

The future quantity and structural effects of contemporary automation

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Chapter 6: Impact Paragraph

Recent decades have witnessed rapid advancements in technologies, generating lively policy and academic debates on the effects of the proliferation of novel automation technologies. This thesis investigated the possible effects of adopting modern automation in advanced and developing economies. The research spanned three broad areas: aggregate productivity growth (Chapter 2), the vulnerability of workers in developing and advanced economies (Chapter 3), and the cross-border impacts of automation-induced reshoring (Chapter 4). This chapter highlights and synthesizes the (joint) implications and relevance of the findings from the analytical chapters of the thesis. This is consistent with article 22.5 of the “Regulations for obtaining the doctoral degree at Maastricht University” decreed by resolution of the board of deans, dated 1 October 2020.

The three analytical chapters were linked in the following ways. Chapter 2 focused on investigating the productivity benefits of automation in advanced economies, whereas Chapter 3 analysed the potential costs linked with unemployment and inequality within advanced and developing regions. Chapter 4 subsequently connected the two regions through trade to study the potential winners and losers of automation-driven reshoring in the global economy.

The motivation of Chapter 2 stemmed from the contrasting expectations regarding the productivity benefits associated with new automation. By providing empirical evidence using modern approaches and data, the chapter contributed to addressing these expectations by showing that, contrary to optimistic expectations, contemporary automation has not yet overcome the productivity paradox experienced during the ICT wave. The intra-sector channel was noted as the main pathway through which productivity gains may arise, which can be complemented by inter-sector channel even if there is employment deindustrialization. The chapter also provided empirical evidence on the differential impacts of various types of automation, especially intangible automation which is widely neglected in the extant literature. These findings underscore the fact that substantial productivity gains over investment costs are not guaranteed but will require planning and policy intervention. This will embody relevant regulations as well as digital and analogue complements such as physical and human investments to strengthen productivity gains, associated with economic growth and improved living standards.

The findings and novel approach of Chapter 3 guide more targeted and proactive policy measures to mitigate the risks of automation to workers in advanced and developing economies. The chapter was motivated by the need to better grasp the groups of workers most susceptible to automation while accounting for key complexities of the labour market as a complex adaptive system. Empirical evidence from the chapter showed that risks decline when workers are more frequently involved in ‘learning’ tasks. There are several wide-ranging issues that the findings touch on within both advanced and developing economies at various levels, including sectoral, country, and regional. The chapter provided empirical evidence

indicating that automation would likely impact a greater proportion of advanced-economy workers whose tasks tend to be more structured than developing-economy workers. This finding has contributed to the debate on differential employment impacts of automation in advanced and developing regions based on their own automation efforts. By demonstrating empirically that different sectors and countries will likely experience automation differently, the chapter also showed that one-size-fits-all policy prescriptions would be ineffective in some settings, necessitating context-specific studies and evidence-based policy interventions. For instance, some countries are likely to experience employment polarization whereas Skill-Biased Technological Change (SBTC) is more probable in others.

Another key takeaway from the chapter which departs from prevalent views is that structural implications driven by automation may not all be unfavourable; specifically, the gender wage and job gaps could be reduced as automation diffuses widely, particularly in advanced countries. Indeed, if automation is considered purely as the displacement of tasks by machine agents, a decline in the gender wage gap would not necessarily be a favourable development outcome given that male workers lose more employment than female workers which can adversely affect the welfare of traditional households where the male workers are breadwinners. However, given the rise in virtualization and digital platforms, the finding can also be indicative of greater opportunities afforded female workers to improve earnings by leveraging modern automation, particularly intangible automation.

The results relating to the Skills and Age dimensions also border on numerous issues such as worsening economic inequality as well as possible immigration issues, and political or social unrest stemming from youth unemployment in developing countries experiencing a youth bulge. The chapter also provided evidence in favour of SBTC and employment polarization demonstrating that both advanced and developing countries will experience inequality in some form. The findings also showed that middle-aged and middle-skilled workers were the most susceptible to automation, implying that jobless recoveries (i.e., weaker employment to output growth) would characterize recovery from the COVID-19 pandemic in some developing countries. Additionally, about 80% of young workers in the developing-region manufacturing sector were found to be vulnerable. Together, these findings will invite policymakers to adopt proactive and nuanced measures to protect vulnerable workers and mitigate the risks of automation-induced unemployment and inequality. This is expected to include shorter-term measures such as social protection and digital skills training programs, coupled with longer-term strategies and reforms to modernize education and equip workers with new skills.

Chapter 4 explored the global repercussions of automation through the lens of reshoring, showing that developing economies are likely to be adversely affected by the backshoring of production activities to advanced countries (even though their own automation effort is likely to generate lower levels of unemployment, as the

previous chapter showed). The development of an input-output global trade model based on comparative advantage that captures non-tradable sectors is an important research contribution given that the applications are not limited to the automation context. This novel approach allows researchers to capture the connectedness in the global economy, including the co-existence of offshoring and backshoring in different sectors. The findings of this study provided evidence of income declines, particularly in lower-income Asia whereas advanced countries are estimated to benefit from a boost in manufacturing production. The research is envisioned to encourage policymakers to pay more attention to the implications of domestic actions on foreign countries, given that global inequality and instability are linked. The findings of the chapter will invite policymakers to focus on fostering strategic partnerships and inclusive policies to mitigate the negative implications of automation-based reshoring, particularly for developing economies. This is expected to encompass incentivizing research and development in automation technologies to complement humans and promoting international cooperation to encourage automation adoption in the developing world to minimize global inequality, ensuring inclusive growth and development across countries and regions.

Broadly, the findings of the thesis have jointly shown that novel automation has not yet generated strong productivity benefits and yet remains associated with risks of displacement which may take place in both similar and different ways in the advanced and developing worlds depending on the level of analysis. Critically also, while developing countries may be less exposed to automation through their own automation efforts, they are still likely to lose overall through reshoring. Additionally, youth unemployment in the developing world is likely to rise via the manufacturing sector due to reshoring coupled with the vulnerability of young workers in the sector.

In conclusion, the thesis relevantly touches on a broad range of issues including productivity growth, employment, reshoring, and inequality. It is envisioned that the insights would shape academic discourse in multiple ways including greater consideration of intangible automation, as well as the indirect repercussions of automation proliferation. The results, conclusions, and recommendations are also envisaged to provide invaluable direction for policymakers by strengthening efforts toward generating productivity gains and adopting proactive and inclusive policy measures that maximize the benefits of automation while mitigating its potential risks. This includes fostering dynamic governance frameworks, promoting strategic partnerships, and implementing targeted interventions and relevant strategies in the short and long term, to address vulnerabilities across sectors, countries, and regions. Ultimately, more nuanced and inclusive approaches would be taken to ensure that the contemporary automation is human-centric and contributes to inclusive and sustainable development in a world where advanced economies benefit without leaving behind developing economies.