

ERF Policy Brief

The Effect of a Carbon Tax on the Egyptian Economy: A General Equilibrium Analysis

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In a nutshell

- Climate change is a reality in Egypt. Temperatures in Egypt have risen 0.34o C/Decade between 1961-2000.
- Climate change is likely to aggravate water scarcity problems, reduce agricultural yields and agricultural output as parts of the Nile Delta is threatened by inundation due to sea level rise.
- Implementing a carbon tax in Egypt leads to substantial reduction in carbon dioxide emissions and raises revenue for the government.
- The effect of the carbon tax on economic growth depends on the use of the additional tax revenue.
- If the revenue is used to fund additional government consumption or cash transfers to private households, the effect is mildly contractionary.
- If the revenue is used to reduce other tax rates in a way that stimulates additional investment, the carbon tax could have a positive impact on economic activity.
- The carbon tax has no discernible adverse effects on the distribution of household income.

Climate Change is a reality in Egypt. According to a recent UNDP study, temperatures in Egypt have risen 0.34o C/Decade between 1961-2000. Climate change poses many threats to the country. These threats include aggravating water scarcity problems, reducing energy generation from clean hydropower, and declining agricultural output as yields fall and as cultivated lands decrease, since parts of the Nile delta is threatened by inundation due to sea level rise. Labor productivity is also susceptible to fall due to heat stress and deteriorating air quality.

Egypt follows a command and control approach to control greenhouse gas (GHG) emissions. By law, if emissions from a source exceed allowable limits set by the Ministry of the Environment, a fine is imposed. However, this fine which ranges from a minimum of EGP 1,000 to a maximum of EGP 20,000 is very modest. If the abatement cost faced by firms is higher than the fine, firms will prefer to pay the fine rather than abate. Thus, this approach to controlling greenhouse gases is not very effective as is evident from the continuous increase in carbon dioxide emissions. In fact, between 1990 and 2018 carbon dioxide emissions have increased by 183%. Moreover, unlike market-based incentives such as a carbon tax for example, this approach does not minimize the cost of controlling greenhouse gases in the economy, as it does not necessarily equalize the marginal abatement costs across sources of emissions.

Nonetheless, the Egyptian government has taken several important steps over the past few years to reduce carbon dioxide emissions. By ratifying the Paris Agreement, Egypt is committed to mitigate greenhouse gas emissions. However, this will be hard to achieve under the current command and control regime as explained above. Energy subsidies which have been in place for decades are being gradually phased out. It goes without saying that the complete removal of fossil fuel subsidies is imperative before it makes sense to implement any kind of market-based incentives to reduce fossil fuel use. A change in the energy mix towards renewables and nuclear energy and away from oil and gas which currently constitutes 98% of primary energy consumption is underway (EHDR, 2021), and the introduction of a carbon tax would be conducive to the achievement of the ambitious targets for the share of renewable energy sources in the power mix set out in Egypt's 2035 Integrated Sustainable Energy Strategy.

Meanwhile, the government is in dire need for resources to finance its ambitious development agenda and the revenues derived from the removal of energy subsidies and the implementation of a carbon tax would no doubt be helpful. One of the advantages of implementing a carbon tax in the case of Egypt is that - unlike tradeable permits- it does not require the creation of a new administrative

body that will be needed to administer and allocate tradable permits.

Simulations with an intertemporal general equilibrium model calibrated to the 2014/2015 social accounting matrix for Egypt suggest that a gradually phased-in carbon tax at a final rate of USD 20 / ton CO₂ could reduce Egypt's fossil-fuel-related GHG emissions by around 6 to 10% relative to the baseline path. After full implementation, the carbon tax revenue amounts to around 2.1 percent of GDP.

The effect of the carbon tax on Egypt's growth prospects depends on how the additional net tax revenue is spent by the government. If the revenue is used to fund additional government consumption or is recycled to the private household sector in the form of cash transfers, the effect on aggregate economic activity is mildly contractionary. The simulation results suggest that Egypt's long-run national income will be about 1.1 to 1.5 percent lower than in the no-carbon-tax baseline scenario in these cases. In contrast, if the revenue is used to finance a cut in other tax rates in a way that stimulates additional investment, the carbon tax could actually have a positive impact on economic growth on top of the beneficial GHG reduction effects – a so-called “double dividend” effect. The simulation result suggest an increase in national income on the order of +1.2 percent relative to the baseline growth path if the additional tax revenue is used to finance a cut in other indirect product taxes.

At the sectoral level, the relative price changes induced by the carbon tax incentivize in particular shifts in the power generation mix towards a lower share of fossil fuels and a higher share of renewables, the adoption of more energy-efficient technologies in industry and households, and shifts to more fuel-efficient modes of transportation. These shifts are associated with significant co-benefits in the form of reduced air pollution.

To assess the distributional impact of the carbon tax, the model-based analysis distinguishes three broad household groups (rural farm, rural non-farm and urban) and each of these groups is further disaggregated into five income sub-groups from poorest to richest. In the scenario without recycling of the carbon tax revenue, all household groups experience a decline in real income following the implementation of the carbon tax, but rural farm households are less affected than the other groups. Within each group of households, the tax tends to be mildly progressive in the sense that the real income of the richest households falls by slightly more than the real income of the poorest households in response to the carbon tax.



Recycling the additional tax revenue in the form of cash transfers to households reduces the negative impact of the tax on real income of all transfer-receiving households. In this case, the net distributional impact depends obviously on the government's choice of transfer mechanism. For example, to generate a distinctly pro-poor distributional outcome, the entire carbon tax revenue could be reserved for a full compensation of pre-transfer losses experienced by the lower income groups, while high-income households would be exempted from compensatory transfers.

Finally, if the carbon tax revenue is used to finance a cut in other indirect taxes, all households experience real income gains, and the distributional impacts are again slightly progressive as the lowest income quintile in each household group enjoys a higher percentage gain in real income than the top quintile.

Overall, these results indicate that an appropriately designed carbon tax need not adversely affect households by much. To a great extent this renders the implementation of a carbon tax in the case of Egypt politically feasible.





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