pattern on how it affects different groups of households.

The analysis of the distributional effects of natural disasters can also help to relaxed some possible biased that may arise if households that are poorly endowed and less integrated to the market are the ones that report having experience a natural disaster.

A quantile regression estimates the value of the dependent variable at different percentiles, conditional on the values of the independent variable. In comparison with the OLS estimator, in quantile regressions we try to find the regression plane that minimizes the sum of the absolute residuals rather than the sum of the squared residuals. In particular, we estimate:

$$Q_{Y|X}(\tau \mid x) = X'\beta + Q_{\varepsilon|X}(\tau \mid x),$$

where $Q_{Y|X}(\tau \mid x)$ is the value of consumption on the τ-percentile, conditional a vector of covariates X.

3. Results

3.1 Natural disasters and poverty transitions

Table 4 shows the odd ratios of the multinomial regression for three different models that include different controls. All models include controls for demographic composition (not reported). These odd ratios—also know as risk ratio—are the ratio between the probability to belong to each category and the probability to belong to the base category, given a unit increase in the corresponding explanatory variable.

According to model 1, the probability of being "Always Poor" is 21 times the probability of being "Never poor", given that the household experienced a natural disaster. Similarly, the probability of being "Always Poor" is 5 times the probability of being "Never poor", given a unit increase in the proportion of member of the household that have as agriculture as main activity. However, this last result vanishes when we add variables that capture the access to services. Then the probability of being "Never Poor" is higher than the probability of being "Always Poor" of having experienced "Several episodes" of poverty (see model 2). In contrast, the variables that capture participation in agricultural activities are not statistically significant. In addition, the probability being "Never Poor" is 13 times the probability of having fallen below the poverty line in just one period given that the household experienced a natural disaster (see column 1, Table 4). Notice that the interaction variables do not have a statistically significant effect. The same thing occurs when we add the coping strategies report by the families (see model 3). In this case, the coefficient of the variable shock jumps which can be indicating a high level of correlation between those variables. These results are consistent if we restrict the sample to agrarian households (households that received income from agricultural activities) (see Table 3 of the annex). These results indicate that limited access to services and lower level of integration to the market, along with natural disasters, are important factors to explain why households remain poor.

Table 4
Multinomial Regression. Dependent Variable: Poverty Transitions
Consumption, 2003-2006

	One episode			Several episodes			Always poor		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Average of shocks (from 0 to 1)	0.0731*	0.0645	0.0558	1.993	17.66	142.1*	21.70***	91.07*	923.8**
	(0.113)	(0.133)	(0.196)	(3.222)	(58.05)	(427.2)	(11.46)	(220.8)	(2601.7)
Total years of education (2002)	1.002	1.005	1.006	0.976**	0.982*	0.980*	0.949***	0.961***	0.959***
	(0.00876)	(0.00857)	(0.00968)	(0.0103)	(0.00975)	(0.0112)	(0.0132)	(0.00988)	(0.0133)
Female head of household (2002)	0.976	0.826	0.859	0.623	0.500	0.512	0.281**	0.202***	0.199**
	(0.635)	(0.584)	(0.636)	(0.337)	(0.312)	(0.317)	(0.169)	(0.125)	(0.130)
Agriculture as main activity (2002)	2.267	1.465	1.396	2.635	1.318	1.243	5.128***	1.839	1.686
	(1.165)	(0.911)	(0.812)	(1.576)	(0.907)	(0.843)	(2.824)	(1.262)	(1.039)
Agriculture as secondary activity (2002)	3.028	1.975	1.756	6.255	3.561	3.284	4.419	1.865	1.846
	(2.696)	(1.999)	(1.670)	(8.690)	(4.732)	(4.271)	(4.679)	(1.421)	(1.200)
Proportion of agricultural income (2002)	2.345***	1.879	1.877	2.013	1.832	1.820	2.185	1.832	2.036
	(0.687)	(1.128)	(1.153)	(1.493)	(1.538)	(1.601)	(1.248)	(1.742)	(1.899)
Low quality dwelling (2002)		0.823	0.743		0.766	0.675		0.588	0.513
		(0.396)	(0.422)		(0.438)	(0.420)		(0.227)	(0.217)
Quantity of animals (2002)		1.000	1.000		1.002	1.000		0.995	0.993
		(0.00989)	(0.00789)		(0.00967)	(0.00912)		(0.0113)	(0.00967)
Access to piped water (2002)		0.540*	0.499*		0.506***	0.457***		0.373***	0.362***
		(0.186)	(0.179)		(0.131)	(0.130)		(0.0410)	(0.0603)
Access to electricity (2002)		0.383***	0.411***		0.302***	0.312***		0.170***	0.173***
		(0.101)	(0.119)		(0.0898)	(0.0800)		(0.0444)	(0.0462)
Vector of assets (2002)		1.000	1.000		1.000**	1.000**		1.000	1.000
		(0.0000)	(0.0000)		(0.0000)	(0.0000)		(0.000)	(0.000)

Table 4 (continued)

	One episode			Several episodes			Always poor		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Shock (mean)* Quantity of animals (2002)		0.987 (0.0273)	0.985 (0.0272)		0.974 (0.0196)	0.970 (0.0252)		0.985 (0.0246)	0.984 (0.0295)
Shock (mean)*Low housing (2002)		2004.8*** (5469.0)	3836.6** (12871.1)		95.25* (258.2)	123.0 (430.7)		107.7 (331.3)	148.9 (538.1)
Shock (mean)*Prop. of agricultural income		0.209 (0.885)	0.450 (1.885)		0.0443 (0.155)	0.0573 (0.181)		0.145 (0.424)	0.141 (0.335)
Coping strategy: savings (average)			0.393 (0.848)			0.00727** (0.0153)			0.00261*** (0.00284)
Coping strategy: assets (average)			7.174 (41.25)			740.8 (3223.3)			23.90 (110.9)
Coping strategy: credit (average)			0.0236** (0.0394)			0.330 (0.537)			0.114 (0.155)
Coping strategy: workload (average)			4.653 (12.93)			0.213 (0.369)			0.0843* (0.118)
Coping strategy: external support (average)			0.000375 (0.00278)			0.00101 (0.00605)			0.000661 (0.00336)
Coping strategy: food (average)			0.442 (0.429)			0.0697 (0.293)			0.159 (0.534)
Demographic fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demographic variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	830	830	830	830	830	830	830	830	830

Note: Exponentiated coefficients; standard errors of the original coefficients in parentheses; *p<0.10 **p<0.05 ***p<0.01.
Source: ENAHO 2002-2006. Balanced panel.

One main disadvantage of the information collected in the *ENAHO*, is that it does not allow us to differentiate between different Natural Disaster that took place during that period. For instance, the impact of a drought on households' income and poverty is expected to be higher than a landslide. At this point, our variable of shock is a measure of the aggregate information for five periods, that combines all natural disaster suffered and reported by the households, regardless their magnitude and impact. To circumvent this potential problem and test the robustness of our results, we analyzed the specifications shown above for each pair of years. In that way, we can identify if there is a differentiated effect for each year. That is to say, this can be signaling that there were particularly damaging shocks in some years. In this exercise the categories of the poverty transitions take into account the poverty exits and entries year by year and are renamed as follow: Poor to Non Poor, Non-Poor to Poor, Remain Poor, Never Poor. We use the specification of model to 2 to estimate this exercise. In this case, we do not use the average of shocks suffered in the two-year period, but rather a variables of shock for each of them.

Table 5 shows the coefficient of the shock suffered in both periods that are being compared (the complete regression in shown in Table 4 of the annex). It is very clear that the results shown in Table 4 are picking up the effects of a shock produced in 2004. The probability of

Table 5
Multinomial Regression. Dependent Variable: Poverty Transitions
Consumption

	Poor- Non poor	Non poor- Poor	Remain poor
Poverty transitions: consumption (2002-2003)			
Shock: Natural Disaster (t)	2.441	5.827	1.518
	(1.502)	(7.709)	(1.194)
Shock: Natural Disaster (t+1)	0.656	0.284	0.93
	(0.575)	(0.42)	(1.086)
Poverty transitions: consumption (2003 -2004)			
Shock: Natural Disaster (t)	1.057	2.252	2.803
	(1.079)	(1.611)	(2.628)
Shock: Natural Disaster (t+1)	13.40**	4.096	14.04***
	(14.13)	(4.893)	(8.665)
Poverty transitions: consumption (2004 -2005)			
Shock: Natural Disaster (t)	6.061***	1.068	4.673***
	(3.812)	(1.033)	(2.375)
Shock: Natural Disaster (t+1)	2.426	0.805	0.516
	(2.347)	(1.410)	(0.886)
Poverty transitions: consumption (2005 -2006)			
Shock: Natural Disaster (t)	0.303	0.595	0.418
	(0.462)	(0.267)	(0.474)
Shock: Natural Disaster (t+1)	1.246	0.898	3.130
	(1.433)	(1.630)	(4.699)

Note: Exponentiated coefficients; standard errors of the original coefficients in parentheses; *p<0.10 **p<0.05 ***p<0.01.
Source: ENAHO 2002-2006. Balanced panel.

"Remain poor" is 14 times higher than the probability of being "Never poor", given that the household reported a shock in 2004. This probability decreases the next period, but it is still statistically significant. Notice that the probability of moving from Poor to Non Poor is also higher than the probability of being Never Poor. This could sound strange, but it is actually capturing the fact that given that the household reported a shock in 2004, its odds of remaining non poor decrease.

We conduct the same analysis using the possession of assets as a measure of poverty. Similarly to the prior models, all specifications include controls for demographic composition (not reported). In both specifications the variable of natural disaster does not have a statistically significant effect over any of the categories of the poverty transitions (see Table 6).

Variables such as the participation of the members in agricultural activities and access to public services have the same direction found in the specifications that use consumption to measure poverty. One can argue that natural disaster affect these households through its negative effect over the agriculture activity, affecting the level and variability of their income, but not their possessions of durable goods.

As we have already explained above, the aggregate measure of shock could be hidden some year specific effect. In this case, the probability of moving from being Non poor to being Poor is 4 times the probability of being Never Poor in assets' possession, given that the household suffered and reported a shock in 2004. However, the specific effect found we found in Table 5 is not so clear in this exercise. Here, we found that a shock suffered in 2005 increases the probability Remain Poor. In this case, the probability of being Never Poor is higher than the probability of exiting a poverty status. That is to say, this shock decreased the probability of holding a level of durables good that is higher than the median for rural households.

Comparing the results of Table 5 and Table 7, we can argue that the shock suffered in 2004 first damaged the household income. These shocks probably force the households to deplete their assets in order to smooth consumption and overcome the negative effects of the shocks. Then, suffer a shock in 2005; made those households more vulnerable since it increased their odds to remain poor in assets possessions. We can also speculate that shocks suffered in 2004 and 2005 affected different assets. One affected income more directly (e.g. frost) while other affected more durable goods (e.g. landslide).

Table 6
Multinomial Regression, Dependent Variable: Poverty Transitions
Assets, 2003-2006

	One episode			Several episodes			Always poor		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Average of shocks	1.021	1.402	6.993	1.006	0.817	2.127	0.369	11.40	26.85
	(0.639)	(2.226)	(8.713)	(0.588)	(0.680)	(1.815)	(0.331)	(17.95)	(68.12)
Total years of education (2002)	0.982**	0.987*	0.989	0.965**	0.968*	0.969*	0.917***	0.925***	0.928***
	(0.00863)	(0.00706)	(0.00677)	(0.0171)	(0.0161)	(0.0162)	(0.0135)	(0.0131)	(0.0124)
Female head of household (2002)	1.445	1.583	1.635	1.925*	2.017*	2.142	3.485**	3.470***	3.534**
	(0.632)	(0.669)	(0.734)	(0.748)	(0.856)	(1.002)	(1.879)	(1.620)	(1.847)
Agriculture as main activity (2002)	2.738	1.821	1.616	7.671***	5.225**	5.158**	8.606**	5.747**	6.501**
	(2.640)	(1.674)	(1.688)	(5.278)	(3.594)	(4.063)	(7.930)	(4.375)	(5.921)
Agriculture as secondary activity (2002)	2.221	1.005	1.123	1.931	0.918	0.957	1.137	0.467	0.497
	(1.885)	(0.713)	(0.837)	(1.391)	(0.616)	(0.693)	(1.168)	(0.450)	(0.524)
Proportion of agricultural income (2002)	2.490**	2.174	2.611*	0.782	0.685	0.671	0.930	0.898	1.019
	(0.955)	(1.115)	(1.333)	(0.167)	(0.171)	(0.189)	(0.213)	(0.623)	(0.698)
Low quality dwelling (2002)		1.174	1.119		0.832	0.773		2.169	2.003
		(0.608)	(0.615)		(0.480)	(0.402)		(1.056)	(0.947)
Quantity of animals (2002)		0.999	0.997		0.997	0.995		1.001	1.000
		(0.00571)	(0.00613)		(0.00384)	(0.00338)		(0.00714)	(0.00738)
Access to piped water (2002)		0.817	0.790		0.421***	0.382***		1.126	1.123
		(0.310)	(0.332)		(0.120)	(0.126)		(0.492)	(0.470)
Access to electricity (2002)		0.270***	0.257***		0.414***	0.408***		0.0991***	0.101***
		(0.0595)	(0.0503)		(0.0472)	(0.0450)		(0.0394)	(0.0382)
Shock(mean)*Quantity of animals(2002)		0.983	0.983*		1.000	1.001		0.855***	0.845**
		(0.0115)	(0.0102)		(0.00842)	(0.00755)		(0.0513)	(0.0616)
Shock(mean)*Low housing(2002)		2.270	1.737		3.541	3.111		0.000720***	0.000***
		(3.027)	(2.570)		(5.088)	(4.165)		(0.00188)	(0.001)

Table 6 (continued)

	One episode			Several episodes			Always poor		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Shock(mean)*Proportion of agricultural income (2002)		0.725 (2.136)	0.340 (0.924)		0.475 (0.410)	0.338 (0.325)		0.808 (3.245)	0.621 (2.966)
Coping strategy: savings (average)			0.104 (0.260)			0.167* (0.165)			0.00136 (0.00625)
Coping strategy: assets(average)			2.502 (12.12)			181.2** (367.0)			1.444 (4.613)
Coping strategy: credit (average)			0.0101 (0.0378)			0.328 (0.943)			0.0441** (0.0607)
Coping strategy: workload(average)			0.304 (0.282)			0.998 (0.761)			0.555 (0.530)
Coping strategy: external support (average)			0.000*** (0.000)			0.0235 (0.0581)			0.000** (0.000)
Coping strategy: food (average)			0.176 (0.311)			0.113* (0.132)			3.100 (6.929)
Demographic fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demographic variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	830	830	830	830	830	830	830	830	830

Note: Exponentiated coefficients; standard errors of the original coefficients in parentheses; *p<0.10 ** p<0.05 ***p<0.01.
Source: ENAHO 2002-2006. Balanced panel.

Table 7
Multinomial Regression. Dependent Variable: Poverty Transitions
Assets

	Poor- Non poor	Non poor- Poor	Remain poor
Poverty transitions: consumption (2002-2003)			
Shock: Natural Disaster (t)	0.319	0.811	0.192
	(0.610)	(0.853)	(0.297)
Shock: Natural Disaster (t+1)	1.004	1.227	1.243
	(0.589)	(1.114)	(0.264)
Poverty transitions: consumption (2003-2004)			
Shock: Natural Disaster (t)	1.821	0.338	0.901
	(1.149)	(0.257)	(0.544)
Shock: Natural Disaster (t+1)	1.982	0.521	1.249
	(1.748)	(0.770)	(0.852)
Poverty transitions: consumption (2004-2005)			
Shock: Natural Disaster (t)	1.754	4.704***	0.988
	(1.004)	(2.032)	(0.759)
Shock: Natural Disaster (t+1)	0.242***	0.473	1.944**
	(0.111)	(0.340)	(0.609)
Poverty transitions: consumption (2005-2006)			
Shock: Natural Disaster (t)	0.865	0.422	1.645
	(0.745)	(0.361)	(1.089)
Shock: Natural Disaster (t+1)	1.217	1.672	0.395
	(0.797)	(0.549)	(0.268)

Note: Exponentiated coefficients; standard errors of the original coefficients in parentheses; *p<0.10 **p<0.05 ***p<0.01.
Source: ENAHO 2002-2006. Balanced panel.

3.2 Natural disasters and per capita consumption growth

The exercises shown above put special emphasis on households exits and entries to poverty. To keep on digging on the effects of natural disasters on household welfare we now focus our attention on the effect of natural disasters on the evolution of consumption over time. We follow the methodology described in Section 2.

Special attention has been placed on testing the validity of the instruments chosen. The system GMM estimator—with three lags of the dependent variable as instruments—has been chosen as the preferred specification to model the accumulation function for the entire data. According to the Arellano/Bond test there is no second-order serial autocorrelation in model 1. Additionally, Hansen statistics shows that the null of exogeneity cannot be rejected. Both conditions are not satisfied by model 2 and model 3 that includes an interaction effect and some coping strategies reported by the households. The coefficient lag of the dependent variable is -0.67 (see Table 8). This means that an increase in 1% of the capital in time t explains 33% of the increase in capital in the next period. In addition, the coefficient of the lag of the dependent variable is lower than the coefficient obtained in an OLS specification (-0.39) and higher than the coefficient obtained in a Fixed Effects model (-1.07). In the preferred specification (model 1) the variable that captures natural disasters have a negative impact over the growth of monthly per capita consumption. The access to services such as electricity and piped water increase the growth rate of monthly per capita consumption.

Table 8
System GMM. Dependent Variable: Growth of Monthly Per Capita Consumption

	Model 1	Model 2	Model 3
(log) Monthly per capita consumption	-0.669**	-0.483***	-0.474***
	(0.239)	(0.114)	(0.127)
Shocks: Natural disaster	-0.076*	-0.078*	-0.065
	(0.033)	(0.037)	(0.041)
Quantity of animals	0.002	0.003***	0.003***
	(0.001)	(0.001)	(0.001)
Vector of assets	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Access to piped water	0.092**	0.083***	0.084**
	(0.033)	(0.024)	(0.026)
Telephone (land line)	0.125	0.081	0.074
	(0.107)	(0.089)	(0.093)
Access to electricity	0.146*	0.105**	0.102**
	(0.063)	(0.035)	(0.038)
Shocks*Poverty(Assets)		0.000	-0.000
		(0.000)	(0.000)
Coping strategy: assets			-0.156
			(0.562)
Coping strategy: savings			-0.125
			(0.267)
Constant	3.313**	2.393***	2.350***
	(1.168)	(0.549)	(0.610)
Arellano-Bond Test	0.100	0.000	0.001
Hansen Test	0.655	0.772	0.706
Demographic fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
N	3320	3262	3262

Note: Standard errors in parentheses; *p<0.10 **p<0.05 ***p<0.01.
Source: ENAHO 2002-2006. Balanced panel.

In order to check the robustness of our results, we repeated this exercises for several subsamples. Specifically, we test the results for four different groups: agrarian households (households that perceived income from agricultural activities), and households living in the three Peruvian geographical domains (Coast, Andes, Rainforest) (see Table 9 and Table 10). The results for the agrarian households are consistent with the results shown in the prior Table 8. In this case, the

variable shock is negative and statistically significant in model 2. In this specification the quantity of animals have a positive effect on the growth rate of monthly per capita consumption. However, the model suffers from serial correlation of second order (see Arellano Bond Test), which can lead to biased coefficients.

Table 9
System GMM. Dependent Variable: Growth of Monthly Per Capita Consumption
Sub-sample: Agrarian Households

Variables	Model 1	Model 2	Model 3
(log) Monthly per capita consumption	-0.446*	-0.481***	-0.504***
	(0.222)	(0.118)	(0.135)
Shocks: Natural disaster	-0.068	-0.077*	-0.073
	(0.037)	(0.037)	(0.040)
Quantity of animals	0.003**	0.003***	0.003***
	(0.001)	(0.001)	(0.001)
Vector of assets	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
Access to piped water	0.058*	0.065**	0.068**
	(0.025)	(0.023)	(0.026)
Telephone (land line)	-0.015	0.010	0.006
	(0.073)	(0.072)	(0.076)
Access to electricity	0.106	0.109**	0.115**
	(0.063)	(0.038)	(0.041)
Shocks*Vector of assets		0.000	0.000
		(0.000)	(0.000)
Coping strategy: assets			0.011
			(0.517)
Coping strategy: savings			-0.080
			(0.258)
Constant	2.188*	2.351***	2.458***
	(1.067)	(0.556)	(0.635)
Arellano-Bond Test	0.013	0.002	0.004
Hansen Test	0.433	0.623	0.718
N	2723	2679	2679

Note: Standard errors in parentheses; *p<0.10 **p<0.05 ***p<0.01.
Source: ENAHO 2002-2006. Balanced panel.

Table 10
System GMM. Dependent Variable: Growth of Monthly Per Capita Consumption
Sub-sample: Geographical Domains

	Coast			Andes			Rainforest		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
(log) Monthly per capita consumption	-0.804*** (0.231)	-0.569*** (0.154)	-0.589*** (0.132)	-0.904*** (0.241)	-0.885*** (0.127)	-0.751*** (0.144)	-0.752*** (0.220)	-0.583*** (0.158)	-0.740*** (0.151)
Shocks: Natural disaster	-0.154*** (0.045)	-0.137** (0.049)	-0.187** (0.068)	-0.115* (0.048)	-0.106* (0.048)	-0.098 (0.057)	0.118* (0.054)	0.092 (0.092)	0.121 (0.099)
Quantity of animals	0.001 (0.001)	0.002 (0.001)	0.000 (0.001)	0.004 (0.003)	0.005*** (0.001)	0.005*** (0.001)	0.001 (0.002)	0.001 (0.002)	-0.000 (0.002)
Vector of assets	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000* (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Access to piped water	0.168** (0.057)	0.118** (0.038)	0.117** (0.040)	0.093 (0.056)	0.123* (0.054)	0.106* (0.049)	0.016 (0.044)	0.035 (0.039)	0.004 (0.045)
Telephone (land line)	0.132 (0.118)	0.114 (0.084)	0.152* (0.077)						
Access to electricity	0.068 (0.051)	0.044 (0.037)	0.041 (0.036)	0.254** (0.095)	0.252*** (0.066)	0.198** (0.069)	0.243*** (0.068)	0.193*** (0.051)	0.248*** (0.060)
Shocks* Vector of assets		-0.000 (0.000)	0.000 (0.000)		-0.000 (0.000)	-0.000 (0.000)		0.000 (0.000)	-0.000 (0.000)
Coping strategy: assets			0.312 (0.297)			1.210 (2.142)			-0.250 (0.384)
Coping strategy: savings			0.309 (0.293)			-0.121 (0.333)			0.943 (0.685)
Constant	4.018*** (1.144)	2.863*** (0.767)	2.986*** (0.654)	4.220*** (1.150)	4.095*** (0.580)	3.501*** (0.656)	3.705*** (1.082)	2.907*** (0.779)	3.685*** (0.747)
Arellano-Bond Test	0.115	0.006	0.032	0.714	0.407	0.165	0.054	0.010	0.049
Hansen Test	0.238	0.196	0.211	0.547	0.321	0.682	0.345	0.525	0.491
N	1096	1071	1071	1224	1206	1206	1000	985	985

Note: Standard errors in parentheses; * p<0.05 ** p<0.01 *** p<0.001.
Source: ENAHO 2002-2006. Balanced panel.

The results found for the sub-samples of each geographical domain are consistent with the results find for the whole sample. Notice that the coefficient of the variables shock has a positive effect. These results have to be taken with cautious since the low number of observations that belong to these sub-sample (250) and the low percentage households that report shocks in that area (7% in average).

3.3 Effects of natural disasters at the bottom of the income (consumption) distribution

As we have mentioned lines above, it is possible that the report of natural disasters is biased to households that are poorly endowed and less integrated to the market. To circumvent this problem and to analyze the impact of natural disaster at the bottom of the consumption distribution, we have estimated a Quantile regression. We use as dependent variable the (log) monthly per capita consumption in 2006. We add dummies for the shock reported in each year as well as some additional controls of the prior period. This model also use controls for demographic composition (not reported). In addition, we have included the variable "plots" that captures the number of plots worked by a household. This variable was included to the *ENAHO* questionnaire just in 2004.

The reported coefficients show the median of each variable in the corresponding percentile. That is why the column that shows the results for the whole sample is equal to the column shows the results for the 50th percentile. The constant term captures the median of the dependent variable if all control variables are set to 0. This constant term is use to compare the coefficients corresponding to each the explanatory variable. For instance, the variable "Shock: Natural disaster" in 2002 decrease the median monthly per capita consumption in 0.28 logarithm points. In other word, having experienced a shock in 2002 reduces the monthly per capita consumption of the bottom 25th of the distribution in 3.85%.[3] It also reduces the monthly per capita consumption of the 50th of the distribution, but in a lower percentage (2.68%) (see Table 11). Further exercises are reported in Tables 5 and 6 of the annex, however the correct interpretation of the coefficient of interaction variables is a pending task in this report.

[3] This result is obtained after exponentiating the value in logs.

Table 11
Quantile Regression, Dependent Variable: (log) Monthly Per Capita Consumption, 2006
Initial Conditions: 2005

Variables	Total	25th percentile	50th percentile	75th percentile
Constant	**3.853*** (0.170)**	**3.538*** (0.165)**	**3.853*** (0.170)**	**4.126*** (0.188)**
Shock: Natural disaster (Yes=1) [2002]	-0.236*** (0.072)	-0.283*** (0.077)	-0.236*** (0.072)	-0.291*** (0.077)
Shock: Natural disaster (yes=1) [2003]	0.134** (0.053)	0.041 (0.056)	0.134** (0.053)	0.058 (0.064)
Shock: Natural disaster (yes=1) [2004]	-0.108** (0.046)	- 0.048 (0.048)	-0.108** (0.046)	-0.119** (0.054)
Shock: Natural disaster (yes=1) [2005]	-0.091* (0.048)	-0.191*** (0.047)	-0.091* (0.048)	-0.138** (0.054)
Shock: Natural disaster (yes=1) [2006]	-0.226*** (0.051)	-0.091* (0.049)	-0.226*** (0.051)	-0.177*** (0.057)
Total years of education (all members) [2005]	0.006*** (0.001)	0.008*** (0.001)	0.006*** (0.001)	0.003*** (0.001)
Gender of the hh (woman=1) [2005]	0.264*** (0.059)	0.103* (0.057)	0.264*** (0.059)	0.363*** (0.063)
Number of plots [2005]	-0.024** (0.010)	-0.031*** (0.009)	-0.024** (0.010)	-0.030*** (0.011)
Main activity: agriculture [2005] 1/	-0.169** (0.067)	-0.216*** (0.071)	-0.169** (0.067)	-0.144* (0.076)
Secondary activity agriculture [2005] 1/	- 0.280*** (0.086)	-0.185* (0.099)	-0.280*** (0.086)	-0.186* (0.099)
Agricultural income (proportion of total income) [2005]	-0.205*** (0.069)	-0.14* (0.072)	-0.205*** (0.069)	-0.008 (0.087)
Livestock (on sheep equivalences) [2005]	0.002*** (0.001)	0.002***	0.002*** (0.001)	0.003*** (0.001)
Vector of assets [2005]	0.000***	0.000**	0.000***	0.000***
Water: access to public network (yes=1) [2005]	0.079** (0.034)	0.013 (0.034)	0.079** (0.034)	0.129*** (0.038)
Telephone (fixed) (yes=1) [2005]	0.872*** (0.179)	0.437*** (0.138)	0.872*** (0.179)	0.584*** (0.136)
Electricity as lightning source (yes=1) [2005]	0.138*** (0.034)	0.187*** (0.036)	0.138*** (0.034)	0.155*** (0.039)
N	771	187	381	582

Note: Standard errors in parenthesis; *p<0.10,**p<0.05,***p<0.01. 1/ Number of individuals as a proportion of total members.
Source: ENAHO 2002-2006: Balanced panel.

4. Conclusions

Natural hazards, an increasingly important phenomenon, have a direct impact on the welfare of regions and specific households. The growing incidence and persistence of natural events are strongly linked to increasing vulnerability of households and communities in developing countries. In order to analyze the impact of natural disasters on welfare for Peruvian rural households we follow a threefold strategy.

According to the multinomial model having experienced a natural disaster increases the probability that a household will not be able to escape from poverty. In particular, the probability of being "Always Poor" is 21 times the probability of being "Never poor", given that the household experienced a natural disaster. In also important to stress that the probability of being "Always Poor" is 5 times the probability of being "Never poor", given a unit increase in the proportion of member of the household that have as agriculture as main activity.

When we conduct the analysis year by year we find that the prior results are picking up the effects of a shock produced in 2004. The probability of "Remain poor" is 14 times higher than the probability of being "Never poor", given that the household reported a shock in 2004.

The analysis of poverty transitions using a measurement of poverty by assets does not give further insights. One can argue that, in our case, natural disaster affect these households through its negative effect over the agriculture activity, affecting the level and variability of their income (consumption), but not their possessions of durable goods.

The analysis of the evolution of consumption over time also shows the negative effects of natural disasters on household's welfare. Natural disasters have a negative impact over the growth of monthly per capita consumption. It is important to notice that access to services such as electricity and piped water increase the growth rate of monthly per capita consumption. In order to check the robustness of our results, we repeated this exercises for several sub-samples. Specifically, we test the results for four different groups: agrarian households (households that perceived income from agricultural activities), and households living in the three Peruvian geographical domains (Coast, Andes, Rainforest) The results found for the sub-samples of each geographical domain are consistent with the results find for the whole sample.

Finally, we also find that having experienced a shock in 2002 reduces the monthly per capita consumption of the bottom 25th of the distribution in 3.85%. It also reduces the monthly per capita consumption of the 50th of the distribution, but in a lower percentage (2.68%).

Annex

Table 1
Descriptive Statistics, 2002-2006
Unbalanced Panel

Variable	Obs	Mean	Sd	Min	Max
Human capital					
Age of the hh	8411	49.58	16.25	14	96
Education of the hh: equal or lower than complete primary (yes=1)	8400	0.28	0.45	0	1
Average years of education of the members of the household	8410	4.45	3.13	0	17
Total years of education of the members of the household	8411	19.31	15.63	0	131
Average years of education of the hh	8411	4.52	4.65	0	18
Gender of the hh (woman=1)	8411	0.16	0.36	0	1
Hh is literate (yes=1)	4105	0.57	0.49	0	1
At least one children don't go to school (yes =1)	8411	0.11	0.31	0	1
Characteristics of the dwellings					
Low qualitity of dwelling's materials (yes=1)	8369	0.15	0.36	0	1
Owner of house (yes=1)	8410	0.85	0.35	0	1
Number of rooms use to sleep	4373	1.60	1.13	0	7
Water: access to public network (yes=1)	8411	0.41	0.49	0	1
Sewerage connected to public network (yes=1)	8411	0.59	0.49	0	1
Electricity as lightning source (yes=1)	8411	0.37	0.48	0	1
Telephone (fixed) (yes=1)	8411	0.01	0.09	0	1
Welfare indicators					
Number of members per worker	8382	2.87	1.84	1	13
Poor [consumption] (yes=1)	8411	0.60	0.49	0	1
Poor [assets] (yes=1)	8411	0.43	0.49	0	1
Monetary expenses (as proportion of total expenses)	8411	0.56	0.23	0	1
Monetary income (as proportion of total income)	8411	0.55	0.26	0	1
Risk management and coping indicators					
Received credit from any source (year 2004-2006) (yes=1)	4375	0.39	0.49	0	1
Receive income from renting private properties	8411	0.10	0.30	0	1
Remittances					
International Remittances (yes=1)	8411	0.25	0.43	0	1
Local Remittances (yes=1)	8411	0.01	0.08	0	1
Remittances (at least one source)	8411	0.00	0.03	0	1
International Remittances (Yearly amount)	8411	602.16	2115.52	0	43176
Local Remittances (Yearly amount)	8411	43.18	828.00	0	33660

Table 1 (continued)

Variable	Obs	Mean	Sd	Min	Max
Food assistance (at least one member, yes=1)					
Glass of milk	8411	0.37	0.48	0	1
Popular dinning room	8411	0.07	0.25	0	1
Schoolar breakfast	8411	0.19	0.39	0	1
Other programm	8411	0.10	0.30	0	1
Proportion of beneficiaries (as a proportion of total members)	8411	0.26	0.29	0	1
Assets					
Livestock (on sheep equivalences)	7916	17.77	29.03	0	530
Vector of assets	8411	863.57	2813.15	0	57795.7
Number of plots (2004-2006)	8411	1.04	2.02	0	20

Source: ENAHO 2002-2006.

Table 2
Descriptive Statistics, 2002-2006
Balanced Panel

Variable	Obs	Mean	Sd	Diff unbalanced Balanced	P-value (comparison with unbalanced sample)
Human capital					
Age of the hh	4150	48.99	15.47	0.60	0.271
Education of the hh: equal or lower than complete primary (yes=1)	4147	0.29	0.46	-0.01	0.476
Average years of education of the member s of the household	4150	4.57	3.06	-0.12	0.340
Total years of education of the members of the household	4150	20.72	16.14	-1.40	0.011**
Average years of education of the hh	4150	4.65	4.65	-0.13	0.457
Gender of the hh (woman=1)	4150	0.13	0.34	0.03	0.001***
Hh is literate (yes=1)	2025	0.58	0.49	0.00	0.817
At least one children don't go to school (yes-=1)	4150	0.03	0.17	0.08	0.000***
Characteristics of the dwellings					
Low qualitity of dwelling's materials (yes=1)	4150	0.18	0.39	-0.03	0.036
Owner of house (yes=1)	4150	0.87	0.34	-0.02	0.228
Number of rooms use to sleep	2265	1.67	1.07	-0.07	0.185
Water: access to public network (yes=1)	4150	0.39	0.49	0.02	0.421
Sewerage connected to public network (yes=1)	4150	0.59	0.49	0.00	0.887
Electricity as lightning source (yes=1)	4150	0.40	0.49	-0.03	0.268
Telephone (fixed) (yes=1)	4150	0.00	0.07	0.00	0.531
Welfare indicators					
Number of members per worker	4144	2.86	1.78	0.01	0.909
Poor [consumption] (yes=1)	4150	0.61	0.49	-0.01	0.688
Poor [assets] (yes=1)	4150	0.39	0.49	0.04	0.020**
Monetary expenses (as proportion of total expenses)	4150	0.57	0.22	-0.01	0.218
Monetary income (as proportion of total income)	4150	0.57	0.25	-0.02	0.113

Table 2 (continued)

Variable	Obs	Mean	Sd	Diff unbalanced Balanced	P-value (comparison with unbalanced sample)
Risk management and coping indicators					
Received credit from any source (year 2004 -2006) (yes=1)	4375	0.39	0.49	0.00	0.946
Receive income from renting private properties	4375	0.10	0.30	0.00	0.729
Remittances					0.787
International Remittances (yes=1)	4375	0.25	0.43	0.00	0.600
Local Remittances (yes=1)	4375	0.00	0.07	0.00	0.812
Remittances (both sources)	4375	0.25	0.44	-0.25	0.882
International Remittances (Yearly amount)	4375	609.97	2190.52	-7.82	0.840
Local Remittances (Yearly amount)	4375	20.05	491.70	23.13	0.128
Food assistance (at least one member, yes=1)					
Glass of milk	4375	0.43	0.50	-0.07	0.000***
Popular dinning room	4375	0.08	0.27	-0.01	0.120
Scholar breakfast	4375	0.22	0.42	-0.03	0.048**
Other program	4375	0.12	0.32	-0.02	0.077*
Proportion of beneficiaries (as a proportion of total members)	4375	0.28	0.29	-0.02	0.057*
Assets					
Livestock (on sheep equivalences)	4375	18.59	30.89	-0.82	0.483
Vector of assets	4375	943.48	2740.07	-79.91	0.327
Number of plots (2004 -2006)	4375	1.01	1.74	0.03	0.687

Note: ***, **, and * indicates significance at the level 1%, 5%, and 10% respectively.
Source: ENAHO 2002-2006. Balanced panel.

Table 3
Multinomial Regressions. Dependent Variable: Poverty Transitions Consumption

Model 2	One episode	Several episodes	Always poor
Average of shocks	0.0690 (0.195)	13.98 (46.36)	36.44* (77.12)
Shock(mean)*Quantity of animals(2002)	0.993 (0.0274)	0.978 (0.0182)	0.991 (0.0238)
Shock(mean)*Low housing(2002)	16666.7** (69930.3)	664.1 (2957.0)	1409.4 (6428.7)
Shock(mean)*Proportion of agricultural income(2002)	0.0701 (0.405)	0.0341 (0.134)	0.234 (0.698)
N	678		
	One episode	**Several episodes**	**Always poor**
Subsample: Coast			
Average of shocks	2702.4 (13802.0)	421400.3 (3925802.9)	13336215.8** (104785085.9)
Shock(mean)*Quantity of animals(2002)	1.027 (0.0541)	0.974 (0.0517)	0.938 (0.0574)
Shock(mean)*Low housing(2002)	135.8*** (18.75)	8.732 (34.54)	5.526 (11.30)
Shock(mean)*Proportion of agricultural income(2002)	0.000139*** (0.000111)	0.106 (0.349)	0.00471*** (0.00786)
N	274		

Note: Standard errors in parentheses; *p<0.10 **p<0.05 ***p<0.01.
Source: ENAHO 2002-2006. Balanced panel.

Table 4
Multinomial Regression. Dependent Variable: Poverty Transitions Consumption

	Poverty transitions: consumption (2002-2003)			Poverty transitions: consumption (2003-2004)			Poverty transitions: consumption (2004-2005)			Poverty transitions: consumption (2005-2006)		
	Poor-Non poor	Non poor-Poor	Remain poor	Poor-Non poor	Non poor-Poor	Remain poor	Poor-Non poor	Non poor-Poor	Remain poor	Poor-Non poor	Non poor-Poor	Remain poor
Shock: Natural Disaster (t)	2.441 (1.502)	5.827 (7.709)	1.518 (1.194)	1.057 (1.079)	2.252 (1.611)	2.803 (2.628)	6.061*** (3.812)	1.068 (1.033)	4.673*** (2.375)	0.303 (0.462)	0.595 (0.267)	0.418 (0.474)
Shock: Natural Disaster (t+1)	0.656 (0.575)	0.284 (0.42)	0.93 (1.086)	13.40** (14.13)	4.096 (4.893)	14.04*** (8.665)	2.426 (2.347)	0.805 (1.410)	0.516 (0.886)	1.246 (1.433)	0.898 (1.630)	3.130 (4.699)
Total years of education (t)	0.991 (0.0146)	1.00 (0.0111)	0.976** (0.00975)	1.000 (0.0113)	0.975** (0.0121)	0.979** (0.0105)	1.002 (0.0128)	1.001 (0.00512)	0.993 (0.009)	1.021* (0.0119)	1.001 (0.0164)	0.983*** (0.00499)
Female head of household (t)	1.008 (0.631)	0.333* (0.212)	0.472 (0.283)	0.492 (0.295)	0.705 (0.358)	0.274** (0.148)	0.812 (0.340)	0.566 (0.442)	0.296*** (0.136)	1.032 (0.616)	0.327 (0.245)	0.218*** (0.119)
Agriculture as main activity (t)	0.990* (0.001)	0.996 (0.00701)	0.994 (0.00595)	1.519 (0.815)	0.589 (0.655)	1.547 (0.674)	1.003 (0.0158)	1.006 (0.0127)	0.997 (0.0140)	0.998 (0.004)	0.996 (0.00418)	0.987*** (0.00466)
Agriculture as secondary activity (t)	0.885 (0.35)	1.002 (0.395)	1.064 (0.258)	2.406 (1.565)	2.435 (2.337)	6.464*** (2.980)	0.278*** (0.0701)	0.581** (0.147)	0.319*** (0.0770)	0.584 (0.205)	0.807 (0.270)	0.294*** (0.140)
Proportion of agricultural income (t)	0.624 (0.205)	0.347*** (0.114)	0.266*** (0.0957)	0.387 (0.326)	0.586 (0.329)	2.935 (2.209)	0.384* (0.207)	0.500** (0.173)	0.260*** (0.0948)	0.382*** (0.0871)	0.391*** (0.110)	0.293*** (0.0748)
Low quality of dwelling (t)	1.000 (0.000)	1.000 (0.000)	1.000** (0.000)	1.464 (0.693)	0.284*** (0.0645)	0.813 (0.148)	1.000* (0.000)	1.000 (0.000)	1.000*** (0.000)	1.000*** (0.000)	1.000* (0.000)	1.000 (0.000)
Quantity of animals (t)	0.958 (0.031)	1.03 (0.019)	0.998 (0.0246)	0.995 (0.006	0.998 (0.004)	0.995 (0.004)	0.991 (0.0120)	0.997 (0.00968)	0.995 (0.0114)	0.958* (0.0221)	1.026*** (0.0102)	1.001 (0.0103)
Access to piped water (t)	3.287 (2.678)	0.000*** (0.000)	4.358 -4.442	1.055 (0.386)	0.481* (0.206)	0.640 (0.255)	1.352 (1.858)	0.306 (0.973)	0.262 (0.318)	0.387 (0.409)	0.000*** (4.15e-15)	3.906 (3.291)

Table 4 (continued)

	Poverty transitions: consumption (2002-2003)			Poverty transitions: consumption (2003-2004)			Poverty transitions: consumption (2004-2005)			Poverty transitions: consumption (2005-2006)		
	Poor-Non poor	Non poor-Poor	Remain poor	Poor-Non poor	Non poor-Poor	Remain poor	Poor-Non poor	Non poor-Poor	Remain poor	Poor-Non poor	Non poor-Poor	Remain poor
Access to electricity (t)	0.348 (0.717)	0.000*** (0.000)	0.361 -0.745	0.511** (0.137)	0.735 (0.158)	0.281*** (0.0748)	0.112*** (0.0830)	0.476 (1.281)	0.408 (0.432)	2314.2** (9037.2)	0.646 (2.190)	331.7 (1216.7)
Vector of assets (t)	1.004 (0.006)	0.981 (0.031)	0.996 -0.0202	1.000 (0.000)	1.000** (0.000)	1.000*** (0.000)	0.983* (0.00894)	0.938** (0.0281)	0.975*** (0.008)	0.990 (0.0161)	0.978 (0.0275)	0.999 (0.0133)
Shock* Quantity of animals (t)	0.756 (0.536)	3.254 (2.916)	1.349 -1.624	0.975 (0.0158)	0.996 (0.00655)	0.987 (0.0162)	0.295 (0.401)	3.079 (5.154)	4.124 (3.625)	0.797 (0.756)	0.000*** (6.88e-15)	0.500 (0.432)
Shock* Low housing (t)	3.074 (5.518)	3.345 (5.237)	4.092 -7.323	4.538*** (2.657)	10.95 (16.56)	2.786** (1.397)	1.488 (2.952)	18319.3*** (61583.7)	1647.6 (8046.4)	0.647 (1.127)	3.050 (7.352)	0.463 (0.906)
Shock* Proportion of agricultural income (t)	2.441 (1.502)	5.827 (7.709)	1.518 -1.194	1.025 (2.214)	0.0101* (0.0241)	0.108 (0.222)	6.061*** (3.812)	1.068 (1.033)	4.673*** (2.375)	0.303 (0.462)	0.595 (0.267)	0.418 (0.474)
Shock* Quantity of animals (t+1)	0.656 (0.575)	0.284 (0.42)	0.93 -1.086	0.985 (0.001)	1.000 (0.004)	0.978*** (0.005)	2.426 (2.347)	0.805 (1.410)	0.516 (0.886)	1.246 (1.433)	0.898 (1.630)	3.130 (4.699)
Shock* Low housing (t+1)	0.991 (0.015)	1.00 (0.011)	0.976** -0.00975	4.359* (3.832)	14.40*** (12.87)	3.734 (5.672)	1.002 (0.0128)	1.001 (0.00512)	0.993 (0.009)	1.021* (0.0119)	1.001 (0.0164)	0.983*** (0.00499)
Shock* Proportion of agricultural income (t+1)	1.008 (0.631)	0.333* (0.212)	0.472 -0.283	0.230 (0.488)	1.794 (3.413)	1.419 (1.886)	0.812 (0.340)	0.566 (0.442)	0.296*** (0.136)	1.032 (0.616)	0.327 (0.245)	0.218*** (0.119)

Note: Standard errors in parentheses; *p<0.10 **p<0.05 ***p<0.01.
Source: ENAHO 2002-2006. Balanced panel.

Table 5
Quantile Regression, Dependent Variable: (log) Monthly Per Capita Consumption, 2006

	Quantile 0.25	Quantile 0.50	Quantile 0.75
Constant	4.492***	4.784***	5.103***
	(0.0662)	(0.0825)	(0.0433)
Average of shocks	-0.691***	-0.947***	-1.506***
	(0.182)	(0.243)	(0.120)
Total years of education (2002)	0.00711***	0.00717***	0.00654***
	(0.00122)	(0.00161)	(0.000747)
Female head of household (2002)	0.0687	0.136**	0.0533*
	(0.0536)	(0.0628)	(0.0303)
Quantity of animals (2002)	0.00312***	0.000893	-0.000144
	(0.000766)	(0.000947)	(0.000525)
Vector of assets (2002)	0.0000240***	0.0000296***	0.0000174***
	(0.00000730)	(0.00000829)	(0.00000341)
Low quality dwelling (2002)	0.0511	0.0371	0.0259
	(0.0570)	(0.0654)	(0.0320)
Access to piped water (2002)	0.102**	0.102**	0.0963***
	(0.0425)	(0.0504)	(0.0266)
Telephone (land line) (2002)	-0.554***	-0.659**	-0.865***
	(0.143)	(0.273)	(0.145)
Access to electricity (2002)	0.263***	0.225***	0.211***
	(0.0448)	(0.0543)	(0.0273)
Agriculture as main activity (2002)	0.428***	0.299***	0.439***
	(0.0707)	(0.0847)	(0.0463)
Agriculture as secondary activity (2002)	-0.00751	-0.187	0.0343
	(0.0987)	(0.140)	(0.0833)
Proportion of agricultural income(2002)	-0.145*	-0.0880	-0.278***
	(0.0838)	(0.0995)	(0.0539)
Shock(mean)*Quantity of animals(2002)	0.000217	0.00559**	0.00909***
	(0.00177)	(0.00246)	(0.00115)
Shock(mean)*Low housing(2002)	-0.117	0.309	0.398***
	(0.232)	(0.282)	(0.121)
Shock(mean)*Proportion of agricultural income(2002)	0.0996	0.143	0.860***
	(0.323)	(0.410)	(0.190)

Note: Standard errors in parentheses; *p<0.05 **p<0.01 ***p<0.001.
Source: ENAHO 2002-2006. Balanced panel.

Table 6
Quantile Regression, Dependent Variable: (log) Monthly Per Capita Consumption, 2006
Including Coping Strategies

	Quantile 0.25	Quantile 0.50	Quantile 0.75
Average of shocks	-0.550***	-1.072***	-1.887***
	(0.0809)	(0.125)	(0.100)
Total years of education (2002)	0.00651***	0.00719***	0.00582***
	(0.000484)	(0.000757)	(0.000910)
Female head of household (2002)	0.0376*	0.0939***	0.00367
	(0.0204)	(0.0290)	(0.0258)
Quantity of animals (2002)	0.00129***	0.000582	-0.0000552
	(0.000304)	(0.000435)	(0.000456)
Vector of assets (2002)	0.0000200***	0.0000288***	0.0000205***
	(0.00000291)	(0.00000341)	(0.00000302)
Low quality dwelling (2002)	0.0646***	0.0641**	0.00574
	(0.0225)	(0.0295)	(0.0276)
Access to piped water (2002)	0.0578***	0.111***	0.0717***
	(0.0171)	(0.0231)	(0.0217)
Telephone (land line) (2002)	-0.458***	-0.558***	-0.783***
	(0.0568)	(0.125)	(0.130)
Access to electricity (2002)	0.229***	0.168***	0.215***
	(0.0176)	(0.0247)	(0.0235)
Agriculture as main activity (2002)	0.375***	0.246***	0.425***
	(0.0267)	(0.0387)	(0.0388)
Agriculture as secondary activity (2002)	0.0110	-0.224***	-0.142**
	(0.0394)	(0.0625)	(0.0721)
Proportion of agricultural income(2002)	-0.110***	-0.179***	-0.311***
	(0.0340)	(0.0445)	(0.0441)
Shock(mean)*Quantity of animals(2002)	0.0000405	0.00470***	0.00830***
	(0.000674)	(0.00113)	(0.00104)
Shock(mean)*Low housing(2002)	-0.189**	0.132	0.463***
	(0.0908)	(0.119)	(0.103)
Shock(mean)*Proportion of agricultural income (2002)	-0.0214	0.605***	1.179***
	(0.121)	(0.180)	(0.162)
Coping strategy: savings (average)	1.193***	0.703***	0.872***
	(0.0904)	(0.149)	(0.152)

Table 6 (continued)

	Quantile 0.25	Quantile 0.50	Quantile 0.75
Coping strategy: assets(average)	0.987***	0.668***	0.198
	(0.119)	(0.232)	(0.181)
Coping strategy: credit (average)	0.513***	0.708***	0.763***
	(0.126)	(0.179)	(0.165)
Coping strategy: workload(average)	0.296***	0.168*	0.183*
	(0.0660)	(0.100)	(0.0965)
Coping strategy: external support (average)	0.491**	0.243	1.775***
	(0.203)	(0.343)	(0.330)
Coping strategy: food (average)	-0.936***	-0.503***	-0.115
	(0.0860)	(0.131)	(0.126)
Constant	4.518***	4.807***	5.153***
	(0.0268)	(0.0375)	(0.0389)

Note: Standard errors in parentheses; * p<0.05 ** p<0.01 *** p<0.001.
Source: ENAHO 2002-2006. Balanced panel.

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