Assessing the Impacts of Low Emission Electricity Investment Senegal: Economy-wide and Distributional Perspectives

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Senegal faces high electricity production costs and aims to reduce reliance on the imported oil and improve electricity access by 2025. With the exploration and production of more natural gas, and the policy of moving away from the traditional oil and coal-based power generation towards gas-to-power generation, Senegal is encouraging higher investment in low emission electricity infrastructure, including gas-based generation. The study uses a recursive dynamic computable general equilibrium model analyze the economy-wide impacts of the investment in low emission electricity, as well as a top-down microsimulation approach to assess the poverty impacts. The study explores alternative financing options, including domestic private savings, government domestic debt, government financing through foreign aid or bonds and foreign investment.

The results indicate that a 15% increase in investment in low emission electricity leads to a reduction of in high emission electricity generation and a significant increase in low emission electricity generation across the alternative financing options. This results in average reduction in the cost electricity production by 6-14%. An increase in investment by 15% results in overall growth in the real GDP, trade and domestic demand. Although there is only marginal differential GDP impacts across the scenarios, slightly larger growth is observed when higher investment is accompanied by governmentâ€™s financing the investment through increased foreign aid, while it is the lowest when allowing the foreign savings to vary with the increased investment. The pattern of GDP growth is largely driven by the expansion in aggregate domestic demand including household, government and intermediate demand. However, trade balance is relatively lower with the foreign aid financing and higher in case of endogenous foreign savings.

Sectors that are major users of electricity like cash crops, processed food industries, other manufacturing, and services gain in production. Among the exporting industries, most benefit accrues to the food-processing sector followed by chemicals, cash crops, petroleum and other manufacturing industries as these industries become more export competitive. The significant increase in electricity production due to increased investment in low emission electricity and the resulting decline in the cost of electricity puts a pressure on sourcing factors of production in non-electricity activities, leading to increase in the prices of non-electricity sectors.

Households benefit from not only increased electricity consumption, but also increase in their food consumption. The rise in both food and non-food consumption is at its lowest in case of financing through foreign investment. The Increased investment in low emission electricity generation affects household welfare positively. In general, relatively higher welfare gains are registered for the urban households than their rural counterparts, and major gains are experienced from foreign bond financing.

The microsimulation poverty analysis in the study has revealed that investing in low emission electricity infrastructure has the potential to mitigate poverty in Senegal. National poverty declines by approximately 0.30-0.32 percentage points over the simulations, with Poverty reduction appearing to be higher in urban areas compared to rural areas Senegal.

Additionally, there is a substantial reduction in CO2 emission per unit, demonstrating enhanced emission efficiency in the electricity sector, while revealing nuanced impacts on other industries. Looking at the sectoral share of emissions in the baseline for 2025 reveals that sectors such as electricity generation, transportation and mining contribute a large share of total CO2 emissions. Investing in low emission electricity generation has a particularly strong effect on the electricity sector, with a substantial decrease in CO2 emissions per unit of electricity generated across all scenarios, indicating that electricity generation has become considerably CO2 efficient.

In short, the study highlights the potential for overall economic growth, welfare and poverty reduction because of increased investment in low emission electricity. The study also emphasizes the need for consideration of the complex interplay of economic growth, energy demand, and emission efficiencies in shaping CO2 emissions trends. Overall, the study suggests that promoting low emission electricity generation infrastructure has potential to contribute to both economic and social development while also addressing environmental concerns in Senegal.