

Submission Summary

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Paper Title

WHAT DO WE KNOW ABOUT ELECTRICITY DEMAND ELASTICITIES WITH IMPLICATIONS FOR THE FUTURE?

Abstract**Overview**

Electricity demand has been one of the longest and most heavily studied of energy products with the first econometric study found published in 1951. My last survey paper relating to electricity, Dahl (2011a) cites 7 studies between 1974 and 2005 that survey or do meta-analyses on electricity demand elasticities. These eight studies span more than 400 econometric electricity demand studies dated between 1951 and 2008. Summary statistics for each of the more than 400 articles are included in the database Dahl (2011b). With electricity currently providing around a quarter of the global anthropomorphic emissions of CO₂ (EPA 2022), electric cars looming on the horizon (10% of new light duty vehicle purchased were electric in 2021 (IEA 2022) and more than 700 million people currently without access to electricity (Worldbank, 2022), this interest has not waned. Since my last extensive database update of electricity demand elasticities (Dedd2011_EI), more than 100 new studies have been found, which contain electricity demand elasticities and two studies do metanalysis. (Labandeira, Labeaga, and López-Otero, 2017) consider all demands for electricity for papers published from 1990-2016 while (Zhu, Li, Zhou, Zhang, and Yang, 2018) consider only residential demand for electricity on papers published from 1990-2016. My goal in this paper is to build on the impressive array of survey work already completed by first gleaning what conclusions they provide and then consider the more than 500 studies collected to find what additional information they provide that can help us better understand electricity demand and how it has evolved.

Methods

The survey work and meta analyses typically consider a number of categories to see their effect on estimated price and income demand elasticities in the short- and long-run and elasticities on static models which do not distinguish between short and long run. Categories can include sectors, data types and frequency, income levels, geographic regions, time period, environmental characteristics, functional form, and econometric methodology. I will begin there as well and compare and contrast the existing surveys. I will then dig deeper and add the more than 100 new electricity demand studies to my existing publicly existing database on electricity demand. Histograms and statistical measures will provide an overview of this rich and most up to date database that considers the demand for electricity for all countries and sectors. The database includes not only the price and income elasticities and categories typically included in the survey work but all the variables included in the estimated equations. This will allow consideration of the effects of other variables that are not as well studied.

Results

From considering the survey work, I will conclude where they agree, where they disagree, where the most uncertainly lies, and important questions that remain to be answered. Then I will proceed to consider the original articles I have collected over the years to do a critical analysis of these available studies, summarize what additional variables have been included, and determine what if anything we can infer about their effect on electricity demand and elasticities. Such variables will include weather, urbanization, and variables relating to policy. Additional I will focus more specifically on topics where less survey work has been done including electricity demand in the poorest of countries, cross price elasticities, elasticities by time of day and electricity demand by industry, which shows rather large variation.

Conclusions

Understanding the likely value of demand elasticities in the past, how they have evolved, and what drove electricity demand growth is important information for a whole host of stakeholders including electric utilities, international capital markets, electricity consumers, electricity regulators and other policy makers interesting in providing clean and

affordable electricity to the global population. The ongoing database should prove valuable to them as well. More importantly, the results from the past will be used to speculate about implications for the future and needed research as we march towards net zero.

References

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Primary Subject Area

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