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Sectoral and Economy-wide Implications of Implicit Power Sector Subsidies: Insights from Ethiopia

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1. Background

Electricity sector in Ethiopia

- Central planned & **public financing** of power infrastructure (Tavoulareas, 2020)
- Grid electricity generation and distribution monopolized by **state-owned utilities** (UNECA & RES4Africa, 2021)
- **Low tariffs** cover < 50% of the costs of supply (Tesfamichael et al., 2021; Hassen et al., 2022)
- Often, power utilities operate with **negative** net profit margins (World Bank, 2019)
- Large implicit **subsidies/quasi-fiscal deficits** relative to utility revenue: 132% (Foster & Morella, 2010) to 353% (Trimble et al., 2016)
- Competes for limited public resources and contributes to higher **public debts** (World Bank, 2019; MoF, 2020)



1. Background

Policy reforms and goals

- **Recovering the costs** of electricity supply has become one of the major policy goals of recent power sector reforms
- Started to **increase electricity tariffs** since from December 2018 which is recently extended up until 2027 (EEU, 2022, 2024)

Research gaps

- **Limited** research on the impacts of these electricity reforms (Hassen et al., 2022; Tesfamichael et al., 2021)
- And, focused on the **demand side**
- **Gaps** in the **supply side** and **economy-wide** implications of the recent policy reforms

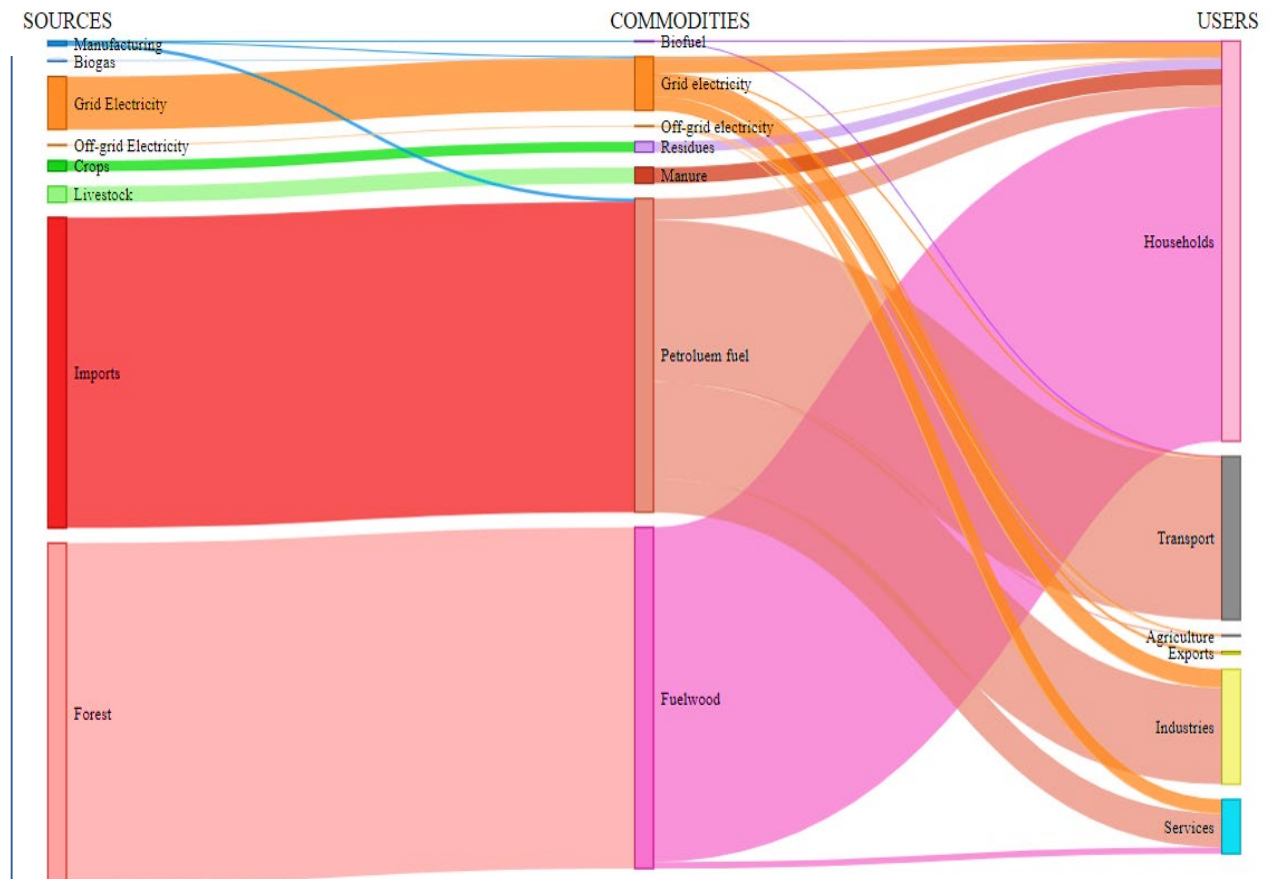


- Dominated by biomass fuels
- Petroleum fuels are imported
- Electricity accounts for not more than 7% (in monetary terms)

2. Data & Methodology

Database & Model calibration

- A recursive dynamic CGE model, DEMETRA (JRC, 2020)
- Calibrated to an adjusted 2015/16 social accounting matrix (SAM) (Mengistu et al., 2019)
- Detailed energy **sources**, **commodities**, **users**
- Electricity– **grid** (13) and **off-grid** (2) sources (EAPP, 2014; MoWIE, 2019)
- Explicit accounting of **implicit production subsidies** (approx. 60%) for grid generation and T&D activities (Trimble et al., 2016)



Energy sector balance– 2015/16, billion ETB



2. Data & Methodology

Database & Model calibration

- Industries can **substitute** first between off- and on-grid sources, and then electricity with petroleum fuels – CES functions
- Households can **substitute** between off-grid, grid electricity, petroleum fuels, fuelwood, biofuels, animal manure, and for **rural households** (+ biogas, crop residues) – CES functions

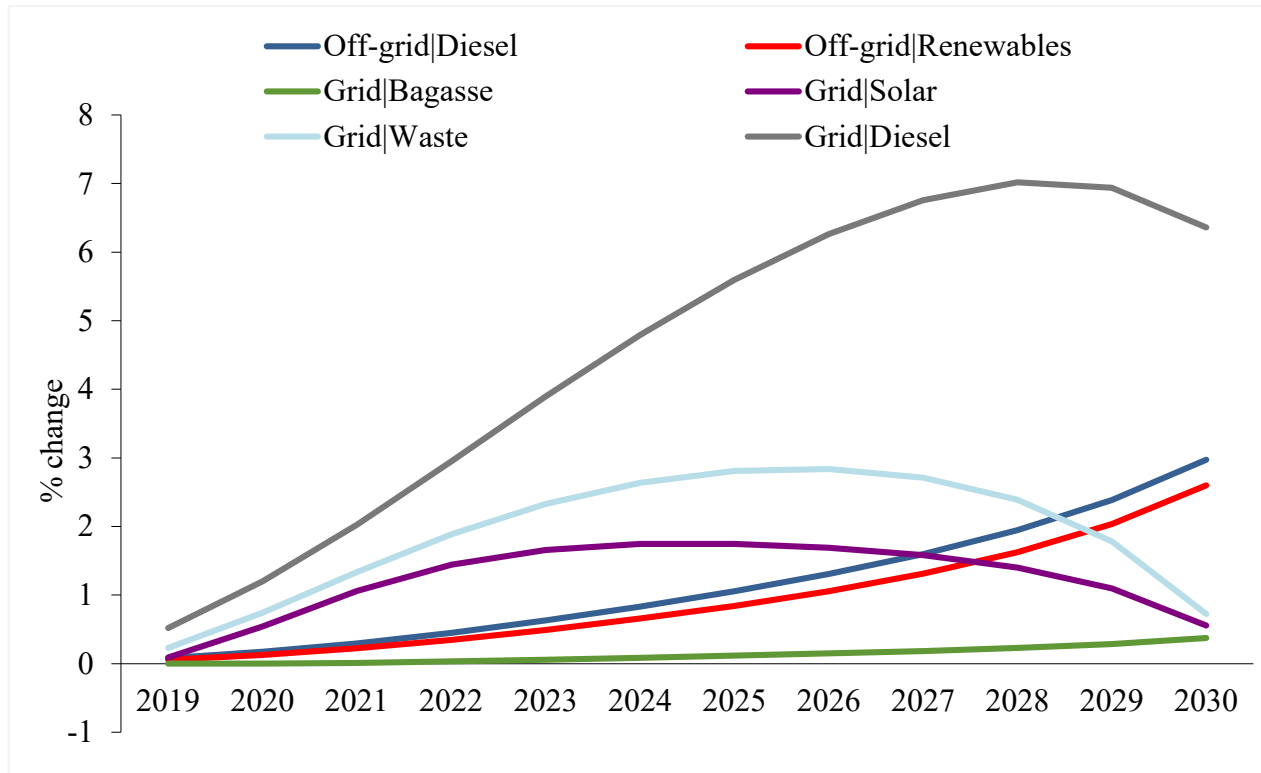
Simulation scenarios

- **Baseline scenario**
 - Driven by economic (IMF, 2024) and population (UNDESA, 2024) growth rates: 2016-2030
- **Policy reform scenarios**
 - A **hypothetical scenario** of reducing the grid electricity sector subsidy rates gradually by 5%/year starting from 2019 to by 60% by 2030.
 - Three alternative ways to allocate the **additional revenues** from the reduced subsidies– to **public spending** (PSIM1), to **national savings** (PSIM2), and to **debt services** (PSIM3)

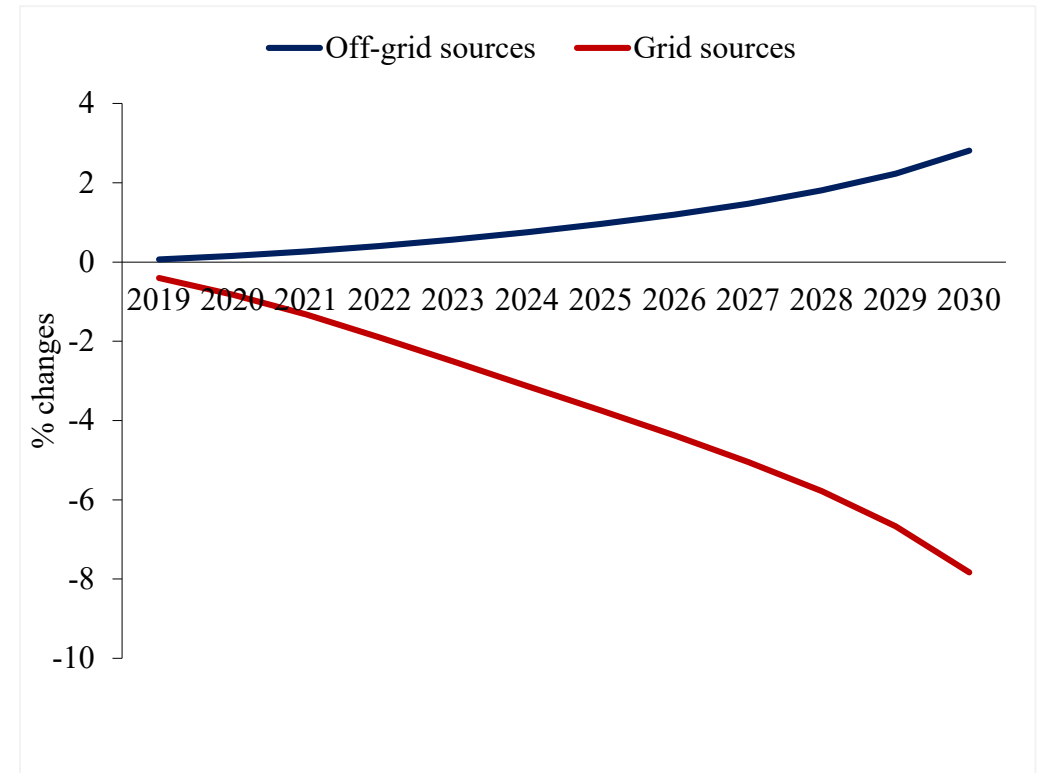


3. Results & Discussions

- Changes in the electricity supply mix
- Not fully offset as the shares of those off-grid and (unsubsidized) grid sources are insignificant
- Thus, total electricity supply decreases



Effects on electricity generation mix

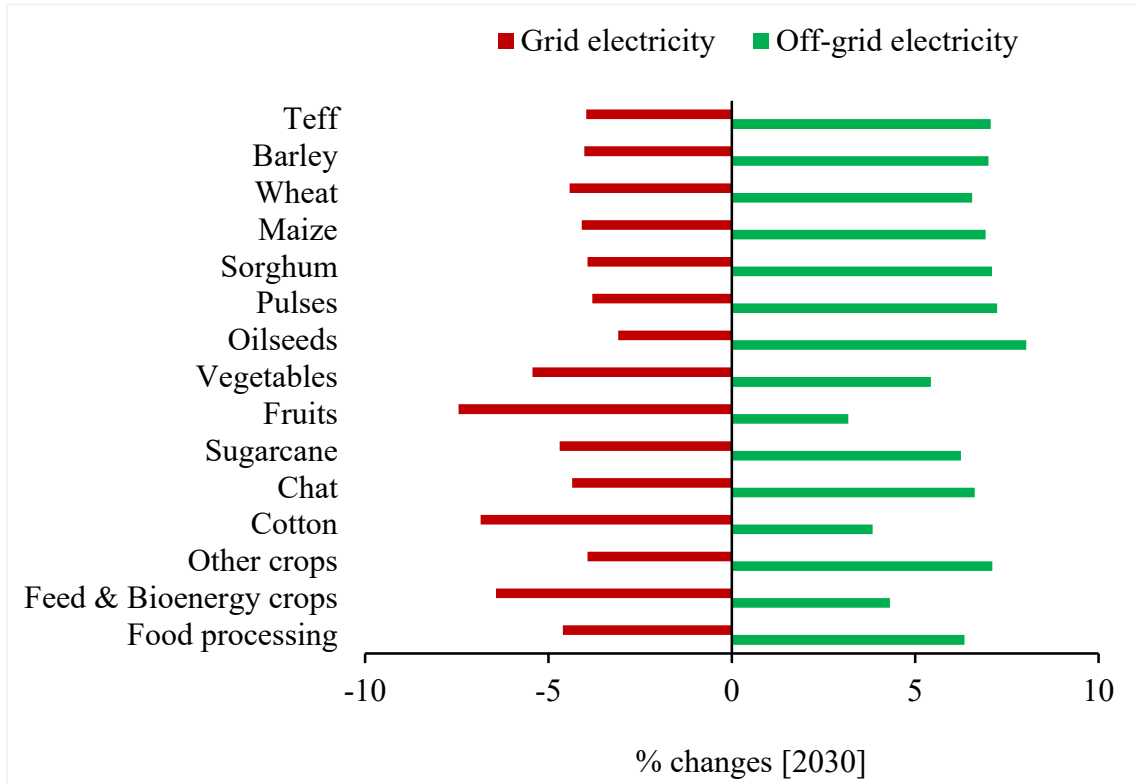


Effects on electricity supply mix

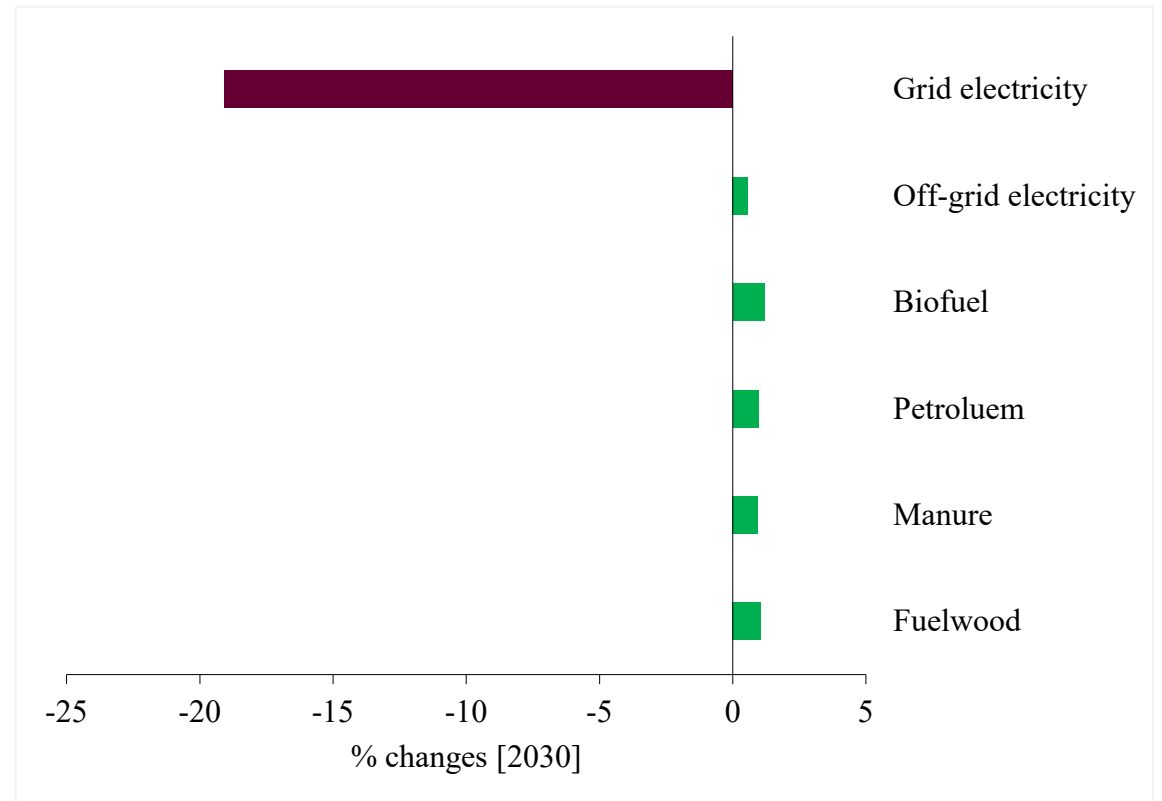


- The demand for electricity grid sources decline across users
- When possible, users substitute it with alternative fuels

3. Results & Discussions



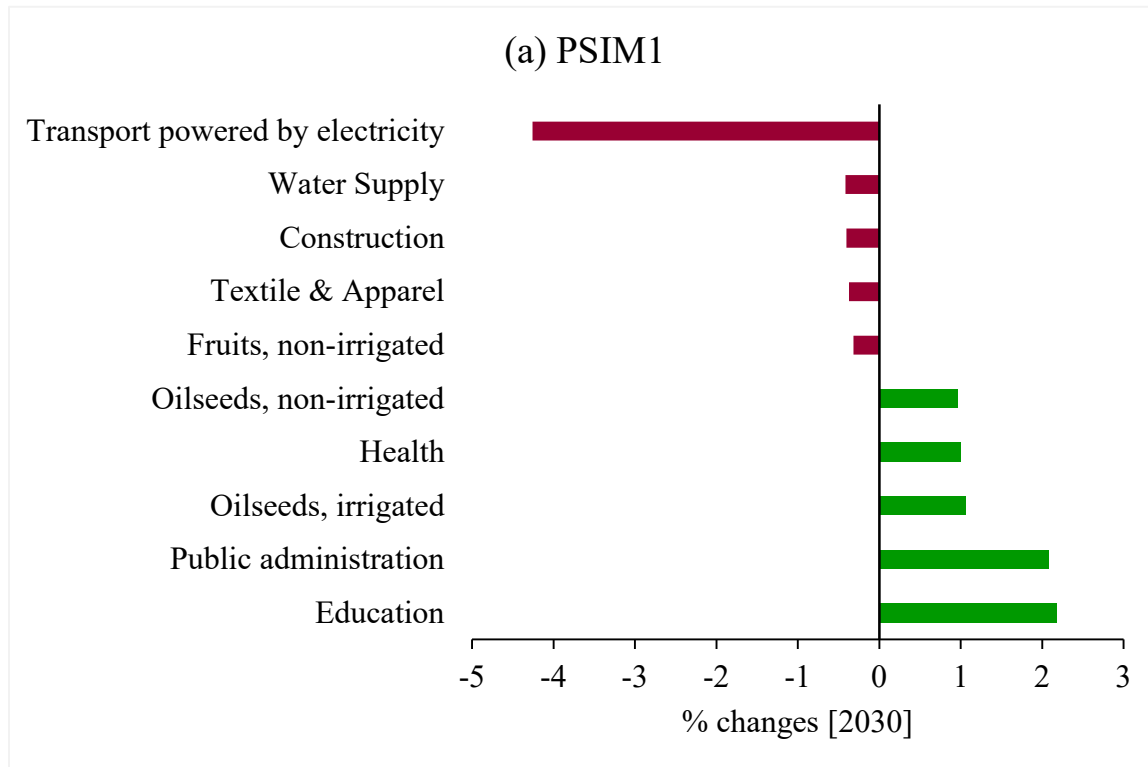
Effects on electricity use in agrifood sectors



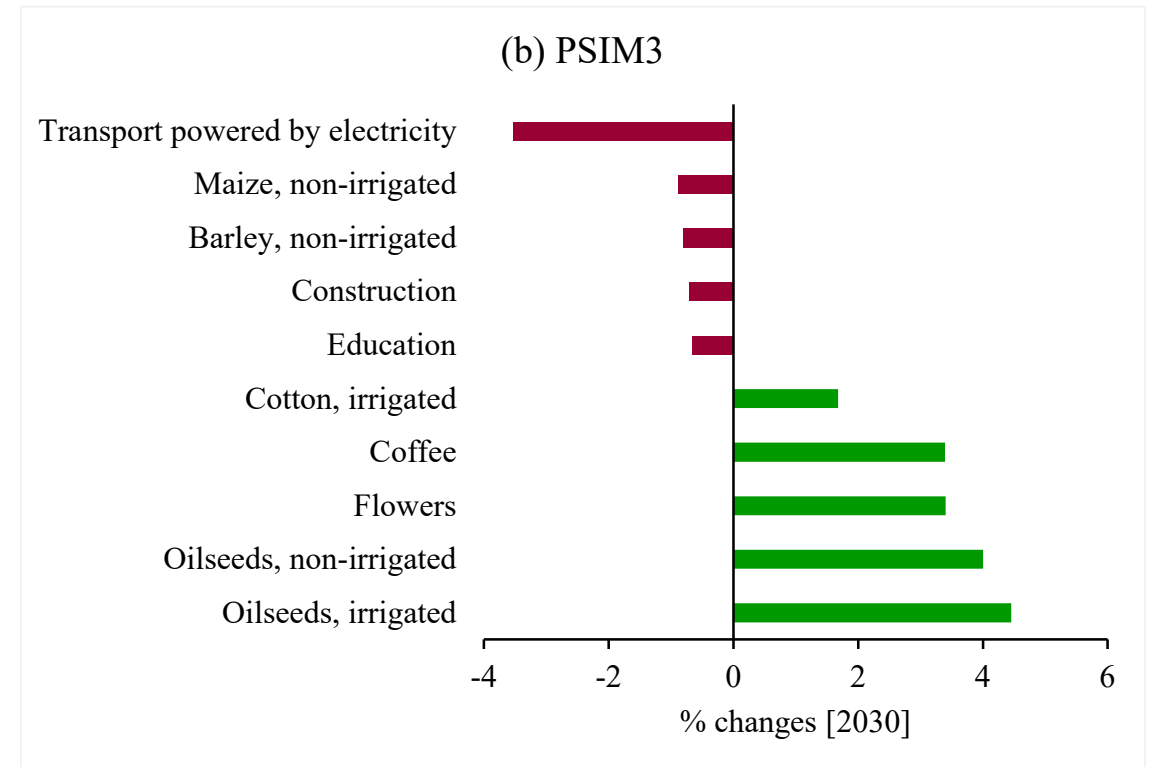
Effects on urban household energy demand

• The negative impacts on electricity-based transport services is noticeable

3. Results & Discussions

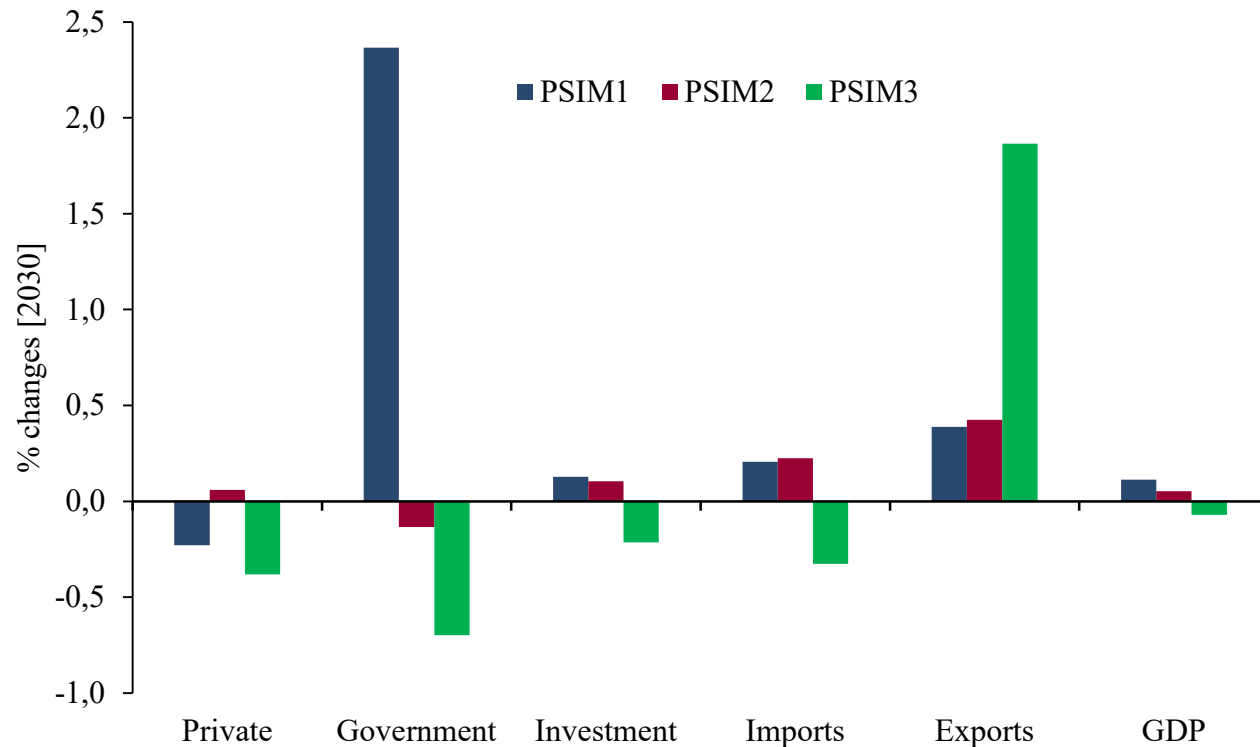


Effects on production sectors, PSIM1



Effects on production sectors, PSIM3

3. Results & Discussions



Effects on the macroeconomy

- PSIM1: Allocating additional revenues to government services (inc. education & health services)
 - Increases labor productivity (model equations!)
 - Real **GDP** ↑
- PSIM2: Allocating additional revenues to national savings would relieve households' burden of savings
 - Private **consumption** ↑
- PSIM3: Allocating additional revenues to debt repayment
 - ETB depreciates – **imports** ↓ & **exports** ↑



4. Conclusions

- Impacts vary across scenarios yet, overall, **insignificant effects on real GDP**
 - Gains in production and allocative **efficiency** in the economy (Roos & Adams, 2020)
 - **Small share of** electricity in the national economic (<1% of GDP) and energy systems (NBE, 2023)
- The increase in the **shares of decentralized** electricity sources that can be supplied by IPPs (e.g., off-grid and utility scale solar PVs) could be a positive sign to attract **private investors** which is also a related power sector reforms goal.



Thank you!

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