

README for the Reproducibility Package for Trade's Emissions Paradox: Cutting Greenhouse Gases, Raising Air Pollution

This README template is designed to be included in reproducibility packages to provide directions for replicating the results in the research paper. The sections mentioned below should be included to guide users through the replication process.

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Overview

All codes necessary to replicate the figures in the paper are recorded in the files “GTAP_Export_Import.R” and “Code_TradeEmissionParadox.R”. To replicate the data, please change the destination and set a directory where the data files exist.

- “Code_Appendix_Figure2_TradeEmissionParadox.R” recorded the codes to replicate figure 2 in the appendix.

The necessary data to replicate the figures in the paper are as follows:

- The data files “GTAP_import.dta” and “GTAP_export.dta” are trade data by country and year. They are generated by “GTAP_Export_Import.R”, which takes the zip files in “data/GTAP Trade data” as inputs. These zip files correspond to the dataset GTAP Trade Data listed below should be downloaded from its data URL. The complete list of zip files is:
 - Data/GTAP Trade data/trade_h0gp_2004_export_csv.zip
 - Data/GTAP Trade data/trade_h0gp_2004_import_csv.zip
 - Data/GTAP Trade data/trade_h0gp_2005_export_csv.zip
 - Data/GTAP Trade data/trade_h0gp_2005_import_csv.zip
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 - Data/GTAP Trade data/trade_h0gp_2007_import_csv.zip
 - Data/GTAP Trade data/trade_h0gp_2008_export_csv.zip
 - Data/GTAP Trade data/trade_h0gp_2008_import_csv.zip
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- Data/GTAP Trade data/trade_h0gp_2010_export_csv.zip
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 - Data/GTAP Trade data/trade_h0gp_2017_import_csv.zip
 - Data/GTAP Trade data/trade_h0gp_2018_export_csv.zip
 - Data/GTAP Trade data/trade_h0gp_2018_import_csv.zip
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 - Data/GTAP Trade data/trade_h0gp_2020_export_csv.zip
 - Data/GTAP Trade data/trade_h0gp_2020_import_csv.zip
 - Data/GTAP Trade data/trade_h0gp_2021_export_csv.zip
 - Data/GTAP Trade data/trade_h0gp_2021_import_csv.zip
 - Data/GTAP Trade data/trade_h0gp_2022_export_csv.zip
 - Data/GTAP Trade data/trade_h0gp_2022_import_csv.zip
- “Emi_per_outpt_2004.CSV” shows sectoral pollution intensity data for countries in 2004.
 - “Emi_per_outpt_2007.CSV” shows sectoral pollution intensity data for countries in 2007.
 - “Emi_per_outpt_2011.CSV” shows sectoral pollution intensity data for countries in 2011.
 - “Emi_per_outpt_2014.CSV” shows sectoral pollution intensity data for countries in 2014.
 - “Emi_per_outpt_2017.CSV” shows sectoral pollution intensity data for countries in 2017.

Other data are as follows:

- “Sectoral_code.csv” shows the GTAP sector listed at: [GTAP Data Bases: Detailed Sectoral List](#)

- “GDP_WDI.csv” records countries' gross domestic production available at [World Bank Open Data | Data](#)
- “Export_to_GDP_WDI.csv” records countries' gross domestic production available at [World Bank Open Data | Data](#)
- “EDGAR_GHG.csv” records countries' greenhouse gas emissions publicly available at [EDGAR - The Emissions Database for Global Atmospheric Research](#)
- “EDGAR_PM2.5.csv” records countries' PM2.5 emissions publicly available at [EDGAR - The Emissions Database for Global Atmospheric Research](#)
- “income_groups.csv” shows country classification based on the World Bank income classification listed at: <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups>

Data Availability

Sectoral pollution intensity data cannot be made publicly available.

Data Sources

Global Trade Analysis Project (GTAP) trade data are provided by the Center for Global Trade Analysis at Purdue University and publicly available for download at (retrieved October, 2024): <https://datacatalog.worldbank.org/search/dataset/0064902/gtap-trade-data>.

Global Trade Analysis Project (GTAP) sectoral pollution intensity data used in the analysis is publicly available (upon subscription) on the GTAP website atv9 retrieved October, 2024): <https://www.gtap.agecon.purdue.edu/>

“Sectoral_code.csv” shows the GTAP sector listed at (retrieved October, 2024): [GTAP Data Bases: Detailed Sectoral List](#)

“GDP_WDI.csv” records countries' gross domestic production available at (retrieved November 2024): [World Bank Open Data | Data](#)

“Export_to_GDP_WDI.csv” records countries' gross domestic production available at (retrieved November 2024): [World Bank Open Data | Data](#)

“EDGAR_GHG.csv” records countries' greenhouse gas emissions publicly available at (retrieved November 2024): [EDGAR - The Emissions Database for Global Atmospheric Research](#)

“EDGAR_PM2.5.csv” records countries' PM2.5 emissions publicly available at (retrieved November, 2024): [EDGAR - The Emissions Database for Global Atmospheric Research](#)

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Statement about Rights

- ✓ I certify that the author(s) of the manuscript have legitimate access to and permission to use the data used in this manuscript.
- X I certify that the author(s) of the manuscript have documented permission to redistribute/publish the data contained within this replication package. Appropriate permission are documented in the LICENSE.txt file.

Instructions for Replicators

New users should follow these steps to run the package successfully:

- Users must first have access to all data files if they are not included in the reproducibility package. They should go to the mentioned links, download the listed files, and place them in the data folder. - Update the following files with your directory paths

- ✓ R Main File: Code_TradeEmissionParadox.R
- ✓ Ensure all required software and dependencies are installed as listed in the [Requirements](#) section.
- ✓ Run GTAP_Export_Import.R
- ✓ Run Code_TradeEmissionParadox.R
- ✓ Run Code_Appendix_Figure2_TradeEmissionParadox.R

Figure 1 requires additional steps to be generated in Excel:

- Open GTAP_GHG_trade.csv
- The bars for “Share of export to GDP” are a bar plot of the results in column F
- The line for “Share of emissions embodied in exports to total GHG emissions” is a line plot from column B
- The line for “Share of emissions embodied in exports to total PM2.5 emissions” is a line plot from column C

List of Exhibits

The provided code reproduces:

- ✓ All numbers provided in text in the paper
- ✓ All tables and figures in the paper

Requirements

Computational Requirements

To replicate the figures, users need to download the R software. Users can freely download the R software from: [R: The R Project for Statistical Computing](#)

- **R Environment Setup:** [R Instructions](#)

Software Requirements

R version 4.5.0

Code Description

All codes necessary to replicate the figures in the paper are recorded in the file “Code_TradeEmissionParadox.R”. To replicate the data, please change the destination and set a directory where the data files exist.

Supplementary figures:

- All codes to replicate figures 1.1, 1.2, and 1.3 are presented in the R main file, “Code_TradeEmissionParadox.R”.
- All codes to replicate figure 2 in the appendix is presented in “Code_Appendix_Figure2_TradeEmissionParadox.R”.