Automation and Human Capital Adjustment: The Effect of Robots on College Enrollment

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October 2023

This folder contains the data and programs required to replicate the results in the main text and the appendix of the paper. The analysis has been executed on STATA 14 using macOS.

Folder content:

- **dofiles**: includes all the STATA do files required to clean the data, build the variables and replicate the analysis starting from the raw data.
- **final_data_provided**: includes the final data to replicate the figures and tables of the analysis.
- **raw_data**: includes the raw data as they have been downloaded from the data sources described in the paper and contributed data from other papers, in particular from Acemoglu and Restrepo (2020) and Autor and Dorn (2013). Notes: Robotics data from the International Federation of Robotics (IFR) are proprietary and cannot be shared. However, the data can be accessed for a fee as described here: https://ifr.org/worldrobotics/.
- **xwalks**: includes geography, wage, industry and occupation crosswalks from Acemoglu and Restrepo (2020) and Autor and Dorn (2013).

When running the master-do-file, the following additional folders are created:

- **final_data**: this folder will include all the data to replicate the figures and tables of the analysis starting from raw data.
- **results**: works as a repository for the tables and figures produced by the do files.
- **temp_data**: includes temporary data which is used to produce **final_data** dta files.

Instructions to replicate the analysis:

Open the master-do-file in **dofiles** and replace the path to this folder at line 17 *global project "path"*.

Running this file will execute the entire analysis. In particular, the files in the subfolder **cleaners** clean raw data on industrial robots from the IFR, employment and output data at the industry level from EU KLEMS, import data from the UN Comtrade, survey data from the US Census and American Community Survey (ACS), and administrative data from the Integrated Postsecondary Education Data System (IPEDS). These data are saved in the folder **temp_data**

and are used to build outcome and explanatory variables using the do files in the subfolder **builders**, which save them in the folder **final_data**.

Finally, the do files in the subfolder **analysis** build all tables and figures in the paper and save them in the folder **results**.

Important note on robotics data from the IFR:

The analysis uses data on the operational stock of industrial robots by country, industry and year provided by the International Federation of Robotics (IFR). These data cannot be shared publicly, but can be purchased directly from the IFR. These data are needed to run the following do-files in the master-do-file:

- "clean ifr data.do"
- "clean shift-component by industry.do"
- "clean exposure to robots.do"

Users who possess IFR data should download them and save them in a dta-file called "robots_all.dta" in the folder **raw_data/automation**. The structure of the dataset is as follows:

country	**year**	**industry**	**robots_market**	**robots_operational**
Denmark	2000	000-All Industries	45	701
Denmark	2001	000-All Industries	65	780
Italy	2010	29-Automotive	1021	20987
…	…	…	…	…

The dataset should include data on shipment (robots_market) and operational stock (robots_operational) of industrial robots for all available IFR industries between 1993 and 2017 (when available) for Denmark, Finland, France, Germany, Italy, North America, Norway, Spain, Sweden, Switzerland and the United Kingdom. Please note that the numbers in the last two columns of the table above are fictitious.

Instructions to replicate the analysis without IFR data:

Open the master-do-file-no-IFR in **dofiles** and replace the path to this folder at line 17 *global project "path"*.

This do file will run the analysis starting from the **final_data_provided** folder.

References

Acemoglu, Daron and Pascual Restrepo, "Robots and jobs: Evidence from US labor markets," *Journal of Political Economy*, 2020, 128 (6), 2188–2244.

Autor, David and David Dorn, "The growth of low-skill service jobs and the polarization of the US labor market," *American Economic Review*, 2013, 103 (5), 1553–97.

Data sources

International Federation of Robotics, "World Robotics 2018," Technical Report, International Federation of Robotics, Frankfurt 2018. https://ifr.org.

Jägger, Kirsten, "EU KLEMS Growth and Productivity Accounts 2017 release," Description of Methodology and General Notes 2017.

National Center for Education Statistics, "Integrated Postsecondary Education Data System", 2021. https://nces.ed.gov/ipeds/.

Ruggles, Steven, Sarah Flood, Ronald Goeken, Josiah Grover, Erin Meyer, Jose Pacas, and Matthew Sobek, "IPUMS USA: Version 9.0 [dataset]. Minneapolis, MN, https://doi.org/10.18128/D010.V9.0," Technical Report 2019.

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