Water Subsidies, Desalination, and Sustainable Resource Management:

Policy Evidence from Algeria

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Outline

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Motivation & Objectives

Why Algeria?

- **Climatic aridity** and issues related to climate change.
- One of the **most urbanized** countries on the African continent (70% of the population).
- **The water stress** index is low, with a water availability ratio of 411 m\(^3\)/year/person.
- Water policy is marked by a **disproportionate approach to managing water resources**, prioritizing increasing water supply rather than optimizing the use of existing resources.
- Extremely reliant on **hydrocarbons, nearly exclusively natural gas**.
- **Subsidy Policy** based on **Social spending**.
- The "Water Emergency Plan 2021" in Algeria.
Motivation & Objectives

The research aims to provide a projection scenario to determine the potential beneficiaries of subsidies in the desalination industry in Algeria.

*Algeria's difficulty in ensuring the long-term viability of water subsidies.*
Very few studies have been carried out on the theme itself, but we have used directly or indirectly related indexed published articles to contextualize this research in particular:


**Context & Methodology**

**Brief literature review**
We first estimate the drinking water demand function on a sample of households, using panel data econometrics.

\[ \ln \text{CONS}_{it} = \beta_0 + \beta_1 \ln(P_{it}) + \beta_2 \ln(R_{it}) + \sum \beta_s \ln(Z_{it}) + \sum \beta_j \text{For}_{it} \]

We will then use the results of these estimates to simulate six scenarios:

- In the first and the second scenario, we will simulate an increase in the average price of 10% and 20%, and estimate the welfare loss engendered by these changes.
- In a third scenario, we will simulate a variation in the price of the first and second blocks, which we will index to the cost of production, and we will estimate the welfare loss engendered by these variations.
- Finally, in the last three scenarios, we will measure the impact of a restrictive policy on the well-being of local populations.
Context & Methodology

Stylized facts

- Water for population

- In Algeria, desalination currently provides 17% of Algeria's water supply.

- Increasing the contribution of desalination to 50%.

- A cubic meter of water costs between AD60 and AD80 to produce, while the state only charges AD18 to sell to the consumer

**Figure 1:** Volume of renewable water per capita in the Middle East and North Africa region in 2020, by country (in cubic meters per inhabitant per year)

*Source: FAO (Aquastat), 2023*
Subsidies, energy and water management in Algeria

Graph 1: Subsidies for fossil fuels worldwide from 2010 to 2021, by fuel type (in billion U.S. dollars)

Figure 2: Real GDP growth (%) and Real GDP per capita growth (%) for Algeria

Source: OECD; IEA, 2023

Source: African Economic Outlook, 2023
### Different scenarios for sustainability and subsidies nexus

<table>
<thead>
<tr>
<th>Advantages of Water Subsidies in Algeria</th>
<th>Disadvantages of Water Subsidies in Algeria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Affordable Water Access</strong>: Algerian water subsidies, which have some of the most accessible prices in the region, ensure that water remains readily accessible to the entire population, particularly those with modest financial resources.</td>
<td><strong>High Cost of Water Management</strong>: Although consumer costs are low, the cost of providing water is considerable. The price of one cubic meter of water in dams is around $0.50, and additional distribution charges range from $0.25 to $0.30. This disparity requires substantial government funding and subsidies, which may stress the national budget.</td>
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<tr>
<td><strong>Promotion of Agricultural Development</strong>: Government subsidies in the agricultural sector, including for irrigation, provide financial assistance to promote the growth and modernization of agriculture. This is crucial for ensuring the country's food security and promoting rural development.</td>
<td><strong>Inefficiency and Lack of Targeted Support</strong>: The extensive subsidy system indiscriminately helps all income brackets, regardless of necessity, potentially increasing inequality and failing to target the most disadvantaged segments of society adequately.</td>
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<tr>
<td><strong>Improving water quality</strong>: Desalination technology can produce high-quality drinking water, which is particularly important in regions where existing water supplies may be contaminated or saline.</td>
<td><strong>Dependency on Government Investment</strong>: The government's investment plays a crucial role in ensuring water resources' long-term sustainability and safety. Due to the reduction in subsidies and the increasing costs, there is a growing requirement for private investment to maintain the water supply.</td>
</tr>
</tbody>
</table>
Different scenarios for sustainability and subsidies nexus

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Description</th>
<th>Mean</th>
<th>Min</th>
<th>Max</th>
<th>Av. PM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Increase average price: 10%</td>
<td>144</td>
<td>27</td>
<td>539</td>
<td>127</td>
</tr>
<tr>
<td>2</td>
<td>Increase average price: 20%</td>
<td>284</td>
<td>53</td>
<td>1057</td>
<td>250</td>
</tr>
<tr>
<td>3</td>
<td>Increase the second tariff block to 28.45 DA/m³</td>
<td>52</td>
<td>0</td>
<td>368</td>
<td>738</td>
</tr>
<tr>
<td>4</td>
<td>Increase the first and the second tariff blocks to 28.45 DA/m³</td>
<td>733</td>
<td>40</td>
<td>1785</td>
<td>1349</td>
</tr>
<tr>
<td>5</td>
<td>Reduction of water supply time by 1 h</td>
<td>140</td>
<td>23</td>
<td>361</td>
<td>134</td>
</tr>
<tr>
<td>6</td>
<td>Reduction of water supply time by 50%</td>
<td>519</td>
<td>71</td>
<td>2244</td>
<td>503</td>
</tr>
</tbody>
</table>

Source: Kertous et al., 2022

The optimal scenario concerns adopting a policy that aligns the second tariff block with production costs, balancing social equity and sustainable water management.
Policy recommendations

• The complex interplay between water subsidies, ecosystem dynamics, and sustainable resource management in Algeria.

• The bilateral relationship between social subsidies and the environment.

• The involvement of the population in bearing part of the costs of water production.

• The water funding strongly correlated with oil prices...would induce ceteris paribus (Water Scarcity)

• Water policy in Algeria is still in the transition phase.

• Adopting a policy that aligns with the second tariff block.

• Encouraging International Partnership (UNEP-Plan Bleu, UNDP....)

• Share Algerian experience to better understand future water risks and challenges worldwide and in the Mediterranean region in particular