Urban and Development Economics: Service Delivery

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Service delivery and the rise of cities

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- Matt: How service delivery (sanitation in particular) affects urbanization
- Me: The challenges of service delivery (water in particular) in LMIC cities

The service delivery challenge

Three themes

Municipal government balance numerous concerns including

1. **Efficiency**: Providing quality service, covering costs
2. **Equity/affordability**: Service delivery to an unequal and heterogeneous population
3. **Uncertainty**: Variable cost of supply, demand (and more so with climate change)

Today: Overview of each theme + case study from Cape Town, South Africa

The scope of the problem

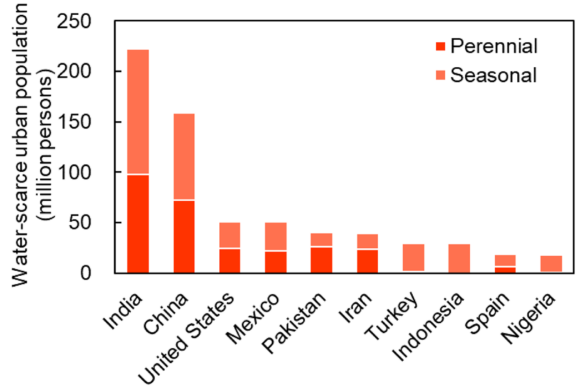
Urban water scarcity

1B people face urban water scarcity

Projected to grow as...

- urbanization and population growth increase demand
- climate change lowers supply, increases variability

Urban water often supplied by municipal utilities



Source: He et al. (2021)

Efficient and effective service delivery

Typical service delivery model: Natural monopoly

- Households and businesses purchase water, sanitation, energy from a single seller
- Billed for consumption ex post
- Prices set to cover both fixed and variable costs of supply
  - Fixed costs are a large share $\longrightarrow$ Optimality of two-part tariff
  - In practice: Fixed costs often covered through "volumetric" prices $>$ marginal cost
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Challenges to cost recovery:

- Weak enforcement of unpaid bills
- Inaccurate bills/political favoritism
- Subsidies or other pricing distortions
- Expanding access/increasing fixed costs

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Bill payment

"Utilities as creditors" (Spink 2022)

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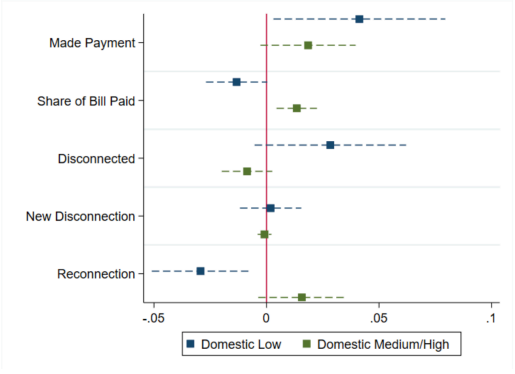
Is non-payment due to weak enforcement? Or low "tax morale"?

- Spink (2022) exploits improvements in enforcement capacity in urban Zambia
- Coville et al. (2023) randomize utility engagement and enforcement in Nairobi
  - No effect of increased engagement by utility staff
  - Enforcement treatment tripled short-run payment probability and increased medium-run bill payment by 50%

The effect of stronger enforcement

Heterogenous responses to enforcement

- Poorer ("Domestic low") households are more likely to be disconnected, don't pay off bills
- Richer households less likely to be disconnected, pay off bills
- Potentially regressive impacts of enforcement? Role for targeting?



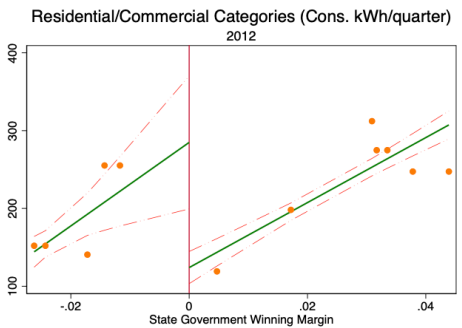
Source: Spink (2022)

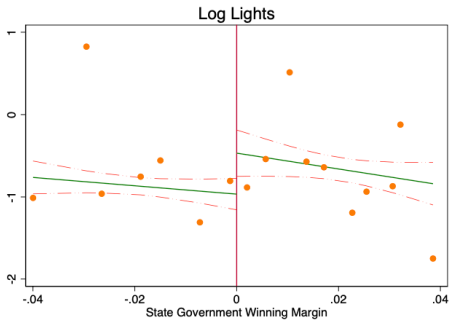
Political favoritism

Public utilities may be susceptible to political influence

Example from Mahadevan (2024); see also Min (2015)

- Following close elections, winning districts pay for less power consumption
- But nightlights indicate higher electricity *use*
  $\longrightarrow$ Undermines cost recovery





Source: Mahadevan (2024)

Affordable and equitable service delivery

Universal access to urban services is rarely achieved in LMICs

Non-payment, theft, political interference, pricing distortions all create pecuniary externalities

- Cost recovery requirements lead to higher tariffs, lower quality services, or state subsidies

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Lack of connection or non-payment of bills driven by *inability* to pay?

- Numerous justifications for subsidizing services for the poor

Common solution: subsidies, sometimes targeted, sometimes not

Table 2.7 Summary of Prevalence of Different Types of Subsidies in Water and Electricity

	Water	*Electricity*
Untargeted subsidies	39% of utilities fail to cover O&M; 69% fail to cover full capital costs	15% of utilities fail to cover O&M; 59% fail to cover full capital costs
Implicit subsidies	Widespread as a result of low meter coverage, lack of separate accounts for sewerage, low revenue collection, and illegal connections	Less widespread as a result of higher metering, but low revenue collection and illegal connections remain problematic
Explicit subsidies with quantity targeting	Widespread IBTs, used by 80% of utilities, suffer from high fixed charges and shallow price gradients	Widespread IBTs, used by 70% of utilities; lesser prevalence of high fixed charges and steeper price gradients
Explicit subsidies with service-level targeting	Significant use of public standpipes	Occasional use that is based on load profile
Funding	Combination of government transfers, cross-subsidies, and unfunded subsidies	Combination of government transfers, cross-subsidies and unfunded subsidies

Source: Komives et al. WB report

The "subsidy trap"

Pricing below cost can undermine investment in fixed costs to maintain service quality

McRae (2015) studies subsidies targeted by neighborhood in urban Colombia

- Electricity demand and bill payment depends on quality of supply
- Utility decides whether to upgrade infrastructure based on returns (net of subsidies)

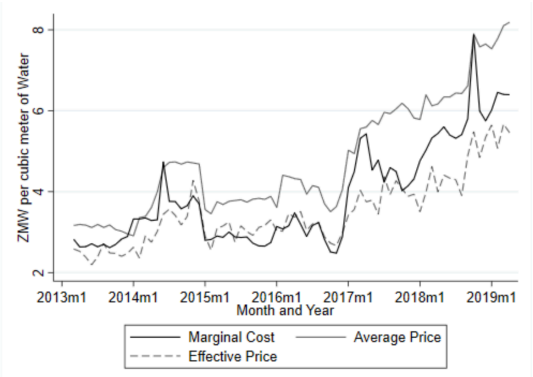
  $\longrightarrow$ Subsidies undermine incentive to invest in infrastructure improvements in low income neighborhoods

The effect of non-payment on tariffs

Lax bill payment enforcement affects prices in two ways

1. Lowers "experienced" price for non-payers
   $\longrightarrow$ Increases their consumption
2. Higher tariffs for everyone
   $\longrightarrow$ Or failure to cover costs

One of many reasons for incomplete cost recovery



Source: Spink (2022)

Targeted subsidies

Many LMICs offer a "lifeline" tariff with a free block

- Extreme version of an increasing block tariff
- Targets subsidies based on consumption (Borenstein, 2012)

Szabo (2015) analyzes free water allocation in urban South Africa

- Acts as a lump sum subsidy; relatively small effects on water use
- Limited redistributive value in the absence of targeting

Around the world, increasing block tariffs often fail to achieve distributional objectives (e.g., Borenstein, 2012)

Dodging Day Zero: Drought, Adaptation and Inequality in Cape Town

Abajian, Cole, Jack, Meng and Visser (2024)

A case study of Cape Town South Africa

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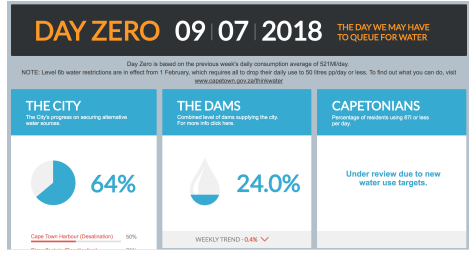
- Utility adapts to ensure demand meets supply
- Consumers adapt to utility's demand-side management; elasticities depend on available substitutes
- Individual demand imposes costs on other consumers via utility's response

This context: Wealthy households pay a fixed cost to access substitutes for public water supply, redistributes cost burden onto lower-income households

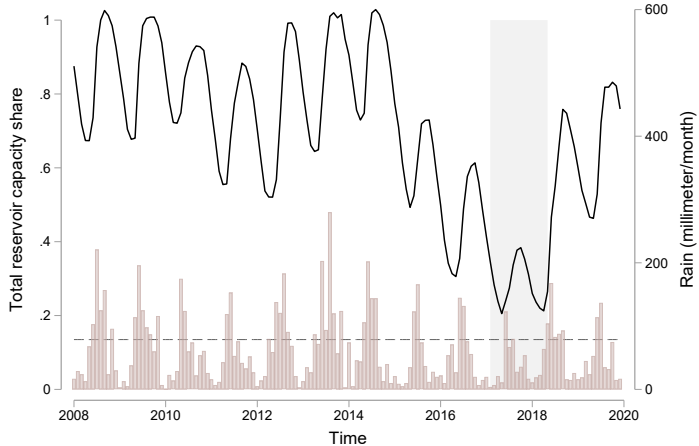
Dams supply 98% of Cape Town's water

Theewaterskloof dam at 11%

"Day Zero": the day taps would run dry



Day Zero didn't happen!



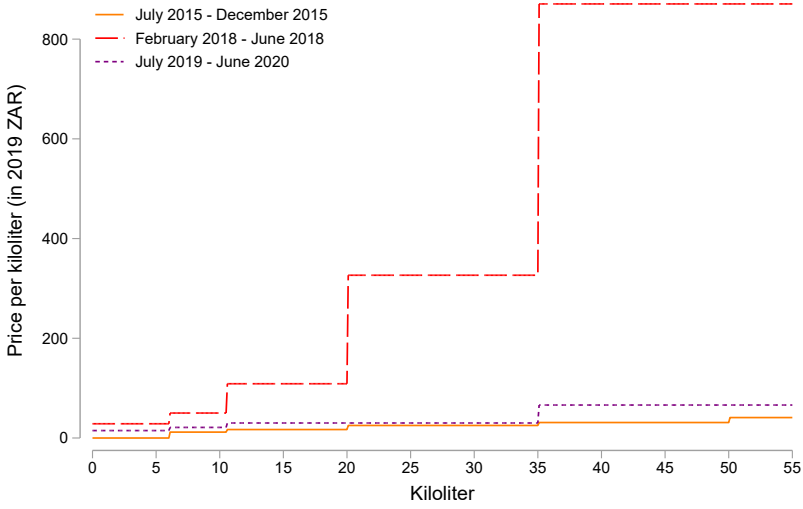
But how did the city reduce demand? And what are the long-run consequences?

Utility response to climate shock: Four implications

Utility raises volumetric prices to ensure that demand does not exceed supply. In the presence of substitutes, this has the following implications:

1. The dispersion of public water use across incomes contracts
2. Caused in part by substitution towards groundwater by wealthier households (as other fixed cost measures, like greywater systems)
3. Total revenue based on volumetric charges declines relative to no supply constraint
4. The revenue burden on wealthier households declines relative to that on poorer households

Utility drought response: water tariffs



Implication 1: Less dispersion in public water use across incomes

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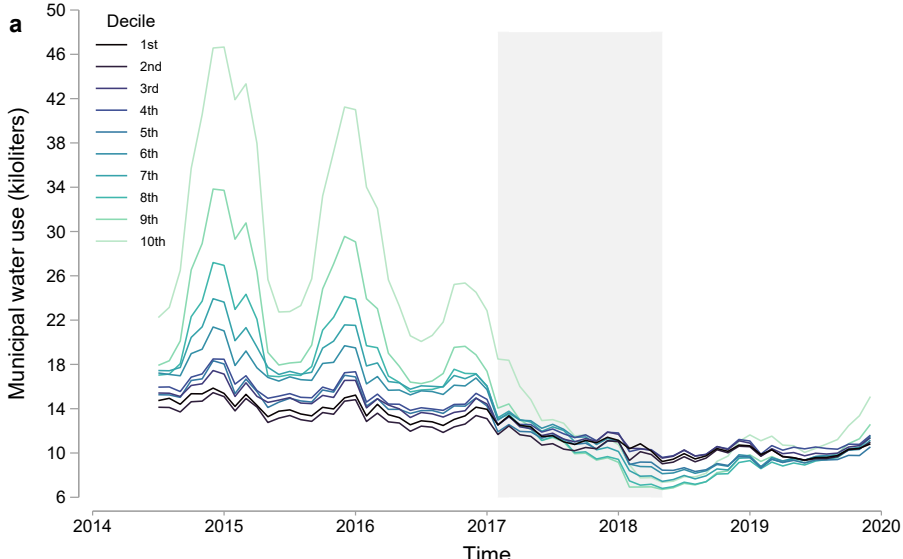
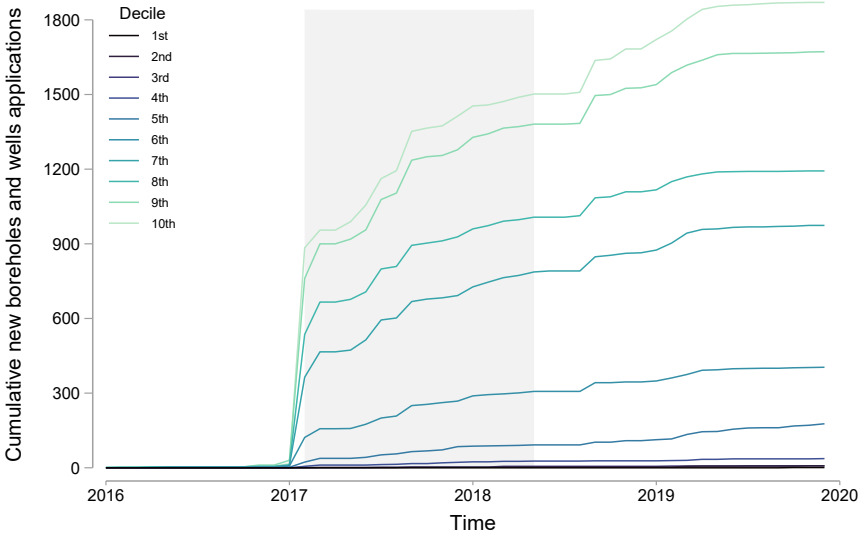


Implication 2: Substitution toward groundwater by wealthier households

Also: other water saving investments should follow a similar pattern



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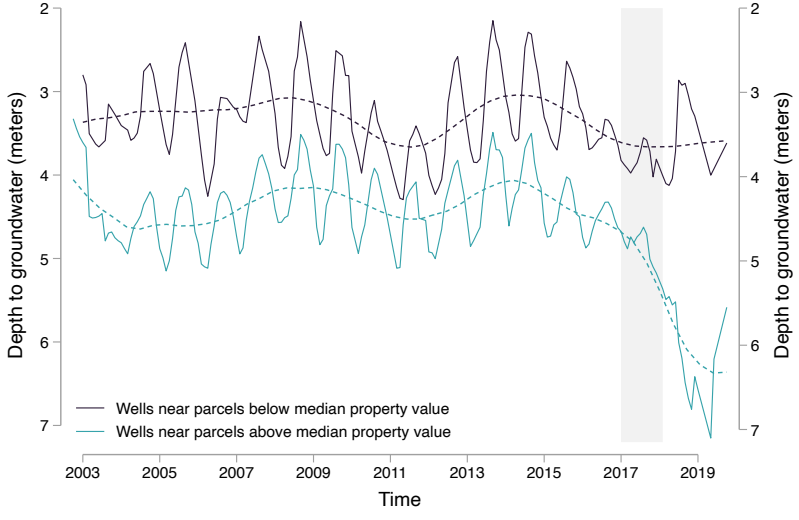

Implications 3 and 4: Fiscal and distributional impacts

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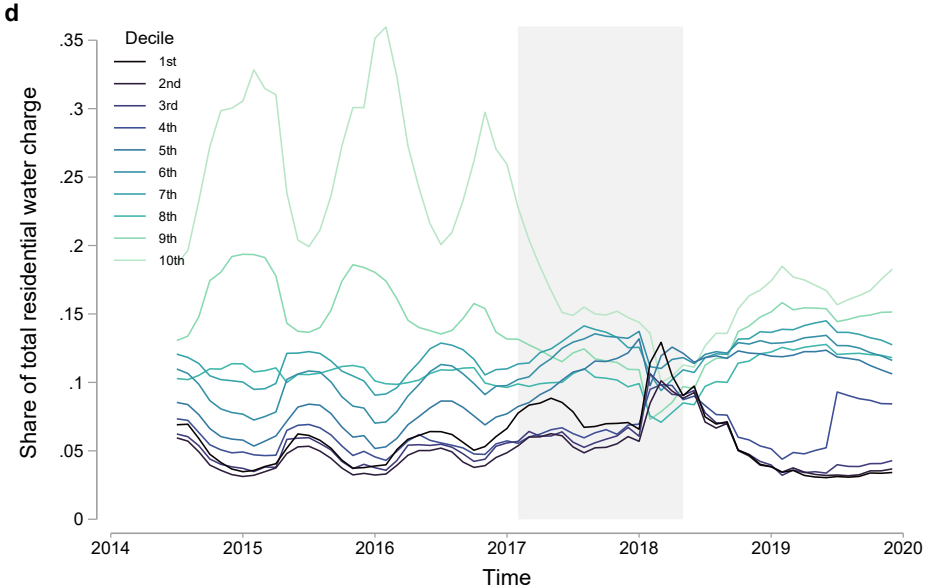
What did the City of Cape Town do to avoid these effects?

- Introduced fixed charges, except for indigent households
- Expanded free water to indigent households (10.5 kL vs. 6 kL before)

Result: Post-drought revenue stabilized

- Implication 3: From 2015 to 2019, billed volumetric charges fell by 22.7%
  ... but with fixed charges included, overall billed revenue rose by 4.3%

Implication 4: The relative revenue burden on rich households declines



Day Zero: A more general story

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Another challenge for urban service delivery? When quality falls or shocks require utility response

- The rich adopt private substitutes at a fixed cost
- Avoid higher tariffs/prices, lower quality goods and services
- Shift costs of maintaining public service onto lower income households – *unless* policy intervenes

Open research questions

1. How does optimal tariff design change if bill payment is incomplete?
2. Is subsidizing services efficient? What approaches to targeting are feasible and effective?
3. Are there agglomoration or growth externalities from subsidizing services for firms? What are the costs and benefits of these policies?
4. What service delivery is most vulnerable to climate change? How can policy adapt?
5. What is the cost of rationing or incomplete access?
    - For consumer welfare, broadly (and how do we measure it)? For health, labor supply and intrahousehold equity?
    - For the utility/service provider?
6. Where does political favoritism and corruption undermine service delivery?

Questions?

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