Sending money to make them feel better? Remittances and household health consumption choices in Peru

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Abstract

This paper uses data from the "Peruvian National Survey of Households" (ENAHO) to investigate whether consumption patterns of Peruvian households are affected by international remittances. Using an Almost Ideal Demand System (AIDS), we assess how and to what extent receiving income transfers from migrants fosters resource allocation towards human capital investment, with particular attention to health-care consumption. Moreover, we test if the health consumption behaviour observed for remittance households correspond to a specific willingness to invest in human capital or constitute a response strategy to negative health shocks. The study finds that international transfers have a positive impact on health and housing budget shares and a negative one on consumption goods, suggesting a tendency to address additional income from remittances to human and physical capital investment. We verify that such propensity to address more resources to medical care is independent from the occurrence of an health shock, confirming the role of transnational migrant transfers in determining a shift in household consumption preferences.

Keywords: Remittances, Health Consumption, Demand system, Peru.
JEL Classification: D12, O15.

1 Introduction

Remittance inflows[1] have surged during the last decades, becoming a fundamental source of external funds for developing countries. Their amount at a global level was three times larger than official development assistance in 2013, and their flows are more regular than both private debt and portfolio equity. Aggregate data for Peru confirm the trends registered at a global level[2]. The economics of migration has devoted increasing efforts to the analysis of the effects of remittances on sending communities (Clemens et al., 2014). The potential additional income provided by remittances may relax household liquidity constraints, fostering poverty reduction, human and physical capital accumulation and insurance against income volatility. On the other hand, these potential benefits may be counterbalanced by the direct costs of migration and the indirect costs in terms of reduced incentives to labour supply and rural productivity of members left behind, and skilled workers being lost (brain drain) (Acosta et al., 2007; Adams and Cuecuecha, 2013; Randazzo and Piracha, 2014; Taylor and López-Feldman, 2010; De Haas, 2009).

Particular attention has been devoted to the impact of remittances on human capital accumulation. Several studies have confirmed that these income flows support resource-constrained households for the enrolment and maintenance of children in school and for improving the quality of their education investment (Cox Edwards and Ureta, 2003). A more recent literature contradicting the "brain drain" hypothesis suggests that, since the returns of education are higher when migrating, the prospect of future migration raises the overall expected returns to education, stimulating higher domestic investment in schooling (Docquier and Rapoport, 2012). There is also evidence of some negative effects of migration, such as school drop-outs and child labour employment due to parental absenteeism (Hanson and Woodruff, 2003; Hildebrandt et al., 2005; McKenzie and Rapoport, 2011).

[1]The term "remittances" indicates the money and goods that are transmitted to households by migrant working outside of their origin communities, either in urban areas or abroad (Adams Jr, 2011). Remittances can be sent through either formal or informal channels. Formal channels include money transfer services offered by banks, post office banks, non-bank financial institutions, foreign exchange bureaus, and money transfer operators (MTOs), e.g. Western Union and MoneyGram. Informal remittances are defined as money transfers that do not involve formal contracts and thus, are unlikely to be recorded in national accounts. Cash transfers occurring through personal relationships, or carried out by unofficial courier companies, friends or relatives are the most common forms of informal remittances (Freund and Spatafora, 2008).

[2]The amount of remittance inflows from abroad reported in 2013 represents the 1.3% of GDP (Migration and Remittances Team, 2014)

The impact of migration on the health status of family members left behind has received less attention. The main contributions investigate the influence of migration on child health, focusing on the effects on infant mortality, birth weight, under-nutrition (underweight), and anthropometric measures (Kanaiaupuni and Donato, 1999; Frank and Hummer, 2002; Hildebrandt et al., 2005). Only a few studies analysed the effects of migration and remittances on health inputs, i.e. expenditures for health services provision (preventive and curative), family planning activities, drugs, etc. Amuedo-Dorantes and Pozo (2011) observe that the sensitivity of Mexican household healthcare expenditures to variations in the level of international remittances is almost three times greater than their sensitivity to changes in other sources of household income. Although heterogeneous in magnitude, positive evidence of the impact of migrant transfers on health expenditure has been proven by some studies investigating the effects of migration on household consumption patterns. Adams and Cuecuecha (2010, 2013) report a slight increase in health marginal budget shares both for internal and international remittance households in Ghana and Guatemala. Mora and Taylor (2006) observe larger marginal health budget shares for Mexican rural households receiving domestic transfers, while no significant difference is noticed for families receiving international remittances.

This paper investigates the impact of international remittances on the consumption of healthcare services. To do that, we use data from the "Peruvian National Survey of Households" of 2011. In particular, we aim to assess whether the observed health consumption behaviour reflects a choice of investing in human capital. A shift in household preferences may be triggered by several interrelated factors linked to migration, which modify the household decision-making process and consequently the resource allocation outcomes: changes in income composition due to remittance inflows, migrants' influence on income allocation decisions, existence of a sort of commitment to address resources coming from remittances towards specific consumption items, transmission of knowledge and good practices by migrants to sending families. On the other hand, an increase in health spending can be caused by health shocks affecting members left behind (Ambrosius and Cuecuecha, 2013). In the occurrence of a negative shock, remittances may constitute an *ex-post* copying strategy to reduce household risk exposure. Therefore, reverse causality problems may occur in the two-way relationship between the migrant decision to send transfers at home and the healthcare consumption choices of relatives left behind. In order to disentangle these two separated effects, we split the sample between households reporting a recent health shock and not and we conduct separate estimations for the two groups. Moreover, we test whether consumption preferences

react to the shock differently according to household remittance status. To have a more complete picture of the influence of remittances on the demand for health, we consider the total amount of health consumption instead of direct expenditures only, as it has been done in all the studies mentioned above. In this way, we can verify whether receiving income from migrants widens the overall level of medical care consumption. Indeed, remittance households may have access to health services through other channel besides out-of-pocket outlays, and this effect cannot be detected considering only direct expenditures.

The identification of the link between remittance income and health demand is obtained by comparing the consumption behaviour patterns of transnational and national households, through the estimation of an Almost Ideal Demand System (AIDS). We address potential selection issues in the migration and remittance decision using an instrumental variable approach. Observing marginal budget shares, we assess that receiving income from migrant transfers reshapes household consumption not only through an overall income effect. In particular, we find that transnational households allocate more resources to healthcare consumption. This result seems to be robust to a potential reverse causality bias due to the occurrence of an health shock, confirming the hypothesis of a role of international remittances in fostering human capital investment.

The next sections are organized as follows. Section 2 presents an overview of theoretical and empirical studies investigating the impact of migration on health status of sending households. The main empirical challenges faced in the estimation of the net effect of remittances on health consumption are here outlined, stressing potentialities and limits of the different methodologies. The characteristics of the dataset used and some descriptive statistics are introduced in Section 3. Section 4 describes the empirical strategy pursued for our estimation and finally Section 5 presents and comments the main findings obtained.

2 Literature review

There are various mechanisms through which household decisions on health may be affected by the migration of a family member. If the additional resources provided by transnational transfers overcome the income reduction due to a lower number of wage earners within the household, household liquidity constraints are relaxed. Such effect has

been verified in several contexts (Adams, 2006; Lu and Treiman, 2007; Taylor and López-Feldman, 2010). This may stimulate recipient households to allocate more resources to health expenditures, fostering the access to healthcare and increasing its quality. On the other side, the absenteeism of a family member worsens the health status of members left behind, especially children, as it weakens caregiver attention and disrupts the division of labour within the household. Such drawbacks may shrink over time as migrants accumulate experience and households adapt to their absence (Kanaiaupuni and Donato, 1999). A further channel through which migration may affect health preferences of sending households is the transfer of health knowledge. An increased awareness by migrants about healthcare practices and lifestyle behaviours incentives relatives' use of both preventive and curative medical care services, and improves the effectiveness of the healthcare provided (Hildebrandt et al., 2005). Knowledge flows may generate spillover effects also on non-migrant households, inducing an additional contribution in terms of "social remittances".

Several studies have tried to identify the net impact of migration on health outputs, considering both the direct income effects provided by transfers and direct and indirect costs of migration. Hildebrandt et al. (2005); Kanaiaupuni and Donato (1999); Frank and Hummer (2002) examine the impact of migration to US on child health in Mexico, measured in terms of infant mortality, birth weight, undernutrition and anthropometric outcomes. The receipt of remittances is significantly and negatively associated with the odds of low birth weight (Frank and Hummer, 2002). The mechanisms through which improved economic conditions due to migrant transfers may enhance health outcomes are various. (Deaton and Paxson, 1998; Case et al., 2002; Fletcher and Wolfe, 2014). Individuals in better socio-economic conditions experience lower exposure to communicable diseases, risky behaviours and sedentary lifestyles. Heterogeneity in the access to healthcare, knowledge about good health practices, and intergenerational transmissions of healthy behaviours are other commonly used arguments to explain reported differences in health status across income groups (Smith, 1999).

Few contributions have investigated the impact of migration on health inputs, analysing the link between the amount of remittance income and healthcare expenditures, or comparing the spending behaviour of families getting migrant transfers with similar no remittance households. Amuedo-Dorantes and Pozo (2011) test whether and to what extent remittances contribute to the purchase of healthcare services in Mexican households. Medical care outlays seem to rise with the amount of income transfers from abroad,

and the responsiveness of healthcare expenditure to remittance income is greater than its responsiveness to other sources of income. (Amuedo-Dorantes et al., 2007; Amuedo-Dorantes and Pozo, 2011). However, this strategy does not permit to verify if the total income elasticity of health expenditure for households receiving remittances differs with respect to others. Indeed, separating income according to the source does not allow to compare the two groups of households at the same level of total income.

Other studies have identified a positive effect of migrant transfers on health expenditure, examining the differences in consumption patterns between remittance and no remittance households using the Working-Leser model[3]. Adams and Cuecuecha (2010, 2013) identify a slight increase in health marginal budget share for both internal and international remittance households in Guatemala and Ghana. Castaldo and Reilly (2007) use a similar specification to describe consumption patterns of Albanian families. The findings show significant and positive effects of external remittances on household health expenditure, while no relevant differences seem to emerge between households receiving domestic transfers and those receiving no remittance. Tabuga (2007) investigates the general relationship between remittances and household consumption patterns in the Philippines underlying that the model does not perform well in explaining the decision-making process determining budget shares allocated to medical care[4].

However, the studies presented above have some limitations. Firstly, those estimating a demand system use a specification which is linear in expenditure[5], assuming constant marginal budget shares with respect to the level of prices and expenditure (Pollak and Wales, 1995). Such assumption has often been contradicted by empirical analyses as inconsistent with the predictions of the Engel law (Barnett and Serletis, 2008). An exception is the study by Mora and Taylor (2006) who adopt a locally flexible functional form[6] as the Almost Ideal Demand System (AIDS) by Deaton and Muellbauer

[3]The Working-Leser (1943, 1963) model relates budget shares linearly to the logarithm of total household expenditure. The estimation of the W-L model is carried out using Ordinary Least Squares (OLS), separately estimating each equation of the demand system. The OLS coefficients and the average budget shares are used to calculate the marginal budget shares and the expenditure elasticity of good i.

[4]The measures of goodness-of-fit reported, i.e. Pseudo R-squared and Adjusted R-squared, are very low.

[5]In addition to Working-Leser model, Rotterdam model and Linear Translog models belong to this category of systems.

[6]A demand system is composed by flexible functional form equations if it is capable to provide a second order approximation to the behaviour of any theoretically plausible demand system at a point in the price-expenditure space (Pollak and Wales, 1995).

(1980b)[7] to estimate the impact of migration on the expenditure patterns of rural Mexican households. Comparing marginal budget shares between households with migrants and otherwise similar households without migrants, they report larger marginal health budget shares for households receiving domestic transfers, while no significant difference is observed for families getting international remittances.

Secondly, all these contributions do not verify whether the re-allocation of resources from remittances to health expenditures reflects a shift in migrant household preferences towards human capital investment. Indeed, increased health spending may be caused by health shocks that create demand for alternative financial sources by liquidity-constrained households. This would be in line with the predictions of the New Economics of Labor Migration theory which identifies international migration as a household strategy to reduce vulnerability to negative shocks through the diversification of income sources. Ambrosius and Cuecuecha (2013) test this hypothesis comparing the impact of health-related shocks on debt levels in national and transnational households in Mexico, reporting no effect of the shocks on the debt-burden of families getting international remittances. Finally, only out-of-pocket expenditures have been considered to investigate the impact of migrant transfer on the demand for health. This could lead to an underestimation of the effect, as it disregards the fact that receiving migrant transfers may widen the ways to access to medical care through channels which are not revealed by direct expenditures, i.e. private insurance, expenditures directly covered by migrants, etc.

Therefore, analogously to Mora and Taylor (2006) we estimated a demand system using the AIDS method, identifying average and marginal effects of receiving transfers on household consumption decisions and assuming a non-linear relationship of total consumption with budget shares. In order to assess whether the health consumption behaviour observed corresponds to household preferences for human capital investment rather than a reaction to health shocks, various specifications of the model were performed. We conducted separated estimations for households recently experiencing a

[7] AIDS is a complex demand system with several desirable properties: it satisfies the aggregation restriction, and with simple parametric restrictions, homogeneity and symmetry. The non-linearity of the AIDS model is commonly circumvented by using a linear approximation to the income deflator, $logP$, as the Stone's Price Index suggested by Deaton and Muellbauer (1980a). Another possible specification which allows to for non-linear relationships between income and consumption is a quadratic extension of the AIDS model, the Quadratic Almost Ideal Demand System (QAIDS) proposed by Banks et al. (1997) which accounts for non-linearity predicted by the Engel curves.

health shock and not, to see whether the positive effect of transfers persists even in absence of a shock, reflecting an increased investment in preventive healthcare. Moreover, further estimations were run to investigate if consumption preferences react differently to shocks according to household remittance status, confirming the idea that remittances may work as an insurance strategy helping families to cope with the drawbacks of negatives shocks. The budget shares are computed considering the annual amount of total consumption, in order to take into consideration also the expenditures covered by different sources other than direct expenditures.

3 Data and descriptive statistics

The data used in this analysis are retrieved from the "National Survey of Households" of 2011 (*ENAHO - Metodologìa Actualizada - Condiciones de vida y pobreza*), conducted by the "Peruvian National Institute of Statistics and Informatics (INEI)". The ENAHO is a yearly survey, nationally representative, and it collects information on dwellings, household expenditures and income, and on demographic, education, health and employment status of each household member. The sample consists of about 24700 observations.

As regards household migration and remittance status, the survey provides details on the frequency with which households receive international remittance, the annual amount of transfers received, and the absence of any household member[8]. Households receiving remittances from abroad represents 2.10% of the sample. The annual amount of remittances received is 5360 Nuevo Soles[9]. Table 1 summarizes the descriptive statistics according to household remittance status. Households receiving international remittances are non-poor (90%), mostly living on the Coast or in Lima (78%), and settled in urban areas (90.73%). About 55% of the household heads have completed at least the secondary level of education, compared to less than 40% for the no remittance group. The household head average age is higher in transnational families. Almost 70% of them has more than 50 years, compared to 50% in the other group. The percentage of female household heads is larger than in no-remittance households. Households receiving transfers from abroad report a remarkably higher level of average total consumption. As

[8] A member is considered "absent" if it is absent from the household for 30 days or more.

[9] Official exchange rate (Nuevo Soles per US dollars, yearly average 2011) is 2.75; International Monetary Fund, International Financial Statistics

regards the self-reported health status, transnational families are more likely to have a member reporting chronic discomfort and a member who have been recently affected by an health shock. As a proxy for the occurrence of an health shock we consider reporting an episode of hospitalization in the 12 months before the survey.

In line with what said before, our main dependent variable is the annual amount of healthcare consumption. This consumption category includes: out-of-pocket outlays (both direct expenditures and outlays for private insurance); expenditures covered by public insurance or any other public institutions; outlays funded by private institutions, private insurances or covered by members of other households; and expenditures financed through other channels[10]. Another argument in favour of this choice is the fact that some recent reforms of the Peruvian Health Sector establish the co-existence of different healthcare providers implementing heterogeneous procedures for accessing and paying for health services[11]. Thus, considering only out-of-pocket outlays could be misleading. In a similar way to what is done for the health item, the annual amount of total consumption is considered for each consumption category.

The average annual health consumption reported by households varies from 1192 Nuevo Soles in Sierra regions to 2801 Nuevo Soles in the Metropolitan area of Lima. Families headed by a woman seem to demand for medical care less than families with a male household head. Furthermore, when the household head is highly educated, the level of health consumption is significantly higher. Summary descriptive statistics reported in Table 2 (panel A) show that transnational households tend to spend more for health, both in terms of direct expenditure and regarding outlays covered by public or private institutions and by members of other households. In particular, we observe that out-of-pocket outlays and expenditures covered by public institutions are more than double for households with international remittances, while the amount of expenditures covered by private insurances or by members of other households are more than three times larger than that reported by no remittance households. Table 2 (panel B) presents the

[10]These expenditure items are calculated asking to the respondents to impute the value of services consumed at market prices.

[11]The Universal Health Insurance Law of 2009 created a regulatory framework to achieve universal health coverage promoting coordinated institutional efforts between the regional governments and the health providers already in existence. It grants to the entire population universal coverage through various mechanisms: contributory insurance for formal workers (via payroll-based contributions and/or private payments); subsidized insurance for the poor (paid with public fiscal funds); and semi-contributory insurance for informal and small-business workers. However, the affiliation to different health insurance programs corresponds to heterogeneous ranges of available services and access costs (Maeda et al., 2014)

Table 1: **Demographic characteristics of households receiving international remittances**

	Remittance Households	**No Remittance Households**
Household composition (%)		
Household size	4.00	3.98
Number of children	0.92	1.16
Number of elderly	0.58	0.34
Poverty status (%)		
Extremely Poor	0.19	7.21
Poor	4.83	19.85
No poor	94.98	72.94
Geographical area (%)		
Costa	38.42	27.44
Sierra	40.42	12.55
Selva	9.65	21.09
Lima	39.38	11.05
Urban	90.73	60.05
Education household head (%)		
No education	17.76	29.31
Primary education	25.87	30.47
Secondary education	35.14	25.53
High school or more	21,24	14,41
Gender household head (%)		
Female	38.80	23.44
Age of the household head (%)		
0-49	30.50	49.03
50-69	44.02	36.56
70 +	25.48	14.41
Total consumption (nuevo soles)	33,607	19,976
Rented House (%)	8.11	7.12
Member with chronic discomfort (%)	87.45	74.64
Member hospitalised in the last 12 months (%)	27.41	17.87

Table 2: **Outcome variables**

	Remittance Households	**No remittance Households**	**Test of means (*)**
Panel A: Healthcare consumption (Nuevo Soles)			
Healthcare consumption (direct expenditure)	2017	927	-11.99***
Healthcare consumption (covered by public insurance or institution)	1113	531	-6.77***
Healthcare consumption (covered by private institution or members of other households)	730	203	-10.12***
Panel B: Average budget shares			
Health	.098	.072	-6.85***
Food	.398	.508	16.52***
Education	.070	.053	-6.53***
Clothing	.043	.051	3.91***
Housing	.221	.180	-9.56***
Transports	.112	.082	-9.99***
Other	.058	.054	-2.09**
Total	1.000	1.000	

**Test of means for remittance status: significant at 0.01 (***), 0.05 (**), 0.1 (*).*

average budget shares for the consumption categories included in the demand system by remittance status. Relevant divergences in consumption allocation emerge between the two groups: households receiving remittances report higher consumption shares for health, education, housing and transports, while smaller budget shares are observed for food and clothes.

In order to identify a specific tendency to address resources from transfers towards human capital investment, it is necessary to disentangle the overall income effect from the remittance effect. As Table 3 shows, relevant divergences in the level of the health budget share are reported not only between households receiving remittances and not, but also across income quartiles. Since the share of medical care outlays is larger for remittance receiving households between transnational and national households, a specific contribution of income from migrant transfers to healthcare funding could be hypothesized in all quartiles.

Table 3: **Household health consumption by income quartile and remittance status**

	1st quartile	**2nd quartile**	**3rd quartile**	**4th quartile**	**Total**
International remittances	0.079	0.082	0.103	0.099	0.098
No remittances	0.053	0.064	0.069	0.088	0.071

4 Empirical strategy

We model household consumption behaviour using an Almost Ideal Demand System. This model overcomes the limits presented by Working-Leser linear demand systems. The idea inspiring the class of models to which the AIDS belongs is to define a functional form which allows to perform a second-order approximation to any direct or indirect utility function or to a cost function. Correspondingly, the demand functions, expressed in terms of budget shares, become:

$$w_{ih} = \alpha_i + \sum_j \gamma_{ij} \log p_j + \beta_i \log \left(\frac{x_h}{P_h} \right), \tag{1}$$

where P is a price index defined by

$$\log P = \alpha_0 + \sum_k \alpha_k \log p_k + \frac{1}{2} \sum_j \sum_k \gamma_{kj} \log p_k \log p_j. \tag{2}$$

The adding up restriction requires that $\sum_{i=1}^{n} \alpha_i = 1$, $\sum_i \beta_i = 0$, $\sum_{i=1}^{n} \gamma_{ij} = 0$. Homogeneity condition is satisfied if and only if for all j, $\sum_j \gamma_{ij} = 0$, while the symmetry condition requires that $\gamma_{ij} = \gamma_{ji}$. However, since our analysis is based on cross-sectional data, we do not have information on the time variation of prices to separately identify price elasticities. Thus, a conventional normalization for cross-sectional data is applied setting $p_i = 1$ and $\log p_i = 0$. Consequently, the budget shares can be written in the form:

$$w_{ih} = \alpha_i + \beta_i \log x_h - \beta_i \alpha_0. \tag{3}$$

Changes in real consumption operate through the β_i coefficients: these are positive for luxuries and negative for necessity goods (Deaton and Muellbauer, 1980a,b). According to this empirical framework, different specifications are implemented, extending the model to include remittance status dummies and interactions of these dummies with total consumption[12]. The specific forms of the equations estimated are:

$$w_{ih} = \alpha_i + \beta_{1j} \log Y_h + \beta_{2i} R_h + \beta_{3i} Z_h + u_{hi}, \tag{4}$$

[12]Separated models are estimated to distinguish between average and marginal effects of remittances on consumption allocation.

$$w_{ih} = \alpha_i + \beta_{1j} \log Y_h + \beta_{2i} \log (Y_h) * R_h + \beta_{3i} Z_h + u_{hi}, \tag{5}$$

where w_{ih} corresponds to the budget share on commodity i for household h, Y_h is total consumption for household h, R_h is the remittance status and Z_h is a vector of household characteristics including both household-level and province-level variables. Such specification permits remittance status to shift the propensity to allocate available income across the different consumption categories, and the functional form holds the attractive theoretical properties of the AIDS model.

As mentioned above, there are various sources of endogeneity in the relationship between remittances receiving status and consumption decisions. Firstly, households receiving migrant transfers might differ from the others for unobserved characteristics (e.g. skills, ability, motivation of migrant members, propensity to risk, previous migratory experiences), which may affect both the decision to send a migrant abroad and household preferences in terms of consumption allocation, giving rise to self-selection issues. Moreover, there exists a reverse causality concern in the two-way relationship between the decision of sending money back and the health conditions of members left behind. An individual may decide to migrate and send remittances because an household member suffers from bad health conditions, while at the same time remittances may foster health investment by loosening liquidity constraints.

Similarly to Mora and Taylor (2006) we use an instrumental variable technique (IV) to overcome these potential sources of bias. The choice of the instruments is driven by the idea that migration networks, together with cultural, community or political factors of the area of origin influence the probability to migrate and remit, but not the consumption decisions of the single households. The argument sustaining this criterion is that past migration facilitates present migration, as a larger network of migrants provides contacts, information and logistic support for new migrants. Moreover, international migration is more likely to be undertaken when people get in touch with successful experiences reported by neighbours or acquaintances. Since recent Peruvian migration history is mostly characterized by labour migration and remittance patterns seems to be very selective at geographical level, historical migration and remittance flows at the local level may represent suitable instruments. Therefore, we include the historical migration rates at the department level (1995-2005)[13] and the share of remittance at the province level

[13]See https://www.inei.gob.pe/estadisticas

in 2007[14] in the first-stage regression. The choice of the time spells for the instruments is partly driven by data constraints but complies with the historical trends of Peruvian migration. Indeed, until the second half of the 1990s, international migration involved exclusively an élite of the urban population in Lima. The economic crisis caused by the escalation of the civil war acted as a push-factor for labour out-migration for all social groups, especially middle class young people (IOM, 2012). Thus, a surge in the outflows occurred at the end of the 1990s, while they became flatter after 2006[15]. As it is shown in the next section, the coefficients of the first-stage regressions are significant and have the expected signs, confirming the validity of the instruments selected.

The demand system equations have been simultaneously estimated using an iterative three-stage least squares procedure (3SLS). In this way, the information contained in the cross-equation error correlations are exploited. Furthermore, to eliminate another potential source of endogeneity, total consumption has been instrumented by total household income and number of household members with high educational levels (Banks et al., 1997; Berloffa et al., 2006). To satisfy the adding-up restrictions required by the AIDS framework, a consumption category, i.e. other goods, is omitted and the estimation of that parameters is residually determined. The explanatory variables are identical for all the equations. They include variables describing household size and composition (i.e. total household size, number of children and elderly members), in order to control for heterogeneous healthcare necessities of the different age groups. Characteristics of the household head, i.e. gender, age group and educational level are encompassed to consider the role of education and informal knowledge in determining the demand for healthcare. The model includes also a set of 4 regional dummies (Costa, Sierra, Selva, Metropolitan area of Lima, with Costa as a reference category) to take into account heterogeneity across different areas of the country. A dummy indicating whether household dwelling is rented is considered to control for household assets. Finally, two proxies of geographical variation in health supply, i.e. the number of hospitals per 1000 population at the province level and a dummy for the presence of an healthcare establishments at the district level, are encompassed to check whether consumption decisions are affected by the availability of healthcare services in the area of residence[16].

[14]The remittance rate at the province level is obtained from the 2007 wave of the ENAHO survey

[15]See http://webinei.inei.gob.pe:8080/sirtod-series/

[16]The data on the healthcare services establishments present in each municipality are retrieved from *El Registro Nacional de Municipalidades* - 2008. For more details, see http://ineidw.inei.gob.pe/ineidw.

In order to detect whether the observed health consumption behaviour corresponds to a choice of investing in preventive healthcare or a response to negative health conditions, some proxies of household members health status are included in the analyses. In particular, we consider a dummy variable reporting the occurrence of a case of hospitalisation among family members during the last 12 months, as a proxy of a negative health shock, and a dummy for the presence of chronic discomforts, in order to control for permanent health conditions. We split the sample according to the hospitalization dummy and we estimate the model considering only household not reporting health shocks during the last year to verify whether the positive effect of transfers on health bugdet shares is confirmed also in these circumstances. Finally, a specification including the interaction between remittance status and the occurrence of the shock is performed to test if resource allocation decisions vary across the two household groups when the shock happens.

5 Results

The outcomes of the second-stage equations for the demand system estimated with instrumental variables reported in Table 4 show that demographic characteristics of the household head, household size and composition and area of residence play a role in determining household preferences in terms of consumption allocation. For what concern the health dimension, we observe that dependency rate, household size, age of the household head and presence of a member with chronic discomfort have a positive impact on health budget shares. Geographical variation of health supply at the local level is not significant in orienting household health consumption decisions.

The results reveal significant differences in the consumption patterns of households receiving remittances with respect to other households. Getting migrant transfers has a positive and significant effect on the consumption shares of health and housing and a negative (and significant) effect on those of education, clothing and transports. In order to have a broader idea of the size of the impact of remittances on consumption patterns, Table 5 displays the consumption elasticity of demand for each category[17]. Coherently

[17] According to the definition of elasticity and in line with the model estimated with interaction variable, see Table 10 in Appendix A2, the consumption elasticity of good j for household i can be derived as $\eta_{ij} = (\alpha_{1j} + w_{ij}) * \frac{1}{w_{ij}} = \frac{\beta_{ij}}{w_{ij}} + 1$. In our case, the consumption elasticity for household receiving international remittances becomes $\eta_{ij}^R = \frac{\beta_{1j}+\beta_{2i}^R}{w_{ij}} + 1$.

with the elements emerged until now, the consumption elasticity of remittance receivers is larger for those consumption items for which receiving transfers has a positive effect on marginal budget shares. Thus, the consumption elasticity of demand for healthcare is larger for families receiving transnational transfers. This give a measure of the propensity to redistribute additional resources towards healthcare for the two household groups as long as total consumption increases. Similarly, elasticities reflect household marginal propensities to allocate total consumption among the various consumption items.

The findings obtained present both similarities and divergences with the studies mentioned earlier. The results are consistent with what observed by Adams and Cuecuecha (2010, 2013) for health and food. For what concerns education, the impact of remittances on consumption behaviour patterns diverges from the positive effect reported by Adams and Cuecuecha (2010, 2013) and Tabuga (2007). The results are hardly comparable with Castaldo and Reilly (2007) analysis, as the consumption categories adopted are different. Nonetheless, the evidence emerged in our estimation is conflicting with their findings showing that households receiving external remittances report higher food budget shared relative to those receiving no transfers.

As suggested by the first-stage regression in Table 6, the occurrence of an health shock among household members, i.e. a reported case of hospitalization during the previous 12 months, has a positive and statistically significant effect on the probability of receiving remittances. This may imply that the additional resources devoted to healthcare coming from migrant transfers constitute an insurance against health shock rather than representing a voluntary household choice of human capital investment. However, the outcomes for the health demand equation across different model specifications reported in Table 8, (Columns 4 - 6) do not confirm this hypothesis. Estimating separated models for households experiencing an health shock or not, we observe that the positive effect of remittances on health budget shares is confirmed also for the subsample of households not experiencing any shock (Column 4). Thus, this evidence indicates that the additional consumption reported by remittance households is intended to invest in preventive medical care. On the contrary, a negative, even though not significant effect of remittances, is found including only families reporting a health shock (Column 5). However, this result may be driven by the absence of sufficient variation within this last subsample to obtain a significant coefficient.

The elements emerged in Model 4 and 5 suggest that identifying how households react to negative health shocks according to their remittance status would provide a broader

picture of how consumption preferences in terms of health are influenced by migrant transfers. Thus, Column 6 reports the results of a model including an interaction term between the occurrence of a shock and the remittance status. Similarly to the other specifications, households receiving remittances address more resources to health in general. As expected, health consumption increases for both household groups in case of shock. However, the interaction term between remittance status and the shock dummy is negative, indicating that in case of shock transnational households devote less resources to healthcare than the others. The magnitude of the coefficients shows that the positive effect of remittances on health budget share is nullified in case of health shock.

A possible interpretation of what observed in this last specification is that remittance households, as devoting a larger amount of resources to health consumption, have access to health insurance providing regular health monitoring services. Consequently, in case of negative shocks they are able to reduce screening costs, limiting the overall detrimental effects caused by adverse health conditions. These findings provide further support to the idea that the higher health consumption levels reported by remittance households are mostly driven by purchases of preventive medical care services rather than extraordinary outlays due to unexpected adverse health conditions. Referring to the full results for this last specification (see Table 13 - Appendix 5), a positive effect of remittances on education consumption in case of negative health shock is reported. Coherently with what observed by Ambrosius and Cuecuecha (2013) this finding suggests that remittances provide an insurance instrument to cope with the indirect costs of a negative health shock, supporting liquidity-constrained families and preventing them from reducing the investment in education.

Table 4: Almost Ideal Demand System with instrumental variables: dummy variables model

	(1) Health	(2) Food	(3) Education	(4) Clothing	(5) Housing	(6) Transports
Ln (total consumption)	0.0138***	-0.1286***	0.0320***	0.0076***	0.0006	0.0490***
	(0.0025)	(0.0039)	(0.0017)	(0.0014)	(0.0028)	(0.0019)
Receiving international remittances (dummy)	0.1103***	-0.0066	-0.0834***	-0.0688***	0.2416***	-0.0829***
	(0.0356)	(0.0556)	(0.0244)	(0.0201)	(0.0407)	(0.0270)
Household size	-0.0052***	0.0305***	0.0024***	-0.0009**	-0.0178***	-0.0035***
	(0.0007)	(0.0010)	(0.0005)	(0.0004)	(0.0008)	(0.0005)
Urban	-0.0071***	-0.0170***	-0.0036***	-0.0114***	0.0454***	-0.0050***
	(0.0016)	(0.0025)	(0.0011)	(0.0009)	(0.0019)	(0.0012)
Number of children	0.0047***	-0.0137***	0.0015***	0.0053***	0.0089***	-0.0073***
	(0.0008)	(0.0012)	(0.0005)	(0.0004)	(0.0009)	(0.0006)
Number of elderly	0.0139***	-0.0098***	-0.0089***	-0.0012*	0.0109***	-0.0038***
	(0.0012)	(0.0019)	(0.0008)	(0.0007)	(0.0014)	(0.0009)
Educational level household head (Primary)	0.0013	-0.0050**	-0.0026**	-0.0012	0.0052***	0.0014
	(0.0015)	(0.0023)	(0.0010)	(0.0008)	(0.0017)	(0.0011)
Educational level household head (Secondary)	-0.0008	-0.0214***	0.0046***	-0.0006	0.0109***	0.0066***
	(0.0019)	(0.0029)	(0.0013)	(0.0011)	(0.0021)	(0.0014)
Educational level household head (High School or more)	0.0171***	-0.0023*	0.0270***	0.0121***		
	(0.0024)	(0.0038)	(0.0017)	(0.0014)	(0.0028)	(0.0018)
Age (group) household head 50-69	0.0049***	-0.0171***	-0.0066***	-0.0055***	0.0225***	0.0022**
	(0.0013)	(0.0021)	(0.0009)	(0.0008)	(0.0015)	(0.0010)
Age (group) household head 70+	0.0116***	-0.0388***	-0.0039**	-0.0060***	0.0375***	0.0012
	(0.0024)	(0.0038)	(0.0017)	(0.0014)	(0.0028)	(0.0018)
Geographical area - Sierra	0.0026*	-0.0074***	0.0138***	0.0065***	-0.0072***	0.0021*
	(0.0015)	(0.0024)	(0.0010)	(0.0009)	(0.0017)	(0.0011)

Geographical area - Selva	0.0006	0.0185***	-0.0085***	-0.0019**	-0.0048***	-0.0018
	(0.0016)	(0.0025)	(0.0011)	(0.0009)	(0.0018)	(0.0012)
Geographical area - Lima	-0.0058**	0.0096**	0.0080***	-0.0129***	0.0144***	0.0061***
	(0.0028)	(0.0044)	(0.0019)	(0.0016)	(0.0032)	(0.0021)
Absent member (dummy)	-0.0072***	0.0473***	-0.0010	-0.0081***	-0.0143***	-0.0054***
	(0.0022)	(0.0034)	(0.0015)	(0.0012)	(0.0025)	(0.0017)
Rent	0.0011	0.0088***	0.0013	0.0040***	-0.0132***	-0.0007
	(0.0020)	(0.0032)	(0.0014)	(0.0011)	(0.0023)	(0.0015)
Chronic discomfort (dummy)	0.0233***	-0.0100***	-0.0018**	-0.0030***	-0.0037***	-0.0027***
	(0.0012)	(0.0019)	(0.0009)	(0.0007)	(0.0014)	(0.0009)
Hospitalization (dummy)	0.0704***	-0.0286***	-0.0109***	-0.0016**	-0.0143***	-0.0092***
	(0.0014)	(0.0022)	(0.0010)	(0.0008)	(0.0016)	(0.0011)
Gender household head	-0.0025*	-0.0182***	0.0068***	0.0046***	0.0045***	0.0011
	(0.0014)	(0.0022)	(0.0009)	(0.0008)	(0.0016)	(0.0010)
Hospitals per 1000 population	-0.0007	0.0030	0.0026**	-0.0022**	0.0015	-0.0006
	(0.0017)	(0.0026)	(0.0011)	(0.0009)	(0.0019)	(0.0013)
Healthcare district (dummy)	-0.0006	0.0036	0.0003	-0.0023***	0.0015	-0.0034***
	(0.0016)	(0.0025)	(0.0011)	(0.0009)	(0.0018)	(0.0012)
Constant	-0.0785***	1.7074***	-0.2706***	-0.0138	0.1785***	-0.3621***
	(0.0215)	(0.0336)	(0.0147)	(0.0122)	(0.0246)	(0.0163)
Observations	24,760	24,760	24,760	24,760	24,760	24,760
R-squared	0.147	0.334	0.164	0.042	0.152	0.175

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5: Almost Ideal Demand System: consumption elasticity

	(1) Health	(2) Food	(3) Education	(4) Clothes	(5) Housing	(6) Transports
Consumption Elasticity (receiving international remittance=1)	1.334	0.744	1.451	1.019	1.131	1.496
Consumption Elasticity (receiving international remittance=0)	1.184	0.746	1.603	1.155	0.999	1.594

Table 6: First-stage regression: Remittance status

Dep. var.: Receiving international remittances (dummy)	Coef.	Std. Err
Household size	0.0002	0.0010
Urban	0.0009	0.0024
Number of children	0.0018	0.0014
Number of elderly	0.0085	0.0021
Education level household head		
No education: reference category		
Primary	0.0063	0.0025
Secondary	0.0136	0.0034
High school or more	0.0106	0.0040
Age group household head		
0-49: reference category		
50 - 69	0.0095	0.0025
70 +	0.0169	0.0041
Geographical Area		
Reference Category: Costa		
Sierra	0.0003	0.0026
Selva	0.0017	0.0029
Lima	0.0008	0.0040
Absent member (dummy)	0.0016	0.0038
Rent (dummy)	-0.0019	0.0036
Chronic discomfort (dummy)	0.0023	0.0022
Hospitalization (dummy)	0.0078	0.0024
Gender of the household head (female)	0.0164	0.0022
Hospitals per 1000 population	-0.0012	0.0034
Healthcare district	0.0006	0.0028
Total income	2.73e-07	3.86e-08
Number of high education members	-0.0014	0.0013
Remittance rate 2007 (province level)	0.5822	0.0386
Historical migration rate (department level)	8.65e-09	7.21e-09
Constant	-.04456	0.0058
R-squared	0.0423	
Number observations	24760	

Table 7: Almost Ideal Demand System - health demand equation

	(1) Full sample Exogenous	(2) Full sample IV	(3) Full sample IV	(4) Health shock=0 IV	(5) Health shock=1 IV	(6) Full sample IV
Ln (total consumption)	0.0168***	0.0138***	0.0134***	0.01225***	0.0230***	0.0141***
	(0.0022)	(0.0025)	(0.0026)	(0.00258)	(0.0073)	(0.0024)
Remittances	0.0053	0.1103***		0.19965***	-0.0840	0.1680***
	(0.0035)	(0.0356)		(0.04577)	(0.0732)	(0.0482)
Remittances*Ln(total consumption)			0.0109***			
			(0.0035)			
Health shock						0.0753***
						(0.0018)
Remittances*Health shock						-0.1774***
						(0.0476)
Observations	24,760	24,760	24,760	20,285	4,475	24,760
R-squared	0.179	0.147	0.146	0.112	-0.005	0.130

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

6 Conclusions

The paper provides some important insights about the impact of remittances on the consumption behaviour of Peruvian households left behind. In particular, the study tests if the propensity to channel income from migrant transfers to health consumption is higher with respect to other sources of income. The AIDS has been identified as the proper empirical specification to model a demand system for seven consumption categories: health, food, education, clothes, housing, transports and other goods. Three-stage least squares techniques have been implemented in order to overcome some common methodological issues presented by this kind of studies. Geographical variation in the historical migration and remittance rates has been exploited to instrument household remittance status and deal with the selectivity issues concerning the probability of receiving remittances.

The findings obtained reveal that remittance flows have complex and heterogeneous effects on Peruvian household consumption behaviours. Notably, transnational transfers seems to reshape household demand not only through an overall income effect. The results consistently confirm a positive and significant impact of international remittances on healthcare consumption, both in absolute terms and as regards budget shares allocation. Moreover, as total consumption rises, the increase in the share of income allocated to health and housing is larger in households receiving international remittances com-

pared to what happens in similar households without migrant transfers. At the same time, the consumption shares devoted to consumption goods, i.e. clothes, fall more than proportionally for the first group. These elements may suggest a propensity to address additional resources provided by international remittances to human and physical capital investment.

However, as the New Economics of Labour Migration claim, this shift in household allocation decisions in favour of health consumption may be related to the adoption of international migration as an insurance strategy to cope with negative shocks. Our analysis, although confirming that households experiencing a shock are more likely to receive transfers from abroad, shows that the propensity to allocate additional resources to healthcare is not directly related to the occurrence of a negative health shock. Such evidence would confirm that the health consumption behaviour observed responds to a voluntary intention to invest in human capital through the acquisition of preventive medical care. This choice could be driven by several aspects related to migration which we are not separately identified by our analysis, i.e. changes in income composition due to remittance inflows, role of migrants in determining income allocation decisions, intra-household informal agreements about the intended use of these resources. Anyway, the outcomes obtained across the various estimations performed uphold the role of migrant transfers in pushing health investment for members left behind, with positive implicit implications for their long-term health status.

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Table 8: **Appendix A1: Household consumption categories - ENAHO survey**

Category	**Description**
Health	Medical care expenditures. Doctor fees, medicines, examinations fees, hospitalization, prenatal check-ups, contraceptives.
Food	Purchased and non-purchased food, both consumed at home or outdoor.
Education	Uniforms, transport, registration fees, school supplies, accommodations. Amusement and cultural consumption.
Clothing	Clothing and footwear consumption.
Housing	Expenditures for rent, fuel, electricity, house maintenance. Payments for furniture and equipment.
Transports and communications	Payments for private and public transportations, travel expenditures, telephone, internet, mail expenditures.
Other	Extraordinary housing and services expenditures, family celebrations, and other type of sporadic expenditure.

Appendix A2: AIDS - exogenous variables

	(1) Health	(2) Food	(3) Education	(4) Clothing	(5) Housing	(6) Transports
Ln (total consumption)	0.0168***	-0.1274***	0.0294***	0.0052***	0.0071***	0.0465***
	(0.0022)	(0.0035)	(0.0015)	(0.0012)	(0.0024)	(0.0016)
Receiving international remittances	0.0053	-0.0129**	0.0032	0.0022	0.0039	0.0012
	(0.0035)	(0.0056)	(0.0024)	(0.0020)	(0.0039)	(0.0027)
Urban	-0.0076***	-0.0175***	-0.0030***	-0.0109***	0.0443***	-0.0045***
	(0.0016)	(0.0025)	(0.0011)	(0.0009)	(0.0017)	(0.0012)
Household size	-0.0057***	0.0302***	0.0029***	-0.0004	-0.0190***	-0.0030***
	(0.0006)	(0.0010)	(0.0004)	(0.0004)	(0.0007)	(0.0005)
Number of children	0.0053***	-0.0135***	0.0010**	0.0048***	0.0102***	-0.0078***
	(0.0007)	(0.0012)	(0.0005)	(0.0004)	(0.0008)	(0.0006)
Number of elderly	0.0150***	-0.0097***	-0.0098***	-0.0019***	0.0133***	-0.0047***
	(0.0012)	(0.0018)	(0.0008)	(0.0007)	(0.0013)	(0.0009)
Educational level household head (Primary)	0.0014	-0.0052**	-0.0026***	-0.0012	0.0056***	0.0013
	(0.0015)	(0.0023)	(0.0010)	(0.0008)	(0.0016)	(0.0011)
Educational level household head (Secondary)	-0.0004	-0.0218***	0.0043***	-0.0006	0.0120***	0.0063***
	(0.0018)	(0.0029)	(0.0012)	(0.0010)	(0.0020)	(0.0014)
Educational level household head (High school or more)	0.0001	-0.0544***	0.0176***	-0.0017	0.0263***	0.0126***
	(0.0024)	(0.0038)	(0.0016)	(0.0013)	(0.0026)	(0.0018)
Age (group) household head 50-69	0.0062***	-0.0170***	-0.0076***	-0.0063***	0.0252***	0.0013
	(0.0012)	(0.0020)	(0.0008)	(0.0007)	(0.0014)	(0.0009)
Age (group) household head 70+	0.0138***	-0.0386***	-0.0057***	-0.0075***	0.0425***	-0.0006
	(0.0023)	(0.0036)	(0.0015)	(0.0013)	(0.0025)	(0.0017)
Geographical area - Sierra	0.0015	-0.0072***	0.0146***	0.0071***	-0.0097***	0.0030***
	(0.0014)	(0.0023)	(0.0010)	(0.0008)	(0.0016)	(0.0011)

Geographical area - Selva	-0.0008	0.0185***	-0.0073***	-0.0010	-0.0079***	-0.0007
	(0.0015)	(0.0024)	(0.0010)	(0.0008)	(0.0016)	(0.0011)
Geographical area - Lima	-0.0017	0.0098**	0.0046***	-0.0157***	0.0238***	0.0028
	(0.0024)	(0.0038)	(0.0016)	(0.0014)	(0.0026)	(0.0018)
Absent member (dummy)	-0.0074***	0.0471***	-0.0008	-0.0079***	-0.0148***	-0.0052***
	(0.0021)	(0.0034)	(0.0014)	(0.0012)	(0.0023)	(0.0016)
Rent (dummy)	0.0008	0.0088***	0.0015	0.0041***	-0.0137***	-0.0006
	(0.0020)	(0.0032)	(0.0013)	(0.0011)	(0.0022)	(0.0015)
Chronic discomfort (dummy)	0.0233***	-0.0101***	-0.0018**	-0.0030***	-0.0037***	-0.0026***
	(0.0012)	(0.0019)	(0.0008)	(0.0007)	(0.0013)	(0.0009)
Hospitalization (dummy)	0.0708***	-0.0288***	-0.0112***	-0.0018**	-0.0133***	-0.0095***
	(0.0014)	(0.0022)	(0.0009)	(0.0008)	(0.0015)	(0.0010)
Gender household head	-0.0008	-0.0181***	0.0053***	0.0034***	0.0085***	-0.0003
	(0.0012)	(0.0019)	(0.0008)	(0.0007)	(0.0013)	(0.0009)
Hospitals per 1000 population	-1.2135	2.9227	3.1081***	-1.8122**	0.2932	-0.1419
	(1.6121)	(2.5625)	(1.0933)	(0.9059)	(1.7555)	(1.2187)
Healthcare district (dummy)	-0.0008	0.0035	0.0005	-0.0022**	0.0010	-0.0032***
	(0.0016)	(0.0025)	(0.0011)	(0.0009)	(0.0017)	(0.0012)
Constant	-0.1060***	1.6974***	-0.2459***	0.0086	0.1180***	-0.3389***
	(0.0186)	(0.0295)	(0.0126)	(0.0104)	(0.0202)	(0.0140)
Observations	24,760	24,760	24,760	24,760	24,760	24,760
R-squared	0.179	0.335	0.211	0.089	0.259	0.211

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Appendix A3: AIDS - interaction variables

	(1) Health	(2) Food	(3) Education	(4) Clothing	(5) Housing	(6) Transports
Ln (total consumption)	0.0134***	-0.1286***	0.0323***	0.0079***	-0.0003	0.0493***
	(0.0026)	(0.0040)	(0.0017)	(0.0014)	(0.0029)	(0.0019)
Receiving remittances*Ln (total consumption)	0.0109***	-0.0006	-0.0081***	-0.0069***	0.0239***	-0.0082***
	(0.0035)	(0.0055)	(0.0024)	(0.0020)	(0.0040)	(0.0027)
Household size	-0.0051***	0.0305***	0.0024***	-0.0009**	-0.0177***	-0.0035***
	(0.0007)	(0.0011)	(0.0005)	(0.0004)	(0.0008)	(0.0005)
Urban	-0.0069***	-0.0170***	-0.0037***	-0.0115***	0.0458***	-0.0051***
	(0.0016)	(0.0026)	(0.0011)	(0.0009)	(0.0019)	(0.0012)
Number of children	0.0047***	-0.0137***	0.0016***	0.0053***	0.0088***	-0.0073***
	(0.0008)	(0.0012)	(0.0005)	(0.0004)	(0.0009)	(0.0006)
Number of elderly	0.0138***	-0.0098***	-0.0089***	-0.0011	0.0107***	-0.0038***
	(0.0012)	(0.0019)	(0.0009)	(0.0007)	(0.0014)	(0.0009)
Educational level household head (Primary)	0.0013	-0.0050**	-0.0026**	-0.0012	0.0053***	0.0013
	(0.0015)	(0.0023)	(0.0010)	(0.0008)	(0.0017)	(0.0011)
Educational level household head (Secondary)	-0.0007	-0.0214***	0.0045***	-0.0006	0.0111***	0.0065***
	(0.0019)	(0.0029)	(0.0013)	(0.0011)	(0.0021)	(0.0014)
Educational level household head (High school or more)	0.0006	-0.0536***	0.0170***	-0.0024*	0.0273***	0.0120***
	(0.0024)	(0.0038)	(0.0017)	(0.0014)	(0.0028)	(0.0018)
Age (group) household head 50-69	0.0049***	-0.0171***	-0.0065***	-0.0054***	0.0224***	0.0023**
	(0.0013)	(0.0021)	(0.0009)	(0.0008)	(0.0015)	(0.0010)
Age (group) household head 70+	0.0116***	-0.0388***	-0.0039**	-0.0059***	0.0374***	0.0012
	(0.0024)	(0.0038)	(0.0017)	(0.0014)	(0.0028)	(0.0018)
Geographical area - Sierra	0.0025	-0.0074***	0.0139***	0.0065***	-0.0075***	0.0022*
	(0.0015)	(0.0023)	(0.0010)	(0.0009)	(0.0017)	(0.0011)

Geographical area - Selva	0.0006	0.0185***	-0.0084***	-0.0019**	-0.0048***	-0.0018
	(0.0016)	(0.0025)	(0.0011)	(0.0009)	(0.0018)	(0.0012)
Geographical area - Lima	-0.0060**	0.0096**	0.0081***	-0.0127***	0.0139***	0.0063***
	(0.0029)	(0.0045)	(0.0020)	(0.0016)	(0.0033)	(0.0022)
Absent member (dummy)	-0.0071***	0.0473***	-0.0011	-0.0081***	-0.0142***	-0.0055***
	(0.0022)	(0.0034)	(0.0015)	(0.0012)	(0.0025)	(0.0017)
Chronic discomfort (dummy)	0.0233***	-0.0100***	-0.0018**	-0.0031***	-0.0036**	-0.0027***
	(0.0012)	(0.0019)	(0.0009)	(0.0007)	(0.0014)	(0.0009)
Hospitalization (dummy)	0.0704***	-0.0286***	-0.0109***	-0.0016**	-0.0143***	-0.0092***
	(0.0014)	(0.0022)	(0.0010)	(0.0008)	(0.0016)	(0.0011)
Rent (dummy)	0.0010	0.0088***	0.0013	0.0040***	-0.0133***	-0.0007
	(0.0020)	(0.0032)	(0.0014)	(0.0011)	(0.0023)	(0.0015)
Gender household head	-0.0026*	-0.0182***	0.0068***	0.0047***	0.0044***	0.0011
	(0.0014)	(0.0022)	(0.0009)	(0.0008)	(0.0016)	(0.0011)
Hospitals per 1000 population	-0.0007	0.0030	0.0026**	-0.0022**	0.0015	-0.0006
	(0.0017)	(0.0026)	(0.0011)	(0.0009)	(0.0019)	(0.0013)
Healthcare district (dummy)	-0.0006	0.0036	0.0003	-0.0024***	0.0016	-0.0034***
	(0.0016)	(0.0025)	(0.0011)	(0.0009)	(0.0018)	(0.0012)
Constant	-0.0749***	1.7072***	-0.2729***	-0.0165	0.1866***	-0.3647***
	(0.0222)	(0.0346)	(0.0152)	(0.0125)	(0.0254)	(0.0168)
Observations	24,760	24,760	24,760	24,760	24,760	24,760
R-squared	0.146	0.334	0.163	0.039	0.149	0.174

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Appendix A4: AIDS - Positive health shock

	(1) Health	(2) Food	(3) Education	(4) Clothing	(5) Housing	(6) Transports
Ln (total consumption)	0.0230***	-0.1212***	0.0255***	0.0037	0.0048	0.0422***
	(0.0073)	(0.0079)	(0.0037)	(0.0026)	(0.0052)	(0.0038)
Receiving international remittances (dummy)	-0.0840	-0.0342	0.0760**	-0.0256	0.0921*	0.0019
	(0.0732)	(0.0796)	(0.0371)	(0.0265)	(0.0520)	(0.0384)
Household size	-0.0143***	0.0274***	0.0023***	-0.0000	-0.0131***	0.0001
	(0.0016)	(0.0017)	(0.0008)	(0.0006)	(0.0011)	(0.0008)
Urban	-0.0225***	-0.0176***	0.0001	-0.0048***	0.0438***	0.0014
	(0.0049)	(0.0053)	(0.0025)	(0.0018)	(0.0035)	(0.0026)
Number of children	0.0074***	-0.0107***	0.0005	0.0044***	0.0074***	-0.0085***
	(0.0021)	(0.0023)	(0.0011)	(0.0008)	(0.0015)	(0.0011)
Number of elderly	0.0184***	-0.0122***	-0.0097***	-0.0033**	0.0134***	-0.0055***
	(0.0037)	(0.0040)	(0.0019)	(0.0013)	(0.0026)	(0.0019)
Educational level household head (Primary)	-0.0083*	-0.0035	0.0003	0.0010	0.0055	0.0027
	(0.0047)	(0.0051)	(0.0024)	(0.0017)	(0.0034)	(0.0025)
Educational level household head (Secondary)	-0.0114**	-0.0165***	0.0058**	0.0011	0.0136***	0.0060**
	(0.0055)	(0.0060)	(0.0028)	(0.0020)	(0.0039)	(0.0029)
Educational level household head (High school or more)	-0.0150**	-0.0461***	0.0181***	0.0022	0.0288***	0.0122***
	(0.0070)	(0.0076)	(0.0035)	(0.0025)	(0.0050)	(0.0037)
Age (group) household head 50-69	0.0214***	-0.0164***	-0.0073***	-0.0086***	0.0148***	-0.0012
	(0.0040)	(0.0044)	(0.0020)	(0.0015)	(0.0029)	(0.0021)
Age (group) household head 70+	0.0454***	-0.0412***	-0.0100**	-0.0109***	0.0261***	-0.0028
	(0.0077)	(0.0083)	(0.0039)	(0.0028)	(0.0055)	(0.0040)
Geographical area - Sierra	-0.0030	-0.0051	0.0145***	0.0023	-0.0042	0.0071***
	(0.0046)	(0.0051)	(0.0024)	(0.0017)	(0.0033)	(0.0024)

Geographical area - Selva	-0.0129***	0.0226***	-0.0036	-0.0033*	-0.0023	-0.0005
	(0.0048)	(0.0052)	(0.0024)	(0.0017)	(0.0034)	(0.0025)
Geographical area - Lima	-0.0028	0.0136	-0.0030	-0.0164***	0.0224***	0.0084*
	(0.0083)	(0.0091)	(0.0042)	(0.0030)	(0.0059)	(0.0044)
Rent (dummy)	0.0106*	0.0009	-0.0039	0.0051**	-0.0094**	-0.0018
	(0.0061)	(0.0066)	(0.0031)	(0.0022)	(0.0043)	(0.0032)
Absent member (dummy)	-0.0151**	0.0444***	-0.0007	-0.0043*	-0.0110**	-0.0067**
	(0.0061)	(0.0067)	(0.0031)	(0.0022)	(0.0044)	(0.0032)
Chronic discomfort (dummy)	0.0258***	-0.0129***	-0.0005	-0.0036**	-0.0038	0.0004
	(0.0044)	(0.0048)	(0.0023)	(0.0016)	(0.0032)	(0.0023)
Gender household head	0.0005	-0.0109**	-0.0022	0.0033**	0.0045	-0.0006
	(0.0045)	(0.0049)	(0.0023)	(0.0016)	(0.0032)	(0.0024)
Hospitals per 1000 population	-0.0058	0.0085	0.0060**	-0.0033*	0.0018	-0.0030
	(0.0051)	(0.0055)	(0.0026)	(0.0018)	(0.0036)	(0.0027)
Healthcare district (dummy)	-0.0125**	0.0091	0.0021	-0.0015	-0.0004	0.0040
	(0.0055)	(0.0059)	(0.0028)	(0.0020)	(0.0039)	(0.0029)
Constant	-0.0360	1.5997***	-0.2140***	0.0187	0.1090**	-0.3318***
	(0.0665)	(0.0723)	(0.0337)	(0.0241)	(0.0473)	(0.0349)
Observations	4,475	4,475	4,475	4,475	4,475	4,475
R-squared	0.112	0.327	0.137	0.106	0.207	0.193

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Appendix A5: AIDS - No health shock

	(1) Health	(2) Food	(3) Education	(4) Clothing	(5) Housing	(6) Transports
Ln (total consumption)	0.0130***	-0.1324***	0.0341***	0.0083***	0.0001	0.0512***
	(0.0025)	(0.0044)	(0.0020)	(0.0016)	(0.0033)	(0.0022)
Receiving international remittances	0.1642***	0.0452	-0.1683***	-0.0821***	0.3029***	-0.1328***
	(0.0398)	(0.0695)	(0.0317)	(0.0254)	(0.0522)	(0.0343)
Household size	-0.0031***	0.0320***	0.0021***	-0.0011**	-0.0187***	-0.0047***
	(0.0007)	(0.0013)	(0.0006)	(0.0005)	(0.0009)	(0.0006)
Urban	-0.0048***	-0.0158***	-0.0043***	-0.0126***	0.0455***	-0.0065***
	(0.0017)	(0.0029)	(0.0013)	(0.0011)	(0.0022)	(0.0014)
Number of children	0.0043***	-0.0151***	0.0023***	0.0055***	0.0089***	-0.0067***
	(0.0008)	(0.0014)	(0.0007)	(0.0005)	(0.0011)	(0.0007)
Number of elderly	0.0120***	-0.0095***	-0.0082***	-0.0005	0.0104***	-0.0030***
	(0.0013)	(0.0022)	(0.0010)	(0.0008)	(0.0017)	(0.0011)
Educational level household head (Primary)	0.0018	-0.0049*	-0.0029**	-0.0013	0.0051**	0.0015
	(0.0015)	(0.0026)	(0.0012)	(0.0010)	(0.0020)	(0.0013)
Educational level household head (Secondary)	-0.0001	-0.0223***	0.0051***	-0.0005	0.0095***	0.0073***
	(0.0019)	(0.0033)	(0.0015)	(0.0012)	(0.0025)	(0.0016)
Educational level household head (High school of more)	0.0022	-0.0545***	0.0171***	-0.0029*	0.0262***	0.0124***
	(0.0025)	(0.0043)	(0.0020)	(0.0016)	(0.0033)	(0.0021)
Age (group) household head 50-69	0.0029**	-0.0178***	-0.0054***	-0.0048***	0.0228***	0.0029**
	(0.0014)	(0.0024)	(0.0011)	(0.0009)	(0.0018)	(0.0012)
Age (group) household head 70+	0.0077***	-0.0395***	-0.0019	-0.0051***	0.0384***	0.0019
	(0.0024)	(0.0043)	(0.0019)	(0.0016)	(0.0032)	(0.0021)
Geographical area - Sierra	0.0042***	-0.0084***	0.0135***	0.0074***	-0.0081***	0.0012
	(0.0015)	(0.0027)	(0.0012)	(0.0010)	(0.0020)	(0.0013)

Geographical area - Selva	0.0034**	0.0177***	-0.0096***	-0.0015	-0.0057***	-0.0020
	(0.0016)	(0.0028)	(0.0013)	(0.0010)	(0.0021)	(0.0014)
Geographical area - Lima	-0.0060**	0.0073	0.0113***	-0.0122***	0.0127***	0.0061**
	(0.0029)	(0.0050)	(0.0023)	(0.0018)	(0.0037)	(0.0025)
Absent member (dummy)	-0.0052**	0.0486***	-0.0018	-0.0092***	-0.0147***	-0.0053***
	(0.0023)	(0.0039)	(0.0018)	(0.0014)	(0.0030)	(0.0019)
Rent (dummy)	-0.0003	0.0113***	0.0018	0.0035***	-0.0136***	-0.0011
	(0.0021)	(0.0036)	(0.0016)	(0.0013)	(0.0027)	(0.0018)
Chronic discomfort (dummy)	0.0227***	-0.0097***	-0.0020**	-0.0030***	-0.0037**	-0.0029***
	(0.0012)	(0.0021)	(0.0010)	(0.0008)	(0.0016)	(0.0011)
Gender household head	-0.0018	-0.0202***	0.0089***	0.0048***	0.0041**	0.0014
	(0.0014)	(0.0024)	(0.0011)	(0.0009)	(0.0018)	(0.0012)
Hospitals per 1000 population	0.0000	0.0016	0.0023*	-0.0017	0.0009	0.0003
	(0.0017)	(0.0029)	(0.0013)	(0.0011)	(0.0022)	(0.0014)
Healthcare district (dummy)	0.0016	0.0028	-0.0002	-0.0024**	0.0021	-0.0050***
	(0.0016)	(0.0028)	(0.0013)	(0.0010)	(0.0021)	(0.0014)
Constant	-0.0826***	1.7426***	-0.2909***	-0.0199	0.1872***	-0.3762***
	(0.0214)	(0.0374)	(0.0171)	(0.0137)	(0.0281)	(0.0185)
Observations	20,285	20,285	20,285	20,285	20,285	20,285
R-squared	-0.005	0.310	0.073	0.031	0.119	0.141

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Appendix A6: AIDS - Interaction with health shock

	(1) Health	(2) Food	(3) Education	(4) Clothing	(5) Housing	(6) Transports
Ln (total consumption)	0.0141***	-0.1302***	0.0324***	0.0073***	0.0024	0.0491***
	(0.0024)	(0.0038)	(0.0017)	(0.0014)	(0.0028)	(0.0019)
Receiving international remittances	0.1680***	0.0550	-0.1620***	-0.0981***	0.3196***	-0.1377***
	(0.0482)	(0.0748)	(0.0339)	(0.0273)	(0.0556)	(0.0369)
Hospitalization (dummy)	0.0753***	-0.0273***	-0.0155***	-0.0043***	-0.0056***	-0.0130***
	(0.0018)	(0.0029)	(0.0013)	(0.0010)	(0.0021)	(0.0014)
Hospitalization*Receiving remittances	-0.1774***	-0.0511	0.1716***	0.0982***	-0.3217***	0.1386***
	(0.0476)	(0.0737)	(0.0335)	(0.0269)	(0.0548)	(0.0364)
Household size	-0.0051***	0.0307***	0.0022***	-0.0009**	-0.0177***	-0.0036***
	(0.0007)	(0.0010)	(0.0005)	(0.0004)	(0.0008)	(0.0005)
Urban	-0.0074***	-0.0161***	-0.0032***	-0.0108***	0.0432***	-0.0047***
	(0.0016)	(0.0025)	(0.0011)	(0.0009)	(0.0019)	(0.0012)
Number of children	0.0045***	-0.0139***	0.0019***	0.0054***	0.0086***	-0.0071***
	(0.0008)	(0.0012)	(0.0006)	(0.0005)	(0.0009)	(0.0006)
Number of elderly	0.0137***	-0.0104***	-0.0085***	-0.0012	0.0111***	-0.0036***
	(0.0013)	(0.0019)	(0.0009)	(0.0007)	(0.0014)	(0.0010)
Educational level household head (Primary)	0.0009	-0.0050**	-0.0022**	-0.0009	0.0044**	0.0017
	(0.0015)	(0.0024)	(0.0011)	(0.0009)	(0.0018)	(0.0012)
Educational level household head (Secondary)	-0.0016	-0.0214***	0.0054***	0.0000	0.0091***	0.0072***
	(0.0019)	(0.0029)	(0.0013)	(0.0011)	(0.0022)	(0.0015)
Educational level household head (High school or more)	-0.0000	-0.0528***	0.0177***	-0.0016	0.0247***	0.0125***
	(0.0024)	(0.0038)	(0.0017)	(0.0014)	(0.0028)	(0.0019)
Age (group) household head 50-69	0.0046***	-0.0181***	-0.0060***	-0.0055***	0.0229***	0.0026**
	(0.0014)	(0.0021)	(0.0010)	(0.0008)	(0.0016)	(0.0010)

Age (group) household head 70+	0.0115***	-0.0403***	-0.0034**	-0.0062***	0.0387***	0.0015
	(0.0024)	(0.0038)	(0.0017)	(0.0014)	(0.0028)	(0.0019)
Geographical area - Sierra	0.0028*	-0.0067***	0.0134***	0.0065***	-0.0076***	0.0019
	(0.0015)	(0.0024)	(0.0011)	(0.0009)	(0.0018)	(0.0012)
Geographical area - Selva	0.0005	0.0194***	-0.0086***	-0.0016*	-0.0059***	-0.0019
	(0.0016)	(0.0024)	(0.0011)	(0.0009)	(0.0018)	(0.0012)
Geographical area - Lima	-0.0057**	0.0083*	0.0090***	-0.0128***	0.0147***	0.0064***
	(0.0028)	(0.0043)	(0.0020)	(0.0016)	(0.0032)	(0.0021)
Absent member (dummy)	-0.0071***	0.0474***	-0.0013	-0.0082***	-0.0140***	-0.0056***
	(0.0022)	(0.0034)	(0.0016)	(0.0012)	(0.0025)	(0.0017)
Chronic discomfort (dummy)	0.0231***	-0.0101***	-0.0016*	-0.0030***	-0.0039***	-0.0025***
	(0.0013)	(0.0020)	(0.0009)	(0.0007)	(0.0015)	(0.0010)
Gender household head	-0.0025*	-0.0190***	0.0072***	0.0046***	0.0049***	0.0013
	(0.0014)	(0.0021)	(0.0010)	(0.0008)	(0.0016)	(0.0011)
Hospitals per 1000 population	-0.0011	0.0032	0.0029**	-0.0020**	0.0006	-0.0003
	(0.0017)	(0.0026)	(0.0012)	(0.0009)	(0.0019)	(0.0013)
Healthcare district (dummy)	-0.0005	0.0037	0.0001	-0.0024***	0.0018	-0.0035***
	(0.0016)	(0.0025)	(0.0011)	(0.0009)	(0.0019)	(0.0012)
Constant	-0.0816***	1.7221***	-0.2738***	-0.0101	0.1611***	-0.3626***
	(0.0210)	(0.0325)	(0.0148)	(0.0119)	(0.0242)	(0.0160)
Observations	24,760	24,760	24,760	24,760	24,760	24,760
R-squared	0.130	0.329	0.098	0.020	0.119	0.144

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1