Energy for Sustainable Development 21 (2014) 66–80

Contents lists available at ScienceDirect

Energy for Sustainable Development

From informal to authorized electricity service in urban slums: Findings from a household level survey in Mumbai

Luisa M. Mimmi *

Sustainable Development Network, The World Bank, 1818 H Street NW, Washington, DC 20433, USA

ARTICLE INFO

Article history:
Received 2 December 2013
Revised 21 March 2014
Accepted 29 May 2014
Available online 28 June 2014

Keywords:
Slum
Household survey
Electricity
WTP
Mumbai
Matching

ABSTRACT

Based on a survey of 3000 households, covering both authorized and informal connections to electricity, the paper examines the key drivers of the demand for regulated electricity service in 4 slums of Mumbai. The methodology builds on the typical slum context, where informal connections are easily obtained and widespread. WTP for safe, authorized electricity provision is estimated through both "stated" preferences and "revealed" ones extrapolated from present electricity demand. WTP estimates are further validated using propensity score matching. The comparative analysis confirms that affordability (of both the initial investment and the increased consumption fees) is a primary barrier to regularization. Additionally, lack of house ownership status or address proof, precarious house construction and, possibly, pressure from local leaders all play an important role in choosing an electricity supplier. Policies to reduce the prevalence of informal connections should also address contextual issues like the intricacy of Mumbai's governance and social exclusion.

Introduction

India's recent urbanization rate has been formidable, particularly in the Greater Mumbai area where population has increased more than 12 times in the past century to reach 12.5 million in 2011. According to the 2011 Indian census, the slum population of Mumbai was a little over 6.5 million, which accounts for 55–60% of the city's population. Despite the work opportunities and the promise of economic and social advancement, men and women who move from villages to megacities must endure the hardship of living in urban slums. Poverty in urban settlements means an insecure residential status, poorly built housing and overcrowding (IIHS, 2011). In addition, access to basic infrastructure in urban slums (paved roads, water and sanitation, electricity and garbage collection) is far from acceptable and supply can hardly keep up with the growth of the slum population (Khandker et al., 2010a).

In this context, many families opt to pay a neighbor to share a meter or turn to unlicensed electricians and even local cartels that can provide the service illegally (common forms of stealing electricity include tapping electricity directly from the distribution feeder and tampering with the energy meter). These options can be much cheaper (as they typically charge a flat rate regardless of consumption)[1] and are facilitated by the pervasive informality, lack of law enforcement in slums and difficult interaction between slum residents and the electrical utilities (Depuru et al., 2010; Mimmi and Ecer, 2010; Smith, 2004). A recent collection of worldwide case studies (Smyser, 2009, p. 5) observes how, because of their poor condition, "slum consumers have very poor internal wiring, no ground fault protection or circuit breakers, and/or very long and often undersized wires or cables connecting them to the electricity grid", resulting in high risk for electrocution and/or fires.

Policy makers in many rapidly growing megacities of the world face the increasingly urgent challenge of improving access to infrastructures and amenities for slum dwellers (Gamos Ltd., 2005). Promoting universal access to improved energy has underpinning political motives (slum dwellers may represent a large share of voters) and regulators are increasingly raising social inclusion concerns. The recognized positive effects of improved energy access on general well-being, health, and income generation opportunities (UN Energy, 2008)[2] justify public interventions and subsidies for the provision and regularization of electricity for the urban poor.

From the electricity suppliers' perspective, informal urban settlements represent both an opportunity and a great challenge. On the one hand, they would benefit from converting this share of (mostly) informal consumers into regular, paying customers and, at the same time, reduce the high non-technical losses and maintenance costs associated with distribution networks in the proximity of urban slums. On the

* The World Bank, 1818 H Street NW, Mail Stop # MC 6-613, Washington, DC 20433, USA. Tel.: +1 202 458 8224.
E-mail address: luisamimmi@gmail.com.

[1] Depuru et al. report that in Mumbai: "Getting an illegal connection from local mafia is very easy and cost effective compared to a regular connection from a utility company. They allow unlimited usage of electricity at a flat rate of about $5 per month compared to an average bill of about $15." (2010, p. 4).

[2] This recent UN report describes the benefits for quality of life associated with access to electricity and points out the centrality of providing energy services in the pursuit of the Millennium Development Goals (MDGs). For additional reference on the role of infrastructure in alleviating poverty see Estache et al. (2002).

http://dx.doi.org/10.1016/j.esd.2014.05.008
0973-0826/

other hand, utilities are often reluctant to face the tricky governance system and lack of tenure security of slums. In addition, they can be discouraged by the relatively low consumption levels of these consumers (ESMAP, 2011), since the necessary capital investments may exceed the expected revenues.

The general lack of data on the slum dweller population of Mumbai coupled with the highly socio-economic diversity among different slum pockets in the city has, thus far, hampered the understanding of which policies could improve the access to basic infrastructure in a way that is affordable and adequate to the slum dwellers' needs.[3] From a policy perspective, it is critical for both local institutions and international aid agencies to achieve a holistic understanding of the main drivers of slum dwellers' demand for improved electricity services, or, to put it differently, what are, in the perspective of slum dwellers, the main barriers to using authorized and safe electricity.

The goal of this paper is to reach a realistic and comprehensive understanding of the reasons that would prompt slum households to obtain an authorized electricity service. The study builds on the assumption that the demand for improved (i.e. legal) electricity, particularly in urban slums, is explained by a multiplicity of factors. While it is possibly the main barrier, affordability is not the only obstacle that prevents slum dwellers to shift from an informal and sub-standard connection to an authorized electricity connection. Other factors affect the consumers' choice, including settlement informality or transitory status (residents cannot provide the paperwork required by utilities) and the unwritten laws that regulate life and economic choices in slums. As a consequence, even subsidizing connections and/or consumption fees may not be enough to reduce the prevalence of informal connections.

Furthermore, the paper adopts an original approach acknowledging the specificity of the urban slum context, where most households can easily obtain the unauthorized supply of electricity from informal suppliers. Accordingly, the question of interest cannot be framed as predicting the demand for a new product or service, but rather as explaining a potential switch (or upgrade) to a regulated service. For this reason, the electricity demand estimation is framed in comparative terms.

The data, collected in 2011 through an in-depth survey of 3000 households across four Mumbai slums, are combined with observations based on several field visits and consultations with local counterparts. The survey conducted on households with both regular and informal electricity service allowed observing the prices paid for the unregulated electricity service (which incidentally is not for free). This was a unique opportunity to gain compelling insight into the willingness to pay (WTP), or the value that people attach to electricity, in terms of both the cost for the initial connection as well as the monthly fees for consumption.

More specifically, the study investigated the following:

1) Importance of affordability investigated through both "stated" and "revealed"[4] WTP for (a) hook-up and wiring and (b) monthly fee from an authorized supplier.
2) Comparison of the regular, authorized electricity service against the informal connection/provision in terms of consumption volumes, quality, safety and reliability of the service.
3) Qualitative analysis of customers' perceptions and institutional context to gain a realistic appreciation of their attitudes toward regularization policies, the determinants of their choices, and the barriers they face.

The survey verified how the demand for improved electricity in slums is most definitely affected not only by the price (both paid for the connection investment as well as for the consumption fees), but also by intangible factors that are less measurable but equally influential in either a positive way (e.g., "social inclusion" or safety) or a negative one (e.g. lack of house ownership status and, possibly, fear of retaliation from the local leaders). Arguably, all of these factors should be pondered by policy makers when tackling the challenging issue of improving access to improved electricity for urban slum dwellers.

Access to electricity in Mumbai slums

Access to electricity in the almost 2000 slums of Mumbai is fairly high compared to other services,[5] with coverage ranging from 70 to 90% of households, although the service is neither reliable nor safe. Noticeably, while most of the urban slums of Mumbai are electrified, it is often through unauthorized connections (National Sample Survey Office, 2010). These connections not only undermine the quality and safety of the service, but also affect all customers by overloading the network and inflating the charges to paying ones.

Many slum rehabilitation programs have been launched in Mumbai over the last sixty years by both the national and the Maharashtra governments to improve housing and infrastructure condition services for slum dwellers. Unfortunately, very little has been accomplished due to recurrent issues like a general lack of development finance, politics and conflicting regulations.[6] Starting in the 1980s and 1990s, the government has progressively encouraged partnerships with private investors and builders, as well as Community Based Organizations (CBOs) and international organizations.[7]

Notably, with the Electricity Act of 2003, Indian regulatory institutions have started endorsing universal access to electricity.[8] While representing an important step, that law remains somewhat lacking because it only enforces the delivery of service up to the metering point on the street (and not to the house). In other words, a significant burden remains on the perspective consumers in terms of investment to obtain the connection, as well as safety risks due to substandard wiring.

Sampling and survey design

The data used in this paper were originally collected for a baseline study,[9] sponsored by the Global Partnership on Output-Based Aid (GPOBA), conducted on the pilot project "Improved Electricity Access for Indian Slum Dwellers in Mumbai". The project, conceived and launched by a partnership of multiple international agencies, aimed at testing customized approaches to improve electricity access in slum

[3] While slums can present extremely heterogeneous socio-economic conditions and physical layout, commonalities emerge from cases observed in various contexts. Marquez and Rufin (2011), Chapter 7, Smyser (2009) and Nexant Inc. (2009) discuss various approaches to sustainable electricity supply for the urban poor.

[4] These definitions and the distinction between the two are discussed in the section—Methods to estimate slum dwellers' willingness to pay for improved electricity.

[5] Access to water and sanitation is highly heterogeneous across the many slums in Mumbai, but the majority of residents rely on shared standpipes for water and community toilets provided by the government (Risbud, 2003).

[6] The reports by IIHS et al. (2011), pp. 53–57 and Risbud (2003), p. 4 offer extensive description of the complex and quite intricate framework regulating Mumbai slums and urban matters.

[7] In 1997, the Government of India established a new Slum Rehabilitation Scheme (SRS). According to the SRS, any slum structure existing prior to January 1, 1995 is legalized and protected from eviction. Additionally, every slum dweller whose name appears in the electoral rolls as on January 1, 1995 and who continues to stay in the slum is eligible for rehabilitation. The SRS stated that every residential slum structure eligible for rehabilitation should be provided with an alternative tenement measuring 225 sq. ft, preferably at the same site, and allowed tenants to form cooperative housing societies and appoint a developer for execution of SRS. Developers received incentives in the form of a free 7.5 square feet sale component for every 10 sq. ft of rehabilitated floor spaces.

[8] The Indian Electricity Act of 2003 states that any customer who can provide proof of residency is entitled to a legal electric connection and the local electric utility is obliged to provide such a connection. Some utilities (including Reliance) also request a "no objection" certificate from the municipality or indemnity bond, which states that a legal connection has no implications toward land tenure.

[9] The baseline report (Mimmi, 2012), also written by the author, is available upon request.