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**FROM INCOME TO HOUSEHOLD WELFARE:  
LESSONS FROM REFRIGERATOR OWNERSHIP  
IN INDIA**

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# **From Income to Household Welfare: Lessons from Refrigerator Ownership in India**

**Sowmya Dhanaraj, Vidya Mahambare and Poonam Munjal**

## **Abstract**

*This paper draws implications for the energy and education policies in developing countries based on the insights derived from studying the determinants of household refrigerator ownership in India. In our study the failure of the government policies to ensure reliable public services such as uninterrupted power supply and improving female education levels turn out to be the key stumbling blocks to raising household welfare in India. While a threshold level of household income is necessary for a purchase of a consumer durable, it is not a sufficient condition. Our results for the determinants of refrigerator ownership in India suggest that, even when households have sufficient purchasing power, the duration of a complementary good (electricity for >17 h per day) is critical for the ownership, all else held constant. Also, females in households tend to derive greater utility from the refrigerator usage due to its impact on lowering household burden of work and easing women's entry into the labour market. Our results confirm the hypothesis that when women bargaining power is proxied by the level of education, households with a female with higher level of education have higher probability of refrigerator ownership.*

**Key words:** *Economic development: urban, rural, Household behaviour, Family structure, Econometric modelling, ownership analysis*

**JEL Codes:** *O180, D120, J120, C50, D71*

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Poonam Munjal**

## INTRODUCTION

Across the world, as incomes grow and cross a certain threshold, households begin to purchase home appliances and vehicles and the utility derived from the use of such durables becomes a major driver of household welfare. Their use lowers time and effort spent on household tasks (washing machine, refrigerators), improves health outcomes (refrigerators, water filter), and raises time spent in leisure (television). It can also raise household income by easing women's entry into the labour market or allowing them to spend additional hours in work.

The relationship between rising incomes and higher durable good ownership – known as the S-curve pattern of ownership diffusion rate, after the famous work by Farrell (1954), is well documented in the literature (McNeil and Letschert, 2010, Wolfram et al, 2012, Dargay et al, 2007, World Bank, 2008). However, there is not much empirical work, especially for emerging countries which analyse variables, in addition to income, that influence household decisions to acquire durable goods. Empirical evidence for a number of developed economies suggests that the slope and the inflexion point of the relationship between durable good ownership and household income are influenced by many other variables like access and reliability of complementary services such as electricity (Wolfram, Shelef, and Gertler, 2012), access to credit (Gertler et al 2013), level of women education, particularly in the case of a household durable good, and labour market opportunities (Greenwood, Seshadri, and Yorukoglu, 2005) and the bargaining power of women in households (Polato e Fava and Arends-Kuenning, 2013).

These studies suggest that while a threshold level of income is a necessary condition for the purchase of a durable good, it is not the sufficient condition. This holds good for India and becomes apparent when we compare the household ownership of alternative consumer durables and vehicles. Particularly in rural India, home to nearly 70 percent of Indian households, despite growing incomes, refrigerator

ownership has not even reached the double-digit level, while twice the number of households own a two-wheeler (table 1) which costs much more than a refrigerator. Such pattern of household ownership of durables is in contrast with some other emerging countries like China. In China, refrigerator ownership in rural areas in 1993 (9.6 percent) was similar to that of India’s rural refrigerator ownership rate in 2011 (8.9 percent) while the motorcycle ownership rate in rural China was only 3.4 percent then, compared to nearly 15 percent in the case of India in 2011 (Beerli, 2010).

**Table 1: percent of Indian Households with Durable Ownership, 2011**

	Rural	Urban	All-India
Television	42.8	82.3	55.4
Refrigerator	8.9	36.4	17.7
Washing Machines	2.0	12.7	5.4
Two wheeler	14.7	32.7	20.4

**Source:** Authors’ computation based on NSHIE, 2011, NCAER

This paper focuses on the relationship between consumer durable ownership and its determinants in the case of India with an objective of establishing the threshold level of income for a purchase of a durable good, and the relative importance of other factors that govern household’s durable purchase decisions. In this paper we chose to study specifically the Indian households’ ownership of refrigerator. The decision to select the refrigerator as a representative durable good for households is based on the nature of the asset which makes it easier to differentiate the impact of alternative parameters on ownership. Firstly, the decision to purchase a refrigerator depends on access, reliability and duration of electricity access (in contrast to mere electricity access), unlike other energy-using assets such as washing machine and air conditioners where only a few hours of electricity is sufficient to make a purchase decision. Most of the empirical literature on this subject does not take into account this fact and analyses how only access to electricity influences the adoption of home appliances, perhaps in the absence of data on the duration of electricity access. Secondly, we focus on the refrigerator

ownership since for other energy-using assets, electricity access is not the only complementary infrastructure that determines the purchase decision. The availability of other complementary services namely, piped water in case of washing machines or climatic conditions in case of air conditioners also matter.

In addition to the role played by a complementary good/service, the decision to purchase a consumer durable is also driven by the intra-household bargaining power. There is sufficient evidence that ownership of durable goods, such as refrigerators and washing machines, reduces time spent in household work and thereby, improves women welfare. Between 1900 and 1970, the introduction of such durable goods reduced the time spent on household work by 70 percent and resulted in a large decrease in the number of domestic helps employed by U.S. households (Greenwood, Seshadri, and Yorukoglu, 2005).

Traditionally a unitary model of households assumes away the dynamics of decision making in a household. A unitary model implies that distribution of income or other measures of bargaining power within the household does not affect the production or consumption outcomes. However, if utility of durable is more skewed towards a particular gender, then it is likely that higher is the bargaining power of that gender within a household, higher is the probability of a household owning a particular durable (holding other variables such as income constant). Recent studies have also concluded that the widespread availability of durable goods was instrumental to free women's time to work outside the household in the United States (Greenwood, Seshadri, and Yorukoglu, 2005), United Kingdom and OECD countries (Tiago, Cavalcanti and Tavares, 2008), although there is some disagreement on its role in raising women's labor force participation (Jones, Manuelli, and McGrattan, 2003).

With India's women labour force participation rate (LFPR) - percent of working age women which work outside home or are looking

for work – at a low of 27 percent compared to China’s 64 percent in 2011 (World Bank, 2015), India’s is set to forego a large of its demographic dividend if women LFPR does not improve in India. Rough calculations suggest that, given the projected population growth by the United Nation’s population division, if India’s and China’s women LFPR stays at the current level, India would have lower labour force even in 2030 of around 550 million compared to China’s 620 million, despite the fact that India would by then, have a much larger working age population of around (940 million) than China’s around 880 million. It is therefore, critical to investigate the channel of the interrelationship between women education, intra-household bargaining power and ownership of durables in India.

With the above background, this paper contributes to the existing literature on the determinants of household durable goods’ ownership in three ways. For the first time in the Indian context, controlling for mean per household spending level, we incorporate an indicator of female bargaining power, and a measure of reliability of electricity (as contrast to only access to electricity) in a household decision to purchase a home appliance. The results of this study have implications for social and economic policies, especially the energy and education policies of the government. Second, we utilise the household-level consumption distribution along with data on household refrigerator penetration for both rural and urban households allowing us to construct the consumption distribution curve for rural and urban household separately and investigate the role played by differences in these parameters across rural and urban areas. These results also have potential implications for demand forecasting for firms selling durable goods such as refrigerator since it demonstrates that the factors other than income have a final bearing on the demand for them. The share of population about to cross the threshold level of income, which makes a durable good affordable, will play a major role in household acquisition of energy-using durable goods and influence the overall durable demand.

## **DATA AND DESCRIPTIVE STATISTICS**

The data for this study is sourced from National Council for Applied Economic Research's (NCAER) Income-Expenditure survey of households (National Survey of Households' Income and Expenditure – 2011). With the pre-survey listing of over 5,14,000 households, the actual survey canvassed 93,186 households across all the states of India with the aim of capturing the socioeconomic and demographic characteristics of Indian households, with a particular focus on income expenditure, savings and debt, and other aspects of household life in India. These included amenities and dwelling details, water usage, health, remote payment and detailed consumer behaviour data, with a section on the consumer mind space. The pre-survey listing data provided even more useful information, relevant for the present study, like quality of electricity received by the households, apart from the other requisite information. Hence, we have based our study on the population estimates obtained from the survey data as well as from pre-survey listing data of those households which were selected for the main survey. This is done by merging the pre-survey listing data with the main survey data so that we have complete data for 93,186 households. As mentioned earlier, the variables used for the study are refrigerator ownership (whether or not a household owns a refrigerator), household's non-food consumption expenditure class (a proxy for disposable income), quality of electricity received by the households (ranging from electricity available for "0 to 8 hours" to "9 to 16 hours" and to "17 to 24 hours"), level of education of the apparent decision-making woman of the household (spouse in the case of households where chief wage earner (CWE) is a male and self for households where CWE is a female).

We analyse rural and urban households separately. The household's annual non-food consumption expenditure has been divided into 12 equal classes – from minimum value to the threshold value above which income does not appear to be a determinant of refrigerator ownership. The distribution of households in rural and urban areas

broadly follows the expected distribution across various consumption classes, with the share of urban households in total households rising at higher consumption classes (Table 2).

**Table 2: Percent of Households by Consumption Classes**

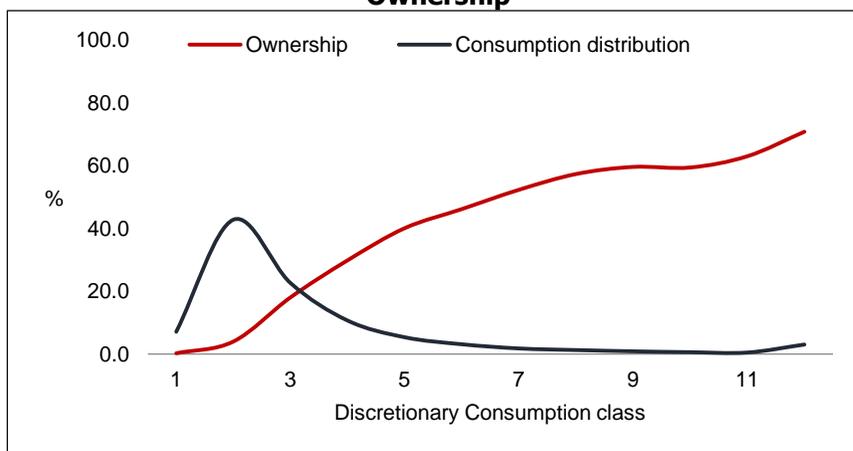
Consumption class	Rural	Urban	Total
1	91.4	8.6	100.0
2	81.9	18.1	100.0
3	62.5	37.5	100.0
4	51.4	48.6	100.0
5	45.6	54.4	100.0
6	41.9	58.1	100.0
7	39.5	60.5	100.0
8	38.6	61.4	100.0
9	38.0	62.0	100.0
10	37.6	62.4	100.0
11	35.8	64.2	100.0
12	38.9	61.1	100.0
Total	68.2	31.8	100.0

**Source:** Authors' computation based on NSHIE, 2011, NCAER

In 2011, household ownership of refrigerator in India was around 17.7 percent. To explore the relationship between household affordability and the ownership, we use each household's annual discretionary (non-food) consumption expenditure as a measure of their affordability. The ownership by the level of discretionary expenditure suggests a typical S-curve relationship between the two variables (figure 1). The refrigerator ownership curve shows an inflexion point at the bottom of the S-curve implying that ownership first rises slowly with income and then increases more quickly. Once the expenditure on food is taken care of, households face a choice between consuming other necessities such as clothing so on and a non-divisible good providing a fixed utility such as durable goods. As household spending increases beyond a certain threshold, utility derived from goods such as clothing begins to fall below the forgone utility from a durable. This generates the S-curve pattern of

durable ownership, under reasonable assumption. Figure 1 also plots the density of households by discretionary expenditure.

**Figure 1: Household Expenditure Distribution and Refrigerator Ownership**

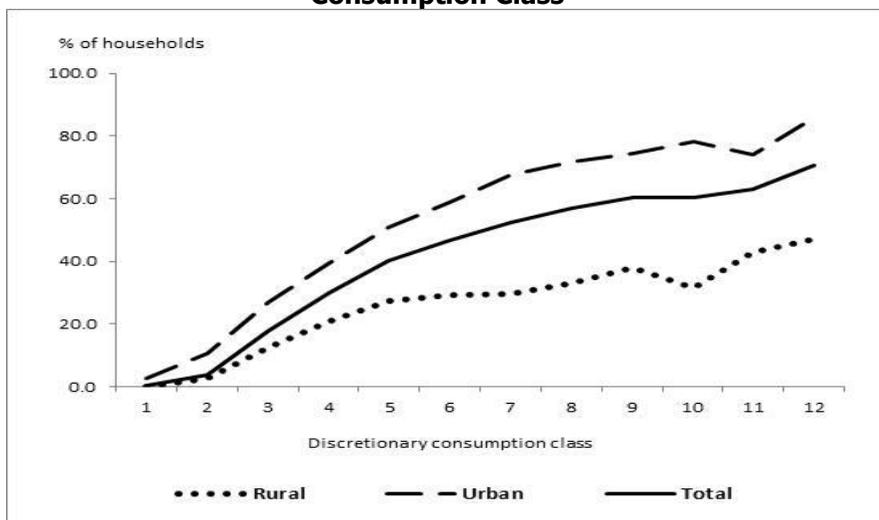


**Source:** Authors' computation based on NSHIE, 2011, NCAER.

Figure 1 suggests the inflexion point of the ownership rate around consumption class 2 after which the ownership rate begins to rise relatively rapidly. The growth in the refrigerator ownership at the lower end of consumption distribution is much faster than at the upper end of the distribution. This, combined with the fact that a large share of households in India are still at the low end consumption distribution, suggests a potential take-off in the refrigerator demand in coming years. In 2011, 4 out of every 5 households in rural India fall within the lowest three consumption classes. In urban India, the same is true for every 1 in 2 households. Now, if the statistical analysis suggests that the threshold level of discretionary spending for a purchase of a refrigerator is cross the consumption level of the class 2, then the demand for refrigerators in India could see a significant rise in the coming years as a large number of households cross this discretionary spending threshold.

The urban-rural breakdown of refrigerator ownership suggests wide differences in the ownership rate with the same discretionary consumption class (Figure 2). that in rural areas, even in the highest consumption class, less than 50 percent of households own a refrigerator, while in urban areas, even in class 5 onwards, more than 50 percent of households own a refrigerator. This suggests that constraints other than affordability are at work in rural areas which influence households' decision to buy a refrigerator.

**Figure 2: percent Refrigerator-Owning Households in each Consumption Class**



**Source:** Authors' computation based on NSHIE, 2011, NCAER.

Besides, the relatively flat slope of the line representing the rural refrigerator ownership in the left half part of figure 2 suggests that there are not large differences in ownership of refrigerators for households whose overall discretionary spending differs by a factor or two. In contrast, in urban India, the slope of the ownership line is much steeper suggesting a higher probability of ownership for smaller increases in discretionary spending. Given that the adoption of refrigerator is faster in urban than in rural areas for the same household spending levels and

that the differences in the ownership levels in rural and urban areas continue even in the higher spending brackets, the factors other than income seem to play a significant role in the ownership level, once the threshold level of discretionary spending is reached.

Other than affordability, one of the primary determinants, which influence the refrigerator purchase decision, is access and duration of electricity. While India has improved the electrification rate from 65 percent in 2008 to 75 percent in 2012, it still lags considerably behind its peers, with around 300 million people still without access to electricity (table 3). Our data reveals that nearly 43 percent of rural households and 13 percent of urban households either do not have access to electricity or receive electricity for less than 8 hours (table 4), making it a major constraint to buy a durable such as a refrigerator.

**Table 3: Electricity Access, 2012**

Region	Population without electricity millions	National electrification rate percent	Urban electrification rate percent	Rural electrification rate percent
China	3	100	100	100
India	304	75	94	67
Thailand	1	99	100	99
Pakistan	56	69	88	57
Brazil	1	100	100	97

**Source:** World Energy Outlook, 2014, IEA

**Table 4: Percent of Households by Duration of Electricity Received, 2011**

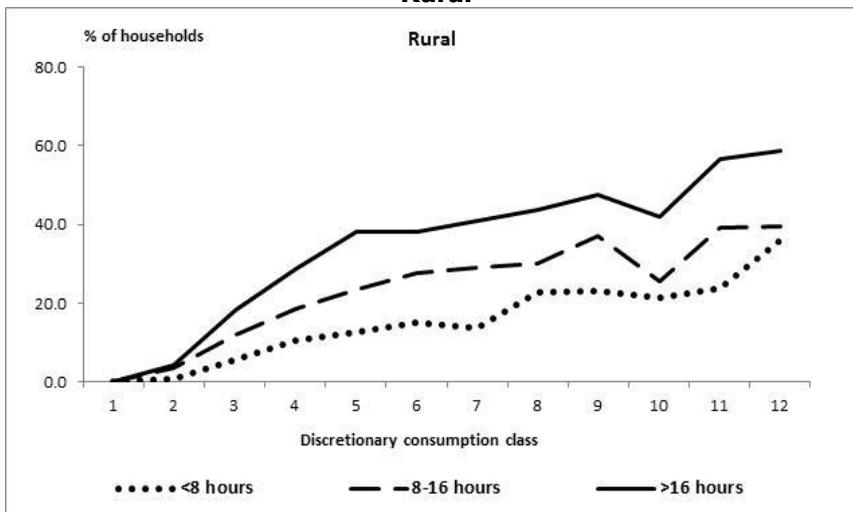
	Rural	Urban	Total
< 8 hours	42.9	12.9	33.3
between 8 to 16 hours	17.9	9.6	15.2
> 16 hours	39.2	77.5	51.5
Total	100.0	100.0	100.0

**Source:** Authors' computation based on NSHIE, 2011, NCAER

For India, World Bank (2008) forecasts ownership of home appliances up to 2030 while assuming that the electrification rate rises in line with income levels. De la Rue du Can et al (2009) forecast the diffusion rate for appliance ownership using regression on income of electrified households. In taking this approach, both the studies do not account for lost demand for durables due to the lack of sufficient electricity access. The objectives of these studies were to forecast India's energy demand, and hence, the focus was not on determinants of household welfare. Given that the utility of refrigerator depends on the reliability and duration of electricity, rather than mere access to electricity, the number of hours of electricity will, a priori, matters in the purchase decision.

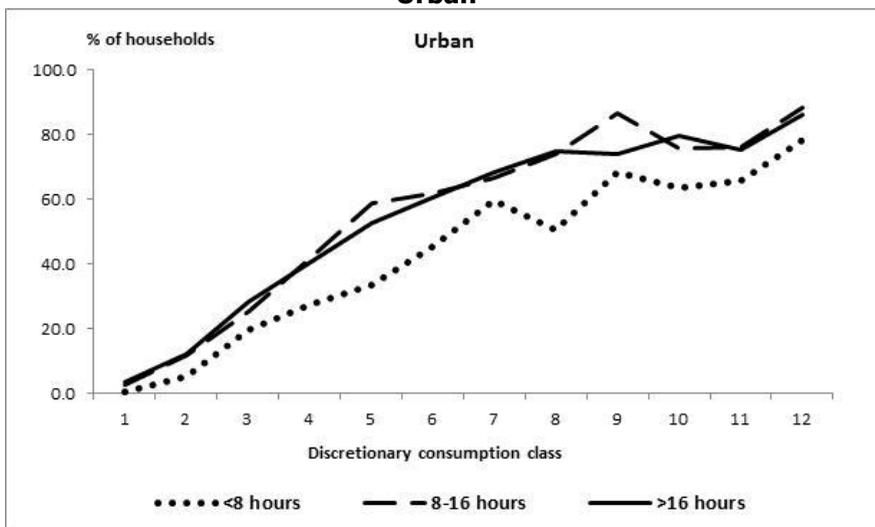
Figures 3 and 4 suggest that above a certain threshold level of consumption, when affordability is no longer a constraint, the duration of electricity access appears to be a constraining variable for refrigerator ownership, especially in rural areas (figure 3). For example, while nearly 60 percent of households with access to electricity for more than 16 hours a day in the upper most consumption class own a refrigerator, the ownership rate is around 36 percent in the same consumption brackets for households which receive electricity for less than 8 hours a day. The difference in the refrigerator ownership rate among households with greater duration of electricity and those with less appears to be less significant in urban India, perhaps because access to electricity is via captive generators.

**Figure 3: Electricity Access and Refrigerator Ownership Rate – Rural**



Source: Authors' computation based on NSHIE, 2011, NCAER

**Figure 4: Electricity Access and Refrigerator Ownership Rate – Urban**



Source: Authors' computation based on NSHIE, 2011, NCAER

One of the critical determinants, a priori, that influences the purchase of a household durable good is the distribution of the intra-household bargaining power. One of the determinants of the female bargaining power within a household is the level of education and in turn, the probability of working outside household. To investigate the role of intra-household bargaining power, the households have been classified into four categories based on the education level of main female of the households: illiterate, primary or below, secondary or below, tertiary or below. With rural and urban education levels in India differing widely (table 5) with female education being significantly higher in urban areas, refrigerator ownership among urban households with a similar level of consumption is likely to be higher than in rural India.

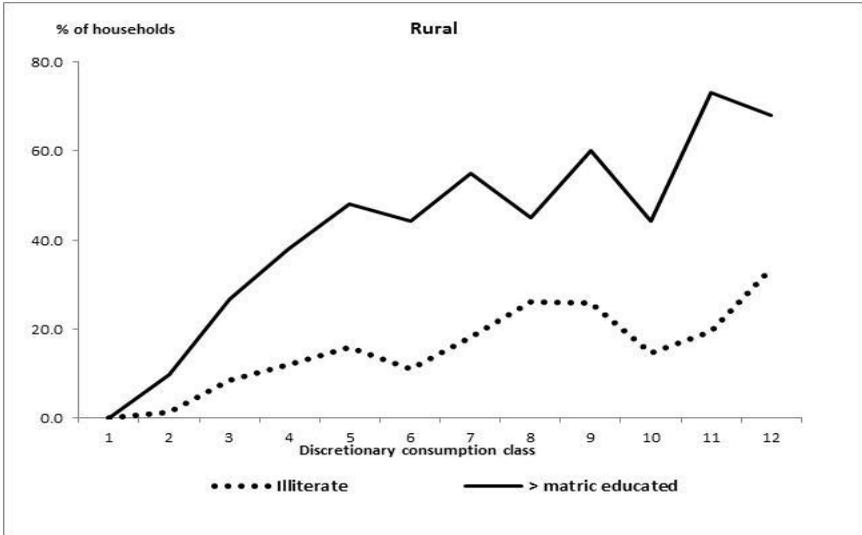
**Table 5: Percent of Households with Education Level of Main Female in Households, 2011**

	<b>Rural</b>	<b>Urban</b>	<b>Total</b>
Illiterate	53.6	24.7	44.4
Primary Education	25.6	26.5	25.9
Matric-level education	16.6	32.2	21.6
> matric education	4.2	16.6	8.1

**Source:** Authors' computation based on NSHIE, 2011, NCAER

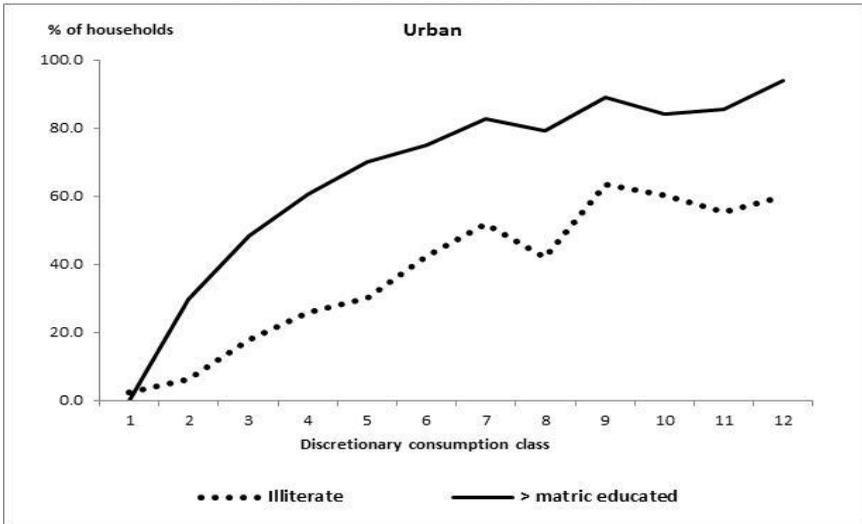
The intra-household bargaining power, proxied by the level of education of main female (spouse in the case of households where chief wage earner is a male and self for households where chief wage earner is a female) in the household, appears to be a significant determinant of refrigerator ownership, controlling for the affordability (figure 5 and 6). This approach amounts to an instrumental variable approach where we use a variable correlated to female bargaining power, but not directly the outcome measure.

**Figure 5: Refrigerator Ownership by Education Level of Main Female in The Household – Rural**



Source: Authors' computation based on NSHIE, 2011, NCAER

**Figure 6: Refrigerator ownership By Education Level of Main Female in the Household – Urban**



Source: Authors' computation based on NSHIE, 2011, NCAER

These results suggest that in both rural and urban areas, female education and its potential impact on women labour market participation along with their earning capacity raises female decision making power within a household and thereby, raises the probability of refrigerator ownership, especially when affordability is not a constraint. The decision-making power gives women ability to choose an asset which lowers time spent in household labour as well as results in better health outcomes. The reallocation of time may also allow females to enter the labour market or those who are already working, to spend more hours at work.

## **ECONOMETRIC MODELLING AND RESULTS**

In order to establish the determinants of refrigerator ownership at household level, we perform a logistic regression analysis since the dependent variable is categorical (that takes value 1 if the household owns a refrigerator and 0 otherwise). We include dummy variables for household's non-food consumption expenditure class as a proxy for disposable income (we group the households into twelve income classes), duration of electricity received by the households (we group the households into 4 categories: receives electricity for "0 hour", "1 to 8 hours", "9 to 16 hours" and "17 to 24 hours") as a proxy for the quality of complimentary good, and the level of education of the apparent decision-making woman of the household (education levels are grouped into 4 broad categories: "illiterate", "primary or below", "secondary or below but above primary" and "tertiary or below but above secondary education") as a proxy for the female bargaining power within a household. We also include age of the household head and household size as other explanatory variables in order to capture the life-cycle stage of the household and economies of scale respectively. To take into account spatial differences in prices, living conditions, climatic conditions, provision of infrastructure (electricity), access to markets etc. we include district fixed effects. The results of step-wise regression analysis for rural and urban areas are presented in Tables 6 and 7.

In columns R1 and U1 of Tables 6 and 7, we find the effect of income on ownership controlling only for household characteristics. It is evident that odds of owning a refrigerator increase significantly in the second income class with respect to the first or the lowest income class. For the next income classes, the odds of owning keep increasing when compared with those of first class but show a decline when compared with those of just preceding income class. In columns R2 and U2, we further control for the quality of complementary public good, i.e., number of hours of electricity received by the household. We find that quality of electricity received by a household is a strong determinant of the refrigerator ownership and the addition of this explanatory variable brings down the effect of income on ownership of the durable good. In columns R3 and U3, we present the full model, i.e., we control for education level of the main female of the household apart from electricity access. The odds of owning a refrigerator increase with an increase in education level of the women and the likelihood of ownership is the highest for women with tertiary education. The addition of this explanatory variable further brings down the effect of income on ownership. However, when women's bargaining power is measured as a male-female education gap<sup>1</sup>, we do not find any significant effect of the variable on refrigerator ownership. This may be due to the fact that in around 85 percent of the households surveyed we find the education level of the woman to be lower (53 percent) or same (32 percent) as that of the male CWE. Among the other household characteristics, age and age squared of the household head do not have a significant effect on ownership, but household size increases the odds of owning a refrigerator as more members reduce the cost of each usage (Rong and Yao, 2003).

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<sup>1</sup> Education levels of the male and female members are measured as 11 categories. We take the difference in education level of the main male member of the household and that of female member and then create dummy variables for positive, negative and no gap and include them in the regression analysis.

**Table 6: Determinants of Refrigerator Ownership – Rural**

VARIABLES	(R1)	(R2)	(R3)
Age	1.006 (0.015)	1.003 (0.015)	1.028* (0.015)
Age squared	1.000 (0.000)	1.000 (0.000)	1.000 (0.000)
Household size	0.969** (0.015)	0.997 (0.012)	1.027** (0.014)
Income class – 2	41.592*** (24.379)	30.718*** (18.190)	26.141*** (15.357)
Income class – 3	241.346*** (142.795)	154.514*** (92.289)	120.266*** (71.036)
Income class – 4	450.070*** (271.846)	275.511*** (168.307)	197.711*** (119.503)
Income class – 5	659.286*** (388.439)	394.388*** (235.239)	272.849*** (162.218)
Income class – 6	695.686*** (416.180)	410.509*** (250.507)	262.767*** (159.711)
Income class – 7	706.437*** (425.163)	446.975*** (274.078)	290.404*** (176.369)
Income class – 8	936.170*** (552.407)	583.683*** (344.681)	361.457*** (215.756)
Income class – 9	1,047.966*** (636.465)	639.352*** (380.629)	400.252*** (236.219)
Income class – 10	884.072*** (569.316)	527.966*** (344.155)	304.815*** (194.220)
Income class – 11	1,408.496*** (897.527)	871.596*** (562.896)	521.092*** (338.636)
Income class – 12	1,636.683*** (932.470)	963.881*** (551.519)	583.356*** (329.177)
_Ielect_rec_2		8.006*** (2.038)	6.805*** (1.802)
_Ielect_rec_3		11.066*** (1.980)	10.120*** (1.879)
_Ielect_rec_4		14.030*** (2.721)	11.652*** (2.294)
Female – primary educ			1.360*** (0.131)
Female – secondary educ			2.976*** (0.321)
Female – tertiary educ			4.649*** (0.646)
Constant	0.001*** (0.000)	0.000*** (0.000)	0.000*** (0.000)
District fixed effects	Yes	Yes	Yes
Observations	42,383	42,162	42,162
Pseudo R-squared	0.239	0.276	0.303

**Note:** Clustered standard errors in parentheses, \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 7: Determinants of Refrigerator Ownership – Urban**

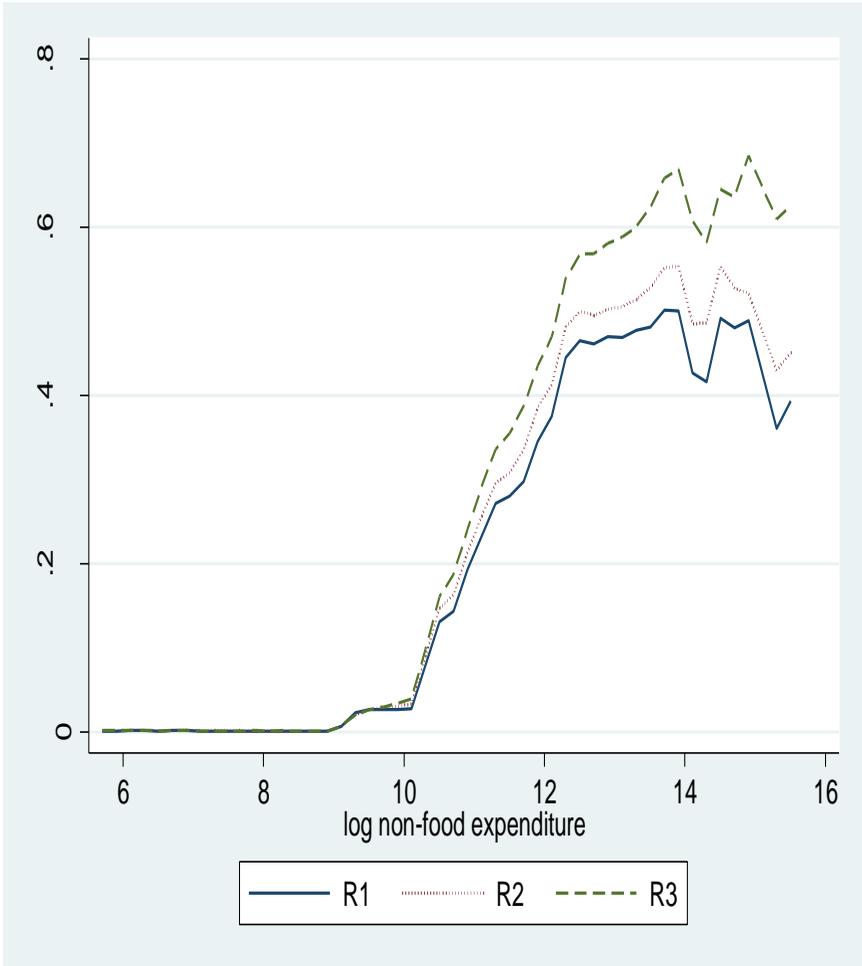
Variables	(U1)	(U2)	(U3)
Age	1.004 (0.009)	1.000 (0.010)	1.015 (0.011)
Age squared	1.000 (0.000)	1.000 (0.000)	1.000 (0.000)
Household size	0.979 (0.014)	0.978* (0.013)	1.037*** (0.014)
Income class – 2	5.738*** (2.290)	4.983*** (1.926)	4.538*** (1.751)
Income class – 3	18.034*** (7.460)	15.021*** (6.067)	12.030*** (4.870)
Income class – 4	31.833*** (13.219)	26.469*** (10.951)	18.881*** (7.747)
Income class – 5	49.637*** (20.880)	43.107*** (18.083)	29.259*** (12.393)
Income class – 6	67.384*** (28.429)	56.225*** (23.471)	34.984*** (14.797)
Income class – 7	97.704*** (41.109)	79.163*** (32.680)	49.187*** (20.312)
Income class – 8	119.254*** (47.357)	110.851*** (43.857)	66.034*** (26.769)
Income class – 9	133.569*** (57.121)	108.234*** (45.260)	63.146*** (26.725)
Income class – 10	155.823*** (62.674)	131.662*** (53.618)	72.583*** (30.575)
Income class – 11	137.239*** (70.450)	112.363*** (57.491)	69.181*** (35.908)
Income class – 12	253.301*** (96.024)	208.582*** (78.091)	105.285*** (40.322)
_Ielect_rec_2		5.275*** (1.261)	3.590*** (0.933)
_Ielect_rec_3		8.584*** (2.390)	6.960*** (2.006)
_Ielect_rec_4		8.033*** (1.924)	6.178*** (1.558)
Female – primary educ			1.450*** (0.110)
Female – secondary educ			2.738*** (0.222)
Female – tertiary educ			6.102*** (0.571)
Constant	0.074*** (0.032)	0.013*** (0.006)	0.004*** (0.002)
Observations	50,618	48,991	48,991
Pseudo R-squared	0.223	0.239	0.278

**Note:** Clustered standard errors in parentheses

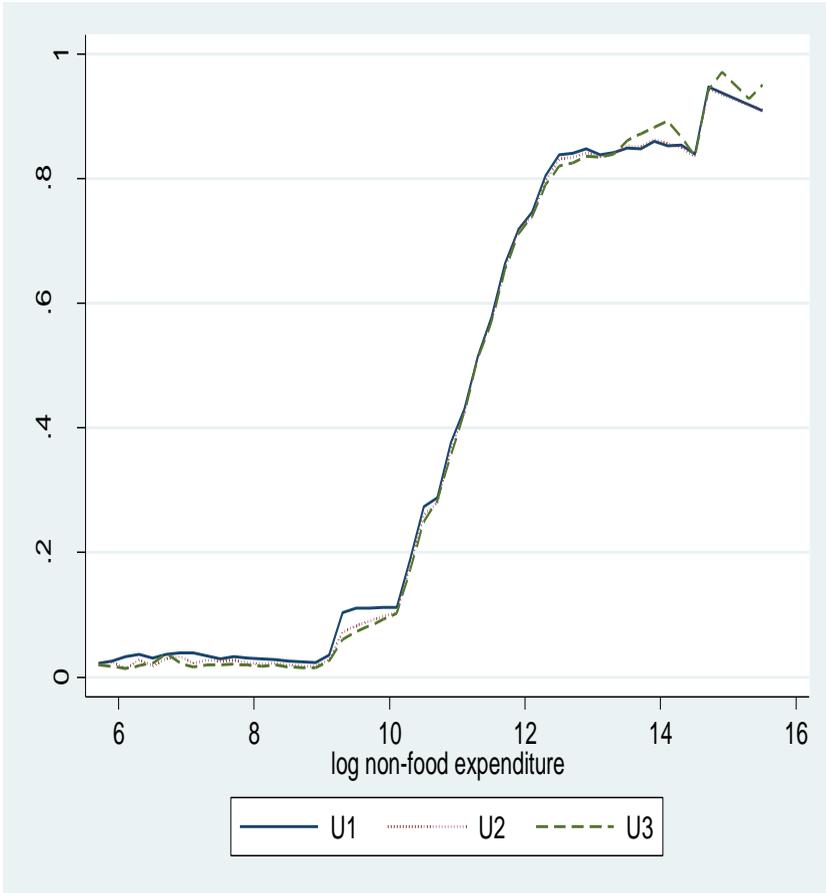
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

In figures 8 and 9 below, we plot the predicted marginal probabilities of owning a refrigerator (obtained by performing the regression analysis in R1-R3 and U1-U3) against log of non-food household expenditure. The graphs show that marginal probabilities of ownership are nearly zero below the threshold level of non-food expenditure (equivalent to INR 22,000). Above this threshold, the probabilities increase sharply as expenditure rises but the graphs become flatter for higher income levels. A comparison of the graphs R1, R2 and R3 show that for rural households with the same level of income, the probability of ownership increases as quality of electricity received improves and education level of women is higher. But this is not very evident in the case of urban households. Thus it can be stated that provision of public goods has stronger effects on durable goods ownership for rural households than for their urban counterparts. Similarly, high bargaining power of women proxied by their levels of education has stronger effect on ownership in rural areas than in urban areas.

**Figure 8: Predicted Marginal Probabilities of Refrigerator Ownership - Rural**



**Figure 9: Predicted Marginal Probabilities of Refrigerator Ownership - Urban**



## **CONCLUSION**

The failure of the government policies to ensure reliable public services such as uninterrupted power supply and increasing female education levels are among the key stumbling blocks to raising household welfare in India. The econometric results from this study suggests that the household expenditure pattern, in particular the decision to purchase a consumer durable, specifically refrigerator depends female intra-household bargaining power, proxied by her education level as well as duration of electricity access. There are significant differences in the ownership pattern within the households in a particular income category, based on differences in these two variables and the results are more pronounced for the rural areas. Our findings also have implications for understanding future growth in appliance ownership in India. While refrigerator adoption has been rapid in urban India, a significant number of rural households which have crossed the threshold level of income necessary to afford a refrigerator will not acquire energy-using assets unless the duration of power supply and female decision-making power within households increases. The refrigerator ownership in India, is therefore likely to rise at a slower rate compared to what has been seen historically in countries such as China.

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