NBER Digital Economics and AI Tutorial

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I study how households respond to electricity prices and participate in retail energy markets. My doctoral research combines administrative consumption data with applied microeconometrics to examine price responsiveness, supplier switching and the role of information in household decisions. I am applying to the tutorial to develop the digital-economics dimensions of this agenda, particularly consumer search and tariff comparability, and to assess how AI can improve measurement and empirical analysis.

Graduate study and doctoral enrolment

My doctoral enrolment spans the University of Missouri, Columbia, in the 2024–2025 academic year and the University of Galway from 2025 to the present. At Missouri, from August 2024 to May 2025, I completed doctoral sequences in advanced microeconomic theory, macroeconomics and econometric theory. I am now in the second academic year of my Galway PhD, where I completed PhD-level courses in Microeconomics, Causal Inference Econometrics, and Philosophy of Social Science.

Before my doctoral studies, I completed an M.S. in Applied Statistics at King Fahd University of Petroleum and Minerals in 2024, ranking second in my class. My thesis combined multivariate GARCH and extreme-value methods to estimate tail-related risk measures for heteroscedastic financial time series. This training developed my grounding in statistical modelling, dependence and empirical validation, which I now apply to household electricity data.

My research preparation also includes work as a research assistant at Missouri on “Just Look: Knowing Peers with Image Representation.” I prepared and validated inputs for machine-learning pipelines using corporate datasets exceeding four million observations and developed R workflows for industry reclassification using Supply and Use tables. This experience gave me practical insight into the importance of data construction and validation when applying machine learning to economic questions.

Dissertation focus and supervision

My dissertation is being developed within the FlexECon project and concerns residential electricity demand and household engagement in Irish retail energy markets. My supervisors are Dr Jason Harold of the University of Galway’s CERIS Research Group, and Dr Niall Farrell from the Economic and Social Research Institute. The current first chapter is described below.

Current research on electricity demand and market participation

My first chapter, “Price Elasticity of Residential Electricity Demand: Evidence from Large-Scale Administrative Microdata with Traditional Metering in Ireland,” asks how households adjust electricity consumption when retail prices rise and how this response differs with supplier-switching behaviour. The economic question concerns two potential margins of adjustment: changing consumption and seeking a different retail offer. Understanding their relationship matters for the design of retail markets and policies that rely on price incentives.

The analysis uses a panel of traditional 24-hour electricity meters in Ireland. Observations follow actual intervals between meter readings, with consumption measured as average daily use. I relate consumption to the VAT-inclusive retail unit tariff using electricity-connection fixed effects, interval weather controls and quarter controls. To investigate price endogeneity, I have also estimated preliminary fixed-effects instrumental-variable models using wholesale-price exposure. The analysis examines delayed wholesale-to-retail transmission and the sensitivity of results to sample composition and the energy-crisis period.

The preliminary findings indicate that electricity demand is price inelastic. In a pooled fixed-effects interaction analysis covering approximately 17.3 million reading intervals across 1.55 million electricity connections, households that have switched supplier exhibit a smaller absolute consumption response than those that have never switched. This pattern raises questions about whether market engagement provides another way to manage electricity expenditure. Distinguishing the role of search from differences in household circumstances and preferences is an important direction for further research.

This work connects to digital economics through the information consumers need to compare offers and act on price signals. A retail tariff can combine unit charges, standing charges, discounts and contractual conditions. Even when offers are publicly available, identifying the relevant terms and comparing expected costs can require substantial attention. My research therefore motivates questions about how the presentation and accessibility of tariff information shape search, switching and consumption decisions.

Research in development

I plan to extend the demand analysis to traditional day and night meters and investigate more flexible approaches to covariate adjustment through Double Machine Learning. I am interested in whether flexible nuisance-function estimation can improve empirical performance while preserving a clear economic interpretation of the target parameter. The validity of the identifying assumptions and the treatment of dependence in panel data would remain central to that work.

A further strand of my doctoral agenda concerns informational nudges and household decision-making using survey data. I want to examine which features of tariff information consumers find difficult to interpret and how alternative presentations affect understanding and intended choices. Connecting such evidence to the administrative-data findings would help distinguish limits on consumption adjustment from barriers to engagement with the retail market.

Planned AI research and contribution to the tutorial

A specific extension I propose is to use large language models to extract pricing and contractual terms from publicly available electricity supplier documents. The aim would be to construct comparable measures of retail offers and information complexity, creating a basis for research on consumer search and market participation. This is a planned pilot, building on my current electricity-market research and experience preparing data for machine-learning applications.

I would begin with a manually coded benchmark of supplier documents and a defined set of fields, including unit rates, standing charges, discount conditions, contract duration and termination provisions. Extraction accuracy would be assessed at the field level and across suppliers, with particular attention to missing conditions, ambiguous wording and inconsistent document formats. Retaining the relevant source passage alongside each extracted value would make the resulting measures auditable and facilitate systematic error analysis.

The methodological question is whether AI-assisted extraction can produce reliable economic measures when documents differ in structure and terminology. Errors may vary systematically with supplier characteristics or contractual complexity, potentially distorting subsequent comparisons. I therefore want to examine how validation design and uncertainty about extracted values should inform empirical inference. The initial pilot would use public documents; any subsequent linkage to administrative data would depend on the relevant access and governance arrangements.

Beyond measurement, I am interested in how AI-assisted comparison could change consumer behaviour and supplier incentives. Reducing the effort required to interpret contracts may broaden search, but the choice of information highlighted could also affect which offers consumers consider. Questions about information quality, recommendations and consumer reliance offer a natural connection between my energy-economics agenda and research on digital intermediation. They also provide a framework for developing future work on informational interventions.

Why this tutorial

The tutorial would help me refine these questions at a stage when my empirical foundation is established and the AI-related extensions are being designed. I would value discussion of how to formulate economically meaningful questions around AI, evaluate text-derived measures and distinguish the effects of improved information from differences in the consumers who use it. Interaction with researchers in digital economics would help me identify the most tractable contribution and the evidence needed to support it.

I would contribute experience working with large administrative panels, electricity-market institutions and household price responses. My statistical training and practical data work would allow me to engage with methodological discussions, while the Irish retail electricity setting provides a concrete application for examining consumer search and information frictions. I hope to leave with a sharper design for the text-measurement pilot and a clearer route from that measurement exercise to a substantive digital-economics research question.