

README for the Reproducibility Package for Rising heat in the labor market: the impact of climate change on jobs in Europe

By Luca Bettarelli, Thomas Farole, Michael Ganslmeier, Indhira Vanessa Santos, Marc Schiffbauer.

*For information about the replication package, please contact Luca Bettarelli at luca.bettarelli@unipa.it.

Overview

The replication package includes two folders: “wbcs” and “ardec”. The former contains the firm-level analysis, while the latter contains the municipality-level analysis. Each folder includes the necessary datasets and Stata do-files to reproduce the results.

Runtime: 30 minutes approximately.

Instructions for Replicators

To replicate the exhibits, the user should follow these steps:

1. Install the required Stata packages: reghdfe, ftools, require, spmap, and winsor2.
2. For the firm-level analysis, modify the global “dir” in line 22 of the “wbcs/replication_wbcs.do” do-file, then execute the do-file.
3. For the municipality-level analysis, modify the global “replication_package” in line 15 of the “ardec/replication_ardec.do” do-file, then execute the do-file.

Data Availability Statement

The replication package relies on three main datasets:

1. World Bank Enterprise Surveys (WBES)

The final dataset used for the firm-level empirical analysis is “wbcs/wbcs.dta”. This dataset is constructed using four datasets from the World Bank Enterprise Surveys (WBES):

- a. **StandardizedNew-2006-2025-core4:**
File name: “New_Comprehensive_December_15_2025.dta”
URL: <https://login.enterprisesurveys.org/content/sites/financeandprivatesector/en/library/library-detail.html/content/dam/wbgassetshare/enterprisesurveys/combineddata/all-economies/StandardizedNew-2006-2025-core4.zip>
Access date: January 2025
- b. **ECA-MENA-with-Green-Economy-41-WBES-full-data:**
File name: “combined WBES_ECA MENA_2020.dta”
URL: https://login.enterprisesurveys.org/content/sites/financeandprivatesector/en/library/library-detail.html/content/dam/wbgassetshare/enterprisesurveys/combineddata/eca-mena_with-green-economy_41-wbes/ECA-MENA-with-Green-Economy-41-WBES-full-data.zip
Access date: January 2025
- c. **Firm-Level-TFP-Estimates-and-Factor-Ratios-Data-and-Documentation:**
File name: “Firm Level TFP Estimates and Factor Ratios_December_15_2025.dta”
URL: <https://login.enterprisesurveys.org/content/sites/financeandprivatesector/en/library/library-detail.html/content/dam/wbgassetshare/enterprisesurveys/combineddata/productivity-estimates/Firm-Level-TFP-Estimates-and-Factor-Ratios-Data-and-Documentation.zip>
Access date: January 2025
- d. **ES-Indicators-Database-Global-Methodology:**
File name: “ES-Indicators-Database-Global-Methodology_December_15_2025.dta”
URL: <https://login.enterprisesurveys.org/content/sites/financeandprivatesector/en/library/library-detail.html/content/dam/wbgassetshare/enterprisesurveys/combineddata/enterprise-surveys-indicators/ES-Indicators-Database-Global-Methodology.zip>
Access date: January 2025

Access policy: These datasets are limited-access and are therefore not included in the replication package. Users can download them directly from the WBES website using the dataset names listed above. Registration is required.

Link:

<https://login.enterprisesurveys.org/content/sites/financeandprivatesector/en/library/combineddata.html>

Once access is granted, users should save the datasets in the “wbcs” folder using the original file names. The do-file “replication_wbes.do” assembles the final “wbcs.dta” dataset used to reproduce all tables and figures in the paper.

2. Temperature data

For the analysis with the WBES data, the dataset “wbcs/wbes_temp.dta” was constructed. This dataset contains weather data from two sources:

- a. ERA5 reanalysis (Copernicus Climate Data Store)
Variable: 2m air temperature
Spatial resolution: $0.25^\circ \times 0.25^\circ$
Temporal resolution: daily (aggregated to yearly in our pipeline)
DOI: 10.24381/cds.4991cf48
Accessed via locally stored NetCDF files.
Frequency: daily
Link: <https://cds.climate.copernicus.eu/datasets/reanalysis-era5-single-levels?tab=overview>
Access date: January 2023
Access policy: The data are publicly available and included in the data.
- b. Wet Bulb Temperature (WBT), World Bank Climate Data
Source: World Bank Climate Change Knowledge Portal / Datastore
Temporal resolution: monthly (aggregated to yearly in our pipeline)
Coverage: 1950–2023
Frequency: monthly
Link: <https://climateknowledgeportal.worldbank.org/download-data>
Navigate to Raster File Access and select “Access NetCDF files on CCKP.” Then follow this path: era5-x0.25/ → wbt/ → era5-x0.25-historical/
Download the dataset: timeseries-wbt-monthly-mean_era5-x0.25_era5-x0.25-historical_timeseries_mean_1950-2023.nc
Access policy: The data are publicly available and included in the data.

Time coverage

The raw climate sources cover 1950–2023. However, the final dataset is restricted to the WBES survey years for which firm GPS coordinates are available, i.e., 1980-2023.

Construction and processing

This section describes the data construction and processing steps conceptually. These steps are not implemented in a standalone script included in the replication package, but are provided to explain how the final dataset was assembled. The dataset was constructed in four steps:

1. Firm geolocation
 - Input: WBES GPS file (GPS_Comprehensive_April_22_2025-MASKED.dta)
 - Variables used: idstd, lon_mask, lat_mask
 - Firms with missing coordinates were dropped.
 - Each firm was assigned to the nearest ERA5 grid cell.
2. ERA5 extraction
 - Daily temperature series were extracted for each firm’s grid cell.
 - Temperatures were converted from Kelvin to Celsius.
 - Daily values were aggregated to yearly means (and additional summary measures, where relevant).

3. WBT extraction

- Monthly wet-bulb temperature values were extracted from the World Bank NetCDF files at the same grid resolution.
- Monthly values were aggregated to yearly means at the firm–location level.

4. Merging (Script: 1_4_MERGE.R)

- ERA5-based temperature measures and WBT measures were merged at the firm–year level.
- Merge keys: idstd (firm identifier) and YEAR.
- The final output was saved as both .RData and .dta files.

Final structure

The resulting dataset is a firm–year panel that links each WBES firm to local climate conditions in its fiscal year since 1980. It contains:

- Firm identifier: idstd
- Year: FYEAR (fiscal year)
- ERA5-based temperature measures (annual aggregates)
- WBT-based temperature measures (annual aggregates)

3. Annual Regional Database of the European Commission website (ARDECO)

The final dataset used for the municipality-level empirical analysis is “ardeco/ ardeco.dta”. This dataset is constructed using seven datasets from the Annual Regional Database of the European Commission (ARDECO) website:

1. SNETZ (employment by industry)
2. SOVGZ (GVA by industry at constant prices)
3. SUVGZ (GVA by industry at PPP)
4. RNLHZ (hours worked by industry)
5. ROWCZ (compensation of employee by industry at constant prices)
6. SOVGDP (GDP per capita at constant price)
7. ROIGZ (Gross Fixed Capital Formation by industry at constant prices)

Access policy: The data are publicly available. The original datasets are not included in the replication package due to version differences across publicly released data.

Link: <https://territorial.ec.europa.eu/ardeco/explorer?lng=en>

No registration is required. For each dataset listed above, users should click on “Download” and select the following options:

- Sector: : A; B–E; F; G–I; J; K; L; M–N; O–Q; R–U
- NUTS version: 2021
- Territorial typology: Default
- Territorial level: NUTS3

Each variable was downloaded as a separate dataset. The datasets were then reshaped into long format and merged into the final file, “ardeco.dta”, which is included in the replication package. No code is provided to automate the download, reshaping, or merging of the ARDECO data. Users may apply their own code to reshape and merge the data.

The original ARDECO datasets were downloaded in January 2025 and may differ from versions available at a later date.

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.