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Electricity Demand and Basic Needs: Empirical Evidence from China's Households

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The Chinese government began to implement an increasing block tariff (IBT) nationwide in the residential sector in July 2012. Although there have been a number of studies on the impacts of an IBT, knowledge about IBT design is still limited, particularly how to determine the electricity volume for the first block of an IBT scheme, which is intended to protect those households with low levels of consumption that are least able to pay higher prices.

In developing countries， the first block of an IBT has usually been set at a subsidized price, ensuring the poor can afford to pay for some minimum volume of energy service to perform such basic tasks as cooking, lighting and heating at an affordable price. Hence, one empirical question concerning IBT is to model household electricity demand such that the size of the minimum-need block can be established.

We investigate the basic electricity needs in China's households based on survey data from three provinces, assuming that the minimum volume of electricity needed provides a measure of "basic needs". We employ a demand-based approach in contrast to the physical-quantity or expenditure-based approaches, which are commonly used in energy poverty research. The energy demand approach does not specify any predefined figures as a threshold of energy poverty, thereby overcoming the drawbacks of arbitrariness and inflexibility of the other approaches.

We examine the pattern that the electricity demand varies with the changes in income, after controlling a number of exogenous variables at levels of household and district. The underlying hypothesis is that if there is indeed some basic level of electricity demand, then the relationship between electricity demand and income should be weak for a household that is merely meeting its basic electricity needs.

The empirical results reveal that household electricity consumption becomes income-sensitive at higher income levels, controlling for other factors. There exists a basic minimum amount of electricity consumption that a household requires, and

that threshold is different between rural and urban areas. Overall, the saturation point for China's household electricity consumption is far from having been reached. The existence of an income threshold implies that if the electricity price rises, the burden imposed could be high for low-income families unless a way was found to minimize the effect of price rises. Given efforts to liberalize electricity prices in China and plans for a price structure based on IBTs in China, it is essential to select the volume and rate of the first block in an IBT scheme so as to mitigate the impacts borne by low-income families.

Under the newly instituted IBT, Beijing households were able to keep the pre-existing rate for monthly usage of up to 240 kWh, pay roughly 10% more for 241-400 kWh, and fully 60% more for consumption above 400 kWh (Lo, 2014). The schemes for other provinces are broadly similar with some relatively minor variation. Assuming an average of roughly 3 (4) residents per urban (rural) household, we estimate basic needs to be roughly 90 kWh per month for rural households and 150 kWh for urban households. Thus, the first IBT block appears to have been set at a level that is too high, equivalent to the average consumption of the *top* decile of urban residents.

The danger of such an approach is that, when introduced, only a very small percentage of residents will have needed to pay the highest rate and almost all residents would have fallen within the lowest block, which includes both those just barely able to meet their basic needs and those consuming at a significantly higher level. As a result, the initial policy targets that motivated the introduction of the IBT, such as stimulating energy-saving behavior and subsidizing basic energy services for targeted consumers, will be difficult to achieve. The more positive interpretation though is that, from a political economy perspective, such a tariff would have been relatively easy to introduce given the situation in 2012, but, given the likelihood of continued increases in household residential consumption, fewer households will over time, first block and more will be subject to the highest rate. Therefore such an approach may produce a more sustainable tariff structure that will become increasingly more effective over time. >

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