

Technological change due to R&D activities is widely acknowledged as a key driver of long-run growth in output per worker in developed countries. Due to the non-rivalrous character of technological ideas, they allow output to grow even when the use of inputs is constant over time. Therefore the assessment of long-run growth perspectives of advanced economies critically depends on the characteristics of the R&D process. In this regard, surprisingly the existing R&D-based economic growth literature almost unequivocally assumes that researchers' labor is the only input in R&D. Reality seems to be different, though: productivity of R&D, translating into the pace of technological progress, depends not just on the labor of researchers but increasingly also on the services of *R&D capital*. Modern R&D capital may range from modest offices at university campuses or computers at researchers' laps to such exquisite machinery as the Very Large Telescope (VLT), the Large Hadron Collider (LHC), or artificial intelligence (AI) algorithms used in genome sequencing. All this capital is clearly crucial for the pace of obtaining new R&D developments. In particular, the use of AI in R&D may revolutionize this process in the future by not just answering research questions, but also asking new ones.

In this research project we aim to identify the role of R&D capital in generating technological change and, ultimately, long-run economic growth. This general research objective will be pursued with the use of macroeconometric analyses (in particular we would like to construct the time series on R&D capital in the USA) and formal economic growth models.

In particular we aim to address the following research questions:

- Are ideas becoming harder or easier to find over time?
- Are capital and labor complements or substitutes in the R&D process?
- How does the buildup of R&D capital affect the long-run growth perspectives of developed economies?
- What could be the possible long-run impacts of the rise of AI technologies?
- As regards the distribution of income, how would the R&D capital as well as AI share of output evolve over time?
- Should we expect a *secular stagnation* in TFP growth (and hence also GDP growth) in the developed economies in the decades to come? Or perhaps an acceleration is more likely?

The project will fill existing gaps in the literature as well as potentially open new avenues for further investigations. Viewed from the empirical perspective, we will be the first to construct the R&D capital series and assess the role of R&D capital in generating TFP growth in the US economy. It appears to us that the empirical approaches used thus far – to focus on R&D labor only or use current flows of R&D spending – are highly unsatisfactory. From the theoretical perspective, in turn, we will be the first to introduce R&D capital in formal R&D-based models of economic growth. We will also provide one of the very first results regarding the role of AI technologies for long-run economic growth. As developments in the field of AI are accelerating fast, we believe that the scope of its possible implications should be also studied from a macroeconomic perspective.