



Access to water as determinant of rental values: A housing hedonic analysis in Rwanda



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ABSTRACT

In this paper, we study the determinants of rental values in urban housing markets in Kigali, Rwanda. In particular, we study the value of access to piped water; due to the high costs associated with installing new piped connections, renting a property with an existing connection is often the only way for low income households to access piped water. Our results indicate that extending the piped network to a new house will in many cases raise the rental value of the house enough to pay for the cost of installing the new connection in less than two years.

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1. Introduction

Cities of developing and emerging countries are growing rapidly. The UN estimates that, for instance, the urban population of sub-Saharan Africa will more than triple by the year 2050 (United Nations Population Division, 2008). This urban explosion requires making significant investments to provide the necessary infrastructure for economic development and to satisfy populations' needs. These

urban services are, among other, water access, electricity, transport and telecommunications.

Meeting this dramatic rise in demand for public services in urban areas is a huge challenge for public policy. In many urban areas in developing countries, such public services are provided in neighborhoods dominated by middle and upper classes, but the necessary infrastructure is absent in the neighborhoods dominated by poorer segments of the population. An important part of the reason is that establishing new infrastructure is costly, and depending on how the costs of provision are financed, this often means either that public utilities lack the funds for new investments, that the households in question cannot afford to pay the connection costs, or both.

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This is deeply problematic for a public service like water. There are important equity problems associated with the current situation, where the poorer households frequently end up paying more for their water, from private vendors, than the more affluent households do for their piped water. Moreover, water provision has huge positive externalities. Access to safe water reduces the risk of contagious diseases, not merely for the connected household, but for other households in the vicinity. It is therefore important for urban authorities to identify means of expanding access to piped water to larger shares of their populations.

Renting housing with established water connections is a potential means of gaining access to the water network, for those households that cannot afford the cost of establishing a new connection. It is, therefore, reasonable to assume that a connection to the piped water network will increase the rental value of a property. By studying the rental market in Kigali urban area in Rwanda, we can estimate this value in order to assess how important piped water is perceived to be by the target group.

The structure of this paper is as follows: firstly, we discuss the background and the existing literature. Section 3 presents the theoretical model of the Hedonic Price Method. Data and variables are presented in Section 4. Section 5 covers the empirical strategy. Results are presented in Section 6. They are then discussed in Section 7.

2. Issues in water provision

Limited access to the public water network is an important problem in urban areas in many developing countries. An important part of the problem is the considerable cost frequently involved in extending the network to new recipients not previously covered. Because of the limited access to private tap connections, water use patterns differ from those in developed countries. Households that do not have private tap connections frequently use a range of different water sources for different needs, using somewhat safer water from e.g. public taps or private vendors for drinking and water from less secure sources (such as unprotected open water collections) for sanitation or laundry needs; see e.g. [Nauges and Strand \(2007\)](#), [Onjala et al. \(2014\)](#) or [Uwera and Stage \(2014\)](#).

Those households that are connected to the public water network and have private tap connections frequently have price and income elasticities similar to those in developed countries ([Nauges and Whittington, 2010](#)). However, even for these households, the public water network is frequently unreliable, due to the poor state of the water infrastructure in many cities. This may lead to shortages and contaminated water in the public networks, causing important welfare losses for the affected households (see e.g. [Baisa et al., 2010](#), for water shortages or [Jalan and Somanathan, 2008](#), for household responses to the threat of contaminated water). Health issues related to water use are of course even more important for those households that lack a private water connection altogether, and may have important impacts on their

behavior (see e.g. [Nauges and van den Berg, 2009](#), or [Onjala et al., 2014](#)).

In the high-growth countries in eastern and southern Asia one may expect that access to water networks will improve in the coming years, as incomes continue to rise and as these countries become sufficiently prosperous to finance large scale extensions in their water networks, analogously to the investments seen in many developed countries in the late nineteenth and early twentieth century ([Briand et al., 2010](#)). However, in poorer countries such as many of those in sub-Saharan Africa, such massive investment programmes are still a long way off; if new connections are established at all, a requirement is frequently that the household in question pays the entire investment cost up front ([Stage and Uwera, 2012](#)). For many liquidity-constrained households in these countries, this is unrealistic, and the only means of securing a connection is by renting a property which is already connected to the water network. Therefore, it is reasonable to expect property markets to reflect the value of water access.

Only a few hedonic pricing studies have been done in African property markets, and even fewer have looked at access to water as a determinant of property prices. Studies that have examined water access have not found conclusive evidence that it matters. [Asabere \(1981a,b, 2004\)](#), studying sales prices in different real estate markets in Ghana, found significant impacts from access to a package of services that included piped water, but did not study access to water separately in any of the listed studies. [Megbolugbe \(1989\)](#), looking at assessed property values in Jos in Nigeria, found that access to water mattered for the valuation of single-household dwellings but not for multi-household dwellings. [Arimah \(1992\)](#), studying rental housing in Ibadan (Nigeria), found no significant impact of access to piped water or of having a water-operated lavatory in the dwelling. [Gulyani and Talukdar \(2008\)](#), on the other hand, found access to piped water to be an important determinant of monthly rent in Nairobi slum areas. [Els and von Fintel \(2010\)](#), studying sales prices in South Africa, found that the number of bathrooms (which is, of course, likely to be linked to water access) mattered significantly, but did not study water access per se. Thus, access to piped water seems to have an impact in some real estate markets, but does not have an impact everywhere. Whether water access matters is therefore something that needs to be studied separately for different markets.

Rwanda is no exception from the problems with water provision experienced in the developing world. In most Rwandan cities, land use plans are not used to guide urban development in practice ([Byamukama et al., 2011](#)). Urban development in Rwanda differs from that in many African countries, in that almost all construction is done on privately owned or privately managed land either by the owner or with the permission of the owner; however, as in most African countries, construction of housing is usually done without consulting the relevant public authorities, and almost no housing developments are made in full compliance with the relevant urban development plans and building codes ([Wakhungu](#)

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