

README for the Section 2 of Comparing the Effectiveness of Low Carbon Policies: A Technology Diffusion Approach

Overview

This package includes all the replication materials for **section 2** of the working paper “Comparing the Effectiveness of Low Carbon Policies: A Technology Diffusion Approach” by Unnada Chewpreecha, Francesca de Nicola, Aaditya Mattoo, Hector Pollitt, and Trang Thu Tran. The original publicly data used are provided in the folder “raw/”. The programs in “code/” prepare the data for analysis and generate the datafiles in “data/”. Results are in “output/”.

Data Availability Statement

The authors of the manuscript certify they have legitimate access to and permission to use the data used in this manuscript. All data are publicly available, and can be downloaded at no cost at the links provided. The folder “raw” includes all the data used in the analysis, and the programs call the Stata and Excel versions in “the folder “raw.” The authors are not responsible for updates to the data made at the source after the versions used in the analysis.

Details on each data source

Data Name	Data Files	Location	Provided	References
World Development Indicator (WDI)	n/a	n/a	FALSE	Accessed directly using “wbopendata”
Ember electricity data	yearly_full_release_long_format.csv	raw/	TRUE	• Accessed 05/29/2025. • Visit this website // https://ember-energy.org/data/yearly-electricity-data/ • Click to download “Yearly electricity data – long format (CSV)”

IEA Government Energy Spending Tracker: Policy Database	IEA_energy_spending.2024.04.25.xlsx	raw/	TRUE	• Accessed 04/25/2024. • Visit this website // https://www.iea.org/data-and-statistics/data-tools/government-energy-spending-tracker-policy-database • Click on “Detailed breakdown” tab, expand all programs in the “Measure” tab • Copy and paste in Excel
OECD Net Effective Carbon Rates 2025	OECD.CTP.TPS,DSD_N ECR.MEANW.Q.A.csv	raw/	TRUE	• Accessed 05/29/2025. • Visit this website // https://data-explorer.oecd.org/vis?lc=en&fs[0]=Topic%2C1%7CTaxation%23TAX%23%7CTax%20and%20environment%23TAX_ENV%23&pg=0&fc=Topic&bp=true&snb=7&df[ds]=dsDisseminateFinalDMZ&df[id]=DSD_NECR%40DF_NECRS&df[ag]=OECD.CTP.TPS&dq=._T._T.FUETAX%2BCARB TAX%2BMPERPRI%2BECRATE%2BSUBSID%2BNETECR..MEANW.Q.A&pd=2021%2C&to[TIME_PERIOD]=false&vw=tb • Go to “Table” table, click Download
RISE	re_pillar_website_upload.xlsx	raw/	TRUE	• Accessed 06/04/2025. • Visit this website // https://data360.worldbank.org/en/dataset/WB_RISE
Solar practical potential from the Global Solar Atlas 2.0	solargis_pvpotential_countryranking_2020_data.xlsx	raw/	TRUE	• Accessed 03/06/2025. • Visit this website // https://datacatalog.worldbank.org/int/search/dataset/0038379

IMF fuel subsidies	EXTERNALfuelsubsidie stemplate2023new.xls x	raw/	TRUE	• Download excel file “Global Photovoltaic Potential Country Rankings” • Accessed 05/29/2025. • Visit this website // https://www.imf.org/en/topics/climate-change/energy-subsidies#Energy%20Subsidies
IRENA LCOE	IRENA-Datafile- RenPwrGenCosts-in- 2023-v2.xlsx	raw/	TRUE	• Accessed 05/29/2025 • Visit this website // https://www.irena.org/Publications/2024/Sep/Renewable-Power-Generation-Costs-in-2023 • Click ‘Download Data’, fill in data request to download

Instructions to Replicators

Expected running time is 10 minutes to generate everything.

You will need to change the root in the “main” do file to your local drive.

All outputs are in the folder “output/” and labelled according to the figures they correspond to.

To replicate, run the “main” do file, which will call the do files associated with each figure. Each figure do file prepares the required data from raw data sources and generates the figure.

Hardware and Software Requirements

- Normal laptop with a 11th Gen Intel(R) Core(TM) i5-1145G7 @ 2.60GHz processor and 16 GB RAM.
- Stata MP/18
 - wbopendata
 - isocodes
 - coefplot

Folder structure

data

|— raw
└— cleaned

code

|— main.do
|— figure2.do
|— figure4.do
└— figure5.do

output

README for the Sections 3-4 of Comparing the Effectiveness of Low Carbon Policies: A Technology Diffusion Approach

This reproducibility package includes materials to replicate the results for three of the four case studies presented in the paper: Thailand, Indonesia, and Vietnam. These analyses were conducted using the FTT-FLEX model developed internally by World Bank staff (Chewpreecha, Dennig, and Hansen, 2024).

The China case study (Figure 10), which uses the E3ME-FTT model developed jointly by Cambridge Econometrics (www.camecon.com) and Mercure et al (Mercure et al, 2014; Mercure et al, 2018), is not included in this package due to copyright restrictions on the code producing the results. The reproducibility package includes the numeric results from that code in the file “ChinaCaseStudy.xlsx” and the generation of figure 10 in Excel.

Variable	Description (access date)	Source
COST__	Levelized Cost of Electricity (Aug 2024)	IEA Levelized Cost of Electricity Calculator (https://www.iea.org/data-and-statistics/data-tools/levelised-cost-of-electricity-calculator)
ACCUMMULATED_PRODUCTION_(tech)	Global baseline cumulative power production by technology (Aug 2024)	Our World in Data (historical) and IEA WEO 2022 (https://www.iea.org/data-and-statistics/data-product/)
LEARNING__(technology)	Learning rate by technology (Aug 2024)	Mercure (2012) \& IRENA (2023), FTT-Power Database
CO2_COEFF__(technology)	CO ₂ intensity by power generation technology (Aug 2024)	Mercure (2012), FTT-Power Database (originally from IEA)

LEAD__(technology) TAU__(technology)	Lead time and lifetime of power plants by technology (Aug 2024)	Mercure (2012), FTT-Power Database (originally from IEA)
OIL/GAS/COAL_PRICE_STEP	Fossil fuel price assumptions (APS/NZE scenarios) (Aug 2024)	IEA WEO 2022 (https://www.iea.org/data-and-statistics/data-product/world-energy-outlook-2022-extended-dataset) \[*purchase required*]
SHARE__(technology)	Historical power generation mix by technology (Aug 2024)	IEA (2023), World Energy Balances (https://www.iea.org/data-and-statistics/data-product/world-energy-balances-highlights) \[*purchase required*]

Data used to construct “3D_diffusion_rate.xlsx” and “DiffusionRate_Ease of Switching.xlsx” charts are generated by the authors by interpolation and contained in the Excel files.

Code Description

This reproducibility package includes the code used to develop country-specific versions of the FTT-FLEX model and simulate policy scenarios for the research paper. The modeling framework allows analysis of technology diffusion and emissions reduction in the power sector under alternative policy settings.

The code is structured into two main components:

1. Model Setup:

* Builds a new country-specific FTT-FLEX model by reading input data from Excel files and applying the system of equations used in the model framework.

* Each country model is constructed using data files named FTTAssumptionsXXX.xlsx, where XXX refers to the ISO3 country code.

2. Policy Simulation:

* Runs user-defined policy scenarios (e.g., carbon tax, renewable energy mandates, lifetime limits) and generates output.

* Produces figures and summary tables replicating the case study results in the paper (Excel Tables and Figures templates are also provided for each case study).

Computational Requirements

This package requires EViews to run the model simulations. All code files provided are in .prg format, which are native to the EViews environment. A valid EViews license is required. Please ensure that EViews is installed and activated on your machine before attempting to execute any programs in this package.

Folder Structure

Data/

├── FTTAssumptionsIDN.xlsx # Input data for Indonesia

├── FTTAssumptionsTHA.xlsx # Input data for Thailand

└── FTTAssumptionsVNM.xlsx # Input data for Vietnam

Build/

└── FTT\FLEX_equations.prg # Core model equations (EViews program)

Main folder

├── IndonesiaCaseStudy.prg # Main simulation for Indonesia

├── IndonesiaCaseStudy.xlsx # Output template for Indonesia results

├── ThailandCaseStudy.prg # Main simulation for Thailand

├── ThailandCaseStudy.xlsx # Output template for Thailand results

└── VietnamCaseStudy.prg # Main simulation for Vietnam

|— VietnamCaseStudy.xlsx # Output template for Vietnam results
|— 3D_diffusion_rate.xlsx # Data and chart for Figure 6 (3D plot)
|— DiffusionRate_EaseOfSwitching.xlsx # Data and chart for ease of switching Figure 6 (2D plot)

Steps for Generating Case Study Results in the Paper (FTT-FLEX)

Thailand Case Study

1. Execute “ThailandCaseStudy.prg”. This program:

- Calls “FTT_FLEX_equations.prg” to build the model.
- Applies policy shocks specific to the Thailand case study.
- Prints out raw results from EViews.

2. Generate Charts

- Copy the raw EViews results from Step 1.
- Paste the results into the “RawEviews” sheet in “ThailandCaseStudy.xlsx”.
- The pre-set Excel template will automatically generate the charts.

Indonesia Case Study

1. Execute “IndonesiaCaseStudy.prg”. This program:

- Calls “FTT_FLEX_equations.prg” to build the model.
- Applies policy shocks specific to the Thailand case study.
- Prints out raw results from EViews.

2. Generate Charts

- Copy the raw EViews results from Step 1.
- Paste the results into the “RawEviews” sheet in “IndonesiaCaseStudy.xlsx”.
- The pre-set Excel template will automatically generate the charts.

Vietnam Case Study

1. Execute “VietnamCaseStudy.prg”. This program:

- Calls “FTT_FLEX_equations.prg” to build the model.
- Applies policy shocks specific to the Thailand case study.
- Prints out raw results from EViews.

2. Generate Charts

- Copy the raw EViews results from Step 1.
- Paste the results into the “RawEViews” sheet in “VietnamCaseStudy.xlsx”.
- The pre-set Excel template will automatically generate the charts.

Contact

For any questions or inquiries on the reproducibility package, please contact Unnada Chewpreecha at uchewpreecha@worldbank.org.