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Understanding the Drivers of Household Energy Spending

Micro Evidence for Latin America[1]

Abstract

The paper investigates the determinants of household energy spending and energy budget shares, with a focus on understanding their non-linear relationship with income, and the presence of economies of scale. The analysis is based on a unique, harmonized collection of official household surveys from 13 Latin American countries. This dataset allows distinguishing between expenditures on electricity, domestic gas, and fuel for private transportation, providing a comprehensive distributional view of the energy spending profile of the residential sector. The estimated empirical Engel curves behave similarly; however, the derived income elasticities show marked distinctions by fuel, and their actual values depend on the households' relative position over the income distribution. For electricity, the elasticity tends to increase in income but stabilize at the wealthiest segments. For gas and transport fuel, it decreases under different income paths. In this dataset, the examination returns income elasticities on the (0,1) interval, suggesting that energy commodities are necessity goods. However, the distribution of aggregate energy expenditure needs to be considered. Specifically, there is a great concentration among the richer groups, particularly for transport fuels, where the top quintile gathers more than half of the aggregate spending. The results also indicate economies of scale—for electricity and domestic gas—with respect to family-age composition, and to a lesser extent with respect to dwelling size. In the case of electricity, these economies are more pronounced for richer households. These results join the previous literature in emphasizing the relevance of taking into account household demographic and socioeconomic trends for energy management.

JEL Classification: D12, Q41.

Keywords: Energy expenditures, Engel curves, household surveys, Latin American countries.

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[1] The findings, interpretations, and conclusions herein are strictly those of the authors and should not be attributed in any manner to their affiliated institutions. This version has benefited from comments and suggestions of Andrea Guerrero, Yi Ji, and an anonymous peer reviewer. All remaining errors are our own responsibility. Corresponding author: Raul Jimenez, rjimenez@iadb.org.

1. Introduction

Energy commodities are essential household needs and represent a relevant component of the household budget (e.g., Fankhauser and Tepic 2007; Bacon et al. 2010; Advani et al. 2013). Lighting, heating, refrigeration, cooking, and transportation exemplify some of the basic activities that require a reliable and affordable supply of modern energy sources. At the same time, environmental considerations require disciplining energy consumption through a variety of measures that directly affect the residential sector, including energy conservation and efficiency measures, as well as pricing mechanisms (e.g., Meyers et al. 2003; Geller et al. 2006). In this context, understanding the factors that determine energy expenditure and their interrelations may contribute to balance the trade-offs between meeting households' basic needs and reducing the environmental impact.

Related literature can be broadly grouped into studies addressing the determinants of energy expenditure—or energy budget shares—and studies on energy consumption at the household level (e.g., Meier et al. 2013; Cayla et al. 2011; Advani et al. 2013; Baker et al. 1989; Heltberg 2004; Fouquet 2014; Pachauri and Jiang 2008; Hanna and Oliva 2015). Overall, their findings indicate the relevant roles of economic and noneconomic factors. One major line of study focuses on economic factors—that is, income and energy prices—and their significant effects on household energy demand and expenditures. The effect seems to be heterogeneous between income groups. For example, the income elasticity estimated by Baker et al. (1989) shows substantial differences between income groups in the United Kingdom, from -0.172 in the top decile to 0.177 in the bottom decile.

The noneconomic factors include household and dwelling characteristics, such as household size, location (urban/rural), appliances, dwelling size, and temperature, among others. Although income and energy prices constitute the key budgetary restrictions for consumption and expenditure decisions, energy demand derives from the noneconomic factors. Empirically, such drivers have a sizeable impact on energy spending (e.g., Poyer et al. 1997; Estiri et al. 2015; Longhi 2015). In the case of the United Kingdom, Longhi (2015) indicates that accommodation characteristics contribute up to 20 percent of gas expenditures and up to 10 percent for electricity.

In response to improvements in living standards and the increasing adoption of durable appliances and vehicles, it is expected that future incremental global energy demand will come mainly from the developing world (BP 2016; Wolfram et al. 2012). However, relatively fewer studies have focused on Latin America, a region which has experienced a dynamic economic progress over the last decades. Previous research on this region mostly address energy consumption—not expenditures—and have concentrated on specific fuels. Among them, Navajas (2009) documents the case of domestic gas consumption in Argentina. Foster et al. (2000) study overall energy consumption in Guatemalan households, focusing on its relationship with income. In a related study, Winkler et al. (2010) discuss access and affordability to electricity services in three developing countries, including Brazil, where the tariff structure seems to contribute towards reducing energy poverty. To the best of our knowledge, Rodriguez-Oreggia and Yepez-Garcia (2014), for the case of Mexico, is the only study that addresses the use of multiple fuels, including domestic gas, electricity, and gasoline.[2]

Another line of study, which has received noticeably less attention, focuses on economies of scale (EOS) in energy consumption (i.e., Ironmonger et al. 1995; Underwood and Zahran 2015). EOS is of interest in the broader literature studying household budget allocation (Benus et al. 1976; Nelson 1988; Deaton and Paxson 1998), and, as an extension of this literature, the presence of EOS is plausible for energy consumption, with relevant policy implications. EOS can appear in different ways; for example, consumption of cooking fuels may increase less than proportionally to family size. Electricity and gas consumption for lighting and heating/cooling may increase linearly with dwelling size. Ironmonger et al. (1995) study the direction of EOS in residential energy use and expenditure in Australia, and find significant EOS with respect to family age composition. Underwood and Zahran (2015) study the case of the United States and find similar results; they further discuss the implications for trends in carbon dioxide emissions.

In this paper, we investigate the determinants of energy expenditures and energy budget shares at the household level, with a focus on evaluating their relationship with income and the existence of EOS. In contributing to the literature, our study jointly addresses expenditures on domestic energy (i.e., electricity and domestic gas) and fuels for private transportation. In addition to addressing EOS with respect to family age composition, we evaluate dwelling size.

[2] In a less related, but important study, Heltberg (2004) examines fuel switching among non-transport fuels in eight developing countries, including Brazil, Guatemala, and Nicaragua.

The study exploits a cross-sectional dataset that covers more than 189,000 households in 13 Latin American countries. The data set harmonizes expenditure headings across different official surveys, providing extensive coverage of the energy expenditure profile of Latin American households by income group. In addition to containing a rich set of covariates, the data set identifies detailed indicators of household geographical location, allowing us to control for a variety of omitted and non-observed factors.

The focus on energy expenditure and its relationship with income is timely and relevant for public policy on the affordability of energy services. In addition to the energy affordability problems that have been largely documented in poor countries, such problems are also present in developed countries, where, even in the recent context of declining energy prices, they have received contemporary media attention.[3] Affordability is the household's ability to pay for a minimum level of service, being intrinsically related to energy poverty—i.e., energy consumption that falls below a certain sufficiency threshold—demanding a distributional analysis to identify vulnerable household groups (Fankhauser and Tepic 2007).

Our results suggest the presence of EOS for family size and dwelling size, although EOS for the latter are considerably smaller. The estimated Engel curves behave similarly between fuels; however, the derived income elasticities show distinctive patterns, by fuel, over the income distribution. For electricity, this elasticity tends to increase in income, stabilizing at the highest income groups. For gas and transport fuel, the income elasticity decreases but follows different patterns along the income distribution. Conditional on using the fuel, our examination returns income elasticities that move on the (0,1) interval. While this result tags energy commodities as necessity goods, it is important to consider that the richest income groups gather half the aggregate energy expenditure and that such concentration is even more pronounced for transport fuels.

The paper makes three main empirical and policy contributions. First, it exploits an original systematization of household surveys from 13 countries that concentrate over 70 percent of the population in Latin America and the Caribbean. These data allow distinguishing expenditures on electricity, domestic gas, and transport fuels, accounting for a large set of covariates. To the best of our knowledge, no previous research has provided comparably extensive coverage of countries and fuels in the household sector in Latin America. Second, in examining EOS with respect to

[3] See, for example: "Where the Poor Spend More Than 10 Percent of Their Income on Energy? Hint: Almost Everywhere in the United States," in *The Atlantic*, June 8, 2016; and "Over 300,000 Poverty-Hit German Homes Have Power Cut Off Each Year," in *The Local*, March, 2, 2017.

family age composition and dwelling size, the paper provides insights on the potential implications of global demographic and construction trends on the energy sector. Third, the paper is timely as it addresses the distribution of energy expenditure and energy affordability in a context of great attention to reforming energy subsidies in developing countries (Coady et al. 2015; Di Bella et al. 2015). The findings may contribute to inform about the potential implications of these reforms in the residential sector.

In section 2, we discuss the data and the variables to be examined. Section 3 provides a distributional descriptive, unconditional review of the patterns of energy expenditure by income decile. In section 4, we present our econometric approach. In section 5, we describe the main estimation results. We conclude in section 6 with a discussion of our results and their potential policy implications.

2. Data, Variables, and Summary Statistics

The analysis is based on a cross-section of national household expenditure surveys from 13 countries.[4] The surveys are performed by the national statistical agencies and were selected because of the detailed information on energy expenditures, as well as socioeconomic characteristics. Annex A provides details on the surveys used in this study. The data include only those households that reported expenditures on at least one source of energy. To reduce the presence of outliers, we trimmed the sample by dropping the 1 percent of households at the lowest and highest income and expenditure levels.

All expenditures are expressed in U.S. dollars and adjusted for purchasing power parity (PPP), using exchange rates provided in the World Development Indicators database: official average exchange rates and PPP conversion factors for private consumption. Since different products or services have a different periodicity of purchase, the data were multiplied by the corresponding factor to express expenditures in annual terms (i.e., the monthly value would be multiplied by 12).

Further, given that national surveys are available for different years, all values were extrapolated to 2014 based on the change in the current household final consumption expenditure per capita (c). For example, in the Dominican Republic, where the last survey available is for

[4] The countries included in this data set are Bolivia, Brazil, Costa Rica, Dominican Republic, Ecuador, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Peru, Paraguay, and Uruguay. Other countries were dropped because of lack of some covariates.

2007, all values were multiplied by the factor ${}^{C_{'14}}/_{C_{'07}}$. This adjustment accounts for inflation and real growth in residential consumption. The data on households' final consumption were also obtained from the World Development Indicators database. The extrapolation affects the absolute expenditure amount, not the expenditure structure.

The same procedure was followed for the population sample weights. These factors are provided by the national statistical agencies for each survey. For years prior to 2014, the weights are adjusted for the annual rate of growth of the urban and rural population.

Harmonization of the income and expenditure headings closely follows the International Comparison Program classification, which is broadly used in national household surveys. This classification allows for a whole picture of the household budget structure by relevant expenditure items. In the case of energy commodities, for the selected countries, we distinguish between domestic energy and transport fuel. Domestic energy includes electricity, natural gas, and other fuels (such as wood, coal, and kerosene). Transport fuel aggregates all fuels reported by the household, including gasoline, diesel, and liquefied petroleum gas, among others.[5]

To reduce potential measurement problems and to reflect household economic conditions, instead of income, we use total annual spending as the main dependent variable. This variable was constructed taking the same expenditure headings in all countries. These headings include food, dwelling maintenance, transportation, communications, entertainment, clothing, health, education, and other monthly expenditures. In this paper, income groups (i.e., quintiles and deciles) are defined based on the distribution of per capita household expenditure within each country. [6]

Other socioeconomic characteristics were selected based on the literature. Table 1 presents the descriptive statistics. The table shows that traditional energy sources have a very low representation in the family budget. Since those are mostly non-commercial energy sources, it is difficult to capture their value in expenditure surveys; therefore, we focus the regression analysis on commercial energy sources: electricity, gas, and fuels for private transportation.

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[5] It is not possible to separate expenditures homogeneously by product or even category across all countries. Therefore, expenditures on gas and electricity include associated expenditures, such as the purchase and installation of meters, meter reading, storage containers, and outstanding charges. In the case of Bolivia, Colombia, Honduras, and Nicaragua, information on transport fuel expenditures aggregates all transport fuels into one category.

[6] This measure of total household expenditure includes monetary and nonmonetary reported consumption. Nonmonetary includes in-kind donations, payments or subsidies, and so forth.

With regard to domestic gas, it is important to mention that, in this sample, the reported expenditures do not distinguish between bottled gas versus network. However, network gas is only present in Brazil, Mexico, and Peru, having a small market share. For example, in Brazil, the residential sector account for around 1.4% of consumption of natural gas in 2015 (according to its national energy balance). Further, less than 1% of the household in the survey under analysis have piped connections. This implies that even distinguishing the type of domestic gas, we would probably have a small sample to perform the estimation.

3. Descriptive Patterns of Energy Expenditure by Income Decile

This section pools our underlying microdata to provide a descriptive view of some patterns that characterize energy spending in the Latin America region. An important consideration is that those patterns can be examined excluding, or not, zero reported spending. In both cases, it is assumed that *zero* does not reflect underreporting, but the non-consumption of a given good or service. Therefore, excluding zeros provides averages that more closely reflect the patterns among the users. However, this approach precludes constructing an average synthetic budget structure that takes into account multiple fuels for a given population group (because users may differ for different fuels). For this reason, some researchers prefer to compute absolute expenditures and their shares in total expenditures across all households regardless of whether they consume a given fuel (see for example Bacon et al. 2010, and Advani et al. 2013). In this section, we follow this practice with the exception of Table 3, which provides some contrasting results.

Figure 1 presents the composition of annual household energy spending, in U.S. dollars, by expenditure decile. This shows great variance between deciles; the richest income groups spend almost seven times what the poorest groups spend. Along the income distribution, the composition of energy spending changes markedly. The greatest increase is observed for liquid fuels for private transportation, which outdoes that of domestic fuels. Indeed, in the first decile, electricity and domestic gas explain around 90 percent of the household energy budget. In the richest group, such share falls to around 32 percent, being displaced by transport fuels. Figure 1 also shows that expenditure on "other" fuels is not significant, as represented in the household expenditure surveys examined here. This is the main reason why those fuels are not included in the regression analysis in the following sections.

For public policy considerations on energy affordability, it is also interesting to express previous expenditures in relative terms, as shares of the household budget (Winkler et al. 2011). Figure 2 plots the trend lines of these energy shares by decile. In contrast to the previous figure—where all energy expenditures increase in income—the associated budget shares for electricity and gas tend to decrease toward the right of the income distribution. Only the budget share of transport fuels increases, reaching a greater share than domestic energy. These interrelations between different types of energy seem to explain the S-shaped curve in total energy (bold blue line), portraying dissimilar energy spending patterns between households in different income groups. While the budget share of domestic fuel decreases along the income distribution, the total energy budget share remains roughly stable, a result of the increasing budget allocation for transport fuels.

According to these patterns, electricity and domestic gas may be considered necessity goods, while spending on transport fuels seems to have the characteristics of a luxury good. As affordability concerns are not material at higher income levels, changes in expenditures on electricity and gas are of interest at the lower income deciles. Together, these two energy sources constitute around 8 percent of household annual total expenditure in the first decile, showing greater vulnerability than richer segments.

To look at the heterogeneity between countries, Table 2 provides the energy budget share by quintile for each country in the sample. The greatest weight of domestic fuels (electricity and gas) in the poorest quintile is observed in Uruguay (13.9 percent), followed by Jamaica (9.7 percent), Brazil (8.6 percent), and Costa Rica (6.6 percent); for the rest of the countries, it is less than 5 percent. To evaluate the degree of vulnerability that these figures represent, we can consider reference estimations. For example, pooling the calculations of different studies, the energy budget share is around 2.1 percent on average and goes up to 17.5 percent for the poorest quintile (Jamasb and Meier 2010; Meier et al. 2013; Bacon et al. 2010). By contrast, Fankhauser and Tepic (2007), based on a compilation from different institutions, use as a general benchmark 10 percent of household income for electricity and 10 percent for heating. One of the lowest thresholds for all household energy expenditures is that of the United States, where it is around 6 percent of income.[7]

[7] https://www.nyserda.ny.gov/About/Newsroom/2016-Announcements/2016-05-19-Governor-Cuomo-Announces-New-Energy-Affordability-Policy; https://www.theatlantic.com/business/archive/2016/06/energy-poverty-low-income-households/486197/.

How much do these results change if we account only for households with positive expenditures? Table 3 presents the average shares conditional on positive expenditures, showing that, as expected, the energy shares increase in all countries. Noticeable, the increments are more pronounced in the case of electricity and transport fuels for the lower income groups. For example, in the case of the Dominican Republic and Honduras, the electricity share, in the 1st quintile, goes from 1.9 and 0.8 percent to 4.7 and 4.3 percent, respectively. As these are countries with high levels of informal electricity connections, these figures more closely reflect the affordability of the poorest households. Regarding transport fuels, Table 3 indicates that households dedicate a sizeable share of their budget to such fuels. Notice, however, that only 11.7 percent of household in the poorest quintile actually report positive expenditures, suggesting that the take-up is relatively low (see Table 4).

In addition to the differences across countries and income groups, there is also considerable variation within each quintile. That is, not only do energy expenditures tend to have a significantly higher weight in lower-income households; they also have a significantly more skewed distribution of energy share. Following Advani et al. (2013), this variation can be observed through a box plot. Figure 3 shows the pronounced variation in energy expenditure shares across income groups, with the distribution depicted from the 10th percentile (bottom whisker) to the 90th percentile (top whisker). The box plots are bounded by the lower quartile (bottom) and upper quartile (top), and the median is depicted by the box's central line. The variability is greater for poorer households: in the poorest quintile, one in ten households spends more than 15 percent of its budget on energy, while more than one in ten report zero energy spending. In the top quintile, by contrast, for the interquartile range, or 50 percent of all households, the energy budget shares are in the narrower range from 1.4 to 4 percent.

It is also useful to know how the aggregate energy expenditure distribution by income and fuel. Table 5 shows that the 20 percent richest concentrate more than 40 percent of total expenditures on energy, while the bottom 20 percent poorest concentrate around 7 percent. Transport fuels constitute the bulk of the energy basket in the richest group. Around 64 percent of total energy expenditures in the fifth quintile go toward private transportation. In contrast, expenditures on domestic energy sources make up the largest share of energy expenditures in the poorest income group, at 76 percent. This aggregate view depicts the distributive characteristics of energy expenditures. While the poorest households are the most vulnerable to price shocks given the energy share in their expenditure, their share of national energy expenditures is less than one-sixth of the highest quintile. This pattern is clearest in the case of fuels for private transportation, where the poorest households account for less than 2 percent of aggregate expenditures on transport fuels, while the richest quintile accounts for 30 percent. In this sample, we do not observe substantial differences among quintiles for domestic gas.

4. Empirical Approach

This section presents the approach to investigate the determinants of energy expenditure. Following a stream of empirical work (e.g., Foster et al. 2000; Meier et al. 2013; Longhi 2015; Martins et al. 2016), we propose a system of equations following a common unrestricted specification for all fuels:

$$lnE_h = \ln f(Y_h, \alpha) + \beta X_h + I_{lh} + \varepsilon_h \quad (1)$$

where E_h represents the spending and budget shares of household h on each specific energy source (i.e., electricity, domestic gas, and transport fuels). $f(Y_h, \alpha)$ represents a functional form of income (Y), which allows us to use different specifications of interest. Energy expenditure and income are expressed in natural logarithms. For the baseline regressions, $f(Y_h, \alpha)$ takes a linear form, $\alpha\ln(Y_h)$, and the estimated α represents the average income elasticity. Consistent with the literature, it is expected to have a positive sign and be less than unity. Although this linear specification provides an overall view of the energy-income association, it is restrictive to assume that this relationship does not change along the income distribution.

Therefore, to examine the correlation between energy expenditures and income, we specify the income function as a polynomial. In the literature, $f(\cdot)$ is specified as first-, second-, and third-order functions (Banks et al. 1997; Meier et al. 2013). We test these specifications and compare their performances to find the most suitable functional form for each energy source.[8] This is an important distinction, as the relationship between energy expenditures and income may depend on the actual energy type. In the cases of electricity and gas, the best fits were found to be a third- and second-degree polynomial, respectively. For transport fuels, the best fit was third degree for spending and second degree for budget share. See Annex B for the regression details.

An advantage of using a polynomial function is that it allows estimating the elasticity at different points of the income distribution. For example, the elasticity corresponding to the third-

[8] We compare their information criteria statistics and adjusted R-squared.

degree polynomial takes the form $\varepsilon_{E,Y} = \alpha_1 + 2\alpha_2 \ln Y_h + 3\alpha_3 \ln Y_h{}^2$. However, the expected signs of the estimated coefficients are less clear, and the focus is on approximating the behavior of energy expenditure along the income range, being a matter of empirical debate. Meier et al. (2013) find that energy spending elasticities increase nonlinearly with income. In contrast, for the case of energy consumption, Foster et al. (2000) (at the household level) and Jimenez and Yépez-García (2016) (at the country level) find evidence of an inverse U-shaped relationship, in the sense that energy consumption tends to stabilize, and even reduce, at higher income levels.

For the set of covariates (X_h) that may affect energy expenditure, we include family age and size composition, urban/rural geographic area, dwelling size, appliances (TV, refrigerator, and computer), vehicle ownership, and ownership of the dwelling. In the case of food expenditures, Benus et al. (1976) evaluate the EOS of family composition by distinguishing the number of members per age group within the household, and adding their squares. The first coefficient is expected to be positive, since expenditures typically increase with family size. The coefficient of the squared variable is interpreted as the direction of the EOS for each cohort. Following this approach, we include two cohorts (number of household members younger than 12 years, and number older than 12 years) and their corresponding squares. To evaluate EOS with respect to dwelling size, we extend this logic by including the square of the number of rooms in the dwelling.

In this exercise, we do not have information on the energy prices paid by end-users. Such information is only available at the country aggregated level, so including those average prices would only capture cross-country variations and could be a noisy measure, as prices may differ significantly within countries. Price variation occurs because most energy pricing mechanisms consider consumption bands and household location settings, among other factors, thereby leading to heterogeneity in final prices across households. This is a context in which average national energy prices are not very informative, especially when they come from cross-sectional data.[9] To reduce this problem, we take advantage of the detailed geographical information provided in the data. This information is translated into fixed effects (I_h), indicating each household's location, which, depending on the survey, may represent a municipality or village. The analysis accounts for more than 8,900 indicators of locations, to capture differences in energy prices faced by households living within the same area, as well as other location-specific effects,

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[9] Including country-average price data here may lead to significant measurement error (me) and, thus, biased estimates. That is, if me is correlated with income or other household characteristics, it will bias all the estimated parameters $(\hat{\alpha}, \hat{\beta})$. The location parameter, among others, may capture the effect of prices, in which case we would not be able to identify the price effects.

such as temperature and the reliability of energy services. These variables also capture country-specific characteristics, such electricity tariffs structures, or natural resource abundance (which may affect energy costs).

However, the location indicator may not completely allow us to identify differences in energy prices paid by end-users within a given area. For example, on the one hand, in the case of electricity, incremental tariffs based on consumption bands may bias the estimation of the income coefficient, since higher income groups tend to present higher electricity consumption and therefore face greater tariffs. Similarly, in countries such as Mexico and Peru, electricity tariffs—in addition to being defined by band of electricity consumption—also depend on geographical location, and tariffs tend to be lower in relatively poorer areas. On the other hand, prices for domestic gas and transport fuels may present spatial variability for different reasons. Prices may vary, reflecting price-skimming strategies of the suppliers, or due to differences in the complementary services provided along with the fuels. At the same time, these prices can vary because of transactional costs, and it is expected that rural areas tend to face higher energy prices.

Meier et al. (2013) argue that those differences can be interpreted as measurement error. The authors use average annual prices and a proxy variable to control for systematic deviations using the following decomposition of the price vector:

$$lnP_h = lnP_t + ln\left(\frac{P_h}{P_L}\right) + ln\left(\frac{P_L}{P_t}\right) \tag{2}$$

where P_h is the actual price paid by the household, P_L is the price common to the location or area of a given household, and P_t is the average annual price. Following this strategy, we can include the price vector in our previous specification (equation 1) and rewrite it as follows:

$$\mathrm{lnE_h} = \ln f(\mathrm{Y_h}, \alpha) + \beta \mathrm{X_h} + \gamma \mathrm{lnP_t} + \gamma\left[\ln\left(\frac{\mathrm{P_h}}{\mathrm{P_L}}\right) + \ln\left(\frac{\mathrm{P_L}}{\mathrm{P_t}}\right)\right] + \mathrm{I_h} + \varepsilon_\mathrm{h} \tag{3}$$

The terms in brackets represent the measurement error. As those terms are not available, Meier et al. use income differences as a proxy. That is, they replace $\mathrm{P_h}$ by household income and $\mathrm{P_L}$ by average income within a geographical area. In our case, the incomes and their averages by location are calculated from the surveys in each country. In our cross-sectional setting, average energy prices ($\mathrm{lnP_t}$) and geographical differences in energy prices ($\ln\left(\frac{\mathrm{P_L}}{\mathrm{P_t}}\right)$) will be absorbed by location fixed effects, $\mathrm{I_h}$. Therefore, we are left to correct the difference in energy prices within each geographic location, such that the final specification is

$$\mathrm{lnE_h = ln\, f(Y_h, \alpha) + \beta X_h + \gamma ln\left(\frac{Y_h}{Y_I}\right) + I_h + \varepsilon_h} \tag{4}$$

where $\ln\left(\frac{\mathrm{Y_h}}{\mathrm{Y_I}}\right)$ is the proxy for different prices faced by households within their location. We call this correction term "*ywithin*." This correction term is not of primary interest in our analysis; rather, it is mainly used in an attempt to clear up the omitted variable problem in the estimations. Intuitively, as *ywithin* reflects the positive price differential faced by households, for higher values for this variable we should expect lower energy expenditure, $\hat{\gamma} < 0$. However, in the case of budget shares, the expected sign of $\hat{\gamma}$ depends on the nature of the good. For necessity goods, it may be expected that the higher is the value of *ywithin* (higher prices faced by the end-user), the higher is the budget share. As expressed *ywithin* can take zero or negative values, therefore to ease interpretation, we applied the custom monotonic transformation $\ln\left(\frac{\mathrm{Y_h}}{\mathrm{Y_I}} + 1\right)$.

It is important to emphasize that we interpret the estimations as conditional correlations. That is, although we expect that the inclusion of the covariates and high-dimensional fixed effects helps to clean up the estimates, they may still be subject to different sources of bias, namely: measurement error of income, sample selection, functional form misspecification, and simultaneity bias between energy expenditure and household income. Nonetheless, in the following, we discuss the implications of these potential problems and how we expect to mitigate them.

Regarding measurement error, one of the main concerns in our context is with household income, as it is known to be highly subject to misreporting, potentially leading to attenuation bias. Following Kay et al. (1984) and Pudney and Francavilla (2006), instead of income, we use household expenditure as a more reliable measure of household economic welfare.

In the case of sample selection, three issues may affect the reliability of the estimated parameters. The dependent variable may be zero for three possible reasons: (i) non-consumption, (ii) no recall of information, and (iii) omitted response during the survey. The last two reasons could lead to inconsistently estimated relationships and, therefore, a lack of external validity due to the censored nature of the data. Here, we assume that (ii) and (iii) are not systematic in our data, which is a common implicit practice in several applications (Foster et al. 2000; Meier et al. 2013).[10]

Functional form misspecification implies that our average estimate may not be representative of the overall relationship, for example, if such link is pronouncedly nonlinear. We expect that the proposed polynomial specifications—for income, family age composition, and dwelling size—will reduce this problem.

The main concern to avoid attributing a causal interpretation to the estimates is the potential existence of simultaneity bias. That is, although the focus is on the effect of income changes on energy spending, it may also be the case that energy spending would, in turn, affect income. The channel would be somewhat indirect; as energy expenditure increases, it generally would represent higher energy use, which may signify a more productive use of time within the dwelling—i.e., better conditions for studying or developing other productive activities. Such a more productive use of time would translate into higher incomes and therefore greater energy expenditures.

5. Results

This section presents the main results of the strategies previously described. First, we present the average estimates of the energy regressions. Subsections 5.2 to 5.3 expand the empirical analysis of the relationship between energy expenditure and income.

5.1 Determinants of Energy Expenditure

Tables 6 and 7 summarize the results of regressing equation 4 for energy spending and energy share of total household expenditure, respectively. Conditional on the set of covariates, the relationship between energy expenditure/share and income is assumed to be linear. Then, the returned coefficient represents the average income elasticity of energy expenditure for the pooled sample.

Overall, the results indicate that household characteristics play a significant role and operate in an expected fashion in determining energy spending, although with relevant distinctions

[10] Under (ii) and (iii), expenditure becomes a latent variable, and its cause is difficult to determine. See Nicoletti and Peracchi (2005) and De Luca and Peracchi (2012) for a discussion of estimation issues for Engel expenditure curves.

between fuels. With respect to energy expenditures (Table 6), the highest sensitivity to an income change is given for transport fuels (0.67 elasticity), followed by electricity (0.39) and domestic gas (0.19). However, although spending on transport fuel increases the most with income, the energy share estimates (Table 7) indicate that its budget weight decreases. That is, on average, expenditure on all fuels increases at a lower rate than income does.

For family age composition, the results strongly suggest the prevalence of EOS with respect to domestic energy (i.e., electricity and domestic gas). For those fuels, all first-degree terms relating to the age distribution of the family—number of children and number of household members older than 12—are positive, indicating that greater household size tends to be associated with higher energy expenditures, as well as higher energy share. All the quadratic terms have a negative sign, reflecting the realization of EOS in energy expenditures. The fact that those quadratic terms are negative and statistically significant in the energy share regression indicates that those EOS are quite relevant for the structure of household budgets. In contrast, expenditure on and share of transport fuels appear not to be systematically correlated with household age composition. These findings are consistent with those of Ironmonger et al. (1995) and Underwood and Zahran (2015). As the authors suggest, the global trend toward smaller family size may offset the potential gain in energy efficiency.

We also observe EOS with respect to dwelling size for electricity spending and its budget share. As expected, there is a positive association between the number of rooms in the dwelling, while the coefficient for the squared variable, although near zero, is statically significant and has a negative sign. This suggests the presence of some energy savings with incremental dwelling size. In the case of domestic gas, the estimations are less clear, with EOS for expenditures but diseconomies of scale in budget share. With respect to transport fuel, a priori there is no clear association with number of rooms. This is the case in our estimations.

An interesting question is whether these EOS differ between rich and poor. We evaluate this by interacting three income groups—first income group = deciles 1 to 3, second = deciles 4 to 6, and third = deciles 7 to 10—with the variables family and dwelling size. Figure 4 presents the estimated marginal effects of electricity and gas expenditure. In the case of domestic gas, the intensity of EOS appears to be the same among the three income groups. In the case of electricity, the EOS of dwelling size also seems to behave in a similar way; however, the EOS of family size seems to be more pronounced for the richest group, emerging for families with more than six members.

The direction of the estimated coefficients for urban/rural location also depends on the specific fuel. Overall, urban households tend to spend more on and have a higher energy weight in their budgets (column 1 in Tables 6 and 7). This result seems to derive mainly from electricity expenditure, which represents an additional 0.89 percent of the budget for urban households, or 30 percent more annual expenditures (column 2 in Tables 6 and 7). Taking as a reference the unconditional rural average electricity expenditures, this means additional spending of around US$100. The association with domestic gas is quite small and less clear. Families living in urban areas spend 1.5 percent less on domestic gas than those in rural areas, although the coefficient is only weakly significant (Table 6, column 3). In contrast, in the budget share regression, the estimated coefficient is positive and strongly significant, indicating that the share of gas is 0.2 percent higher in urban areas (Table 7, column 3).

With respect to transport fuels, differences by urban/rural areas are also small. Compared with rural households, urban ones tend to spend 7 percent less on transport fuels, with an associated 0.3 percent lower share of their budget. Recall that these estimations are conditional on having positive energy expenditure. Unconditional estimates usually show that in urban areas liquid fuel expenditures tend to be higher. This is because the computations include zero expenditures, of which urban households tend to have a lower proportion.

The appliances variables—refrigerators, computers, and TVs—are strongly correlated with higher electricity expenditure and the share of electricity in the household budget. Consistent with the extensively documented role of these appliances in increasing energy consumption, our estimations indicate that having a refrigerator, computer, and TV increases energy expenditure (and shares) by about 30.8 (0.86 percent), 13.8 (0.41), and 11.3 percent (0.31), respectively. These estimates are greater than the marginal income effects. As would be expected, having appliances is not systematically related to expenditures on domestic gas or transport fuels.

As in Meier et al. (2013), the variable that is intended to capture measurement error in individual energy prices is statically significant for all domestic fuels, with the expected negative sign. That is, *ywithin* seems to work in capturing prices differentials within an area of residence, in the sense that it echoes higher prices faced by the end-users, having a negative effect on energy expenditures. In addition, and in a symmetric way for the case of energy budget share as the dependent variable, our estimated coefficients for *ywithin* are positive and significant for domestic fuels. That is, *ywithin* (energy prices) would be positively associated with the weight of energy consumption in the household budget, suggesting that electricity and gas are necessity goods. The results are not significant in the case of transport fuels.

As an aside, to provide a glance at the heterogeneity in our estimations, we also perform the regression by each country in our sample. Overall, the findings prevail across countries. For simplicity, Table 8 reports the income elasticities by country. Annex C reports the complete results. Apart from transport fuels in Jamaica, all the estimated income elasticities for energy expenditures are in the range (0,1), reinforcing the intuition that in the household sector, all fuels—even for private transportation—could be considered necessity goods.

5.2 Energy Engel Curves

This subsection examines the shape of the relationship between energy expenditure/share and household income. For these estimations, in equation 4, we specify $\ln f(Y_h, \alpha)$ with the best fit polynomial for each fuel (see Annex B), controlling for the same set of covariates as in the other regressions. Figure 5 presents the conditional predicted energy expenditures (panel A) and energy shares (panel B) along the income distribution of our sample. These curves are typically referred to as conditional Engel curves.

The conditional predicted energy expenditure monotonically increases with income, shaping a linear relationship with a relatively tight 95 percent confidence interval. According to these estimations, greater differences are found in transport spending, as the corresponding Engel curve has a steeper slope than for electricity and gas.

Although energy expenditures increase with income, panel B shows that there is a large decrease in their budget weight as families become wealthier. As in panel A, the 95 percent confidence interval is relatively tight, suggesting low heterogeneity across households within each income group. Despite that poorer households have lower energy expenditures, they compromise a larger share of household income, implying pronounced affordability problems. Everything else constant, expenditure on electricity and gas in households at the lower income decile tend to represent between 6 and 12 percent of their budgets.

These patterns also prevail for transport fuel. This finding is in contrast with Figure 2, where the share of transport fuels increases with income. However, Figure 2 shows unconditional averages by income group, which do not account for other covariates, such as household size or ownership of vehicles, among others. The estimated curves in Figure 5 represent the net correlation between energy expenditures/shares and household income conditional on all the covariates, and therefore offer a better approximation of the true association between those variables.[11] We interpret the differences between the conditional and unconditional transport fuel shares as being a result of significant heterogeneity in the values of the covariates between income groups. In other words, conditional on being actual users of transport fuels—i.e., car owners—the share of expenditures on those fuels decreases for richer households.

5.3 Estimated Income Elasticities along the Income Distribution

Figure 6 plots the estimated income elasticities at different income percentiles. In line with previous results, these curves show that the elasticities remain positive and lower than unity for all fuels over the entire income distribution. However, and in contrast to the energy Engel curves, the elasticities present markedly different paths across fuels. For the case of electricity, its corresponding elasticity presents a concave shape, increasing from around 0.2 and stabilizing around 0.5. That is, electricity expenditure grows at an incremental rate as income rises, up to a point where the rate of change stabilizes at a positive level. By contrast, the elasticity of domestic gas tends to decrease, although with greater variance. Still, the greatest variance is observed for transport fuels, for which the elasticity growths up to the 25th income percentile and then declines for richer segments. These estimates are consistent with those of Foster et al. (2000) and Jimenez and Yepez-Garcia (2016), who find that the income elasticity of energy consumption decreases to the right of the income distribution. These results may reflect a decreasing marginal utility in energy consumption and/or access to durable assets that are more energy-efficient.

The results in this section are robust in the estimations by country (Annex C) and to the inclusion of different variables, such as the number of TVs and vehicles (information that is available for a reduced sample of countries). The results are also robust to the use of alternative polynomial specifications.

[11] For these predictions, all the covariates are set to their average values.

6. Conclusions

We used a comprehensive data set of households in 13 Latin American countries to study the determinants of energy expenditure, with a focus on its relationship with income and the presence of EOS. Specifically, we address the link between energy expenditures—electricity, domestic gas, and transport—and household location, family composition, dwelling size, durable goods ownership, and income. Altogether, our findings highlight the relevance of these variables in shaping energy spending and affordability, but with important differences between fuels.

In addition to income, domestic fuels expenditures/budget shares are importantly driven by household socioeconomic characteristics. Urban/rural location and household appliances explain more than 50 percent of energy expenditures; however, its weight in the family budget tends to decrease as income grows at a higher rate. On the other hand, the materialization of EOS of household size is clearer than for dwelling size, and further, it is more pronounced in wealthier households.

The estimated conditional Engel curves have similar shapes between fuels; however, we find noticeable differences in the path of income elasticity along the income distribution. Although these elasticities are less than unity for all fuels, they tend to be highest across all income groups for transport fuel, followed by electricity and domestic gas. For electricity, the elasticity monotonically increases with income, but tends to stabilize starting at the 75th percentile. For gas, it decreases continually over the income range of our sample. For transport fuel, it increases up to the 25th percentile, and then begins to decrease. These results portray electricity, domestic gas, and even transport fuels as necessity goods. However, it is important to take into account that the richer segments concentrate most of the residential energy expenditure, especially in the case of liquid fuels.

These results imply that demographic and construction trends have implications for energy policy. The trend toward smaller family size may dilute the EOS of household size. On the other hand, our findings suggest that energy efficiency and conservation standards for household and building construction are clearly required to compensate their observed small EOS.

To the extent that the observed energy spending patterns reflect energy consumption, our findings may have implications for energy efficiency and conservation policies. The detected EOS suggest that energy efficiency policies for housing and buildings may have significant effects not only on energy consumption, but also on related expenditures, relieving household budgets.

Similarly, given the sizeable explanatory power—on energy expenditures—of ownership of appliances and cars, these implications extend to the implementation of energy efficiency standards for durable goods. These results suggest that such policies not only would save energy, but also would increase affordability, which would have a greater effect on the poorer groups. To inform energy efficiency policies, further research may be oriented to investigate, among others, the differences in EOS between income groups.

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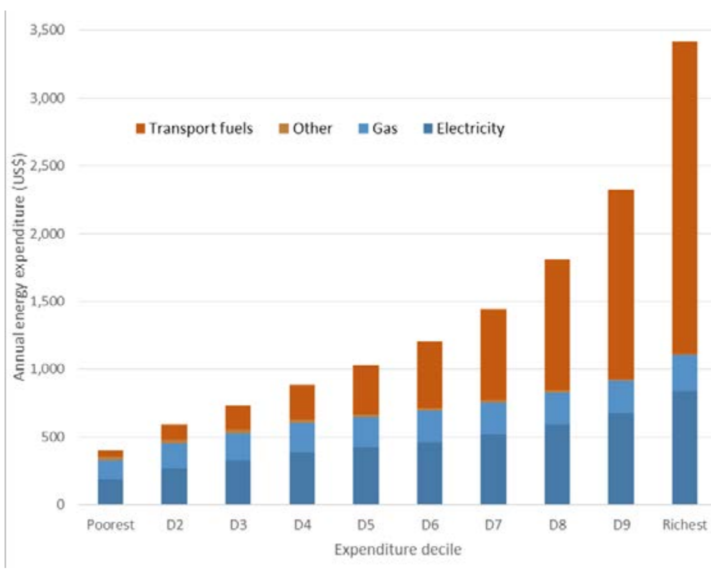
Table 1: Summary Statistics of Household Fuel Expenditures

Variable	Obs	Mean	Pct1	Pct99	SD
Share of electricity expenditures	164,554	3.60	0.30	18.16	3.72
Share of household domestic gas expenditures	145,058	2.23	0.11	12.31	2.61
Share of expenditures on other domestic fuels	26,172	3.08	0.05	21.40	4.56
Share of transportation expenditures	54,518	7.42	0.48	32.48	6.67
Annual household expenditures on electricity (PPP US$)	164,554	493	34	2,667	571
Annual household expenditures on domestic gas (PPP US$)	145,058	237	41	928	204
Annual household expenditures on other fuels (PPP US$)	26,172	232	7	1,609	355
Annual household expenditures on transportation fuels (PPP US$)	54,518	1,709	73	9,606	2,033
Annual household total expenditures (PPP US$)	189,555	23,439	1,340	82,457	638,403
Area of habitation (rural/urban; urban=1, %)	189,555	0.72	0.00	1.00	0.45
Household size	189,555	3.80	1.00	10.00	1.96
Dwelling Size (total number of rooms)	189,555	4.03	1.00	10.00	2.50
Ownership of a refrigerator (%)	189,555	0.73	0.00	1.00	0.45
Ownership of a computer (%)	189,555	0.24	0.00	1.00	0.43
Ownership of a TV (%)	189,555	0.88	0.00	1.00	0.33
Ownership of an automobile (%)	189,555	0.20	0.00	1.00	0.41
Ownership of the dwelling (%)	189,555	0.70	0.00	1.00	0.46
Education level (from 1=incomplete primary or less to 6=university or higher)	189,555	2.85	1.00	6.00	1.32
Age of the household head	189,554	48.38	21.00	86.00	15.86
Gender of the household head (male=1, %)	189,555	0.72	0.00	1.00	0.45

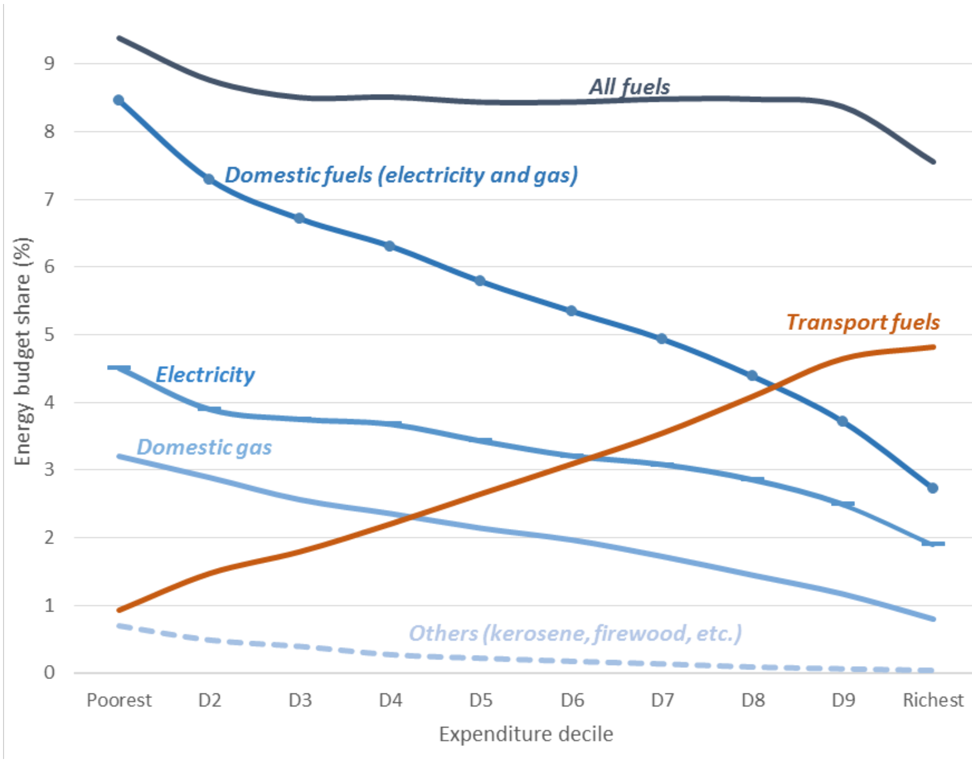
Note: Column Obs counts only households with positive reported values. All values are weighted using the population expansion factor.

Figure 1: Composition of Household Energy Spending by Expenditure Decile



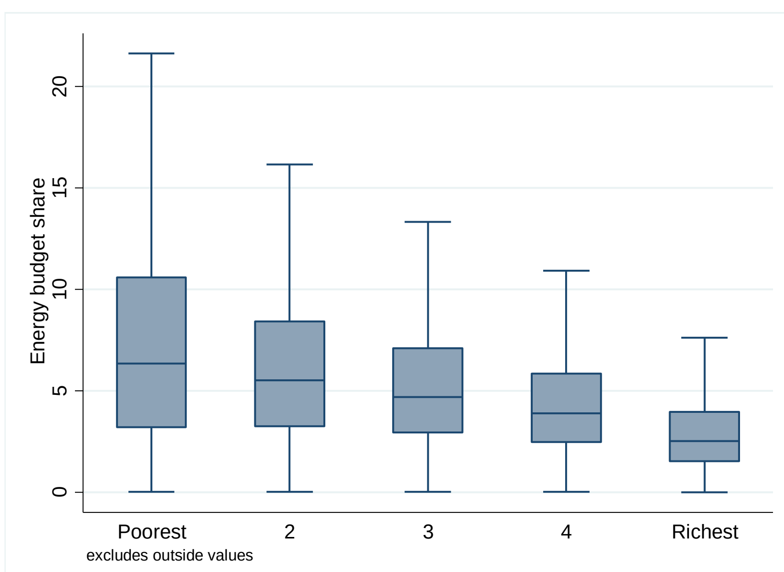
Note: Includes zero reported energy expenditures. Values are weighted using the population expansion factor.

Figure 2: Household Energy Budget Share by Expenditure Decile



Note: Includes zero reported energy expenditures. Values are weighted using the population expansion factor.

Figure 3: Household Energy Spending by Expenditure Decile



Note: The figure does not include outside values. Values are weighted using the population expansion factor.

Table 2: Energy Budget Shares, by Total Household Expenditure Quintile (%)

Country	Fuel	Poorest	Q2	Q3	Q4	Richest	Country	Fuel	Poorest	Q2	Q3	Q4	Richest
		Expenditure quintile, pc hh							Expenditure quintile, pc hh				
Bolivia	All	3.3	3.7	3.6	4.0	3.7	Jamaica	All	10.0	10.3	11.2	11.0	11.9
	Electricity	1.8	1.9	2.0	2.0	1.8		Electricity	7.1	6.9	7.3	6.2	5.3
	Gas	1.0	0.8	0.7	0.6	0.4		Gas	2.6	2.8	2.7	2.4	1.7
	Transport fuels	0.5	1.0	1.0	1.4	1.5		Transport fuels	0.2	0.6	1.2	2.4	4.9
Brazil	All	9.5	8.3	8.2	8.0	7.1	Mexico	All	9.0	10.0	10.2	10.9	10.6
	Electricity	5.0	4.4	3.8	3.3	2.2		Electricity	3.7	3.2	2.7	2.6	1.9
	Gas	3.6	2.2	1.6	1.0	0.5		Gas	3.1	3.6	3.4	2.8	1.9
	Transport fuels	0.9	1.8	2.8	3.8	4.4		Transport fuels	2.1	3.2	4.2	5.5	6.8
Costa Rica	All	11.4	9.5	8.6	8.2	6.7	Nicaragua	All	3.1	5.2	6.3	7.2	9.9
	Electricity	5.3	3.9	3.2	2.4	1.6		Electricity	2.0	2.8	2.8	2.9	3.2
	Gas	1.3	0.7	0.5	0.3	0.1		Gas	1.0	1.9	2.2	2.2	1.7
	Transport fuels	4.8	4.9	4.9	5.5	5.0		Transport fuels	0.1	0.6	1.2	2.1	5.0
Dominican Republic	All	6.9	7.1	7.3	8.0	9.4	Peru	All	6.2	6.0	5.6	5.1	4.8
	Electricity	1.9	2.2	2.2	2.4	2.5		Electricity	2.9	2.6	2.7	2.6	2.4
	Gas	3.1	2.7	2.3	1.9	1.3		Gas	2.8	2.9	2.4	1.9	1.3
	Transport fuels	1.9	2.3	2.8	3.7	5.7		Transport fuels	0.5	0.5	0.5	0.5	1.2
Ecuador	All	2.8	2.8	2.8	3.1	3.5	Paraguay	All	5.2	6.3	7.2	7.6	8.5
	Electricity	1.8	1.7	1.7	1.7	1.6		Electricity	2.1	2.4	2.7	2.7	2.6
	Gas	0.7	0.5	0.4	0.3	0.2		Gas	0.8	1.5	1.4	1.4	1.1
	Transport fuels	0.3	0.5	0.7	1.0	1.8		Transport fuels	2.2	2.4	3.1	3.4	4.7
Guatemala	All	5.3	5.8	7.4	8.3	9.0	Uruguay	All	15.6	14.4	12.4	10.8	9.8
	Electricity	4.7	4.0	4.2	4.1	3.5		Electricity	9.8	8.9	7.4	6.0	4.5
	Gas	0.2	1.1	1.9	2.1	1.5		Gas	4.1	3.0	2.3	1.7	1.1
	Transport fuels	0.5	0.7	1.3	2.1	3.9		Transport fuels	1.7	2.5	2.7	3.2	4.2
Honduras	All	0.9	2.7	4.6	6.0	8.6	Pooled Sample	All	8.4	8.2	8.2	8.4	7.9
	Electricity	0.8	2.0	2.8	2.8	3.0		Electricity	4.2	3.7	3.3	3.0	2.2
	Gas	0.1	0.4	1.0	1.3	0.7		Gas	3.0	2.5	2.1	1.6	1.0
	Transport fuels	0.0	0.3	0.8	2.0	4.9		Transport fuels	1.2	2.0	2.9	3.8	4.7

Note: Includes zero reported energy expenditures. All values are weighted using the population expansion factor.

Table 3: Energy Budget Shares, by Total Household Expenditure Quintile (%)

Country	Fuel	Expenditure quintile, pc hh Poorest	Q2	Q3	Q4	Richest	Country	Fuel	Expenditure quintile, pc hh Poorest	Q2	Q3	Q4	Richest
Bolivia	Electricity	1.9	2.0	2.0	2.1	1.8	Jamaica	Electricity	10.9	8.6	8.4	7.0	5.6
	Gas	1.5	1.0	0.8	0.6	0.4		Gas	6.7	5.2	4.7	4.1	3.3
	Transport fuels	4.0	4.3	3.6	4.0	3.7		Transport fuels	7.9	8.2	8.7	9.3	9.6
Brazil	Electricity	5.8	4.8	4.1	3.4	2.3	Mexico	Electricity	4.1	3.5	2.9	2.7	2.0
	Gas	4.0	2.3	1.6	1.1	0.6		Gas	7.4	5.6	4.7	3.9	2.7
	Transport fuels	11.2	9.6	9.5	8.8	7.0		Transport fuels	11.7	10.7	10.6	10.8	9.7
Costa Rica	Electricity	5.3	3.9	3.2	2.4	1.6	Nicaragua	Electricity	3.4	3.8	3.7	3.7	3.7
	Gas	2.2	1.4	1.1	0.7	0.4		Gas	6.5	5.0	4.1	3.3	2.2
	Transport fuels	10.2	8.5	8.4	7.9	6.7		Transport fuels	10.6	11.9	11.3	10.9	13.4
Dominican	Electricity	4.7	4.2	3.6	3.6	3.1	Peru	Electricity	3.7	2.9	2.9	2.8	2.5
Republic	Gas	4.0	3.4	2.9	2.6	2.1		Gas	6.8	3.7	2.7	2.0	1.4
	Transport fuels	9.5	8.7	9.2	10.5	10.8		Transport fuels	5.4	3.6	3.3	3.5	4.3
Ecuador	Electricity	2.3	2.1	2.0	1.9	1.6	Paraguay	Electricity	2.6	2.9	3.1	3.2	2.9
	Gas	0.8	0.6	0.5	0.4	0.3		Gas	2.6	2.3	1.9	1.8	1.3
	Transport fuels	4.2	3.8	3.8	3.9	3.9		Transport fuels	4.3	4.3	4.9	5.2	6.5
Guatemala	Electricity	7.0	5.1	5.0	4.6	3.7	Uruguay	Electricity	11.7	9.5	7.7	6.1	4.5
	Gas	8.8	5.5	4.2	3.2	2.1		Gas	6.5	4.8	3.6	2.8	1.7
	Transport fuels	10.3	7.3	6.5	6.0	6.7		Transport fuels	7.1	6.6	6.0	6.0	6.3
Honduras	Electricity	4.3	3.7	3.6	3.4	3.2	Pooled	Electricity	5.0	4.2	3.6	3.2	2.3
	Gas	10.6	7.4	4.3	3.2	1.9	Sample	Gas	4.5	3.0	2.4	1.9	1.2
	Transport fuels		15.4	15.0	14.0	11.1		Transport fuels	10.2	9.2	9.3	9.0	7.7

Note: Excludes zero reported energy expenditures. All values are weighted using the population expansion factor.

Table 4: Distribution of Fuels' Take-Up by Quintile,
(as percentage of total households within each quintile)

Expenditure quintile, pc hh	Electricity	Dom. Gas	Transport Fuel
Poorest	77.2	64.5	11.7
Q2	84.7	77.1	19.8
Q3	88.3	81.2	26.9
Q4	91.2	82.3	36.3
Richest	94.4	79.0	52.8
Total	86.8	76.5	28.8

Note: Includes zero reported energy expenditures. Values are weighted using the population expansion factor.

Table 5: Distribution of Aggregate Energy Expenditures, by Quintile and Fuel (as a percentage of total energy expenditure)

Expenditure quintile, pc hh	All fuels	Electricity	Dom. Gas	Transport Fuel
Poorest	6.8	3.3	2.3	1.2
Q2	11.4	5.2	3.1	3.2
Q3	16.1	6.5	3.3	6.3
Q4	23.7	8.1	3.5	12.1
Richest	42.0	11.1	3.8	27.2
Total	100.0	34.3	15.9	49.8

Note: Includes zero reported energy expenditures. Values are weighted using the population expansion factor.

Table 6: Energy Expenditure Regressions, Pooled Sample

	Dependent: Ln(expenditure in..)			
	All	Electricity	Gas	Transport fuels
	(1)	(2)	(3)	(4)
Ln(household expenditure)	0.636***	0.386***	0.192***	0.667***
	(0.019)	(0.016)	(0.014)	(0.034)
Urban=1, Rural=0	0.765***	0.297***	-0.015*	-0.055**
	(0.021)	(0.010)	(0.007)	(0.021)
Number of children	0.016	0.033***	0.032***	-0.045**
	(0.010)	(0.008)	(0.007)	(0.016)
Number of children squared	-0.010***	-0.005**	-0.002	0.005
	(0.002)	(0.002)	(0.001)	(0.003)
Number of hh members older than 12	0.086***	0.102***	0.127***	-0.032
	(0.014)	(0.012)	(0.010)	(0.025)
Number of hh members older than 12, squared	-0.010***	-0.010***	-0.011***	-0.001
	(0.001)	(0.001)	(0.001)	(0.003)
Number of rooms in the dwelling	0.108***	0.068***	0.022***	0.027***
	(0.006)	(0.004)	(0.003)	(0.008)
Number of rooms in the dwelling, squared	-0.005***	-0.001***	-0.001*	-0.001*
	(0.000)	(0.000)	(0.000)	(0.000)
Ownership of a refrigerator	0.409***	0.308***	0.044***	-0.003
	(0.014)	(0.011)	(0.008)	(0.022)
Ownership of a computer	0.051***	0.138***	-0.009	0.008
	(0.010)	(0.008)	(0.007)	(0.014)
Ownership of a TV	0.546***	0.113***	0.007	0.005
	(0.020)	(0.012)	(0.010)	(0.026)
Ownership of an automobile	0.666***	0.081***	0.009	0.305***
	(0.010)	(0.009)	(0.007)	(0.014)
Ownership of the dwelling	0.065***	0.038***	0.020**	0.007
	(0.009)	(0.008)	(0.006)	(0.015)
ywithin	-0.135***	-0.261***	-0.180***	-0.025
	(0.040)	(0.033)	(0.029)	(0.063)
Education level of the hh head	0.039***	0.023***	-0.003	0.014**
	(0.003)	(0.003)	(0.002)	(0.005)
Age of the hh head	0.003***	0.004***	0.004***	0.001*
	(0.000)	(0.000)	(0.000)	(0.001)
Gender of hh head	0.066***	-0.018**	-0.011*	0.098***
	(0.008)	(0.007)	(0.006)	(0.015)
Observations	189554	164554	145058	54518
Adjusted R-squared	0.624	0.624	0.552	0.544

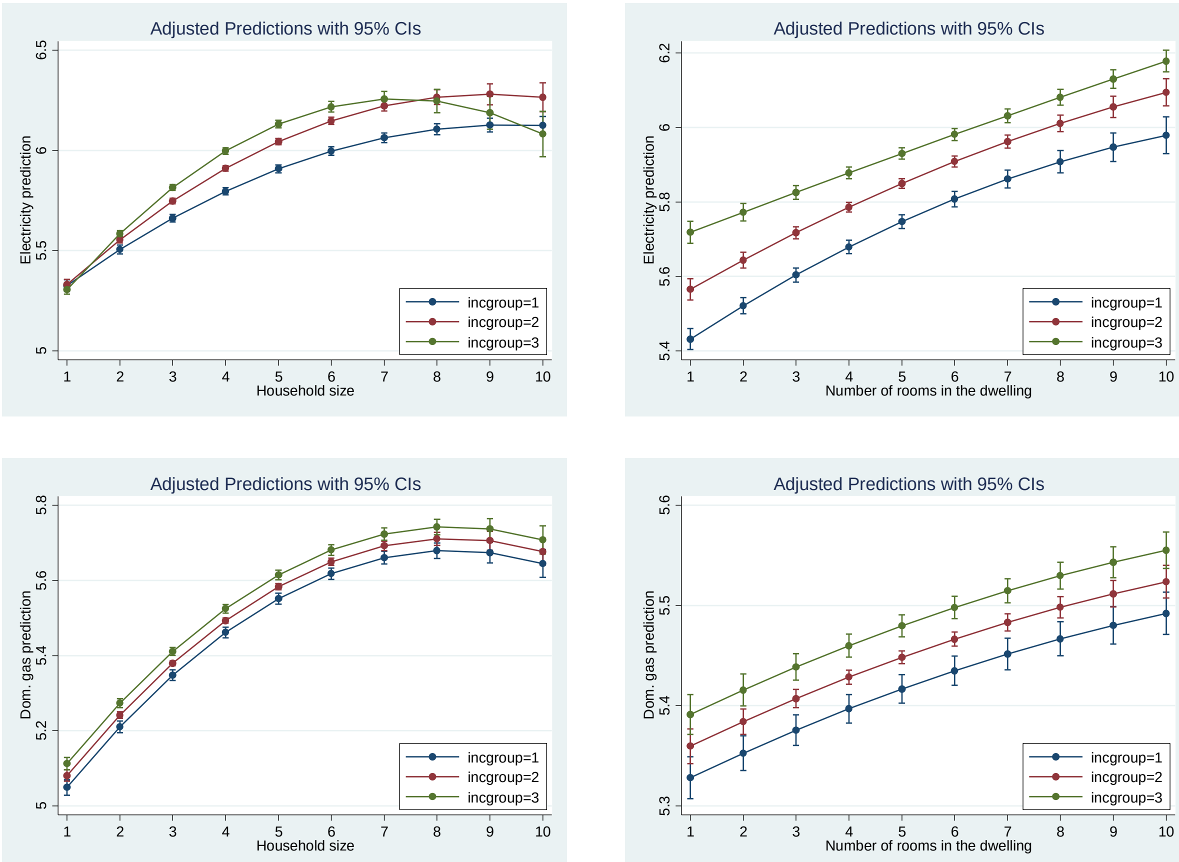
Note: Robust standard errors in parentheses. Estimation based on households with positive reported energy expenditures. Regressions are weighted by the population expansion factor. Statistical significance at *<0.1, **<0.05, and ***<0.01. All regressions contain household location dummies.

Table 7: Energy Budget Share Regressions, Pooled Sample

	Dependent: Income Share of …			
	All	Electricity	Gas	Transport fuels
	(1)	(2)	(3)	(4)
Ln(household expenditure)	-3.232***	-3.256***	-2.949***	-2.478***
	(0.147)	(0.106)	(0.067)	(0.297)
Urban=1, Rural=0	1.627***	0.889***	0.244***	-0.172
	(0.071)	(0.044)	(0.029)	(0.159)
Number of children	0.140*	0.491***	0.340***	-0.399**
	(0.071)	(0.046)	(0.026)	(0.143)
Number of children squared	-0.020	-0.048***	-0.031***	0.052
	(0.014)	(0.010)	(0.005)	(0.027)
Number of hh members older than 12	0.770***	0.928***	0.670***	-0.394
	(0.098)	(0.066)	(0.040)	(0.209)
Number of hh members older than 12, squared	-0.075***	-0.068***	-0.054***	0.013
	(0.010)	(0.006)	(0.004)	(0.022)
Number of rooms in the dwelling	0.574***	0.224***	0.035*	0.187**
	(0.036)	(0.016)	(0.016)	(0.068)
Number of rooms in the dwelling, squared	-0.025***	-0.005***	0.004***	-0.006
	(0.002)	(0.001)	(0.001)	(0.004)
Ownership of a refrigerator	1.620***	0.858***	0.074*	0.086
	(0.084)	(0.055)	(0.036)	(0.197)
Ownership of a computer	0.294***	0.411***	0.164***	-0.075
	(0.081)	(0.033)	(0.022)	(0.133)
Ownership of a TV	1.177***	0.312***	-0.130*	-0.059
	(0.102)	(0.060)	(0.056)	(0.266)
Ownership of an automobile	5.389***	0.272***	0.279***	1.803***
	(0.088)	(0.035)	(0.024)	(0.129)
Ownership of the dwelling	0.409***	0.068*	0.071***	-0.078
	(0.065)	(0.031)	(0.021)	(0.130)
ywithin	0.624*	1.796***	1.680***	0.030
	(0.293)	(0.191)	(0.114)	(0.529)
Education level of the hh head	0.173***	0.079***	-0.031***	0.066
	(0.025)	(0.011)	(0.008)	(0.044)
Age of the hh head	0.016***	0.011***	0.013***	0.016***
	(0.002)	(0.001)	(0.001)	(0.005)
Gender of hh head	0.634***	-0.074*	-0.021	0.665***
	(0.059)	(0.030)	(0.022)	(0.129)
Observations	189554	164554	145058	54518
Adjusted R-squared	0.321	0.378	0.582	0.277

Note: Robust standard errors in parentheses. Estimations based on household with positive reported energy expenditures. Regressions are weighted by the population expansion factor. Statistical significance at *<0.1, **<0.05, and ***<0.01. All regressions contain household location dummies.

Figure 4: Economies of Scale of Household Size and Dwelling Size, by Income Group



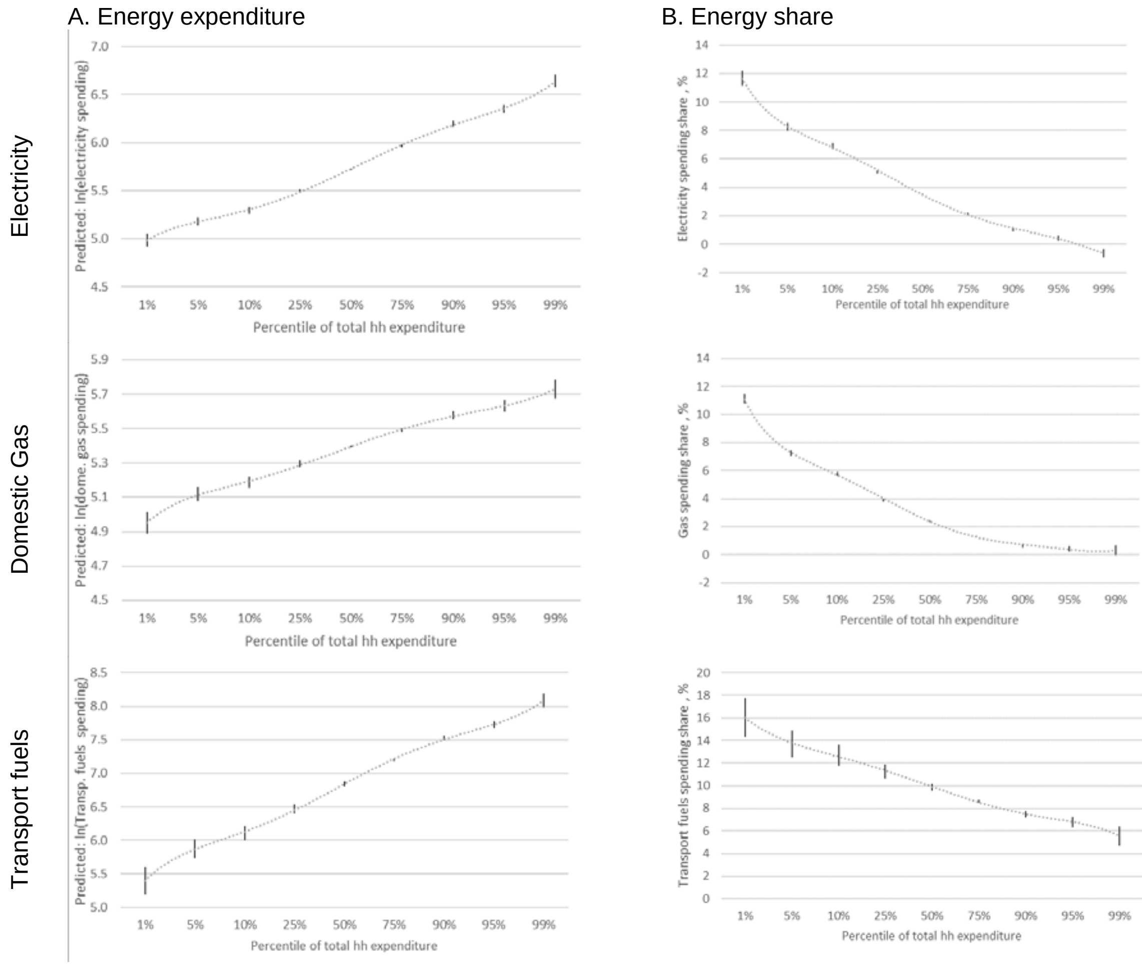
Note: Incgroup = 1 includes deciles 1 to 3; Incgroup = 2 includes deciles 4 to 6; Incgroup = 3 includes deciles 7 to 10.

Table 8: Estimated Income Coefficient, by Country

Country	Expenditure on			Budget Share of		
	Electricity	Domestic gas	Transport fuels	Electricity	Domestic gas	Transport fuels
Bolivia	0.290	0.061	0.259	-0.870	-0.465	-0.023
Brazil	0.431	0.154	0.661	-2.537	-2.252	0.915
Costa Rica	0.229	0.262	0.698	-3.689	-0.508	0.580
Dom. Republic	0.491	0.331	0.656	-1.138	-1.235	0.911
Ecuador	0.365	0.067	0.473	-1.116	-0.477	0.161
Guatemala	0.427	0.127	0.678	-3.368	0.246	0.248
Honduras	0.529	0.142	0.928	-0.371	0.144	0.622
Jamaica	0.483	0.204	0.769	-3.338	0.142	0.053
Mexico	0.341	0.357	0.759	-2.648	-1.146	1.434
Nicaragua	0.471	0.248	0.812	-0.732	0.015	0.971
Peru	0.344	0.447	0.328	-2.606	-0.959	-0.100
Paraguay	0.708	0.345	0.535	-0.564	-0.241	-0.482
Uruguay	0.490	0.304	0.620	-3.594	-1.977	0.546
Pooled sample	0.386	0.192	0.667	-3.256	-2.949	-2.47

Source: Energy regressions by country; see the full results in Annex C.

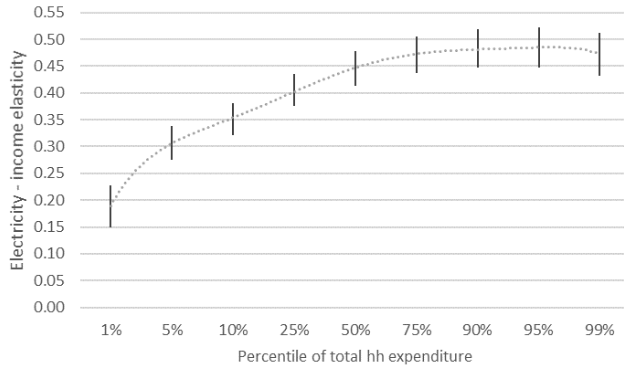
Figure 5: Conditional Energy Curves



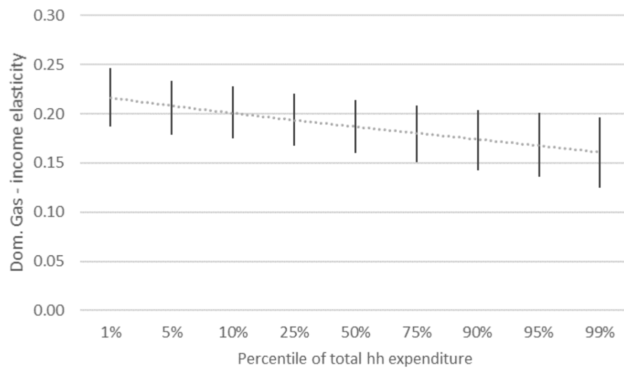
Note: In panel A, the y-axis is energy expenditures on a natural logarithm scale. In panel B, the y-axis is energy expenditure as a percentage of the household budget.

Figure 6: Estimated Income Elasticities

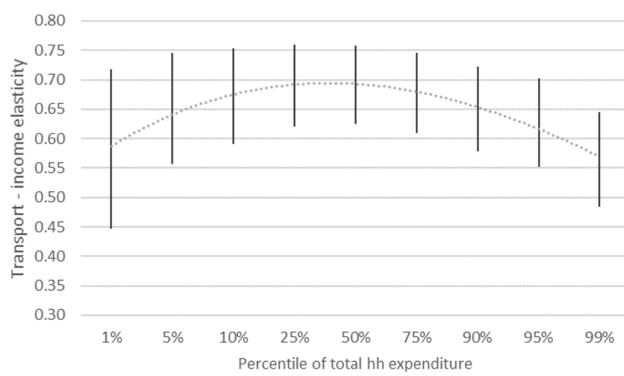
A. Electricity



B. Domestic gas



C. Transport fuel



Note: Estimated income elasticities at percentiles of household per capita total expenditure, with 95% confidence interval. Calculations derive from the best fit polynomial for each fuel, see Annex B.

Annex A: Sources

Countries	Survey Name	Year
Bolivia	Encuesta de Hogares	2013
Brazil	Pesquisa de Orçamentos Familiares	2008/2009
Costa Rica	Encuesta Nacional de Ingresos y Gastos	2013
Dom. Republic	Encuesta Nacional de Ingresos y Gastos de los Hogares	2007
Ecuador	Encuesta Nacional de Ingresos y Gastos de los Hogares Urbanos y Rurales	2011/2012
Guatemala	Encuesta Nacional de Ingresos y Gastos Familiares	2009/2010
Honduras	Encuesta Nacional de Condiciones de Vida	2004
Jamaica	Jamaica Survey of Living Conditions	2012
Mexico	Encuesta Nacional de Ingreso-Gasto de los Hogares	2014
Nicaragua	Encuesta Nacional de Hogares sobre Medición de Nivel de Vida	2014
Paraguay	Encuesta de Ingresos y Gastos y de Condiciones de Vida	2011/2012
Peru	Encuesta Nacional de Hogares sobre Condiciones de Vida y Pobreza	2014
Uruguay	Encuesta Nacional de Gastos e Ingresos de los Hogares	2005/2006

Annex B. Polynomial Regressions

	Dependent: Ln(expenditure in..)				Dependent: Budget Share of …			
	All	Electricity	Gas	Transport fuels	All	Electricity	Gas	Transport fuels
First Degree Polynomial								
Ln(household expenditure)	0.636***	0.386***	0.192***	0.667***	-3.232***	-2.440***	-1.561***	0.769***
	(0.019)	(0.016)	(0.014)	(0.034)	(0.147)	(0.101)	(0.065)	(0.100)
Observations	189554	164554	145058	54518	189554	189554	189554	189554
Adjusted R-squared	0.624	0.624	0.552	0.544	0.321	0.331	0.317	0.319
AIC	483422	304301	157984	99622	1200672	925765	821667	1114717
BIC	483595	304491	158162	99792	1200855	925968	821850	1114900
Second Degree Polynomial								
Ln(household expenditure)	1.025***	0.136*	0.316***	1.382***	-4.631***	-5.908***	-4.637***	5.914***
	(0.075)	(0.062)	(0.043)	(0.143)	(0.527)	(0.375)	(0.318)	(0.336)
Ln(household expenditure)^2	-0.022***	0.014***	-0.007**	-0.038***	0.080**	0.198***	0.176***	-0.294***
	(0.004)	(0.003)	(0.002)	(0.007)	(0.027)	(0.018)	(0.016)	(0.019)
Observations	189,554	164,554	145,058	54,518	189,554	189,554	189,554	189,554
Adjusted R-squared	0.625	0.624	0.552	0.545	0.321	0.335	0.322	0.322
AIC	483,294	304,213	157,955	99,505	1,200,635	924,744	820,277	1,113,890
BIC	483,487	304,413	158,153	99,684	1,200,828	924,947	820,470	1,114,083
Third Degree Polynomial								
Ln(household expenditure)	-1.052***	-2.356***	-0.016	-1.685**	-0.481	-7.952***	0.695	6.777***
	(0.256)	(0.167)	(0.169)	(0.551)	(2.189)	(1.909)	(1.515)	(1.414)
Ln(household expenditure) ^2	0.192***	0.267***	0.026	0.259***	-0.347	0.408*	-0.373*	-0.383**
	(0.024)	(0.016)	(0.015)	(0.050)	(0.205)	(0.178)	(0.147)	(0.144)
Ln(household expenditure)^3	-0.007***	-0.008***	-0.001*	-0.009***	0.014*	-0.007	0.018***	0.003
	(0.001)	(0.000)	(0.000)	(0.002)	(0.006)	(0.005)	(0.005)	(0.005)
Observations	189,554	164,554	145,058	54,518	189,554	189,554	189554	189,554
Adjusted R-squared	0.625	0.625	0.552	0.545	0.321	0.335	0.323	0.322
AIC	483,090	303,748	157,948	99,420	1,200,622	924,726	820049	1,113,891
BIC	483,303	303948	158,166	99,607	1,200,845	924,940	820263	1,114,094
Min. AIC	483,090	303,748	157,948	99,420	1,200,622	924,726	820,277	1,113,890
Min. BIC	483,303	304,413	158,153	99,607	1,200,828	924,940	820,470	1,114,083
Selected models	third	third	second	third	second	third	second	second

Note: Robust standard errors in parentheses. Regressions are weighted by the population expansion factor.
Statistical significance at *<0.1, **<0.05, and ***<0.01. All regressions contain the covariates of Annex B and household location dummies.

ANNEX C: ENERGY REGRESSIONS BY COUNTRY

A. ENERGY EXPENDITURES

ELECTRICITY

ln(Electricity Expend.)	BOL	BRA	CRI	DOM	ECU	GTM	HND	JAM	MEX	NIC	PER	PRY	URY
Ln(household expenditure)	0.290	0.431	0.229	0.491	0.365	0.427	0.529	0.483	0.341	0.471	0.344	0.708	0.490
	(0.030)	(0.024)	(0.090)	(0.082)	(0.025)	(0.057)	(0.070)	(0.052)	(0.034)	(0.065)	(0.026)	(0.087)	(0.035)
Urban=1, Rural=0	0.333			0.081	0.156	0.127	0.385	0.137		0.488	0.212	0.458	
	(0.079)			(0.041)	(0.011)	(0.025)	(0.051)	(0.063)		(0.036)	(0.019)	(0.048)	
Number of children	-0.016	0.047	0.187	-0.086	-0.000	-0.029	-0.029	-0.037	0.042	-0.030	-0.011	0.017	-0.006
	(0.017)	(0.014)	(0.051)	(0.043)	(0.013)	(0.024)	(0.031)	(0.029)	(0.018)	(0.032)	(0.014)	(0.037)	(0.021)
Number of children squared	0.001	-0.007	-0.023	0.006	-0.000	0.004	0.000	0.000	-0.004	0.004	0.002	-0.017	0.001
	(0.004)	(0.003)	(0.015)	(0.008)	(0.002)	(0.004)	(0.005)	(0.006)	(0.004)	(0.006)	(0.003)	(0.007)	(0.005)
Number of hh members older than 12	0.032	0.115	0.265	-0.067	0.074	0.034	-0.035	0.002	0.135	-0.015	-0.010	-0.084	0.060
	(0.025)	(0.019)	(0.064)	(0.058)	(0.018)	(0.030)	(0.042)	(0.038)	(0.028)	(0.040)	(0.018)	(0.055)	(0.034)
Number of hh members older than 12	-0.002	-0.011	-0.022	0.001	-0.008	-0.003	0.001	-0.003	-0.011	-0.000	0.000	0.005	-0.008
	(0.003)	(0.002)	(0.006)	(0.005)	(0.002)	(0.002)	(0.004)	(0.004)	(0.003)	(0.004)	(0.002)	(0.005)	(0.004)
Number of rooms in the dwelling	0.102	0.061	0.114	0.126	0.086	0.080	0.127	0.120	0.053	0.041	0.114	0.163	0.113
	(0.017)	(0.008)	(0.047)	(0.036)	(0.011)	(0.023)	(0.027)	(0.009)	(0.014)	(0.036)	(0.011)	(0.030)	(0.017)
Number of rooms in the dwelling, squ	-0.006	-0.001	-0.007	0.001	-0.003	-0.003	-0.003	-0.001	-0.000	0.012	-0.006	-0.006	-0.006
	(0.002)	(0.000)	(0.004)	(0.004)	(0.001)	(0.003)	(0.003)	(0.000)	(0.001)	(0.005)	(0.001)	(0.003)	(0.002)
Ownership of a refrigerator	0.354	0.371	0.380	0.247	0.201	0.352	0.544	0.381	0.221	0.328	0.373	0.233	-0.081
	(0.020)	(0.026)	(0.072)	(0.041)	(0.013)	(0.029)	(0.041)	(0.034)	(0.024)	(0.030)	(0.014)	(0.052)	(0.015)
Ownership of a computer	0.091	0.157	0.091	0.373	0.118	0.125	0.096	0.082	0.088	0.195	0.154	0.082	0.070
	(0.018)	(0.013)	(0.069)	(0.138)	(0.012)	(0.037)	(0.049)	(0.023)	(0.017)	(0.036)	(0.013)	(0.037)	(0.018)
Ownership of a TV	0.105	0.115	0.051	0.122	0.090	0.068	0.250	0.092	0.117	0.208	0.122	0.120	0.097
	(0.029)	(0.024)	(0.032)	(0.051)	(0.017)	(0.026)	(0.062)	(0.040)	(0.028)	(0.055)	(0.015)	(0.063)	(0.048)
Ownership of an automobile	0.094	0.085	0.010	0.142	0.087	0.102	0.153	0.076	0.043	0.151	0.058	0.103	-0.006
	(0.018)	(0.013)	(0.026)	(0.045)	(0.015)	(0.048)	(0.039)	(0.026)	(0.017)	(0.050)	(0.018)	(0.035)	(0.016)
Ownership of the dwelling	0.113	0.023	0.083	0.038	0.004	0.061	-0.015	0.045	0.088	-0.115	-0.031	-0.013	0.025
	(0.018)	(0.012)	(0.039)	(0.034)	(0.011)	(0.026)	(0.036)	(0.024)	(0.016)	(0.032)	(0.013)	(0.036)	(0.016)
ywithin	-0.318	-0.347	-0.004	-0.258	-0.080	-0.322	-0.327	-0.305	-0.153	-0.223	-0.299	-0.326	-0.291
	(0.058)	(0.052)	(0.171)	(0.172)	(0.053)	(0.128)	(0.138)	(0.107)	(0.072)	(0.135)	(0.057)	(0.165)	(0.073)
Education level of the hh head	0.036	0.018	0.023	0.091	0.044	0.031	0.071	-0.002	0.025	0.045	0.026	0.002	0.019
	(0.007)	(0.004)	(0.015)	(0.014)	(0.005)	(0.013)	(0.015)	(0.012)	(0.006)	(0.012)	(0.004)	(0.015)	(0.007)
Age of the hh head	0.004	0.002	0.008	0.006	0.005	0.004	0.005	0.005	0.006	0.005	0.005	0.002	0.002
	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Gender of hh head	-0.031	-0.022	-0.023	-0.003	-0.015	-0.059	-0.059	-0.074	-0.013	-0.061	-0.030	0.030	-0.006
	(0.017)	(0.011)	(0.033)	(0.031)	(0.011)	(0.027)	(0.036)	(0.019)	(0.015)	(0.027)	(0.011)	(0.030)	(0.015)
Observations	8479	48001	2493	3523	32559	6949	4276	4677	16377	5242	21996	4064	5918
Adjusted R-squared	0.640	0.517	0.408	0.406	0.409	0.507	0.530	0.484	0.520	0.527	0.692	0.532	0.500

DOMESTIC GAS

ln(Electricity Expend.)	BOL	BRA	CRI	DOM	ECU	GTM	HND	JAM	MEX	NIC	PER	PRY	URY
Ln(household expenditure)	0.061	0.154	0.262	0.331	0.067	0.127	0.142	0.204	0.357	0.248	0.447	0.345	0.304
	(0.018)	(0.018)	(0.176)	(0.043)	(0.012)	(0.037)	(0.056)	(0.054)	(0.037)	(0.040)	(0.027)	(0.079)	(0.043)
Urban=1, Rural=0	-0.117			0.008	-0.068	0.018	-0.036	-0.003		-0.004	0.108	0.026	
	(0.040)			(0.022)	(0.005)	(0.016)	(0.031)	(0.057)		(0.030)	(0.018)	(0.042)	
Number of children	0.029	0.073	0.083	-0.068	0.022	-0.031	-0.029	-0.020	-0.045	-0.019	-0.039	-0.057	0.007
	(0.013)	(0.009)	(0.070)	(0.024)	(0.006)	(0.018)	(0.024)	(0.028)	(0.018)	(0.014)	(0.013)	(0.038)	(0.028)
Number of children squared	0.000	-0.008	-0.009	0.007	-0.000	0.005	0.005	-0.001	0.008	0.001	0.002	0.006	-0.005
	(0.003)	(0.002)	(0.014)	(0.005)	(0.001)	(0.003)	(0.004)	(0.006)	(0.004)	(0.002)	(0.002)	(0.008)	(0.006)
Number of hh members older than 12	0.083	0.185	0.247	-0.052	0.003	-0.035	-0.010	-0.065	-0.002	0.010	-0.026	0.038	0.067
	(0.018)	(0.014)	(0.109)	(0.031)	(0.010)	(0.023)	(0.032)	(0.041)	(0.023)	(0.020)	(0.018)	(0.053)	(0.038)
Number of hh members older than 12	-0.005	-0.014	-0.025	0.003	0.004	0.004	0.002	0.005	-0.002	-0.002	-0.000	-0.008	-0.009
	(0.002)	(0.001)	(0.010)	(0.003)	(0.001)	(0.002)	(0.003)	(0.004)	(0.002)	(0.002)	(0.002)	(0.005)	(0.004)
Number of rooms in the dwelling	-0.016	0.020	0.054	0.089	-0.014	-0.009	-0.021	0.058	0.023	-0.012	0.002	0.040	0.049
	(0.011)	(0.006)	(0.084)	(0.027)	(0.005)	(0.011)	(0.018)	(0.010)	(0.014)	(0.015)	(0.011)	(0.025)	(0.024)
Number of rooms in the dwelling, squ	0.001	-0.000	-0.006	0.000	0.004	0.001	0.005	-0.001	0.000	0.003	-0.000	-0.003	-0.003
	(0.001)	(0.000)	(0.007)	(0.003)	(0.001)	(0.001)	(0.002)	(0.000)	(0.001)	(0.002)	(0.001)	(0.002)	(0.003)
Ownership of a refrigerator	-0.008	0.052	-0.247	0.165	-0.009	0.005	-0.036	0.047	0.079	0.012	0.038	0.043	-0.005
	(0.013)	(0.013)	(0.152)	(0.020)	(0.005)	(0.013)	(0.022)	(0.034)	(0.024)	(0.015)	(0.011)	(0.053)	(0.020)
Ownership of a computer	-0.020	-0.032	-0.014	-0.128	0.009	0.002	-0.056	-0.065	0.011	-0.022	-0.015	0.022	-0.028
	(0.012)	(0.010)	(0.166)	(0.113)	(0.006)	(0.016)	(0.032)	(0.027)	(0.017)	(0.015)	(0.011)	(0.028)	(0.024)
Ownership of a TV	0.045	0.001	-0.078	0.067	-0.005	0.011	0.012	-0.018	0.010	-0.018	-0.024	-0.060	0.117
	(0.020)	(0.014)	(0.059)	(0.024)	(0.006)	(0.018)	(0.042)	(0.049)	(0.039)	(0.048)	(0.017)	(0.076)	(0.066)
Ownership of an automobile	0.005	-0.004	0.012	0.092	0.001	0.002	0.012	0.091	0.023	0.006	-0.016	-0.029	0.008
	(0.013)	(0.009)	(0.040)	(0.034)	(0.008)	(0.017)	(0.026)	(0.027)	(0.017)	(0.018)	(0.016)	(0.029)	(0.021)
Ownership of the dwelling	-0.048	0.033	-0.061	0.056	0.019	0.015	0.017	-0.031	0.028	0.045	0.009	0.023	-0.027
	(0.013)	(0.009)	(0.065)	(0.020)	(0.004)	(0.014)	(0.018)	(0.022)	(0.016)	(0.017)	(0.011)	(0.030)	(0.022)
ywithin	-0.056	-0.199	-0.302	-0.144	0.049	-0.011	-0.160	-0.119	-0.238	-0.330	-0.760	-0.226	-0.169
	(0.040)	(0.037)	(0.339)	(0.086)	(0.027)	(0.070)	(0.105)	(0.112)	(0.074)	(0.076)	(0.059)	(0.145)	(0.093)
Education level of the hh head	-0.003	-0.017	-0.011	0.045	0.000	0.004	0.018	0.015	0.010	-0.004	-0.009	-0.001	-0.012
	(0.005)	(0.004)	(0.026)	(0.009)	(0.002)	(0.006)	(0.009)	(0.014)	(0.006)	(0.005)	(0.003)	(0.013)	(0.009)
Age of the hh head	0.000	0.004	0.013	0.006	0.001	0.001	0.001	0.002	0.006	0.001	0.003	0.002	0.001
	(0.000)	(0.000)	(0.002)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Gender of hh head	-0.008	-0.008	-0.047	-0.008	0.004	0.003	-0.006	-0.004	-0.026	-0.005	0.007	-0.006	-0.035
	(0.011)	(0.008)	(0.059)	(0.019)	(0.005)	(0.014)	(0.018)	(0.020)	(0.015)	(0.012)	(0.010)	(0.026)	(0.021)
Observations	7765	49313	1306	4614	34237	3483	1591	2904	10445	4099	18130	3017	4154
Adjusted R-squared	0.220	0.344	0.313	0.337	0.191	0.291	0.291	0.170	0.284	0.132	0.248	0.174	0.186

EXPENDITURE ON TRANSPORT FUELS

ln(Electricity Expend.)	BOL	BRA	CRI	DOM	ECU	GTM	HND	JAM	MEX	NIC	PER	PRY	URY
Ln(household expenditure)	0.259	0.661	0.698	0.656	0.473	0.678	0.928	0.769	0.759	0.812	0.328	0.535	0.620
	(0.080)	(0.062)	(0.148)	(0.100)	(0.071)	(0.120)	(0.182)	(0.300)	(0.062)	(0.151)	(0.085)	(0.108)	(0.088)
Urban=1, Rural=0	0.023			-0.098	-0.073	-0.016	-0.356	0.111		-0.022	-0.311	-0.134	
	(0.297)			(0.058)	(0.029)	(0.055)	(0.098)	(0.251)		(0.089)	(0.054)	(0.052)	
Number of children	0.063	-0.023	-0.107	0.003	-0.019	-0.080	-0.280	-0.166	-0.094	-0.030	0.014	0.062	0.062
	(0.046)	(0.032)	(0.075)	(0.050)	(0.036)	(0.057)	(0.068)	(0.165)	(0.028)	(0.087)	(0.041)	(0.051)	(0.056)
Number of children squared	-0.025	0.004	0.010	-0.005	0.002	0.014	0.036	0.049	0.013	0.001	0.002	-0.008	-0.023
	(0.011)	(0.007)	(0.017)	(0.009)	(0.007)	(0.010)	(0.010)	(0.034)	(0.005)	(0.022)	(0.007)	(0.009)	(0.015)
Number of hh members older than 12	-0.074	0.021	-0.177	0.024	-0.047	0.027	-0.266	-0.279	-0.080	-0.160	0.091	0.134	-0.053
	(0.070)	(0.049)	(0.125)	(0.087)	(0.047)	(0.074)	(0.082)	(0.254)	(0.045)	(0.079)	(0.055)	(0.068)	(0.077)
Number of hh members older than 12	0.007	-0.009	0.015	-0.008	0.003	-0.006	0.017	0.025	0.003	0.014	-0.011	-0.010	0.010
	(0.008)	(0.005)	(0.014)	(0.010)	(0.005)	(0.006)	(0.007)	(0.028)	(0.005)	(0.007)	(0.006)	(0.006)	(0.009)
Number of rooms in the dwelling	0.085	-0.016	0.049	-0.006	-0.032	-0.015	0.011	-0.011	0.083	-0.045	0.054	-0.000	-0.033
	(0.042)	(0.017)	(0.066)	(0.037)	(0.026)	(0.042)	(0.049)	(0.040)	(0.026)	(0.067)	(0.033)	(0.035)	(0.038)
Number of rooms in the dwelling, squ	-0.009	0.001	-0.004	0.006	0.003	0.003	-0.001	0.000	-0.006	-0.000	-0.003	0.003	0.004
	(0.005)	(0.001)	(0.006)	(0.003)	(0.003)	(0.004)	(0.004)	(0.000)	(0.002)	(0.008)	(0.003)	(0.003)	(0.003)
Ownership of a refrigerator	-0.120	-0.138	-0.009	0.035	0.021	0.025	0.008	-0.222	0.077	-0.015	-0.008	0.010	-0.042
	(0.058)	(0.053)	(0.197)	(0.057)	(0.044)	(0.057)	(0.123)	(0.165)	(0.054)	(0.075)	(0.044)	(0.056)	(0.037)
Ownership of a computer	0.118	-0.049	0.144	0.010	0.044	0.103	-0.021	0.173	0.030	0.092	0.008	0.059	-0.027
	(0.050)	(0.024)	(0.094)	(0.162)	(0.028)	(0.056)	(0.060)	(0.114)	(0.025)	(0.060)	(0.042)	(0.050)	(0.044)
Ownership of a TV	0.027	0.042	0.018	-0.035	-0.028	-0.087	-0.626	0.380	-0.027	0.160	-0.101	0.014	0.244
	(0.098)	(0.048)	(0.049)	(0.074)	(0.072)	(0.086)	(0.201)	(0.285)	(0.064)	(0.149)	(0.058)	(0.078)	(0.123)
Ownership of an automobile	0.671	0.434	0.276	0.525	0.766	0.292	0.368	1.009	0.116	0.525	0.411	0.487	0.673
	(0.054)	(0.026)	(0.040)	(0.059)	(0.037)	(0.051)	(0.098)	(0.177)	(0.023)	(0.063)	(0.050)	(0.048)	(0.041)
Ownership of the dwelling	-0.012	-0.064	0.025	-0.033	0.019	0.016	0.040	0.044	0.097	-0.086	0.031	-0.025	0.015
	(0.044)	(0.025)	(0.057)	(0.048)	(0.027)	(0.057)	(0.063)	(0.105)	(0.026)	(0.078)	(0.052)	(0.047)	(0.043)
ywithin	-0.063	-0.079	-0.258	0.044	0.015	0.083	-0.578	-0.150	-0.125	-0.157	0.689	0.816	0.278
	(0.156)	(0.118)	(0.268)	(0.167)	(0.127)	(0.201)	(0.275)	(0.494)	(0.115)	(0.232)	(0.166)	(0.201)	(0.162)
Education level of the hh head	0.001	0.010	0.008	0.066	0.059	0.045	0.022	-0.048	0.011	0.013	0.003	0.018	0.013
	(0.019)	(0.008)	(0.023)	(0.021)	(0.011)	(0.023)	(0.024)	(0.058)	(0.010)	(0.022)	(0.014)	(0.021)	(0.017)
Age of the hh head	0.000	0.001	0.002	0.002	0.000	0.003	0.000	-0.003	0.001	0.001	-0.001	-0.004	-0.005
	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.004)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)
Gender of hh head	0.038	0.094	0.017	0.225	0.092	0.188	0.236	0.167	0.060	-0.005	0.019	0.193	0.253
	(0.050)	(0.026)	(0.051)	(0.053)	(0.036)	(0.064)	(0.065)	(0.100)	(0.028)	(0.059)	(0.047)	(0.042)	(0.041)
Observations	2584	15801	1626	2004	8666	2325	918	986	7670	1083	4710	2981	3164
Adjusted R-squared	0.282	0.447	0.451	0.518	0.452	0.479	0.327	0.336	0.439	0.464	0.478	0.473	0.509

Note: Robust standard errors in parentheses. Regressions are weighted by the population expansion factor. All regressions contain household location dummies.

ANNEX C: ENERGY REGRESSIONS BY COUNTRY

A. ENERGY EXPENDITURES

ELECTRICITY

ln(Electricity Expend.)	BOL	BRA	CRI	DOM	ECU	GTM	HND	JAM	MEX	NIC	PER	PRY	URY
Ln(household expenditure)	0.290	0.431	0.229	0.491	0.365	0.427	0.529	0.483	0.341	0.471	0.344	0.708	0.490
	(0.030)	(0.024)	(0.090)	(0.082)	(0.025)	(0.057)	(0.070)	(0.052)	(0.034)	(0.065)	(0.026)	(0.087)	(0.035)
Urban=1, Rural=0	0.333			0.081	0.156	0.127	0.385	0.137		0.488	0.212	0.458	
	(0.079)			(0.041)	(0.011)	(0.025)	(0.051)	(0.063)		(0.036)	(0.019)	(0.048)	
Number of children	-0.016	0.047	0.187	-0.086	-0.000	-0.029	-0.029	-0.037	0.042	-0.030	-0.011	0.017	-0.006
	(0.017)	(0.014)	(0.051)	(0.043)	(0.013)	(0.024)	(0.031)	(0.029)	(0.018)	(0.032)	(0.014)	(0.037)	(0.021)
Number of children squared	0.001	-0.007	-0.023	0.006	-0.000	0.004	0.000	0.000	-0.004	0.004	0.002	-0.017	0.001
	(0.004)	(0.003)	(0.015)	(0.008)	(0.002)	(0.004)	(0.005)	(0.006)	(0.004)	(0.006)	(0.003)	(0.007)	(0.005)
Number of hh members older than 12	0.032	0.115	0.265	-0.067	0.074	0.034	-0.035	0.002	0.135	-0.015	-0.010	-0.084	0.060
	(0.025)	(0.019)	(0.064)	(0.058)	(0.018)	(0.030)	(0.042)	(0.038)	(0.028)	(0.040)	(0.018)	(0.055)	(0.034)
Number of hh members older than 12	-0.002	-0.011	-0.022	0.001	-0.008	-0.003	0.001	-0.003	-0.011	-0.000	0.000	0.005	-0.008
	(0.003)	(0.002)	(0.006)	(0.005)	(0.002)	(0.002)	(0.004)	(0.004)	(0.003)	(0.004)	(0.002)	(0.005)	(0.004)
Number of rooms in the dwelling	0.102	0.061	0.114	0.126	0.086	0.080	0.127	0.120	0.053	0.041	0.114	0.163	0.113
	(0.017)	(0.008)	(0.047)	(0.036)	(0.011)	(0.023)	(0.027)	(0.009)	(0.014)	(0.036)	(0.011)	(0.030)	(0.017)
Number of rooms in the dwelling, squ	-0.006	-0.001	-0.007	0.001	-0.003	-0.003	-0.003	-0.001	-0.000	0.012	-0.006	-0.006	-0.006
	(0.002)	(0.000)	(0.004)	(0.004)	(0.001)	(0.003)	(0.003)	(0.000)	(0.001)	(0.005)	(0.001)	(0.003)	(0.002)
Ownership of a refrigerator	0.354	0.371	0.380	0.247	0.201	0.352	0.544	0.381	0.221	0.328	0.373	0.233	-0.081
	(0.020)	(0.026)	(0.072)	(0.041)	(0.013)	(0.029)	(0.041)	(0.034)	(0.024)	(0.030)	(0.014)	(0.052)	(0.015)
Ownership of a computer	0.091	0.157	0.091	0.373	0.118	0.125	0.096	0.082	0.088	0.195	0.154	0.082	0.070
	(0.018)	(0.013)	(0.069)	(0.138)	(0.012)	(0.037)	(0.049)	(0.023)	(0.017)	(0.036)	(0.013)	(0.037)	(0.018)
Ownership of a TV	0.105	0.115	0.051	0.122	0.090	0.068	0.250	0.092	0.117	0.208	0.122	0.120	0.097
	(0.029)	(0.024)	(0.032)	(0.051)	(0.017)	(0.026)	(0.062)	(0.040)	(0.028)	(0.055)	(0.015)	(0.063)	(0.048)
Ownership of an automobile	0.094	0.085	0.010	0.142	0.087	0.102	0.153	0.076	0.043	0.151	0.058	0.103	-0.006
	(0.018)	(0.013)	(0.026)	(0.045)	(0.015)	(0.048)	(0.039)	(0.026)	(0.017)	(0.050)	(0.018)	(0.035)	(0.016)
Ownership of the dwelling	0.113	0.023	0.083	0.038	0.004	0.061	-0.015	0.045	0.088	-0.115	-0.031	-0.013	0.025
	(0.018)	(0.012)	(0.039)	(0.034)	(0.011)	(0.026)	(0.036)	(0.024)	(0.016)	(0.032)	(0.013)	(0.036)	(0.016)
ywithin	-0.318	-0.347	-0.004	-0.258	-0.080	-0.322	-0.327	-0.305	-0.153	-0.223	-0.299	-0.326	-0.291
	(0.058)	(0.052)	(0.171)	(0.172)	(0.053)	(0.128)	(0.138)	(0.107)	(0.072)	(0.135)	(0.057)	(0.165)	(0.073)
Education level of the hh head	0.036	0.018	0.023	0.091	0.044	0.031	0.071	-0.002	0.025	0.045	0.026	0.002	0.019
	(0.007)	(0.004)	(0.015)	(0.014)	(0.005)	(0.013)	(0.015)	(0.012)	(0.006)	(0.012)	(0.004)	(0.015)	(0.007)
Age of the hh head	0.004	0.002	0.008	0.006	0.005	0.004	0.005	0.005	0.006	0.005	0.005	0.002	0.002
	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Gender of hh head	-0.031	-0.022	-0.023	-0.003	-0.015	-0.059	-0.059	-0.074	-0.013	-0.061	-0.030	0.030	-0.006
	(0.017)	(0.011)	(0.033)	(0.031)	(0.011)	(0.027)	(0.036)	(0.019)	(0.015)	(0.027)	(0.011)	(0.030)	(0.015)
Observations	8479	48001	2493	3523	32559	6949	4276	4677	16377	5242	21996	4064	5918
Adjusted R-squared	0.640	0.517	0.408	0.406	0.409	0.507	0.530	0.484	0.520	0.527	0.692	0.532	0.500

DOMESTIC GAS

	BOL	BRA	CRI	DOM	ECU	GTM	HND	JAM	MEX	NIC	PER	PRY	URY
Ln(household expenditure)	0.061	0.154	0.262	0.331	0.067	0.127	0.142	0.204	0.357	0.248	0.447	0.345	0.304
	(0.018)	(0.018)	(0.176)	(0.043)	(0.012)	(0.037)	(0.056)	(0.054)	(0.037)	(0.040)	(0.027)	(0.079)	(0.043)
Urban=1, Rural=0	-0.117			0.008	-0.068	0.018	-0.036	-0.003		-0.004	0.108	0.026	
	(0.040)			(0.022)	(0.005)	(0.016)	(0.031)	(0.057)		(0.030)	(0.018)	(0.042)	
Number of children	0.029	0.073	0.083	-0.068	0.022	-0.031	-0.029	-0.020	-0.045	-0.019	-0.039	-0.057	0.007
	(0.013)	(0.009)	(0.070)	(0.024)	(0.006)	(0.018)	(0.024)	(0.028)	(0.018)	(0.014)	(0.013)	(0.038)	(0.028)
Number of children squared	0.000	-0.008	-0.009	0.007	-0.000	0.005	0.005	-0.001	0.008	0.001	0.002	0.006	-0.005
	(0.003)	(0.002)	(0.014)	(0.005)	(0.001)	(0.003)	(0.004)	(0.006)	(0.004)	(0.002)	(0.002)	(0.008)	(0.006)
Number of hh members older than 12	0.083	0.185	0.247	-0.052	0.003	-0.035	-0.010	-0.065	-0.002	0.010	-0.026	0.038	0.067
	(0.018)	(0.014)	(0.109)	(0.031)	(0.010)	(0.023)	(0.032)	(0.041)	(0.023)	(0.020)	(0.018)	(0.053)	(0.038)
Number of hh members older than 12	-0.005	-0.014	-0.025	0.003	0.004	0.004	0.002	0.005	-0.002	-0.002	-0.000	-0.008	-0.009
	(0.002)	(0.001)	(0.010)	(0.003)	(0.001)	(0.002)	(0.003)	(0.004)	(0.002)	(0.002)	(0.002)	(0.005)	(0.004)
Number of rooms in the dwelling	-0.016	0.020	0.054	0.089	-0.014	-0.009	-0.021	0.058	0.023	-0.012	0.002	0.040	0.049
	(0.011)	(0.006)	(0.084)	(0.027)	(0.005)	(0.011)	(0.018)	(0.010)	(0.014)	(0.015)	(0.011)	(0.025)	(0.024)
Number of rooms in the dwelling, squ	0.001	-0.000	-0.006	0.000	0.004	0.001	0.005	-0.001	0.000	0.003	-0.000	-0.003	-0.003
	(0.001)	(0.000)	(0.007)	(0.003)	(0.001)	(0.001)	(0.002)	(0.000)	(0.001)	(0.002)	(0.001)	(0.002)	(0.003)
Ownership of a refrigerator	-0.008	0.052	-0.247	0.165	-0.009	0.005	-0.036	0.047	0.079	0.012	0.038	0.043	-0.005
	(0.013)	(0.013)	(0.152)	(0.020)	(0.005)	(0.013)	(0.022)	(0.034)	(0.024)	(0.015)	(0.011)	(0.053)	(0.020)
Ownership of a computer	-0.020	-0.032	-0.014	-0.128	0.009	0.002	-0.056	-0.065	0.011	-0.022	-0.015	0.022	-0.028
	(0.012)	(0.010)	(0.166)	(0.113)	(0.006)	(0.016)	(0.032)	(0.027)	(0.017)	(0.015)	(0.011)	(0.028)	(0.024)
Ownership of a TV	0.045	0.001	-0.078	0.067	-0.005	0.011	0.012	-0.018	0.010	-0.018	-0.024	-0.060	0.117
	(0.020)	(0.014)	(0.059)	(0.024)	(0.006)	(0.018)	(0.042)	(0.049)	(0.039)	(0.048)	(0.017)	(0.076)	(0.066)
Ownership of an automobile	0.005	-0.004	0.012	0.092	0.001	0.002	0.012	0.091	0.023	0.006	-0.016	-0.029	0.008
	(0.013)	(0.009)	(0.040)	(0.034)	(0.008)	(0.017)	(0.026)	(0.027)	(0.017)	(0.018)	(0.016)	(0.029)	(0.021)
Ownership of the dwelling	-0.048	0.033	-0.061	0.056	0.019	0.015	0.017	-0.031	0.028	0.045	0.009	0.023	-0.027
	(0.013)	(0.009)	(0.065)	(0.020)	(0.004)	(0.014)	(0.018)	(0.022)	(0.016)	(0.017)	(0.011)	(0.030)	(0.022)
ywithin	-0.056	-0.199	-0.302	-0.144	0.049	-0.011	-0.160	-0.119	-0.238	-0.330	-0.760	-0.226	-0.169
	(0.040)	(0.037)	(0.339)	(0.086)	(0.027)	(0.070)	(0.105)	(0.112)	(0.074)	(0.076)	(0.059)	(0.145)	(0.093)
Education level of the hh head	-0.003	-0.017	-0.011	0.045	0.000	0.004	0.018	0.015	0.010	-0.004	-0.009	-0.001	-0.012
	(0.005)	(0.004)	(0.026)	(0.009)	(0.002)	(0.006)	(0.009)	(0.014)	(0.006)	(0.005)	(0.003)	(0.013)	(0.009)
Age of the hh head	0.000	0.004	0.013	0.006	0.001	0.001	0.001	0.002	0.006	0.001	0.003	0.002	0.001
	(0.000)	(0.000)	(0.002)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Gender of hh head	-0.008	-0.008	-0.047	-0.008	0.004	0.003	-0.006	-0.004	-0.026	-0.005	0.007	-0.006	-0.035
	(0.011)	(0.008)	(0.059)	(0.019)	(0.005)	(0.014)	(0.018)	(0.020)	(0.015)	(0.012)	(0.010)	(0.026)	(0.021)
Observations	7765	49313	1306	4614	34237	3483	1591	2904	10445	4099	18130	3017	4154
Adjusted R-squared	0.220	0.344	0.313	0.337	0.191	0.291	0.291	0.170	0.284	0.132	0.248	0.174	0.186

EXPENDITURE ON TRANSPORT FUELS

	BOL	BRA	CRI	DOM	ECU	GTM	HND	JAM	MEX	NIC	PER	PRY	URY
Ln(household expenditure)	0.259	0.661	0.698	0.656	0.473	0.678	0.928	0.769	0.759	0.812	0.328	0.535	0.620
	(0.080)	(0.062)	(0.148)	(0.100)	(0.071)	(0.120)	(0.182)	(0.300)	(0.062)	(0.151)	(0.085)	(0.108)	(0.088)
Urban=1, Rural=0	0.023			-0.098	-0.073	-0.016	-0.356	0.111		-0.022	-0.311	-0.134	
	(0.297)			(0.058)	(0.029)	(0.055)	(0.098)	(0.251)		(0.089)	(0.054)	(0.052)	
Number of children	0.063	-0.023	-0.107	0.003	-0.019	-0.080	-0.280	-0.166	-0.094	-0.030	0.014	0.062	0.062
	(0.046)	(0.032)	(0.075)	(0.050)	(0.036)	(0.057)	(0.068)	(0.165)	(0.028)	(0.087)	(0.041)	(0.051)	(0.056)
Number of children squared	-0.025	0.004	0.010	-0.005	0.002	0.014	0.036	0.049	0.013	0.001	0.002	-0.008	-0.023
	(0.011)	(0.007)	(0.017)	(0.009)	(0.007)	(0.010)	(0.010)	(0.034)	(0.005)	(0.022)	(0.007)	(0.009)	(0.015)
Number of hh members older than 12	-0.074	0.021	-0.177	0.024	-0.047	0.027	-0.266	-0.279	-0.080	-0.160	0.091	0.134	-0.053
	(0.070)	(0.049)	(0.125)	(0.087)	(0.047)	(0.074)	(0.082)	(0.254)	(0.045)	(0.079)	(0.055)	(0.068)	(0.077)
Number of hh members older than 12	0.007	-0.009	0.015	-0.008	0.003	-0.006	0.017	0.025	0.003	0.014	-0.011	-0.010	0.010
	(0.008)	(0.005)	(0.014)	(0.010)	(0.005)	(0.006)	(0.007)	(0.028)	(0.005)	(0.007)	(0.006)	(0.006)	(0.009)
Number of rooms in the dwelling	0.085	-0.016	0.049	-0.006	-0.032	-0.015	0.011	-0.011	0.083	-0.045	0.054	-0.000	-0.033
	(0.042)	(0.017)	(0.066)	(0.037)	(0.026)	(0.042)	(0.049)	(0.040)	(0.026)	(0.067)	(0.033)	(0.035)	(0.038)
Number of rooms in the dwelling, squ	-0.009	0.001	-0.004	0.006	0.003	0.003	-0.001	0.000	-0.006	-0.000	-0.003	0.003	0.004
	(0.005)	(0.001)	(0.006)	(0.003)	(0.003)	(0.004)	(0.004)	(0.000)	(0.002)	(0.008)	(0.003)	(0.003)	(0.003)
Ownership of a refrigerator	-0.120	-0.138	-0.009	0.035	0.021	0.025	0.008	-0.222	0.077	-0.015	-0.008	0.010	-0.042
	(0.058)	(0.053)	(0.197)	(0.057)	(0.044)	(0.057)	(0.123)	(0.165)	(0.054)	(0.075)	(0.044)	(0.056)	(0.037)
Ownership of a computer	0.118	-0.049	0.144	0.010	0.044	0.103	-0.021	0.173	0.030	0.092	0.008	0.059	-0.027
	(0.050)	(0.024)	(0.094)	(0.162)	(0.028)	(0.056)	(0.060)	(0.114)	(0.025)	(0.060)	(0.042)	(0.050)	(0.044)
Ownership of a TV	0.027	0.042	0.018	-0.035	-0.028	-0.087	-0.626	0.380	-0.027	0.160	-0.101	0.014	0.244
	(0.098)	(0.048)	(0.049)	(0.074)	(0.072)	(0.086)	(0.201)	(0.285)	(0.064)	(0.149)	(0.058)	(0.078)	(0.123)
Ownership of an automobile	0.671	0.434	0.276	0.525	0.766	0.292	0.368	1.009	0.116	0.525	0.411	0.487	0.673
	(0.054)	(0.026)	(0.040)	(0.059)	(0.037)	(0.051)	(0.098)	(0.177)	(0.023)	(0.063)	(0.050)	(0.048)	(0.041)
Ownership of the dwelling	-0.012	-0.064	0.025	-0.033	0.019	0.016	0.040	0.044	0.097	-0.086	0.031	-0.025	0.015
	(0.044)	(0.025)	(0.057)	(0.048)	(0.027)	(0.057)	(0.063)	(0.105)	(0.026)	(0.078)	(0.052)	(0.047)	(0.043)
ywithin	-0.063	-0.079	-0.258	0.044	0.015	0.083	-0.578	-0.150	-0.125	-0.157	0.689	0.816	0.278
	(0.156)	(0.118)	(0.268)	(0.167)	(0.127)	(0.201)	(0.275)	(0.494)	(0.115)	(0.232)	(0.166)	(0.201)	(0.162)
Education level of the hh head	0.001	0.010	0.008	0.066	0.059	0.045	0.022	-0.048	0.011	0.013	0.003	0.018	0.013
	(0.019)	(0.008)	(0.023)	(0.021)	(0.011)	(0.023)	(0.024)	(0.058)	(0.010)	(0.022)	(0.014)	(0.021)	(0.017)
Age of the hh head	0.000	0.001	0.002	0.002	0.000	0.003	0.000	-0.003	0.001	0.001	-0.001	-0.004	-0.005
	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.004)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)
Gender of hh head	0.038	0.094	0.017	0.225	0.092	0.188	0.236	0.167	0.060	-0.005	0.019	0.193	0.253
	(0.050)	(0.026)	(0.051)	(0.053)	(0.036)	(0.064)	(0.065)	(0.100)	(0.028)	(0.059)	(0.047)	(0.042)	(0.041)
Observations	2584	15801	1626	2004	8666	2325	918	986	7670	1083	4710	2981	3164
Adjusted R-squared	0.282	0.447	0.451	0.518	0.452	0.479	0.327	0.336	0.439	0.464	0.478	0.473	0.509

Note: Robust standard errors in parentheses. Regressions are weighted by the population expansion factor. All regressions contain household location dummies.