

# **ENVIRONMENTAL IMPACTS OF COAL SUBSIDIES IN TURKEY: A General Equilibrium Analysis**

Sevil Acar  
Istanbul Kemerburgaz University

Erinç Yeldan  
Bilkent University

In order to cite:

Acar, S. and Yeldan, E. 2016. Environmental Impacts of Coal Subsidies in Turkey: A General Equilibrium Analysis, Energy Policy, Volume 90, Pages 1-15. doi:10.1016/j.enpol.2015.12.003

We aim at providing an analytical quest for Turkey to :

- (i) study the true social and economic costs of the existing coal subsidization scheme
- (ii) assess the regional adjustments of phasing out coal subsidies in a dualistic economy characterized by fiscal and external constraints and labor market rigidities.

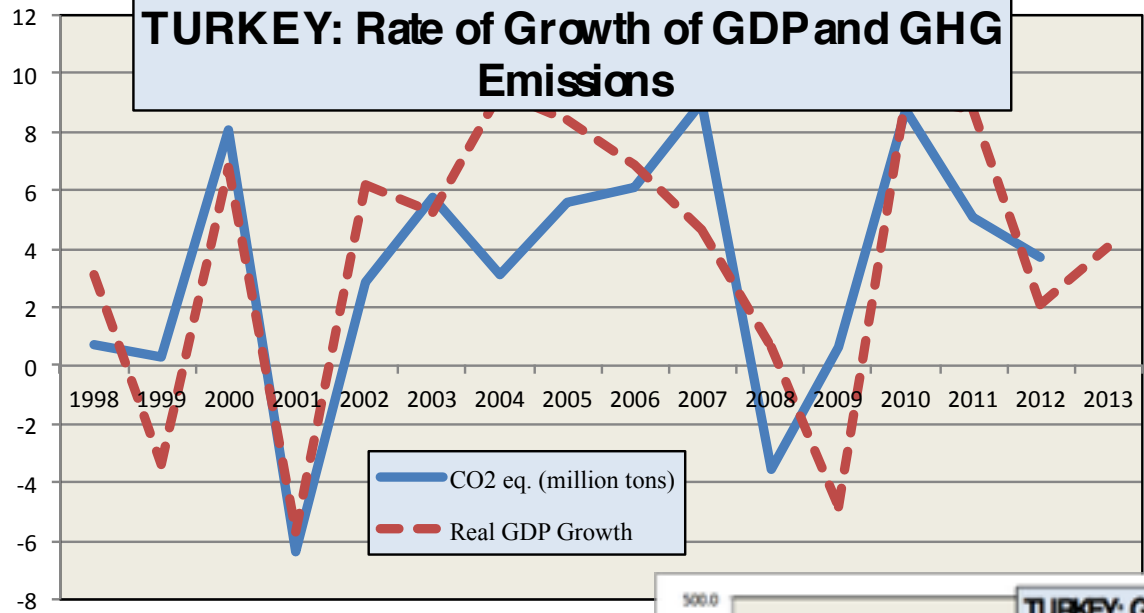
For this aim,

We develop an applied general equilibrium model and utilize both macro and micro level data to assess the impact of the current arsenal of coal subsidy policies.

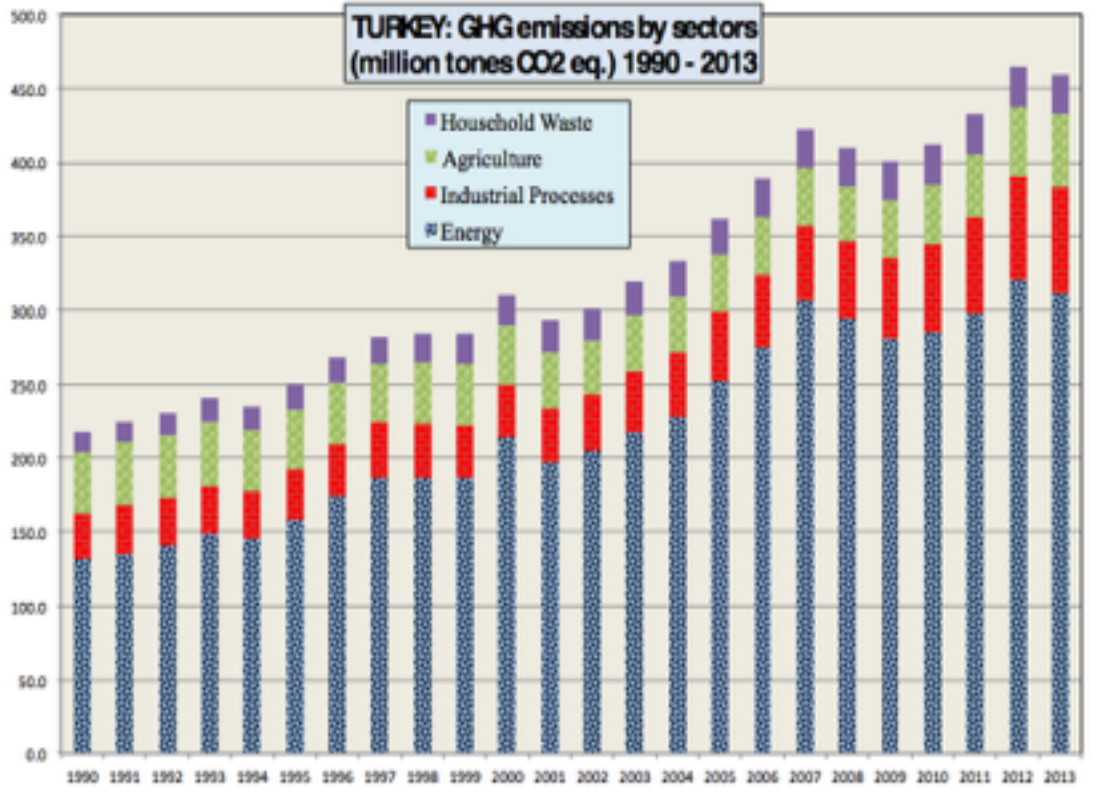
Turkey is rapidly increasing its demand for electricity and primary energy sources.

- On a per capita basis, Turkey's consumption of electricity power has grown from 300 kWh in 2005, to 400 kWh, by 2010 with an increase of eight-folds from 1980 to 2010.
- Official figures project continued increase in energy demand, with installed capacity expected to grow from 64 GW in 2014 to approximately 120 GW in 2023.
- The strategic direction for Turkey's energy sector focuses heavily on expansion of coal-fired power generation using domestic resources.

# TURKEY: Rate of Growth of GDP and GHG Emissions



# TURKEY: GHG emissions by sectors (million tons CO2 eq.) 1990 - 2013



# Coal Subsidies in Turkey

- A total of US\$730 million accrued to the coal sector in the form of subsidies in 2013.
- Quantifiable subsidies to the coal sector result in a per-kWh subsidy of around US \$0.01, which increases to US\$0.02 per kWh when consumer subsidies are included.
- These numbers demonstrate an underestimation of the total subsidy amount since they exclude investment guarantees, the regional incentive scheme measures, price and purchase guarantees, permissive environmental impact assessment (EIA) procedures, etc.

## **The Business-As-Usual Base Path 2015-2030**

- The model is solved sequentially up to 2030 with each solution referring to a calendar year.
- With an average annual rate of growth of 4% over 2015-2030, Turkish aggregate CO<sub>2</sub> emissions reach to 682 million tons (to 821.9 million tons of CO<sub>2</sub>(eq) gaseous emissions in total).
- This is reported to stand at 459 million tons of CO<sub>2</sub>(eq) in 2013 by the TurkStat.

# Policy Scenarios Envisaged

## 1. Eliminate subsidies on coal production

- Eliminate existing subsidies that correspond to 0.1% of GDP (730 mUSD)

## 2. (1) + Eliminate regional investment subsidies on coal

- Regional coal investments are subsidized indirectly by reduced income taxes and corporate taxes at a rate of 30% in the high-income region; 35% in the low-income region.

# RESULTS

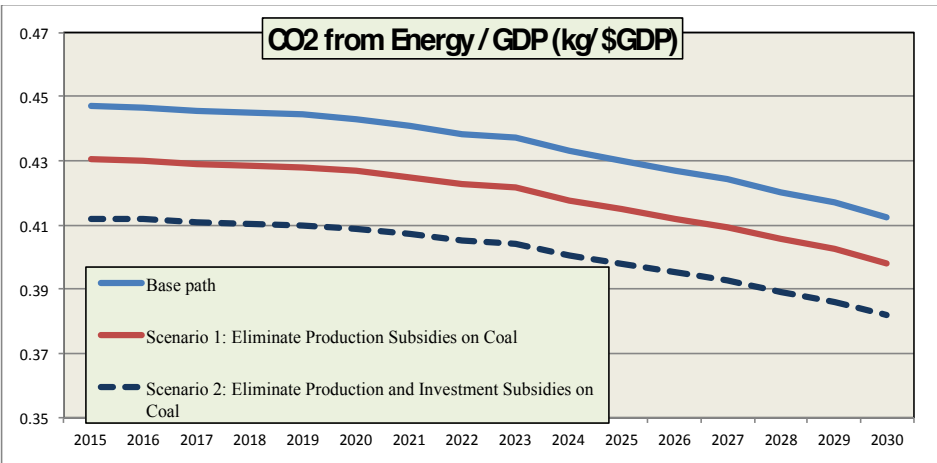
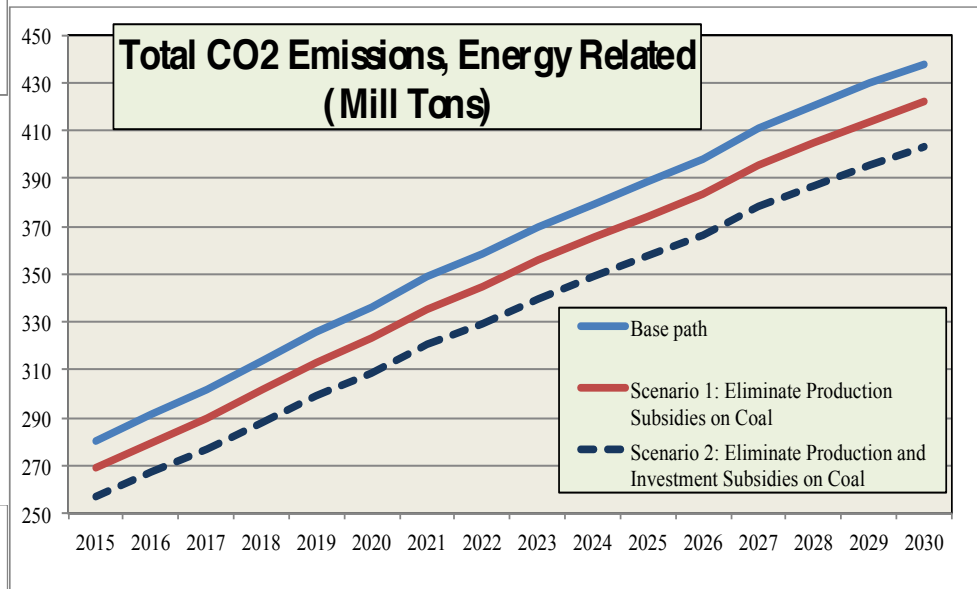
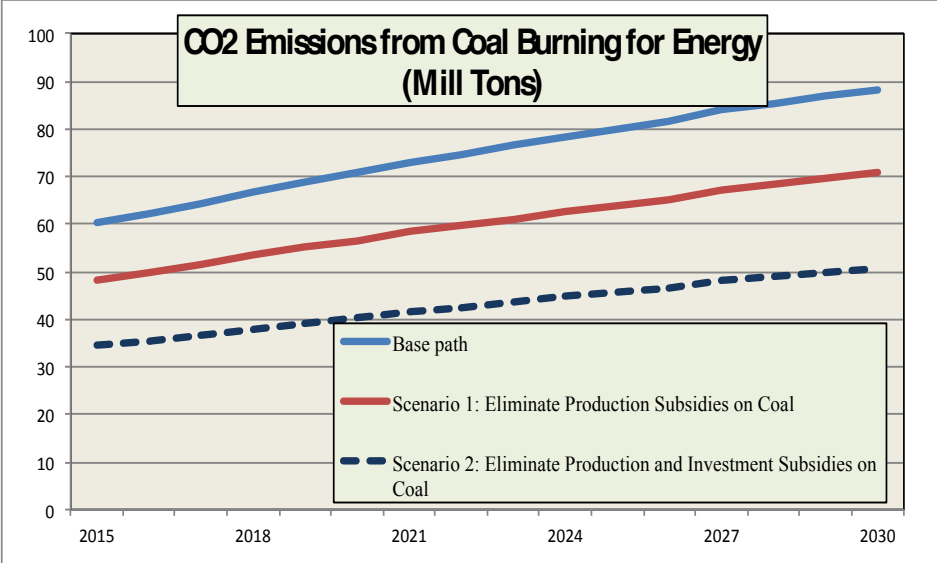


## Scenario 1:

- Coal production falls by 29% in both the high- and low-income regions.
- Aggregate GDP falls by 0.2%.
- CO<sub>2</sub>(eq) emissions are reduced by 2.5% (20.3 million tons) over the base path by 2030.
  - Emissions from coal combustion fall by
    - 4.2 m tons in low-income;
    - 13.4 m tons in high-income region.
  - 3.4 m tons reduction of energy-related emissions of hhs
- These numbers imply that CO<sub>2</sub> emissions from energy per \$ of GDP falls to 0.398 kg under the scenario, from 0.412 kg of the base path.

## Scenario 2:

- GDP loss by 2030 is only 0.5%.
- Reduction in CO<sub>2</sub>(eq) emissions reach to 5.4%.
  - Emissions from coal combustion fall by
    - 42.6% in low-income;
    - 42.7% in high-income region.
- Total abatement of energy related CO<sub>2</sub> emissions reach to 42.5 million tons
- Ratio of CO<sub>2</sub> from energy to GDP falls to 0.382 kg/\$.



## Conclusion

- Elimination of production and investment subsidies to coal results in a slight reduction of GDP; but a considerable decrease in CO<sub>2</sub> (eq) emissions in both high and low-income regions.
- Currently, while TR has ambitious plans for deployment of renewable energy, these are compromised by maintenance of subsidies to coal fired power generation and coal mining.
- Elimination of coal subsidies and earmarking these funds towards renewable energy, green jobs, or CO<sub>2</sub> mitigation will likely result in gains in efficiency and environmental abatement.