



# Bribes, bureaucracies, and blackouts: Towards understanding how corruption at the firm level impacts electricity reliability



Jacquelyn Pless<sup>a,\*</sup>, Harrison Fell<sup>b</sup>

<sup>a</sup> University of Oxford, Oxford Martin Programme on Integrating Renewable Energy, Institute for New Economic Thinking at the Oxford Martin School, Eagle House, Walton Well Road, Oxford OX2 6ED, UK

<sup>b</sup> North Carolina State University, Department of Agriculture and Resource Economics, 4312 Nelson Hall, Raleigh, NC 27695, United States

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## ABSTRACT

This paper looks at whether bribes for electricity connections affect electricity reliability. Using detailed firm-level data, we estimate various specifications based upon repeated cross-sections and means-based pseudo-panels to show that bribes are closely related to poorer electricity reliability. We find that the propensity to bribe for an electricity connection is associated with an increase of 14 power outages per month and a 22% increase in annual sales lost due to power outages on average. The results parallel a tragedy of the commons story: electricity, which exhibits common-pool resource characteristics, suffers from overexploitation as self-interested individual firms rationally bribe for electricity, creating negative impacts in aggregate on the overall quality of the resource. Given the importance of electricity reliability for economic growth and development, the findings imply that improving oversight and enforcement measures at the consumer level that target the reduction of bribery for electricity connections could contribute to growth and development.

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## 1. Introduction

More than 1.2 billion people around the world are without electricity and 1 billion more have access to only unreliable power networks (UN, 2015). Unreliable and inadequate power can hinder or completely halt enterprise productivity, creating significant constraints on economic activity, growth, and human development. A handful of papers empirically illustrate these effects. For example, Andersen and Dalgaard (2013) demonstrate how weak power infrastructure leads to a substantial growth drag, Fisher-Vanden et al. (2015) show that electricity shortages significantly limit firm productivity, Rud (2012) studies electricity provision and industrial development and finds a strong relationship between electrification and manufacturing output, and Dollar et al. (2005) show that power losses have a statistically significant negative effect on productivity.<sup>1</sup> Poor electricity reliability also impedes the ability of households to conduct everyday activities, ranging from revenue generating and capacity building activities to social engagements. Humans rely critically on a secure and

\* Corresponding author.

E-mail addresses: [jacquelyn.pless@ouce.ox.ac.uk](mailto:jacquelyn.pless@ouce.ox.ac.uk) (J. Pless), [hfell@ncsu.edu](mailto:hfell@ncsu.edu) (H. Fell).

<sup>1</sup> Furthermore, Eberhard et al. (2008) find that gross domestic product (GDP) losses due to power outages can be as high as 6 percent. Mishra et al. (2009) find bidirectional Granger causality between energy consumption and GDP, exhibiting positive impacts, for a panel of Pacific Island countries. Kessides (1993) provides a comprehensive review of an older set of literature on the impacts of infrastructure on economic development, focusing mostly on the

stable, high-quality supply of power, however improving reliability is characterized by vast complexity and is not strictly an issue related to investing in physical electrical infrastructure expansions and improvements. The problems are often symptoms of much deeper issues that transcend the boundaries of the electricity sector and are intimately tied to areas such as governance, corruption, fiscal policy, social equity, and political institutions.

As such, the underlying causes of poor electricity reliability are complex and critically relevant to policymakers, revenue-generating firms, and ultimately every member of society. In this paper, we focus on corruption at the consumer (firm) level and show how bribery for electricity connections is related to poorer electricity reliability as measured by power outages and their related commercial losses. Bribery in our research refers to whether manufacturing and services firms make informal payments in order to obtain electricity connections. Assuming that this is done with the intention of securing reliable service, bribes such as these reflect rational self-interested behavior as firms aim to secure the electricity services required for operations. However, in aggregate, we postulate that this bribing behavior overexploits the electrical grid, creating a weaker system that is more vulnerable to power outages. In light of this, these firms actually experience more power outages and incur greater commercial losses, which is contrary to the intuitive result of the bribe transaction resulting in more secure and reliable service provision.

Using detailed firm-level bribery and electricity reliability data we form a dataset of repeated cross-sections including 72,617 manufacturing and services firms across 118 countries from 2006 to 2012. We also create a means-based pseudo-panel for an additional set of specifications. Instrumenting for the endogeneity of bribery with two firm-level instruments, our results across numerous robustness checks consistently show that bribes for electricity connections have a statistically significant correlation with more monthly power outages and their related commercial losses. In the preferred specifications, we find that the propensity to bribe for an electricity connection is associated with an increase of 14 power outages per month and a 22% increase in annual sales lost due to power outages on average.<sup>2</sup> Interpreted differently, a one standard deviation increase in the propensity to bribe is associated with experiencing 5 more power outages per month and a 7.5% increase in annual sales lost due to power outages.

Our empirical setting is motivated by the observation that electricity networks exhibit common-pool resource (CPR) characteristics in which the resource (the shared electricity grid) faces the risk of being over-exploited due to a tension between individual rationality and social efficiency. It may be rational for individual firms to offer bribes to secure electricity connections for business operations, but in aggregate, such connections that create ‘unmanaged demand’ may overload the electrical grid. In this context, bribing serves as a proxy for over-use. Consider the case of a firm bribing a power supplier employee for an electricity connection. This employee may not disclose the activity to management, and thus the power that is supplied to the firm conditional on the bribe is not accounted for in the power supply model. Without knowledge of this bribe, management is left without a true estimate of the quantity of electricity it needs to provide to the grid and a supply-demand imbalance can occur, negatively impacting operational efficiency.<sup>3</sup> If there is a high incidence of this activity across firms sharing the same electrical wires, the system may become overburdened by the ‘unmanaged demand’. This inefficiency can lead to system failure. Essentially, while one may reasonably expect that bribes for electricity ensure its provision, an abundance of this activity on a shared system may adversely impact the resource quality in aggregate. If we believe that bribing is a good proxy for over-use of electricity, then our results suggest that this overexploitation of electricity, due in part to consumer behavior, weakens the grid and makes it more vulnerable to power outages. This mirrors outcomes of the well-known CPR problem, constituting a type of social dilemma in which rationality at the individual level leads to an outcome that is not optimal from the perspective of the group. See [Appendix A](#) for more details on how electricity as a service exhibits CPR characteristics, with a particular focus on how electricity is rival and non-excludable.

To our knowledge, this paper is the first to study how corrupt behavior at the consumer level impacts the demand side of the electricity sector. A body of empirical research specifically focusing on corruption’s implications for infrastructure sectors and growth has emerged over the past few decades,<sup>4</sup> some of which focuses on electricity. While the question of how corruption, in its broad sense, impacts the power sector and its performance is not new, very few papers address the issue of reliability.<sup>5</sup> Most of the existing literature measures corruption at the country level (rather than consumer level) and focuses on the electricity sector supply side impacts (i.e., generation, transmission, and distribution) rather than demand

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implications for economic growth but also highlighting the importance of infrastructure for improvements in other development indicators that capture quality of life.

<sup>2</sup> According to the [World Bank Enterprise Surveys](#), the data source for our outage data, a power outage occurs when there is equipment malfunction from the failure of adequate supply of power. Brownouts are also considered power outages. Respondents were asked to calculate the number of outages in a typical month, so if outages are seasonal, this does not include months in which outages are most frequent or when they are most infrequent.

<sup>3</sup> Expanding upon the traditional framework of thinking of natural resources, similar CPR stories are applicable to congestion and infrastructure such as traffic on highways. In the general CPR framework, individuals can consume a common resource to the individual’s benefit but with an associated social cost: if aggregate consumption exceeds that which is supplied, the quality of the resource deteriorates or perhaps diminishes entirely. If overconsumption occurs in the form of bribes for electricity connections that are not accounted for in electricity providers’ supply models, total demand can exceed that which is expected and supplied.

<sup>4</sup> For instance, [Fisman and Svensson \(2007\)](#) show that bribery is negatively correlated with firm growth and [Bah and Fang \(2015\)](#) show that business environment—which includes a measure of corruption—is negatively associated with productivity and output in Sub-Saharan Africa.

<sup>5</sup> [Stalon \(1997\)](#) discusses the electric sector governance problem generally, focusing on a subset of problems that must be solved to preserve the reliability of bulk power systems in restructure electricity industries, however no empirical analysis is conducted. Infrastructure operations—such as electricity provision—are particularly vulnerable to corruption ([Bergara et al., 1998](#)) thus drawing increasing interest from researchers, decision-makers, and

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