

A REGIONAL DECOMPOSITION OF DOMESTIC ELECTRICITY CONSUMPTION IN INDIA: 1980-2005

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(1) Overview

Access to electricity services is fundamental to development and has been shown to be important for improving the quality of life and level of human well being. Yet, despite this general recognition of the importance of electricity for development, in India, close to 40 percent of households still lack access to this basic service. Recognizing this as a fundamental drawback, the government has made several policy reforms and initiated several programs to achieve the target of improving access. The National Electrification Policy 2005 aims at total village electrification by 2010 and total household electrification by 2012. While significant progress in electrification has been achieved in certain regions and states of the country, in others, particularly in rural areas, large fractions of the population still lack access. In fact, due to the increasingly poor financial situation of state utilities, the rate of village electrification dropped during the latter half of the nineties compared to the decade before.

Besides the still unsatisfying situation regarding access, the electricity supply situation in India is also quite alarming in many respects. Shortfalls in supply seriously affect the quality of life of the population and their economic growth potential. While access has improved over the last few decades, there has been an increasing gap between demand and supply and deteriorating quality of supply. In India, per capita consumption of electricity is very low - between 100 and 450 kilowatt (kW) per annum, with an average of about 300 kW (corresponding figures for Canada and the United States are 17,300 and 12,500 kW, respectively). This reflects a poor standard of living, particularly in hamlets and villages where electricity consumption is particularly low.

This paper aims to assess the recent growth in electricity consumption within the domestic or household sector in India at a regional level, looking at data spanning the period of the last two and a half decades. Our objective in doing so is to understand the relative importance of some of the important drivers of change and the differences in the relative importance of these drivers across different regions of the country, between rural and urban populations and across different periods of time.

(2) Methods

We analyze the importance of different drivers by carrying out a decomposition analysis of household electricity consumption employing the logarithmic mean Divisia index decomposition method, which is currently seen as one of the most favorable decomposition techniques (Ang 2004; Ang and Liu 2001, 2007a and b, Liu and Ang 2007). We decompose electricity use into four factors, namely into electricity use by connected household (this captures per capita consumption), share of connected households among all households (this captures changes in electrification), household size and total population. We do this analysis at a state level and at the level of some more aggregated groups of states ("high income north", "poor states", "medium growth western states", "southern states") and for the whole of India. We also undertake a similar analysis further differentiated for rural and urban households separately. Data for the analysis is derived from two different sources. We employ microdata from various rounds of nationally representative household consumer expenditure surveys, as well as data on number of

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connections and domestic electricity sales from various state utilities as reported by the Central Electricity Authority (CEA) of India.

(3) Results

At an all-India level, growth in the share of connected households explains most of the total growth in electricity consumption for almost the entire period spanning 1980-2005. Only in the 1990s did growth in electricity use per connected household have a larger influence on total growth in domestic electricity consumption. However, an analysis of changes over time at a regional level reveals significant differences across different states. In the states of the rich North, most of the increase in electricity consumption occurred during the late 1980s and early 1990s. During this period, growth in the number of connected households and in population was about equally important in driving growth as the increase in electricity use per connected household. In the states of the industrialized West, the situation was similar to that in the North. By contrast, in the poorer states of the East and North East, growth in number of connected households explained most of the total growth during this entire period. However, the pace of increase in providing connections slowed down significantly during the late 1990s and early 2000s and was even negative during some years. The situation was similar in the poor states of the Indian heartland where most of the increase in domestic electricity consumption can be explained by the increase in the share of connected households, even though these states continue to have the largest share of unelectrified households to date. In the states of the South, increases in the share of connected households explained most of the increase in consumption during the 1980s and early 1990s. However, towards the late 1990s and early 2000s, increase in electricity use per connected households was more important in driving the increase in electricity consumption in this region. The state of Orissa, which holds a rather unique position, as it was one of the first states of India to implement electricity sector reforms, experienced the most growth in domestic electricity use in the early 1990s. The growth in the early 1990s in Orissa was largely on account of the rise in use per connected households. However, during the late 1990's, after reforms, the increase in share of connected households played a more important role in driving the increase in consumption. However, in the early 2000's electricity use per connected household had a negative impact on changes in electricity consumption, which seems to suggest that the reforms were not really very effective in improving the electricity supply situation in the state.

The analysis of changes decomposed further for rural and urban households separately, suggests that at an all-India level urbanization had a more important role in driving the increase in domestic electricity consumption after the late 1990s. Prior to this the effect of the share of rural to urban households was rather insignificant. However, of course, the results differ when analyzed for different regions, as urbanization rates differ significantly across different states of the country.

(4) Conclusions

In this paper, we analyze the factors that have influenced changes in electricity consumption in India's domestic sector. Results from our analysis suggest that the importance of different key factors in explaining the change in domestic electricity consumption in India vary significantly by region and period in time. However, most important in all cases have been changes in access and changes in per capita use, while household size and total population developments have been of secondary influence in most regions. The progress in household electrification currently is also very different across different states of the country. Comparing the results of our analysis with the timing of different reforms, policies and programs, as in the case of the state of Orissa, also allows us to understand the effectiveness of these actions in improving the electricity access and supply situation in the state. The government has a huge challenge ahead of it to meet the target of universal household electricity access by 2012. A differentiated analysis of the current and historical changes in the electricity sector, such as presented in this paper, is an important input to developing effective strategies and programs to improve the situation in different regions.

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