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The Heterogeneous Impact of Automation on Labor Productivity: Evidence from the Logistics Industry

Roman Vervoort
Eindhoven University of Technology

Problem definition: Automation is being adopted at large scale, yet whether these investments translate into higher labor productivity remains theoretically and empirically ambiguous. We examine how labor productivity evolves following an automation event and whether this trajectory depends on firms' labor flexibility and on where automation enters the operating system: physical process execution or planning and coordination. Methodology/results: Using a detailed panel of Dutch logistics firms, we identify automation events from firm-level automation cost data and estimate staggered difference-in-differences models comparing treated firms with not-yet-treated firms. We find that automation events are followed by a significant short-run decline in labor productivity, with an average reduction of 3.5% post automation. The effect gradually attenuates within the five-year time window. Thus, automation does not generate immediate productivity gains on average. The decline is less pronounced for firms with higher labor flexibility; these firms see an average 5.5% rise in labor productivity during the post-automation period. By contrast, it is more pronounced in contexts where automation is more likely to alter the execution of physical processes rather than planning and coordination. Managerial implications: Managers may want to account for the transition phase in which output and labor adapt to the new process. More importantly, our findings emphasize that managers should consider their capacity to adjust labor input during the post-automation transition, particularly when the investment is intended to reduce reliance on labor.