

1. Paper identification

1.1 Title: How Effective are Emission Trading Systems in Reducing Emissions? Empirical Evidence from EU, New Zealand and Republic of Korea

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1.3 Working Paper number (if assigned):

2. Software and environment

2.1 Software used: Stata 18.0

2.2 Required packages and versions: FECT 0.1.1

3. Execution instructions

3.1 Exact command(s) to reproduce all results:

3.1.1 Setup working directory in the leading program Master.do

3.1.2 Install stata package following the installation guide
https://yiqingxu.org/packages/fect/stata/fect_md.html

3.1.3 Run the leading program master.do

3.2 Expected runtime: 5 hours

4. Output mapping: Replication package includes 6 folders:

4.1 data: raw data: See ReadME_Data for details

4.2 temp: processed data: See ReadME_Data for details

4.3 dofile: STATA dofiles

4.3.1 Master.do: leading program for all other programs.

4.3.2 All_Cnt_DataCleaning_1.do: Data Preparation

4.3.3 All_Cnt_DataCleaning_2.do: Merge datasets

4.3.4 Summary.do: create summary statistics (table 1)

4.3.5 Raw ems Trend.do: create raw emission trends for each country (figures 1, 4, 6, 8)

4.3.6 Regression_elec_ems_EU_ets.do // Power Sector all EU-ETS countries (table 2, figures 2, 3)

4.3.7 Regression_elec_ems_EU15_ets.do // Power Sector 15 EU-ETS countries (table 4, figure 5)

4.3.8 Regression_elec_ems_SK_ets.do // Power Sector South Korea (table 8, figure 9)

4.3.9 Regression_elec_ems_NZ_ets.do // Power Sector New Zealand (table 6, figure 7)

4.3.10 Regression_ems_EU_ets.do // All-sector EU-ETS countries (table 2, figure 2, figure 3)

4.3.11 Regression_ems_EU15_ets.do // All-sector 15 EU-ETS countries (table 4, figure 5)

4.3.12 Regression_ems_SK_ets.do // All-sector South Korea (table 8, figure 9)

4.3.13 Regression_ems_NZ_ets.do // All-sector New Zealand (table 6, figure 7)

4.3.14 Regression_elec_ems_EU_ets_phase.do // Power Sector all EU-ETS countries (table 3)

4.3.15 Regression_elec_ems_EU15_ets_phase.do // Power Sector 15 EU-ETS countries (table 5)

4.3.16 Regression_elec_ems_SK_ets_phase.do // Power Sector South Korea (table 9)

4.3.17 Regression_elec_ems_NZ_ets_phase.do // Power Sector New Zealand (table 7)

4.3.18 Regression_ems_EU_ets_phase.do // All-sector Emission all EU-ETS countries (table 3)

4.3.19 Regression_ems_EU15_ets_phase.do // All-sector Emission 15 EU-ETS countries (table 5)

4.3.20 Regression_ems_SK_ets_phase.do // All-sector Emission South Korea (table 9)

4.3.21 Regression_ems_NZ_ets_phase.do // All-sector Emission New Zealand (table 7)

4.4 fig: output figures

4.4.1 trend subfolder: raw emission trends for each country

co2_ems_EU (figure 1)

co2_ems_EU15 (figure 4)

co2_ems_NZ (figure 6)

co2_ems_K (figure 8)

4.4.2 elt subfolder: GSC output for power sector. Note: This folder includes all specifications and estimator combinations for each ETS. However, in the paper, we only report the preferred ones which are as follows:

ELT-EU-ETS-FE-3 (figure 2)

ELT-EU-ETS-MC-3 (figure 2)

ELT-EU-ETS-MC-EquiTest-3 (figure 3)

ELT-EU15-ETS-MC-2 (figure 5)

ELT-NZ-ETS-MC-3 (figure 7)

ELT-SK-ETS-MC-2 (figure 9)

4.4.3 output for all sector. Note: This folder includes all specifications and estimator combinations for each ETS. However, in the paper, we only report the preferred ones which are as follows:

EU-ETS-MC-EquiTest-1 (figure 3)

EU15-ETS-MC-1 (figure 5)

NZ-ETS-MC-1 (figure 7)

SK-ETS-MC-3 (figure 9)

4.5 table: output tables

4.5.1 summary (table 1)

4.5.2 att_ETS_elec_ems (table 2, 3, 4, 5, 6, 7, 8, 9, 10 panel (A))

4.5.3 att_ETS_ems (table 2, 3, 4, 5, 6, 7, 8, 9, 10 panel (B))

4.5 log: Running logs

5.1 Raw Data

Location: "../Replication Package/data"

5.2 Processed Data

-Location: "../Replication Package/temp"

-Fully reproducible from raw data using two data cleaning dofiles:

..dofile/All_Cnt_DataCleaning_1

..dofile/All_Cnt_DataCleaning_2

-Input data for all analysis: temp_clean.dta

5.3 Data README

-Data sources: International Energy Agency, the World Bank and Our World in Data

-Coverage: 137 countries spanning the years 2000 to 2020.

-Key variables: CO2 Emission, Electricity CO2 Emission; GDP per capita; Population; Electricity Generation; Electricity Generation by Gas; Electricity Generation by Coal; Gas Price; Coal Price; Carbon Tax Indicator

STATA dofiles

1. Master Script

-Location: "../Replication Package/dofile/master.do"

-Instruction: change the .. to your local user directories before running.

2. Data cleaning

-All_Cnt_DataCleaning_1.do: Data Preparation

-All_Cnt_DataCleaning_2.do: Merge datasets

3. Summary statistics

-Summary.do: create summary statistics table 1

-Raw ems Trend.do: create raw emission trends for each country (figures 1, 4, 6, 8)

4. Analysis

-Regression_elec_ems_EU_ets.do // Power Sector all EU-ETS countries (table 2, figure 2, figure 3)

-Regression_elec_ems_EU15_ets.do // Power Sector 15 EU-ETS countries (table 4, figure 5)

-Regression_elec_ems_NZ_ets.do // Power Sector New Zealand (table 6, figure 7)

-Regression_elec_ems_SK_ets.do // Power Sector South Korea (table 8, figure 9)

-Regression_ems_EU_ets.do // All-sector EU-ETS countries (table 2, figure 2, figure 3)

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-Regression_ems_NZ_ets_phase.do // All-sector Emission New Zealand (table 7)

-Regression_ems_SK_ets_phase.do // All-sector Emission South Korea (table 9)

Data Availability Statement

****Emission Data - Outcome Variable****

Filename and location: ../replication Package/data/annual-co2-emissions-per-country

Source: Our World in Data - CO₂ and Greenhouse Gas Emissions

Data URL: <https://ourworldindata.org/co2-and-greenhouse-gas-emissions#explore-data-on-co2-and-greenhouse-gas-emissions>

Access date: March 2023

Access policy: Open - Publicly available and redistributable

Citation: Hannah Ritchie, Pablo Rosado, and Max Roser (2023) - “CO₂ and Greenhouse Gas Emissions” Published online at OurWorldinData.org. Retrieved from: 'https://ourworldindata.org/co2-and-greenhouse-gas-emissions' [Online Resource]

Filename and location: ../replication Package/data/CO2_electricity_emission

Source: International Energy Agency - Greenhouse Gas Emissions from Energy

Data URL: <https://www.iea.org/data-and-statistics/data-product/greenhouse-gas-emissions-from-energy>

Access date: March 2023

Access policy: Limited access - Requires purchase or human approval

Citation: IEA, Greenhouse Gas Emissions from Energy, IEA, Paris
<https://www.iea.org/data-and-statistics/data-product/greenhouse-gas-emissions-from-energy>, Licence: Terms of Use for Non-CC Material

****ETS Status - Treatment Variable****

Filename and location: ../replication Package/data/carbon-emissions-trading-system

Source: Our World in Data - Which countries have a carbon emissions trading system?

Data URL: <https://ourworldindata.org/grapher/carbon-emissions-trading-system>

Access date: March 2023

Access policy: Open - Publicly available and redistributable

Citation: Dolphin and Merkle (2024) – with major processing by Our World in Data.

****Control Variables****

Filename and location: ../replication
Package/data/API_NY.GDP.PCAP.CD_DS2_en_csv_v2_4901665

Source: World Development Indicators - GDP per capita (current US\$)

Data URL: <https://data.worldbank.org/indicator/NY.GDP.PCAP.CD>

Access date: March 2023

Access policy: Open - Publicly available and redistributable

Citation: World Bank. 2023. "World Development Indicators" [dataset].
<https://data.worldbank.org/indicator/NY.GDP.PCAP.CD>. Accessed March 2023.

Filename and location: ../replication
Package/data/API_NY.GDP.MKTP.CD_DS2_en_csv_v2_4901850

Source: World Development Indicators - GDP (current US\$)

Data URL: <https://data.worldbank.org/indicator/NY.GDP.MKTP.CD>

Access date: March 2023

Access policy: Open - Publicly available and redistributable

Citation: World Bank. 2023. "World Development Indicators" [dataset].
<https://data.worldbank.org/indicator/NY.GDP.MKTP.CD>. Accessed March 2023.

Filename and location: ../replication
Package/data/API_SP.POP.TOTL_DS2_en_csv_v2_4902028

Source: World Development Indicators - Population, Total

Data URL: <https://data.worldbank.org/indicator/SP.POP.TOTL>

Access date: March 2023

Access policy: Open - Publicly available and redistributable

Citation: World Bank. 2023. "World Development Indicators" [dataset].
<https://data.worldbank.org/indicator/SP.POP.TOTL>. Accessed March 2023.

Filename and location: ../replication Package/data/electricity-generation

Source: Our World in Data - Total electricity generation

Data URL: <https://ourworldindata.org/grapher/electricity-generation?tab=table>

Access date: March 2023

Access policy: Open - Publicly available and redistributable

Citation: Ember (2026); Energy Institute - Statistical Review of World Energy (2023) – with major processing by Our World in Data. Accessed March 2023.

Filename and location: ../replication Package/data/electricity-coal

Source: Our World in Data - Electricity generation from coal

Data URL: <https://ourworldindata.org/grapher/electricity-coal?tab=table>

Access date: March 2023

Access policy: Open - Publicly available and redistributable

Citation: Ember (2026); Energy Institute - Statistical Review of World Energy (2023) – with major processing by Our World in Data. Accessed March 2023.

Filename and location: ../replication Package/data/electricity-gas

Source: Our World in Data - Electricity generation from gas

Data URL: <https://ourworldindata.org/grapher/electricity-gas>

Access date: March 2023

Access policy: Open - Publicly available and redistributable

Citation: Ember (2026); Energy Institute - Statistical Review of World Energy (2023) – with major processing by Our World in Data. Accessed March 2023.

Filename and location: ../replication Package/data/fossil-fuel-price-index

Source: Our World in Data - Fossil fuel price index

Data URL: <https://ourworldindata.org/grapher/fossil-fuel-price-index?tab=table>

Access date: March 2023

Access policy: Open - Publicly available and redistributable

Citation: Energy Institute based on S&P Global Platts - Statistical Review of World Energy (2023). Accessed March 2023.

Filename and location: ../replication Package/data/coal-price

Source: Our World in Data - Coal-prices

Data URL: <https://ourworldindata.org/grapher/coal-prices>

Access date: April 2026

Access policy: Open - Publicly available and redistributable

Citation: Energy Institute based on S&P Global Platts - Statistical Review of World Energy (2025) – with major processing by Our World in Data

Filename and location: ../replication Package/data/Carbon pricing data (Apr 2024)

Source: Pantheon

Data URL: <https://dev-rad-carbon-pricing.pantheonsite.io/about#download-data>

Access date: April 2024

Access policy: Limited access - Requires purchase or human approval

Citation: Pantheon. "carbon pricing" [dataset]. <https://dev-rad-carbon-pricing.pantheonsite.io/about#download-data>. Accessed April 2024.