

VERTICAL INTEGRATION AS FIRM-LEVEL RESPONSE TO ELECTRICITY SHORTAGES: DOES TRANSACTION COST ECONOMICS SUFFICIENTLY EXPLAIN?

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Overview

In developing countries, industries are often plagued with power shortages. In response, some firms make their own electric power but most of the others do not. Why do we observe such divergent behavior in the decision to self-generate? While previous literature focuses on factor demand and marginal cost structure as key determinants for this decision, it does not explain divergent behavior in firms with similar key characteristics. We, therefore, take the perspective of contractual relationships and treat electricity provision as a transaction. Applying a discrete choice ‘make or buy’ model on a primary dataset of Indian manufacturing firms, we find that higher the sensitivity to ‘transaction-specificity’ in electricity use by manufacturing firms, greater the likelihood that they will go for vertical integration. But this is limited by contextual factors like firm size, location and operational environment. We conclude that even a standardized and physically non-specific asset can generate ‘transaction-specific’ costs, if the context demands so. We contend that transaction cost economics not only explains vertical integration of electricity by firms but in similar contexts can be used to explain the industrial organization of other energy resources which may otherwise be non-specific in nature.

Methods

We estimate some variations of a binary choice probit model to check for the robustness of the key variables which explain the ‘make or buy’ decision for electricity. Additionally a Heckman 2-stage model is also estimated to see which factors influence the extent of self-generation. Transaction specificity variables are measured through power intensity and dependency. Power cuts and voltage fluctuations show supply uncertainty. The number of power holidays reflects policy uncertainty. The data comes from a representative sample of 107 firms (of which nearly 40% go for vertical integration) generated through a primary survey of industries we conducted in the southern Indian state of Andhra Pradesh over a period of eight months. The sample consists of firms from all the regions of the state and stratified based on industry types as per the 3 digit classification of the Indian Annual Survey of Industries (ASI).

Results

We find that, when the context is of supply shortages, some firms make their own electric power while others buy from the grid depending on their *sensitivity* to transaction costs. Although electricity is not a specific asset in itself and has a high opportunity cost outside the transaction, we show that it generates transaction specificity for the buyer who gets ‘locked-in’ to non-production. Such specificity is because electricity has high coordination economies which impose high costs on buyers when a context of shortages prevails. The power specificity (*PWR_SPEC*) variable comes out significant and matches our hypothesis in terms of the direction of the causality. Higher is the specificity, more likely the firm will opt for self-generation. We observe variation cross industrial categories. Food manufacturing firms and chemical firms are more likely to opt for the ‘make’ option as compared to other industrial categories. This matches the proposition that transaction specificities would be higher for them as their dependence on continuous power supply is higher. Power shortage, firm size and location variables are also significant confirming that contextual factors influence the decision. However, operational environment does not significantly explain this divergent behaviour but this could be due to insufficient operational heterogeneity.

Conclusions

We conclude that there is a wide scope and need for research on industrial behaviour related to energy assets in developing country contexts. This is because the conditions, whether be it policy or operational environment, differ very much from the developed countries. This implies that firms work under constraints that do not often allow marginal cost considerations to be met efficiently. More importantly such contexts are beset with incomplete or uncertain contractual relationships. And when this happens, sensitivity to transaction cost concerns increase. The challenge lies in identifying and dealing with them. Our study demonstrates that there is high sensitivity to transaction-specificity in electricity use by manufacturing firms. This is despite the fact that electricity is a standardized, non-specific asset and in a different context (that of developed countries) would not generate transaction costs or motivate vertical integration at the firm-level. Yet, a mere shift in the context transforms it into a kind of 'transaction-specific' asset leading to vertical integration. We, therefore, contend that transaction cost economics does explain integration of electricity by firms but only when the appropriate type of transaction-specificities are identified, which in turn could vary widely with contexts. More research using the perspective of contractual relationships and contextual factors would be useful in identifying critical transaction-specificities and enhance the understanding of firm behaviour in developing economies, especially in relation to energy assets.

References

- GULYANI, S. 1999. Innovating with Infrastructure: How India's Largest Carmaker Copes with Poor Electricity Supply. *World Development* 27, 1749–1768.
- JOSEPH, K. L. 2010. The politics of power: Electricity reform in India. *Energy Policy*, 38, 503-511.
- LEE, K. S., ANAS, A., VERMA, S. & MURRAY, M. 1996. Why manufacturing firms produce some electricity internally? *World Bank Policy Research Working Paper Series 1605* [Online].
- MEYER, R. 2012. Vertical Economies and the Costs of Separating Electricity Supply--A Review of Theoretical and Empirical Literature. *The Energy Journal*, 33.4.
- NOOTEBOOM, B. 1993. An analysis of specificity in transaction cost economics. *Organization Studies*, 443-451.
- ROSE, K. & MCDONALD, J. F. 1991. Economics of electricity self-generation by industrial firms. *The Energy Journal*, 12.2, 47-66.
- WILLIAMSON, O. E. 2002. The Theory of the Firm as Governance Structure: From Choice to Contract. *The Journal of Economic Perspectives*, 16.3 171-195.