

Global economic implications of the Nationally Determined Contributions of the Paris Agreement

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What is the Paris Agreement?

United Nations Framework Convention on Climate Change agreement to:

- (a) Limit temperature increases to “well below” 2°C or, if possible, 1.5°C ;
- (b) Improve adaptation to climate change; and,
- (c) Ensure “finance flows” are “consistent” with (a) and (b).

Nationally Determined Contributions are commitments to reduce greenhouse gas emissions that countries make in order to achieve (a).

Climate change is a wicked problem



Photo credit: Win McNamee, Getty Images, 2017

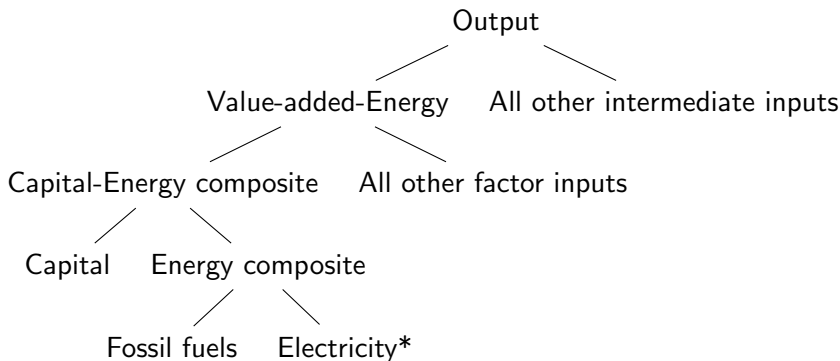
President Trump gives notice of his intention to withdraw the USA from the Paris Agreement

CGE modelling can help

Non-exhaustive list of contributions:

- OECD (2012) - ENV-Linkages
- Golub (2013) - GDyn-E
- Chen et al. (2016) - EPPA
- Fujimori et al. (2016) - AIM/CGE
- Kompas et al. (2018) - GTAP-INT
- Liu et al. (2019) - G-Cubed
- Brinsmead et al. (2019) - GTAP-ANO

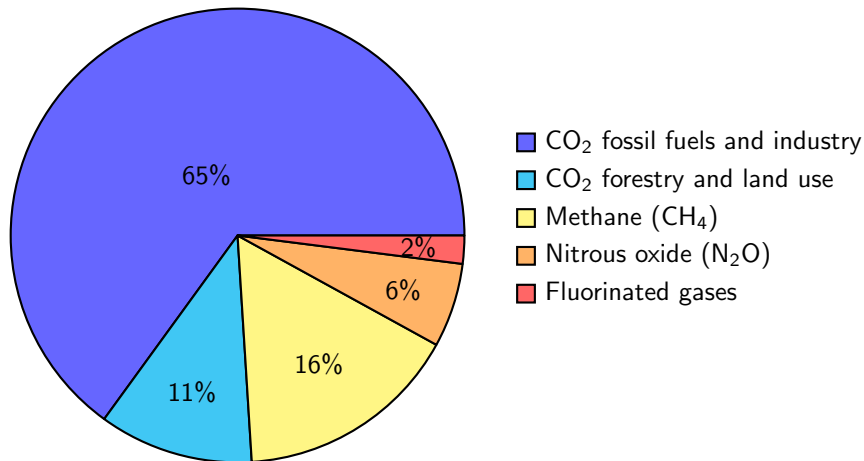
GDyn-E



Includes accounting of carbon dioxide (CO₂) emissions from consumption of fossil fuels.

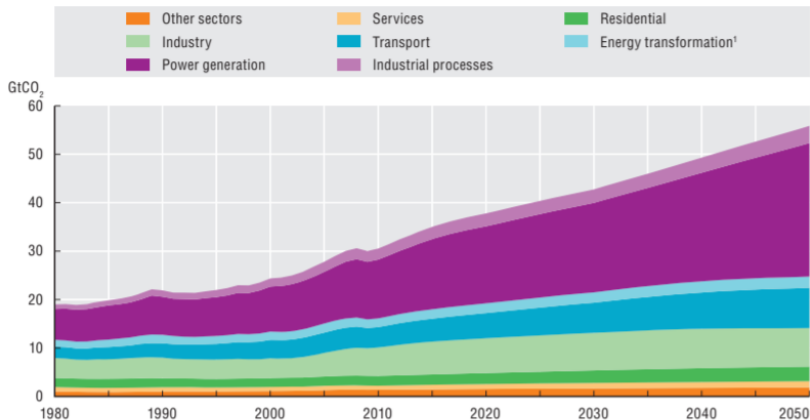
*The electricity sector is disaggregated in this study.

Coverage of greenhouse gas emissions



Source: Intergovernmental Panel on Climate Change (2014)

Coverage of CO₂ emissions



1. The category "energy transformation" includes emissions from oil refineries, coal and gas liquefaction.

Source: OECD (2012)

Ways GDyn-E is expanded in this study

1. Increased number of greenhouse gases covered
 - Data from Ahmed et al. (2014)
 - Method based on Brinsmead et al. (2019)
2. Increased detail in representation of largest source of greenhouse gas already covered (CO_2) - the power generation/electricity sector
 - Data from various sources, discussed next
 - Method based on Peters (2016)

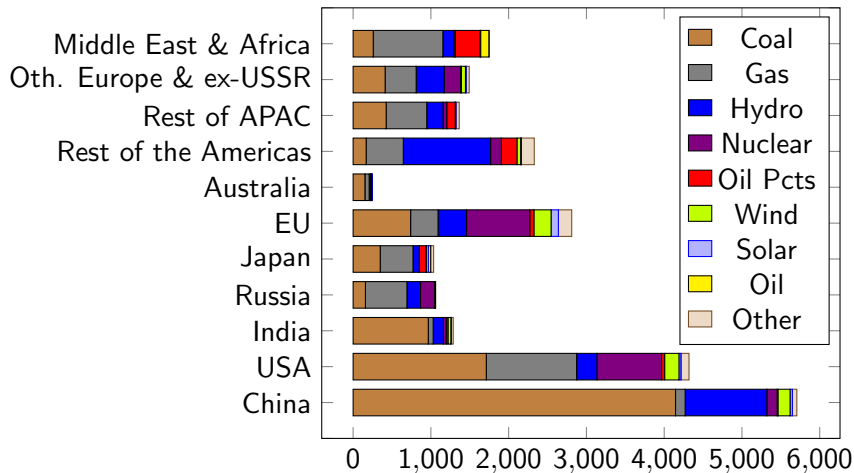
Disaggregated electricity sector

- Transmission and Distribution
- Generation
 - Coal
 - Gas
 - Hydro
 - Nuclear
 - Oil products
 - Wind
 - Solar
 - Oil
 - Other

Share of transmission and distribution in electricity cost

- China: 32% (He et al., 2015)
- USA: 20% (EIA, 2019)
- EU: 31% (Eurostat, 2020)
- India: 31% (Power Finance Corporation, 2016)
- Russia: 11% (Summanen and Arminen, 2018)
- Japan: 28% (Federation of Electric Power Companies of Japan, 2020)
- Australia: 54% (Australian Competition and Consumer Commission, 2018)

Electricity output by generation technology in 2014 (MWh)



Sources: IEA (2016a), IEA (2016b) and author's calculations

Global average levelised cost of electricity (\$/MWh)

Regional values taken from IEA/NEA (2015) where available, otherwise global averages applied:

Technology	Capital	O&M	Fuel	Total
Hydro	\$24.13	\$9.73	\$-	\$33.85
Coal	\$13.00	\$7.77	\$27.87	\$48.64
Nuclear	\$25.30	\$14.17	\$10.08	\$49.55
Solar	\$64.22	\$24.77	\$-	\$88.99
Gas	\$7.42	\$5.55	\$78.27	\$91.23
Oil	\$13.73	\$24.40	\$67.93	\$106.06
Wind	\$71.95	\$38.21	\$-	\$110.16
Other	\$12.17	\$16.74	\$96.03	\$124.95
Oil Products	\$33.01	\$15.90	\$242.00	\$290.91

Sources: IEA/NEA (2015), IEA/NEA (2010), Lazard (2016) and author's calculations

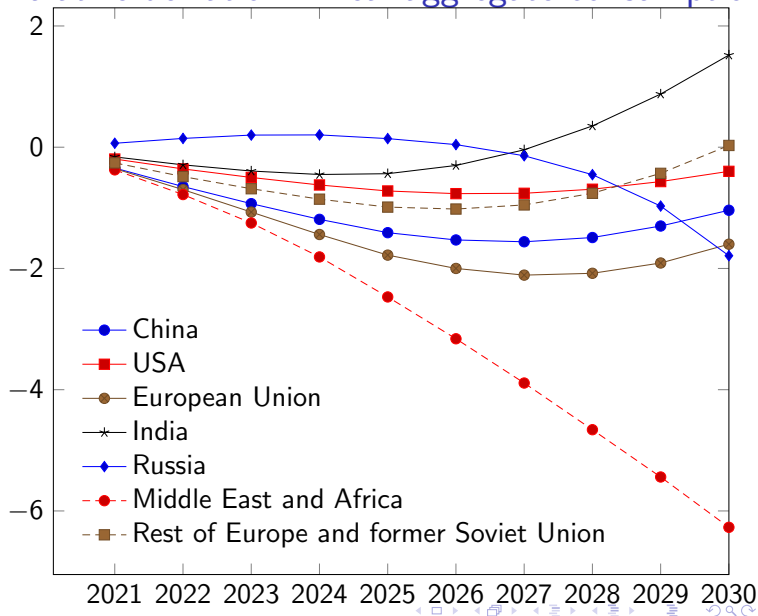
Nationally Determined Contributions

Annual percentage changes in emissions quotas

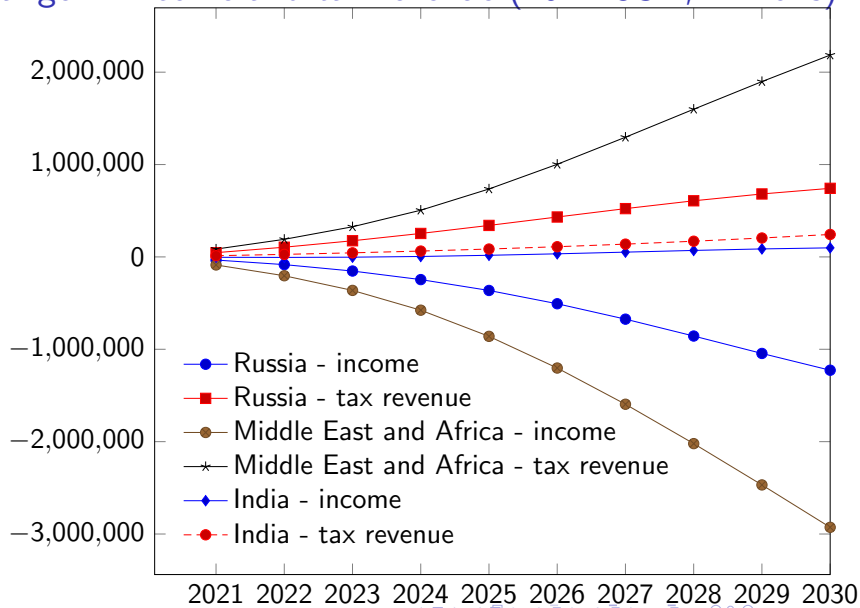
Region	2020-2025	2025-2030
China and Hong Kong	0.6	0.6
United States	-2.3	0.0
European Union	-3.3	-3.3
India	2.0	2.0
Russia	1.9	1.9
Japan	-2.2	-2.2
Australia	-1.5	-1.5
Middle East and Africa	1.3	1.4
Rest of Asia and the Pacific	2.3	2.9
Rest of the Americas	-0.4	0.3
Rest of Europe and former Soviet Union	1.0	0.7

Source: Fenhann (2020) and author's calculations

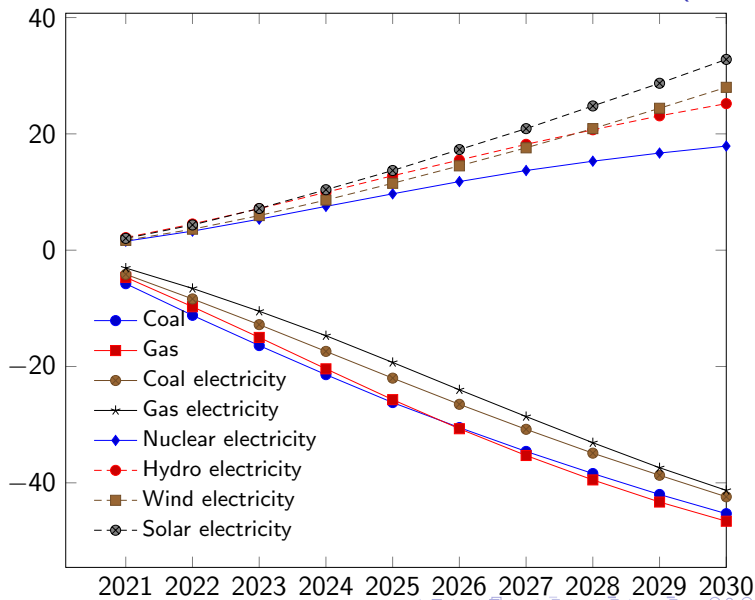
Cumulative deviation in real aggregate consumption (%)



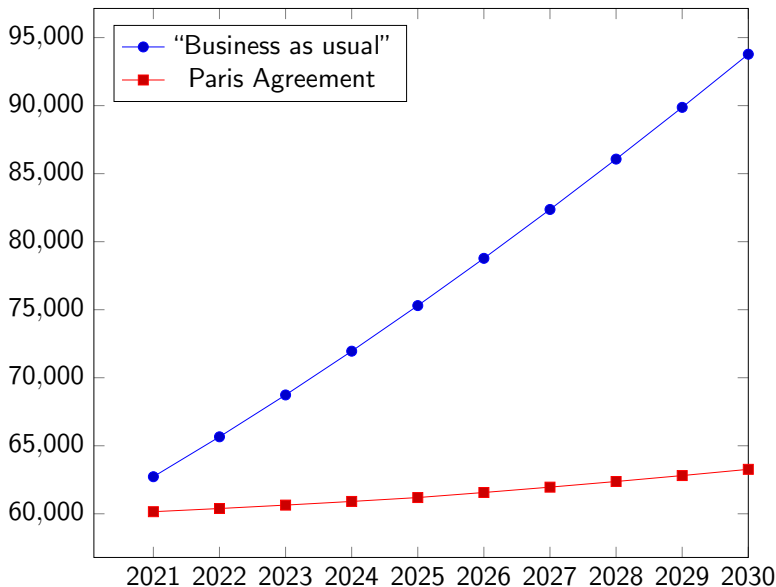
Change in income and tax revenue (2014 USD, millions)



Cumulative deviation in global sector output (percent)



Global greenhouse gas emissions (megatonnes CO₂ equiv.)



Next steps

- Updates to baseline during historical period
- Disaggregation of the agricultural sectors
- Update emissions of non-CO₂ gases
- Technological change, especially outside the electricity sector
- Extension beyond 2030

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