Technological change, Automation, and Artificial Intelligence:
a Task-based model approach and its applications

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Overview

The last decades have witnessed major advances in automated technologies, and future progress in artificial intelligence is expected to drastically change the economy. In this course, we analyze task-based models, a class of models that has been increasingly used to analyze the macroeconomic consequences of the adoption of automated technologies and their effects on the labor market. The course is structured in three parts. In the first part, we analyze macroeconomic and labor market trends that can be associated with technological change and automation, and we introduce the task-based framework as a theoretical tool useful to explain those trends. In the second part, we consider some applications of the task-based framework in recent research. In particular, we analyze the relation between automation and the labor market polarization, inequality, demographics, and the supply of skills. We also use the task-based framework to get insights regarding the possible effects of artificial intelligence on the economy. In the last part of the course, students will present a paper of their choice on topics studied in class with the scope of encouraging discussion.

Assessment

Your final grade will be determined as follows:

- 40% of the grade: Participation to lecture and discussion
- 60% of the grade: Presentation + Report/Research Proposal

Participation: Your participation in classroom discussion has positive externalities. Therefore, to encourage an active behavior, part of your grade will be determined by your participation in the lectures and the discussion during presentations.
Presentation: Each participant in the course needs to pick a paper from a list of papers that will be provided during the course to present in class. The length of the presentation is 30-45 min (to

be decided). The last lectures of the course will be devoted to these presentations.

Report/Research proposal: You are required to produce a report on the paper you have presented or a small research proposal in which you apply the models studied in class to a relevant economic question. More details in class.

Organization Details

Lectures: Monday, 17.00 - 18.30
Room: F427
Office hours: by appointment, F224
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Course Outline & Readings

1. Introduction
    - Empirical evidence on the economic effects of automation
    - Canonical vs task approach (David, 2013)
2. Baseline task-based model
    - Productivity and Displacement effect (Acemoglu and Restrepo, 2018b)
    - Reinstatement effect (Acemoglu and Restrepo, 2019b)
3. Extensions to the baseline model (Acemoglu and Restrepo, 2019a)
    - High and low skilled labor
    - Automation at the expense of new tasks
    - Excessive automation
4. Automation and the labor market polarization
    - Labor market polarization (Autor et al., 2006)
    - The 3-types task-based model (Acemoglu and Autor, 2011)
5. Automation and inequalities
    - Wage inequality (Acemoglu and Restrepo, 2018c)
    - Wealth inequality (Moll et al., 2021)

6. Automation and demographics

    - Labor scarcity and automation (Acemoglu and Restrepo, 2017)
    - Age composition of the labor supply and automation (Acemoglu and Restrepo, 2022)

7. Technology and skills

    - Technology-skill mismatch (Acemoglu and Zilibotti, 2001)
    - Endogenous skill supply (Acemoglu and Autor, 2011)

8. Artificial Intelligence

    - Are we approaching an economic singularity? (Nordhaus, 2015)
    - High-skill automation (Acemoglu and Restrepo, 2018a)
    - The wrong kind of AI? (Acemoglu and Restrepo, 2020)

References

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Acemoglu, D. and Restrepo, P. (2022). Demographics and automation. *The Review of Economic Studies*, 89(1):1–44.

Acemoglu, D. and Zilibotti, F. (2001). Productivity differences. *The Quarterly Journal of Economics*, 116(2):563–606.

Autor, D., Katz, L. F., and Kearney, M. S. (2006). The polarization of the us labor market.

David, H. (2013). The'task approach'to labor markets: an overview.

Moll, B., Rachel, L., and Restrepo, P. (2021). Uneven growth: Automation's impact on income and wealth inequality. Technical report, National Bureau of Economic Research.

Nordhaus, W. D. (2015). Are we approaching an economic singularity? information technology and the future of economic growth. Technical report, National Bureau of Economic Research.