

Living Jerrycan to Jerrycan: The Cost of Drinking Water in Urban Nigeria

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Research Question

The goal of my research is to **quantify the effect of water vending on the cost and accessibility of safe drinking water.**

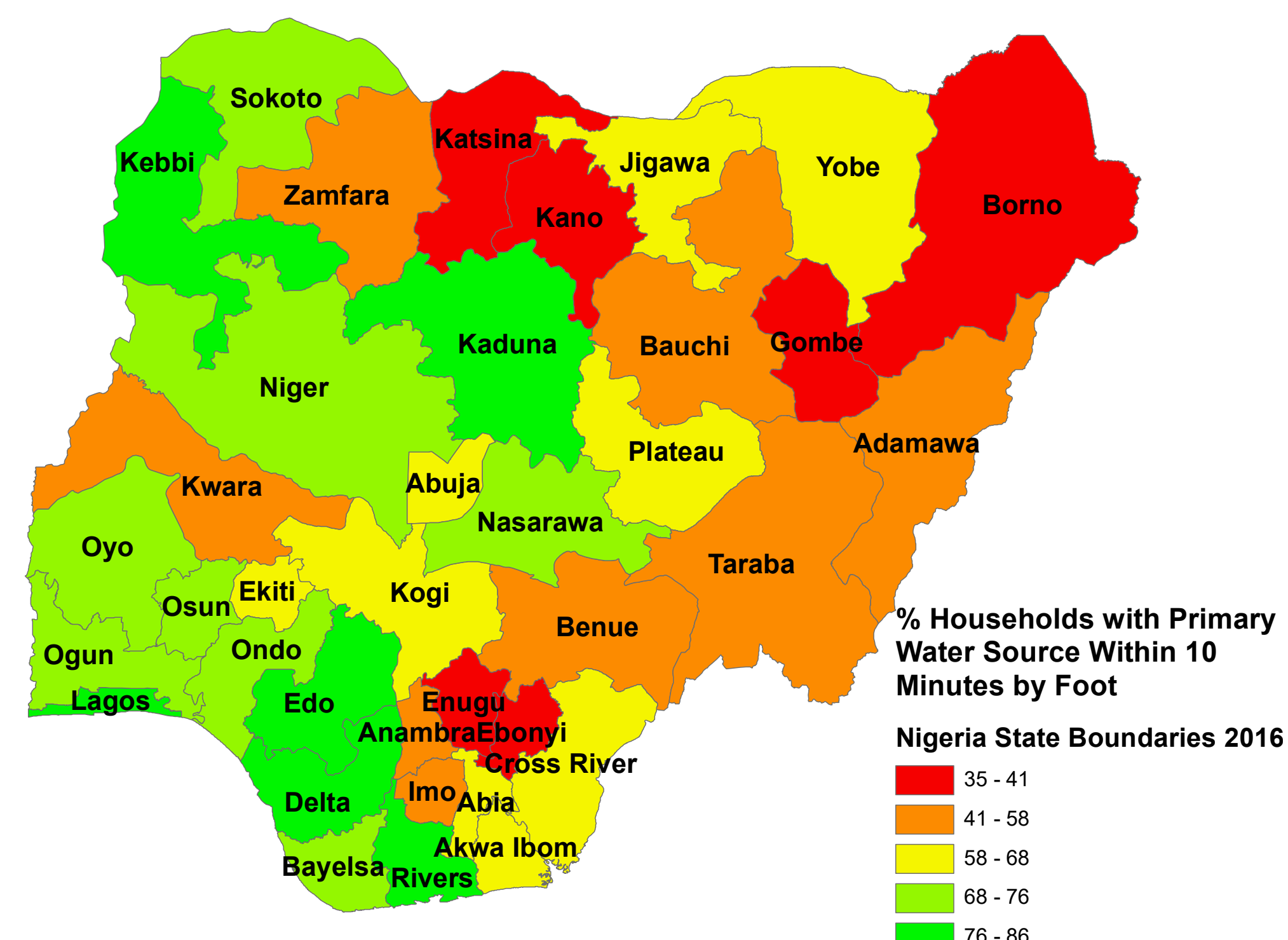
- Water vendors (*mairuwas*) deliver water by the can to households and urban marketplaces where piped water is not readily available.
- The number of households using vendors as their primary source of potable water has exploded recently, especially in urban southwest Nigeria (Lagos and Ogun states).
- **Are vendors helping or hurting Nigeria's sustainable development?**

Introduction

“We come back from work late in the night and our saving grace are the mairuwas [vendors] because we don't have time to start looking for water. Mairuwas are readily available; all we need to do is to provide the cash and the water will be at our door steps. We don't know the source and we don't need to ask anybody.”

—Lagosians quoted in *Vanguard*

Water stress, lack of quality infrastructure, and high upfront costs of household piped water connections create demand for an alternative convenient and sanitary water source.



Public Utility Water

Less than 10% of households surveyed by IPUMS DHS and UNICEF (1999-2016) have a piped water connection inside their home.

- State-run utilities charge a steep fixed connection fee which must be paid upfront, and subsidies are not available.
- Where it exists, infrastructure is often rusty and unreliable. Erratic power supply to distribution facilities leads to frequent service interruptions.
- Existing subsidies are only for water consumption, and thus only benefit households that can afford a connection.

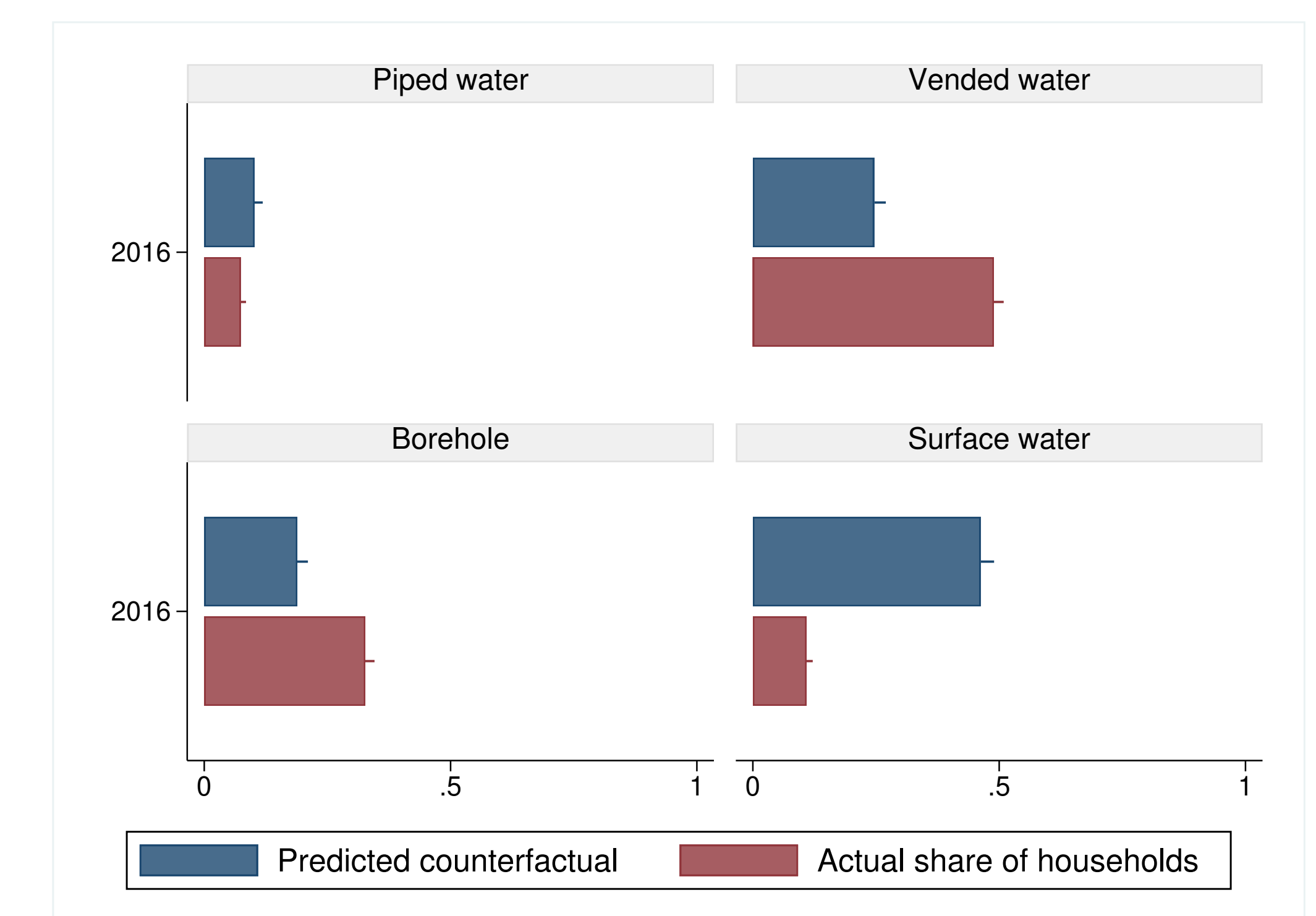
Vendors

In densely populated southwest Nigeria, the market for vended water has exploded in the past decade. **In Lagos, the share of households relying on vendors increased from 8.4% in 2007 to 62.7% in 2016.**

- **The good:** Vendors get potable water into low-infrastructure areas quickly, preventing households from falling back on unprotected boreholes and surface water.
- **The bad:** Vendors can exploit water stress, desperation, and liquidity constraints to nickel-and-dime households into paying a hefty markup for water.

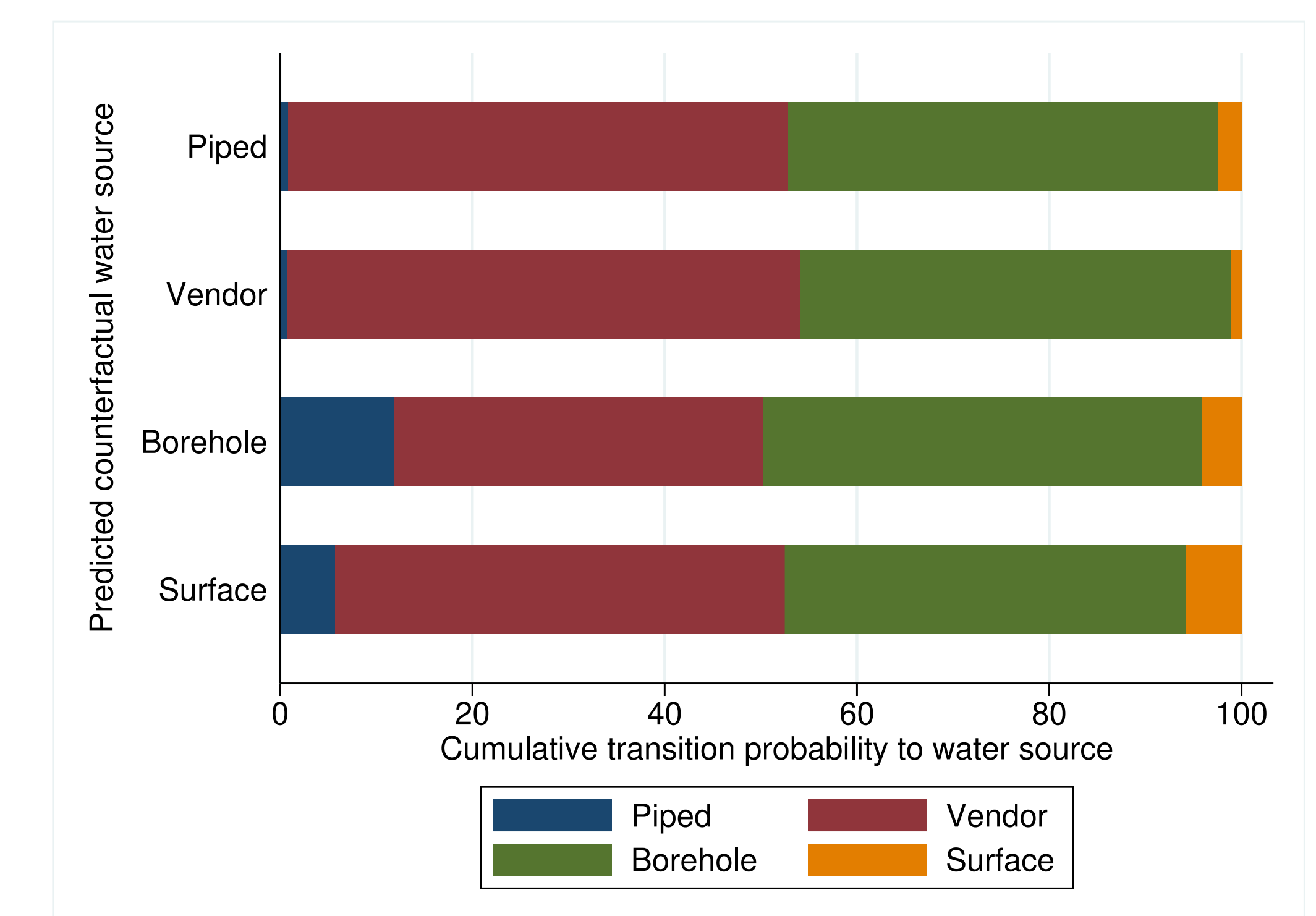
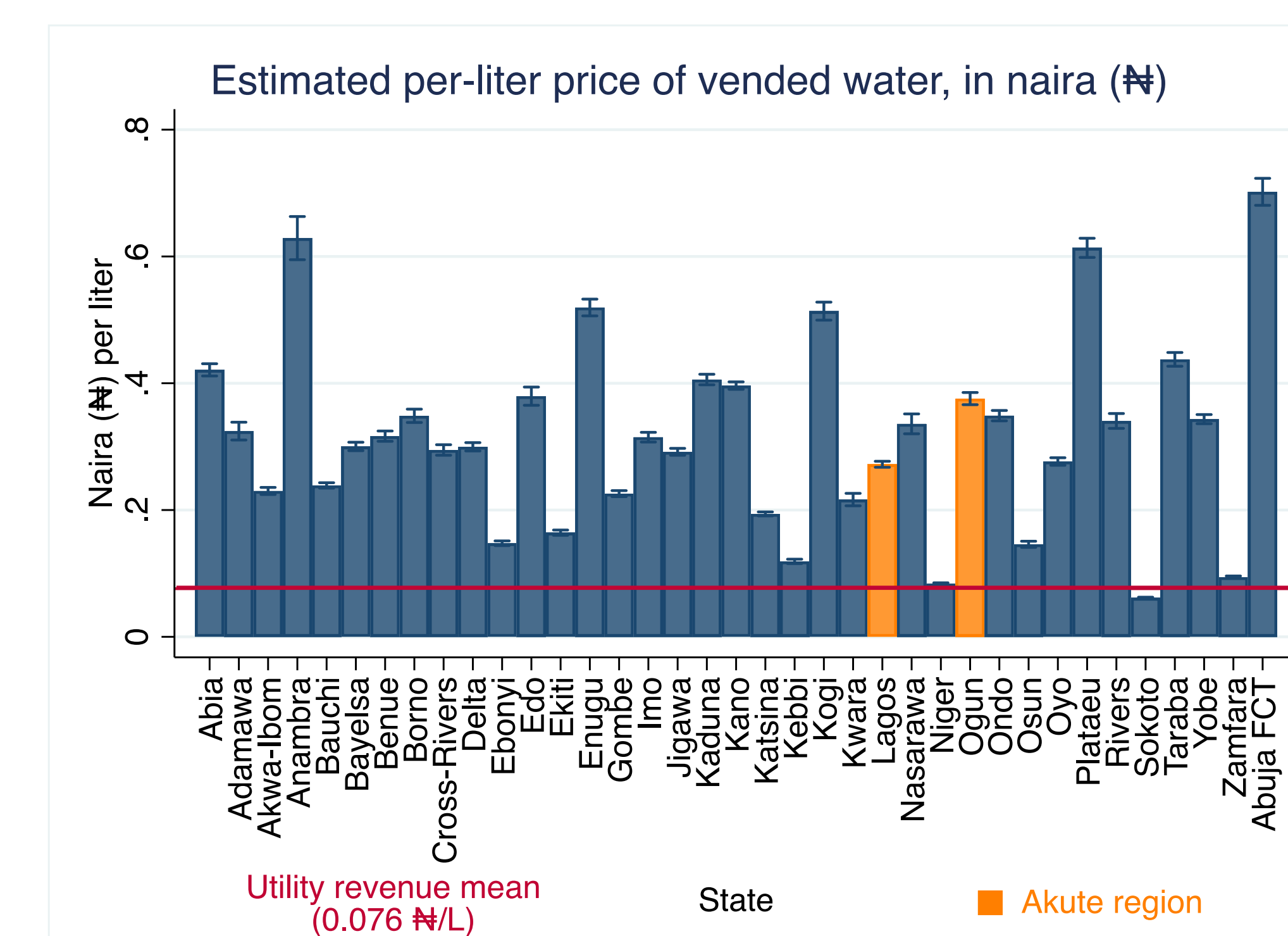
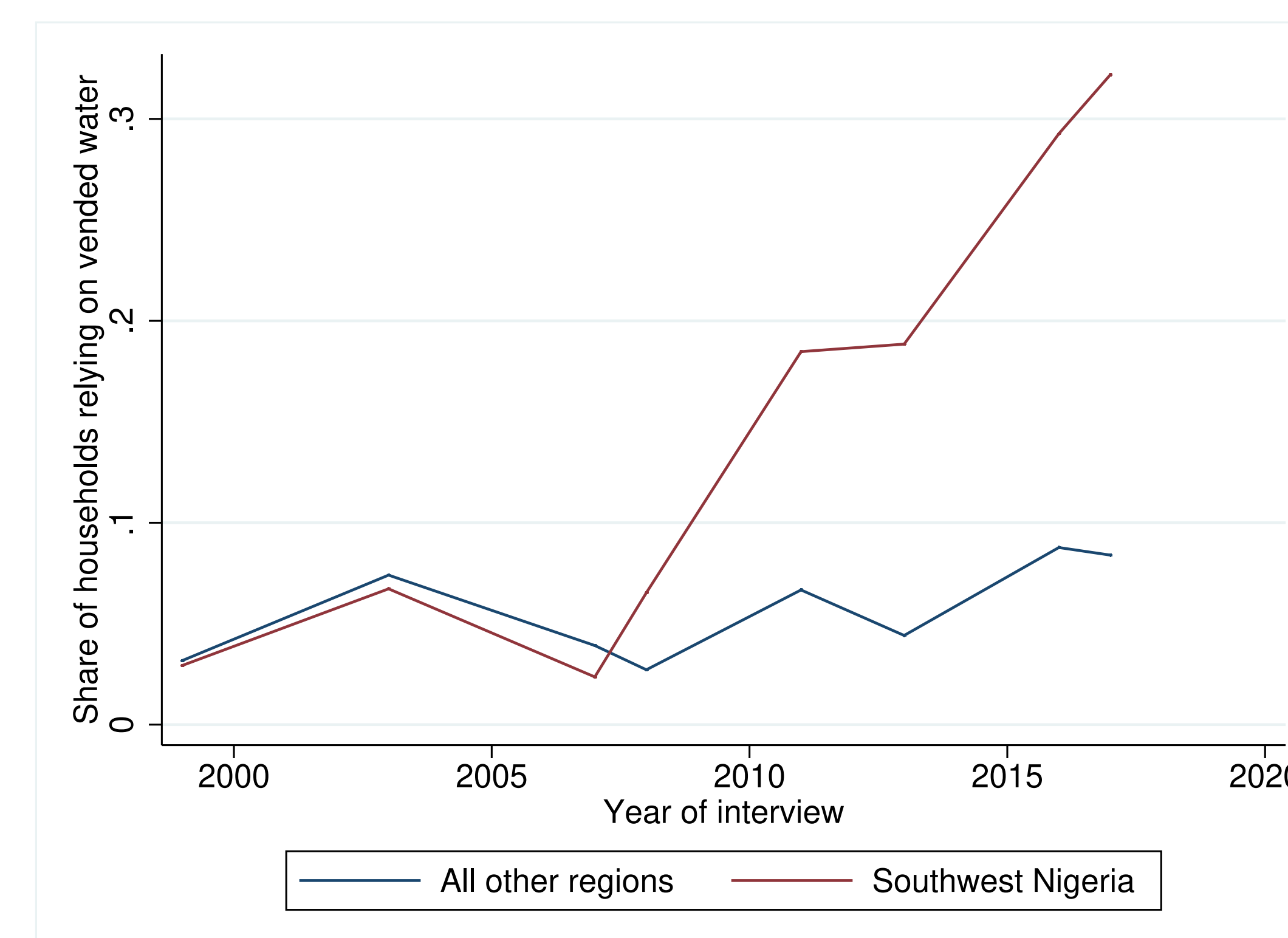
Methods: Machine Learning

To predict the unobservable counterfactual water source, I use a *k*-nearest-neighbors machine learning classification algorithm with household characteristics as predictors. The algorithm achieves **90.6% accuracy** on the testing sample (before 2010).



Paying Now or Paying Over Time, Several Times Over

While the markup per jerrycan is mere pennies, after just over 100 days of relying on vendors as their primary potable water source, a household will have paid the standard connection fee in markup alone.



Which Water Sources Are Displaced By Vended Water?

To determine the effect of water vending on social welfare, we need to know the counterfactual: **what water source would households be using if vendors had not entered the market?**

This provides some evidence of both the good and the bad: vendors displace both superior and inferior quality sources. The next step of this project is to measure the effect of this displacement on health outcomes, such as waterborne disease morbidity.

Acknowledgements

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