The input-output approach in rural electrification assessments: a review of experiences and challenges

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Input-output analysis is a powerful tool for studying complex economic structures, their interdependencies and environmental impacts. Input-output analysis, pioneered by Nobel laureate Wassily Leontief in the 1930s, revolutionised economic analysis by providing a systematic framework to understand inter-industry relationships. The method rapidly became a cornerstone of economic planning and policy analysis in the 1950s. By the 1960s, input-output analysis had already spread globally, guiding economic planning in various countries. Its application subsequently expanded beyond industrial interdependencies to include regional and social dimensions. Scholars have refined the method, incorporating dynamic elements, addressing sectoral complexities, and applying it to other fields. Miller (2021) provides a comprehensive overview of the latest developments, including the construction and application of multiregional and interregional models, the application of these models to global economic issues such as climate change and international trade, and their use in energy and environmental studies. These developments have significant implications for various fields, including economics, regional science, urban planning, and public policy analysis.

Within energy studies, the input-output approach could be a powerful tool for studying the multiple and complex effects of rural electrification projects. More than 775 million people still live without electricity, and recent reports suggest that such a figure has increased for the first time in decades (IAE, 2022). The input-output approach could be instrumental in identifying key sectors directly and indirectly affected by rural electrification, such as agriculture, manufacturing, and services sectors, which may experience changes in production and income due to improved access to electricity. It could assist in quantifying changes in output, income, and employment across economic activities due to rural electrification, including not only the sectors directly involved in electricity generation but also those that benefit indirectly from increased economic activity, or assist in the assessment of how income is distributed among different sectors and households, allowing policymakers to identify potential equity issues and design targeted interventions. Moreover, input-output analysis could be extended to assess the environmental impact of rural electrification by examining the resource use and emissions associated with increased economic activities. Therefore, policymakers could use input-output analysis to evaluate the potential effects of different policy scenarios related to rural electrification, assisting them in making informed decisions about investment priorities, subsidy programs, and regulatory frameworks.

However, several challenges and difficulties are still associated with applying input-output methodologies in rural electrification analysis. In this study, we aim to analyse the existing applications of input-output methods on rural electrification projects, the challenges and the difficulties associated with its applications in such contexts, and to discuss how alternative approaches, such as qualitative methods, can help address some of these challenges. Based on a review of recent articles related to the application of input-output methodologies in the study of rural electrification, we will analyse the scope of the applications and their challenges to discuss the areas of opportunity and limitations of their application in the local context. Preliminary results suggest that the availability of detailed and accurate data for rural areas, especially in developing countries, is one of the main challenges. Obtaining such data for rural regions may be limited or incomplete. Rural economies frequently include a substantial informal sector, which may not be well-documented or included in official statistics, leading to an incomplete representation of the economic activities in rural areas. Other challenges include how rural electrification impacts can vary significantly across different regions or how to adapt these models to incorporate dynamic changes over time or behavioural changes. Finally, our study will discuss whether integrating qualitative data

could create a more holistic and context-specific understanding of the complexities associated with rural electrification.

References

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