

Inequality and Household Energy Consumption in Urban Mexico

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Over the last two decades deep inequality remained a salient feature of income distribution in Mexico, but this aspect unmasked an important transformation in the consumption patterns of a growing urbanized population: the level of energy consumption is increasing and consumed goods are changing across income strata. Using 1998 and 2008 household income and expenditure national surveys, this paper analyzes trends in the stratification of energy consumption, particularly it explores to what extent energy spending follows inequality patterns. Studies suggest on the one hand that upper and middle-income household could be driving increments in energy consumption, due not only to their income gains but also because of their life styles (Gram-Hanssen 2006, Jensen 2007). On the other hand, research also points to the central contribution to energy demand that is being made by increments on the living standards of low-income populations in some developing countries (see Hummel et al 2009, Pachauri 2004). It is unclear, however, whether any of these processes are taking place in Mexico since poverty levels remained high and the share of middle-income household decreased. Still, energy consumption grew rapidly.

I suggest that to fully consider this issue, it is necessary to analyze the determinants of *the level* of energy households' demand and to compare its *composition* by income strata (low, middle, high) and across time. By analyzing changes in the bundle of household goods it could be possible to account for differences in increments on energy spending and to explore the specific pattern or contribution of income groups.

Background

World energy consumption is fast growing in the last decades despite technological innovations and public policies to reduce it; moreover, it is expected that energy demand will keep growing in the near future. According to the Energy secretary, in 2007 the household direct energy consumption represented nearly 17% of total energy consumption in Mexico –

including electricity, coal, oil, firewood and natural gas¹. Even though Mexico per capita energy consumption is low compare to countries of similar developed level and to industrialized countries, its energy demand increased rapidly until mid 2000s (OECD 2005). Moreover, according to official estimations per capita demand will grow due to population and economic growth trends, as well as changes in life styles (SENER 2008).

However, research in Mexico still focuses on aggregated level without looking at differences in the patterns and intensity of household energy consumption. These issues are central given inequality levels, as well as changes in income distribution over the last decades. Between 1998 and 2008, about 17% of the households remained under subsistence poverty, which means they cannot afford enough food, while about 28% of urban households was unable to afford basic food, health and education needs. Along these years, the Gini coefficient fluctuated between 53.2 and 52.1 (CONEVAL 2009), with only small decrements mainly explains by economic downturn.

Studies conducted elsewhere suggest that energy consumption varies broadly not only as a consequence of household income, but also as a result of demographic characteristics such as family structure and living arrangement (Shipper 1996, de Sherbinnin 2007). In particular, studies show that household size, family life-cycle, as well as household head impact the level of energy consumption, while other factors such as labor marker insertion – beyond income- has been less explored has determinant (O’Neill et al. 2001, Przkawetz et al. 2001, Pucher et al. 1998, Greening and Jeng 1994). However, the weights of these factors also seem to vary across countries, time and specific energy source (Lenzen et al. 2006, Jensen 2008, van den Berg 2008, Przkawetz et al. 2001, Pucher et al. 1998, Greening and Jeng 1994). Clearly, income is a central determinant of household consumption, however, research suggests important difference in energy consumption among households of the same income strata (Jiang and O’Neill 2004). Moreover, as Ropke and Reisch (2005) suggest consumption patterns do not merely respond to basic needs, but they are also influenced by social and cultural expectations about social status.

Data and Methods

I use data from the National Household Consumption and Expenditure Survey 1998 and 2008, (ENIGH by its acronym in Spanish) which collect information on household ordinary expenses and income sources. In addition, the survey provides detailed information on dwellings

¹ This only includes energy use for cooking, heating, water and lighting, and it does not consider the indirect demand generated by households.

characteristics and goods, including electronics, vehicles. The ENIGH also includes data on household members such as age, sex, employment, marital status, occupation, education. The survey has been collected biannually since 1992 and it is representative for urban and rural localities. In 1998, the urban sample includes 11069 households while in 2008, 22871 households.

This paper analyzes only direct energy consumption from total household expenditure on all energy sources, and then it will be translated into kilograms of standard coal equivalent, following primary energy use method. I first, describe general trends using cross-sectional data. Preliminary results based on energy expenditures suggest that between 1998 and 2008, that average energy consumption grew both in absolute and per capita terms, although income levels remained relatively stable (see table 1). Although median energy spending increased by income strata, within each groups there is a large dispersion both in terms of its level and the percentage that it represents respect of total household expenditure (see table 2).

To explore such dispersion, I analyze changes in the composition of good available at the house as well as dwelling characteristics through cluster analysis, both for the entire urban sample and by income strata (low, middle and high). Finally, for the 2008 year I run an OLS regression model to identify the socio-economic determinants of the level of household energy consumption having as independent variables household structure, living arrangements, household head's socioeconomic characteristics, and dwelling attributes.

Table 1 Energy Household Expenditure					
		total		per capita	
		1998	2008	1998	2008
	Mean	636.2	1641.8	181.84	491.81
	Median	496.2	1203.3	124.64	322.88
	Mode	296.8	604.9	92.00	300.82
	Std. Deviation	646.7	1806.5	222.44	633.53
	10	184.0	361.6	42.57	102.28
	20	267.1	601.6	62.56	151.23
	30	330.0	782.1	80.79	209.80
	40	412.5	952.8	101.64	266.23
	50	496.2	1203.3	124.64	322.88
	60	582.7	1459.0	153.33	403.29
	70	696.1	1760.4	191.67	506.69
	80	858.7	2256.2	245.34	675.17
	90	1187.1	3227.3	362.56	1002.74
% Energy expenditure respect of total household expenditure					
		1998	2008		
	Mean	0.04	0.02		

Median		0.04	0.01		
Mode		0.00	0.01		
Std. Deviation		0.03	0.02		
Minimum		0.00	0.00		
Maximum		0.69	0.33		
	10	0.01	0.00		
	20	0.02	0.01		
	30	0.02	0.01		
	40	0.03	0.01		
	50	0.04	0.01		
	60	0.04	0.02		
	70	0.05	0.02		
	80	0.06	0.02		
	90	0.08	0.03		

Table 2 Energy Expenditure by Income Strata

		1998	1998	2008	2008
		Total	per capita	Total	per capita
Low-income					
Mean		468.0	103.3	1265.8	4881.5
Median		409.5	86.6	998.1	4846.9
Mode		192.9	46.0	604.9	4839.4
Std. Deviation		320.0	72.4	1068.6	1873.0
Minimum		5.1	0.8	6.0	128.5
Maximum		4956.1	639.5	14542.5	8272.5
Middle-income					
Mean		702.4	208.7	1777.0	14292.2
Median		582.7	168.7	1361.1	13051.1
Mode		613.3	148.4	604.9	15123.0
Std. Deviation		578.2	162.8	1692.4	4845.6
Minimum		5.9	3.0	15.0	8272.6
Maximum		9660.1	2415.0	27826.8	26919.1
High income					
Mean		1202.3	462.1	2951.6	58617.1
Median		814.4	322.7	1814.8	40115.0
Mode		296.8	593.5	907.4	30246.0
Std. Deviation		1350.6	495.5	3572.0	111535.8
Minimum		21.5	10.7	21.2	26924.1
Maximum		17509.4	5836.5	41437.7	4350233.0