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COVID-19, 4IR and the Future of Work

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KEY MESSAGES

- COVID-19 is an unprecedented public health crisis that has led to staggering losses in economic activity and jobs. It can also hasten the uptake of Fourth Industrial Revolution (4IR) technologies that could automate – and possibly eliminate – certain jobs.
- Firms are facing pressures that can tip the balance towards more automation due to COVID-19. Firms will need to restructure and reorganise to adjust to the post-pandemic economic environment that will involve constraints on human interaction and risk mitigation regulations.
- Constraints to labour supply – such as the withdrawal of workers who are elderly or have pre-existing conditions – will encourage firms to explore the feasibility of automation. Likewise, government policy meant to ameliorate the economic impacts of the pandemic – such as lower interest rates or subsidies for digitalisation – can reduce costs for automation and further tip the balance towards uptake of 4IR technologies.
- 4IR scenarios that would benefit from further examination include the possibility that certain routinised “white collar” front- and back-office environments could see accelerated automation in response to the COVID-19 crisis at a rate exceeding that for manufacturing sectors.
- Policymakers will need to conduct a careful, sector-by-sector and gender-based analysis of jobs at risk of automation that factors in the “New Normal.” This assessment should consider traditional dynamics while also accounting for COVID-specific variables such as post-pandemic economic considerations, emerging challenges faced by workers, and unintended impacts of crisis-response policies.
- As employers balance these factors in deciding on whether to automate, policymakers need to address the impact of these decisions on the jobs, income, and welfare of workers. Access to skills development and labour market information will ensure that workers have access to opportunities in the post-pandemic digital economy. Social protection will be crucial in ameliorating job precariousness and income uncertainty in the 4IR New Normal.
- Regional cooperation will also have a role to play in providing a forum for policy coordination, development of regional public goods, and sharing of information.

The COVID-19 pandemic is an unprecedented public health crisis that has led to staggering losses in economic activity and jobs. Even as the world grapples with containing the virus and stemming the economic haemorrhage, it is becoming clear that the pandemic is contributing to the accelerated deployment of Fourth Industrial Revolution (4IR) automation technologies. This acceleration could proceed unevenly across sectors and manifest in unexpected ways, impacting not only the manufacturing sector but also leading to the automation of white collar jobs in both front- and

back-office contexts. Many argue that these changes will be permanent, and, since increased 4IR automation is itself expected to reduce aggregate demand for labour in the short run, such an outcome would complicate post-pandemic job recovery in the APEC region.

To account for these new factors and better understand how they will ripple through member economies, policymakers need to conduct a careful, sector-by-sector and gender-based analysis of jobs at risk of automation that factors in new, COVID-

specific variables. This assessment will need to consider traditional dynamics – including labour costs, technological innovation, ease of routinisation, and level of capital expenditure – while also accounting for COVID-specific variables such as “New Normal” economic considerations, emerging challenges faced by workers, and unintended impacts of crisis-response policies.

This policy brief aims to discuss these issues and provide recommendations on regional- and economy-level policy actions that could mitigate the risks of labour market disruption and jobless economic recovery in the aftermath of the COVID-19 crisis.

COVID-19 and the Future of Work

As forecasts drastically cut global projections for economic and jobs growth, the impact of COVID-19 on APEC economies is rapidly emerging. The Policy Support Unit (PSU) estimates that the APEC region’s economy will contract by 2.7 percent in 2020 – the worst downturn since the 2008 global financial crisis a decade ago (Figure 1).¹ This translates to a loss in output of USD 2.1 trillion. Unemployment in the region is also expected to increase to 5.8 percent, with a total of 81 million people unemployed this year – 23 million people more than in 2019.

These are optimistic estimates that assume a partial recovery of output and jobs in the second half of 2020 and no additional waves of COVID-19 later this year. They may also underestimate the scale of unemployment by undercounting furloughed workers (i.e., workers who have been temporarily laid off or whose hours have been reduced). For instance, one attempt to include furloughed workers in the total US unemployment rate finds a “real” unemployment rate of 21.1 percent, compared with the official rate of 14.7 percent in April 2020.² COVID-19’s impact on the informal economy, where official data is sparse, is also likely to be undercounted.

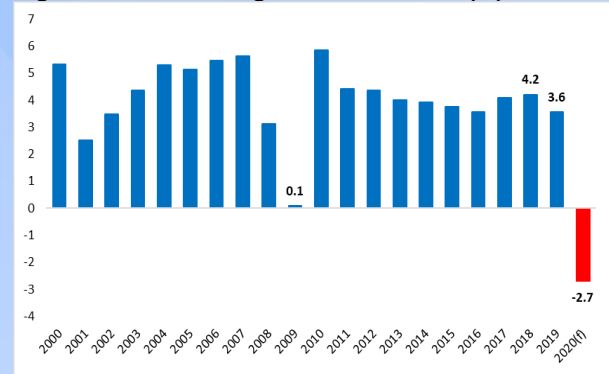
¹ <https://www.apec.org/Publications/2020/04/APEC-in-the-Epicentre-of-COVID-19>

² <https://www.mercatus.org/bridge/commentary/what%E2%80%99s-real-unemployment-rate-introducing-pandemic-furlough-rate>

³ <https://www.apec.org/Publications/2020/05/APEC-Regional-Trends-Analysis---What-Goes-Around-Comes-Around:https://data.worldbank.org/indicator/NE.CON.TOTL.ZS>

⁴ <https://www.forbes.com/sites/hanktucker/2020/05/03/coronavir-us-bankruptcy-tracker-these-major-companies-are-failing-amid-the-shutdown/#13713b23425a>

Figure 1. APEC GDP growth, 2000-2020 (%)



Note: f = forecast.

Source: IMF World Economic Outlook (April 2020); APEC PSU staff calculations.

As businesses pull back and employment levels contract, knock-on effects are rippling through APEC. Consumer spending, the largest contributor to the region’s economy, will continue to decline amid unemployment and job uncertainty.³ This trend is already evident in the demise of retailers such as corner coffee shops and high street apparel, as well as major suppliers within global value chains. Large companies such as the US retailers JC Penney and Hertz, Canadian auto parts manufacturer Spectra Premium, and Chile’s LATAM Airlines have filed for bankruptcy protection.⁴ Oil and gas companies are also experiencing major setbacks with many companies filing for restructuring or liquidation, such as the US oil and gas driller Diamond Offshore Drilling and Singapore-based oil trader Hin Leong. In China, where COVID-19 was first reported, nearly half a million small businesses have shuttered permanently in the first quarter of 2020.⁵

The New Normal. Until a vaccine becomes available – at the soonest by early 2021⁶ – SARS-CoV-2, the virus that causes COVID-19, will remain an elusive threat to public safety. SARS-CoV-2 has a lengthy incubation period that can extend up to 14 days, during which time infected individuals can spread the virus before showing symptoms.⁷ Furthermore, more than 25 percent of all infected individuals may never show outward signs of infection.⁸ As the virus is new, there is no pre-

⁵ <https://www.scmp.com/economy/china-economy/article/3078581/coronavirus-nearly-half-million-chinese-companies-close-first>

⁶ <https://www.nature.com/articles/d41573-020-00073-5>

⁷ <https://pubmed.ncbi.nlm.nih.gov/32150748/>; <https://science.sciencemag.org/content/368/6490/489>.

⁸ <https://www.livescience.com/coronavirus-asymptomatic-spread.html>

existing immunity in the population, so it can spread exponentially without mitigating measures.

The Center for Infectious Disease Research and Policy (CIDRAP) presents a number of scenarios in which the first wave of COVID-19 in spring 2020 will likely be followed by subsequent waves of transmissions that vary only in intensity into 2021.⁹ Regardless of which path the pandemic ultimately follows, the world appears to have entered a period many now refer to as the New Normal in which a return to pre-pandemic social and economic conditions will be impossible for upwards of two to three years.¹⁰

Pre-COVID Automation Trends. Prior to COVID-19, the consensus view was that the global economy had entered a new era of automation termed the Fourth Industrial Revolution (4IR) characterised by advances in artificial intelligence and machine learning, the Internet of Things, autonomous hardware and software robotics, and advanced data systems that enable real-time and predictive analytics. While the term “automation” often evokes images of robots replacing workers on factory floors, the phenomenon encompasses a broad range of work across all sectors and includes many white collar functions, such as accounts payables processing, the extraction of data from business documents, and other “routine” tasks, which Jaimovich and Siu (2019) define as those that “follow a well-defined linear structure or procedural routine.”¹¹

A number of APEC economies lead the world when it comes to employing 4IR technologies. According to the International Federation of Robotics, Korea and Singapore have the most industrial robots per manufacturing worker in the world.¹² Japan and Korea are the world’s top two producers of robotic systems, with market shares of 52 and 12 percent, respectively. Thailand is catching up and has one of the highest global adoption rates of automated systems.¹³ Besides industrial robots, robotic process automation (RPA) technology – or software

bots – which uses artificial intelligence to automate backend business processes, is seeing steady uptake globally. One market intelligence firm predicts that the RPA market in the Asia Pacific region will grow at a compounded annual growth rate of 32 percent during the period 2020–2025.¹⁴

Most notable from a jobs perspective, the introduction of 4IR automation technologies has consistently shown to generate short-term negative impacts on the labour market.¹⁵ A recent economic study on the US industrial data found that adding one robot in manufacturing in the US replaced on average 3.3 workers domestically over the period 1990–2007, and lowered wages by 0.42 percent.¹⁶ In addition, the observed decline in labour share of GDP and the decoupling of wage growth from productivity growth have been attributed to greater automation and the resulting loss of bargaining power for labour.¹⁷

4IR Automation and the New Normal. Businesses in the region now face an uncertain future in which the possibility of ongoing or cyclical mitigation measures will need to be factored into planning for the next two to three years and beyond. With balance sheets under pressure, weakened consumer spending, and the baseline cost of doing business shifting dramatically, APEC firms are already adapting their operations and business strategies to accommodate New Normal conditions. These conditions are also likely to impact firm-level choice with respect to 4IR automation, as a range of factors compete to influence organisational decisions to adapt existing business processes or shift to new methods of operation.

Even in an unlikely near-term scenario requiring no additional extreme mitigation efforts, there will still be a level of confusion and uncertainty in economies that will slow the return to normal levels of commerce, mobility, and trade, a disquieting post-lockdown structural shift *The Economist* is calling the “90% economy.”¹⁸ Taken together, these COVID-specific challenges may accelerate the

⁹https://www.cidrap.umn.edu/sites/default/files/public/downloads/cidrap-covid19-viewpoint-part1_0.pdf

¹⁰ <https://www.industryweek.com/technology-and-iiot/article/21129334/what-will-manufacturings-new-normal-be-after-covid19>

¹¹ https://www.brookings.edu/wp-content/uploads/2019/11/Siu-Jaimovich_Automation-and-the-middle-class.pdf

¹²<https://ifr.org/downloads/press2018/IFR%20World%20Robotic%20Presentation%20-%2018%20Sept%202019.pdf>

¹³ <https://www.technologyreview.com/2018/11/27/66355/these-charts-show-how-asia-is-dominating-industrial-robot-adoption/>

¹⁴ <https://www.mordorintelligence.com/industry-reports/asia-pacific-robotic-process-automation-market>

¹⁵<https://www.mckinsey.com/~/media/mckinsey/featured%20insights/Digital%20Disruption/Harnessing%20automation%20for%20>

[0a%20future%20that%20works/MGI-A-future-that-works-Executive-summary.ashx](https://www.mckinsey.com/~/media/mckinsey/featured%20insights/Digital%20Disruption/Harnessing%20automation%20for%20)

¹⁶<https://www.journals.uchicago.edu/action/showCitFormats?doi=10.1086/705716>

¹⁷ <https://www.elibrary.imf.org/view/IMF081/23926-9781475564655/23926-9781475564655/ch03.xml>; https://www.oecd-ilibrary.org/employment/oecd-employment-outlook-2012/labour-losing-to-capital-what-explains-the-declining-labour-share_empl_outlook-2012-4-en; <https://www.apec.org/Publications/2017/11/APEC-Regional-Trends-Analysis-2017>.

¹⁸ <https://www.economist.com/leaders/2020/04/30/life-after-lockdowns>; <https://www.economist.com/finance-and-economics/2020/05/02/why-the-unemployed-in-america-could-face-a-lost-decade>

move to automated systems in many sectors of APEC economies.

In order to better understand possible economic scenarios where pandemic-related unemployment levels are compounded by firm-level decisions to automate, there is a need to develop a more granular and nuanced understanding of the underlying factors influencing firms' decision-making processes pertaining to 4IR prior to and after the COVID-19 crisis.

Pre-Pandemic Factors for 4IR Automation

While the cost of labour relative to capital is an important consideration in the decision to automate, research shows that it does not entirely explain firm-level choice with respect to 4IR automation. Additional factors include innovation in the market, the type of task to be automated, and the type of capital expenditure associated with the automation opportunity. It should be noted that these four factors are not exclusive from one another and may also interact dynamically and in a nonlinear fashion. These four influencers are outlined below.

Labour Costs. It is generally understood that the decision to automate with 4IR technologies begins with a firm-level return-on-investment analysis using labour costs as a common starting point. Managers typically collect information on wages and wage inflation, the related costs of employee training, insurance, healthcare costs or taxes, and other necessary measures to maintain human employees. This is then compared to the capability of automation to conduct tasks more rapidly, produce fewer errors, reduce costs, and lower any production-related risks. In general, the manager looks for a simple trade-off between labour costs versus capital investment that generates sufficient savings to pay off the up-front capital costs within the lifecycle of the system.¹⁹

Innovation in the Market. Another factor influencing the decision to automate is innovation in the marketplace. The speed of innovation in key segments of 4IR technologies – particularly with respect to cloud computing, robotics, artificial

intelligence, and 5G-powered Internet of Things – is accelerating at a rapid clip, driving down costs, progressing towards platform-level deployments that ease application development, and growing more powerful with every iteration. In addition, many key software technologies involved in the creation of 4IR solutions such as Google's TensorFlow, Microsoft's Cognitive Toolkit, and Keras, a deep-learning toolkit, have been open-sourced, meaning that they are not proprietary and require no licensing fees to use or deploy. The combined effect of rapid innovation and open source drives down software development costs, speeds deployments, and drives rapid innovation in the sector. Given the level of private equity investment in artificial intelligence startups, which in 2018 was estimated to be USD 50 billion, the rapid development of new, low-cost 4IR solutions is likely to continue.²⁰

Occupation and Task. Evidence suggests that routine tasks, particularly during times of economic retrenchment, are at risk of automation as a result of firm-level changes in organisational structure and the adoption of new management techniques and new technologies.²¹ Research by McKinsey and Company found that jobs with highly repetitive features were strong candidates for automation, and that hourly wage rates did not fully explain firm-level decisions to automate. Further research suggests that both blue- and white-collar jobs with repetitive and routinised processes – whether cognitively sophisticated or relatively simple – are at risk of automation by 4IR technologies, and that wage rates do not fully explain decisions to automate.²² There is also a gender dimension to this consideration, with female workers facing greater threats from the automation of routine office jobs as they are relatively overrepresented in these occupations.²³

Type of Capital Expenditure. The type of expenditure associated with automating blue-collar factory-level processes can be quite different compared to that associated with automating typical white-collar processes, with the former being more typically a capital cost, and the latter typically a business expense. This is due to the different types

¹⁹ <https://asiafoundation.org/publication/the-future-of-work-across-asean/>

²⁰ <https://www.oecd.org/going-digital/ai/private-equity-investment-in-artificial-intelligence.pdf>

²¹ Nir Jaimovich and Henry Siu, "Job Polarization and Jobless Recoveries," *Review of Economics and Statistics* 102, no. 1 (March 2020): 129–47; Paul Gaggl and Greg C. Wright, "A Short-Run View of What Computers Do: Evidence from a U.K. Tax Incentive," *American Economic Journal: Applied Economics* 9, no. 3 (2017): 262–94.

²² Nir Jaimovich and Henry Siu, "How Automation and Other Forms of IT Affect the Middle Class: Assessing the Estimates," (Brookings Economic Studies Report, 2019); David H. Autor,

Lawrence F. Katz and Melissa S. Kearney, "The Polarization of the US Labor Market," *American Economic Review* 96, no. 2 (2006): 189–94; Maarten Goos and Alan Manning, "Lousy and Lovely Jobs: The Rising Polarization of Work in Britain," *Review of Economics and Statistics* 89, no. 1 (2007): 118–33; Daron Acemoglu and David Autor, "Skills, Tasks and Technologies: Implications for Employment and Earnings," in *Handbook of Labor Economics*, vol. 4B, ed. Orley Ashenfelter and David Card (Elsevier, 2011), ch. 12, 1043–171.

²³ <https://www.weforum.org/agenda/2019/03/women-face-greater-threat-from-job-automation-than-men;>
<https://hbr.org/2019/11/as-jobs-are-automated-will-men-and-women-be-affected-equally>

of processes to be automated, and the mix of software and hardware that is required in each case.

Factory-level automation often requires the purchase of hardware (e.g., plant, equipment, machinery, physical robotics) and software, which must be obtained, installed, and maintained by the firm. Personnel must also be trained to run the new equipment and software. From an accounting perspective, these expenditures are typically considered “costs of an asset” and are added to a firm’s balance sheet, with the asset’s depreciation added to its income statement.

On the other hand, routine and repetitive white-collar tasks, such as document tracing, accounts payable and invoicing services, can be automated largely with cloud-based software solutions (e.g., RPA technology) that require minimal up-front asset costs. In addition, these front- or back-office solutions are typically offered as relatively low-cost subscription-based software-as-a-service options that can be started and stopped at will, thus reducing the risks associated with experimentation. There may be some additional costs, such as third-party assistance, costs associated with scaling, or employee and executive onboarding, but from an accounting perspective the expenditures associated with the automation of white-collar processes are: (1) generally lower than hardware and software acquisitions related to factory automation, and (2) typically considered “business expenses” that are added to a firm’s income statement.

This second point alludes to a key consideration: different types of expenditures associated with automation impact firms’ financial statements differently. In general, firms balance a variety of factors in making investment decisions such as automating. These factors may include their current financial conditions (e.g., profit margins, current assets and liabilities, cash reserves), prevailing taxes as well as public incentive schemes, their forecasts for future growth in their market and the broader economy, and their appetite for risk. Since different automation technologies impact firms’ finances differently, the distinction between types of capital expenditure has implications for the potential to automate. For example, a company may be disinclined to invest in automation equipment if the loan required to purchase the equipment causes its debt-to-equity ratio to become uncomfortably high, or lowers its debt service ratio below what it feels is a healthy margin of safety. In a second example, another company may be willing to invest in automation software under the argument that its monthly subscription cost only affects the

company’s operating expenses, and if anything, reduces its taxable income.

Post-Pandemic Factors for 4IR Automation

As the COVID-19 crisis has spread around the world, its impact on local communities, businesses, and workers has created new forces that may either promote or inhibit the transition to 4IR-enabled automation. These potential influencers include firm-level changes in organisational structure; constrained labour supply and productivity; and second-order effects of government policies that aim to respond to the COVID-19 crisis.

Firm-Level Reorganisation. As firms recover from the early phases of the crisis, they will face a range of new challenges, some financial and others related to workforce safety. These challenges may compel them to accelerate efforts to automate production processes or pursue organisational restructuring (e.g., staff cuts, mergers or spin offs of low-performing divisions, management changes). Evidence of this phenomenon has already begun to manifest in some APEC economies. An early example is the US-based Carrier Global, a manufacturer of heating and air-conditioning systems, which has implemented social distancing rules on its assembly lines and plans to replace some workers with robots.²⁴ Below are two contexts in which firms reorganising their operations in response to the New Normal could accelerate the automation of production processes:

- **Automation to Reduce Risk and Observe New Guidelines:** Firms may choose to automate certain processes that currently require close proximity of workers to follow social distancing guidelines and to protect themselves from liability or related costs associated with the pandemic. This could evolve in a number of ways and impact sectors of the economy ranging from the factory floor to front- and back-office services as well as consumer-facing businesses such as retail or hospitality.
- **Automation to Lower Costs:** Many APEC economies are facing powerful headwinds from a global recession that will impact balance sheets for years to come. The financial impact on many APEC businesses may prompt organisational restructuring that leads to automation as a cost-saving measure.

Constrained Labour Supply and Productivity. The pandemic will also have a significant impact on certain workers – particularly women, the elderly,

²⁴ <https://www.washingtonpost.com/business/2020/05/08/jobs-coronavirus-unemployment-economy-politics/>

the immuno-compromised, or workers without SARS-CoV-2 antibodies – who will be disadvantaged in the workplace in the short run due to the nature of the SARS-CoV-2 virus. This may contribute to tighter labour supply and productivity conditions, which could affect firms' decision to automate.

- Constrained Working Conditions for Women:** Cultural norms often dictate that women shoulder a greater share of household chores and responsibilities. Work-from-home and home-based-schooling arrangements that have been implemented in response to lockdown measures are increasing the number of hours women spend on household responsibilities more than men.²⁵ This has an impact on the energy and focus of female workers, which could lead to a reduction in productivity. This can incentivise firms to automate occupations that have a high proportion of female employment.
- Elderly and Vulnerable Populations Retreat from the Workforce:** Older workers, those with pre-existing respiratory conditions, and the immuno-compromised, have been advised to take extra precautions such as maintaining social distance until a vaccine is developed. If firms opt to avoid hiring from among these populations, or if members of these groups decide to exit the workforce, then the resulting reduction in the supply of skilled workers could influence firm-level calculations concerning automation.
- Change in Workers' Preferences over Safety:** The conflicting pressures on workers to protect themselves from COVID-19 while also returning to work may present the workforce with difficult choices. Workers may be more inclined to embrace the expansion of 4IR automation if it allows for greater social distancing or some related safety benefit. Workers might also self-select to be away from certain workplace environments in favour of those that allow for more personal space at the work site or through work-from-home policies. This could speed firms' drive to 4IR automation.

Second-Order Policy Effects. In the face of a global economic slowdown, APEC economies will face considerable pressure to protect jobs, maintain wage rates, and assist the unemployed. First among these measures will be the pressure for central banks to lower interest rates to release the flow of credit to businesses and consumers and help

²⁵ <https://www.forbes.com/sites/adigaskell/2020/04/01/breaking-down-the-gender-divide-to-survive-working-from-home/>

²⁶ <https://www.safe.gov.cn/en/2020/0215/1637.html>

stimulate the economy. In addition, policymakers may feel pressures to adopt policies designed to protect workers and wages through adjustments in labour mobility policies, industry-level regulations, and economy-wide workforce policies. Bolstering social safety nets through stimulus payments directly to workers, emergency unemployment benefits, loan deferment programmes, and other temporary relief measures are also necessary to protect workers.

However, certain policies may have second-order effects that lead firms to consider the return of investment for 4IR automation in a new light. Examples of such policies include interest rates lowered through monetary policy, efforts to certify workers who possess antibodies to COVID-19 (such as through “immunity passports”), and policies which restrict labour mobility. Such policies, while developed to protect workers from COVID-19 economic shocks, could lead to the further tightening of labour markets and drive up the relative cost of labour.

- Low Interest Rates:** Central banks around the world are cutting interest rates in response to the looming pandemic-triggered economic recession. Low interest rates are intended to encourage bank lending, keep firms operating, and help businesses and individuals access capital at low cost. However, lower interest rates also mean lower cost of capital expenditures for firms, which could encourage them to invest in 4IR automation.
- Public Stimulus Packages That Support Business' Adoption of Digital Solutions:** Many governments are helping businesses navigate the COVID-19 pandemic through policies that encourage the use of digital tools and services. For example, China has encouraged businesses' adoption of new online financial technology service, thereby enabling safer (i.e., remote) interactions between customers and merchants.²⁶ Malaysia is supporting firms to digitise their business operations through the government's Digital Economy Corporation.²⁷ These measures are critical to not only keeping firms afloat during this period of economic uncertainty, but also to helping them achieve long-term resiliency. However, these policies may have the second-order effect of encouraging firms to introduce software-specific automation of certain tasks.
- Employment Limited to COVID-19 Immune Workers:** The private sector may be

²⁷ <https://mdec.my/digitalvscovid-entrepreneurship-and-business/>

encouraged to institute firm-level policies that require workers in densely populated work environments to verify that they are immune to COVID-19 and therefore no longer at risk.²⁸ If this practice is to become widespread (e.g., through a formal government testing and certification process), the result will be both a reduction in the supply of qualified “certified” workers, greater employment uncertainty where certifications are required, and upward pressure on wages, especially among skilled workers. In some industries, this development could provide further incentive to automate.

- **Restrictions on Labour Mobility:** Certain policies that are designed to limit the supply of low- and medium-skilled workers through restrictive immigration and labour mobility policies can have the effect of keeping wages artificially high and discourage the hiring of workers.²⁹ Policies that constrain the supply of labour need to be acknowledged as a factor when evaluating firms’ decision to automate.

Each of these policy choices have their costs and benefits and should be considered carefully. APEC economies should monitor their potential second-order effects on firm-level decisions to automate, noting that for workers, some policy options could be particularly costly. For example, economies that opt for certification of workers with “immunity passports” may see unintended consequences due to the possibility that such credentials will not be reliable. Given that the World Health Organization³⁰ has stated that human antibody response to the SARS-CoV-2 virus is still not yet fully understood, and that laboratory tests to determine the presence of antibodies require further validation, the validity of an “immunity passport” is still open to debate.

Policy Implications

In all likelihood, APEC economies will need to contend with a wave of firm-level restructurings that will take place simultaneously. Should this occur, and should firms choose to adopt 4IR automation technologies, the region will likely experience short-term accelerated unemployment as a result. This is a phenomenon that APEC should study closely, while also considering new approaches to manage the challenges that stem from automation.

²⁸ [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)31034-5/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)31034-5/fulltext)

²⁹ Lant Pritchett, “The Future of Jobs Is Facing One, Maybe Two, of the Biggest Price Distortions Ever,” (Economic Research Forum Working Paper 1370, September 2019); Michael Clemens, Ethan Lewis and Hannah Postel, “Immigration Restrictions as Active Labor Market Policy: Evidence from the Mexican Bracero Exclusion,” *American*

One notable area that should be examined more carefully given the COVID-19 crisis is the impact of 4IR technologies on jobs in office settings. Many “white collar” tasks are repetitive and routine, including document tracing, data extraction from documents, accounts payable and invoicing services, and even international call centres. Given that these services can be replaced with 4IR software solutions, automation will be cheaper and easier to introduce. As firms look to cut costs, the job losses in office settings could accelerate at a rate that exceeds losses in certain manufacturing sectors.

4IR challenges must also be understood and managed both during and after the COVID-19 crisis, noting that in each prior period of industrial revolution, automation and technological progress have consistently generated greater productivity and more jobs for workers over the long run while also creating disruptions that lead to job loss in the short run. It is this intersection of events – the pandemic’s impact on employment along with the progress of 4IR automation – that APEC policymakers must contend with.

Expand Social Safety Nets. Policymakers should expand and adapt social safety nets to protect workers’ livelihoods and ensure their basic needs are met. 4IR is expected to increase the uncertainty of employment in a rapidly digitising global economy, and this precariousness is exacerbated by COVID-19. Targeted credit, tax refund, and cash transfer programmes, such as those already being implemented across many APEC economies, are needed to provide income security and consumption smoothing. Many economies are also expanding coverage and benefit levels of unemployment insurance and other social insurance schemes to meet the needs of workers who have lost their jobs.

Access to healthcare will be more important than ever to improve resilience to this and future public health crises. To support female workers, policymakers should consider measures that provide improved parental leaves, childcare facilities, and internships and funding programmes targeted to women.

Monitor Automation Trends Carefully. Working more closely with the private sector can allow for a deeper and more authoritative analysis of 4IR

Economic Review 108, no. 6 (2018): 1468–87; Michael A. Clemens, Claudio E. Montenegro, and Lant Pritchett, “The Place Premium: Bounding the Price Equivalent of Migration Barriers,” *The Review of Economics and Statistics* 101, no. 2 (2019): 201–13.

³⁰ <https://www.who.int/news-room/commentaries/detail/immunity-passports-in-the-context-of-covid-19>

issues which can help economies anticipate skills gaps, manage the pressures on workers, and chart a course for a more innovative and resilient economy going forward. Industry associations such as the International Federation of Robotics (IFR), the Institute for Robotic Process Automation and Artificial Intelligence (IRPA AI), and the Association of RPA Implementers have deep relationships with vendors and could provide market intelligence on automation trends. Partnerships with platform companies such as LinkedIn, Burning Glass, and EMSI – companies which effectively function as labour market analytics firms – can provide information mined from data on skills demand, market trends, and job listings. Enhanced Public-Private Partnerships (PPPs) would allow APEC to monitor the intersection of 4IR and COVID-19 trends more closely. Working with research organisations and policy experts could help sharpen this analysis further.

Support Workforce Upskilling and Retraining.

With enhanced access to better data on skills demand and jobs, APEC economies could work more closely with private sector partners to adapt available skills training programmes to the needs of the current and post-pandemic workforce. Prior to the pandemic, it was clear that skills such as digital literacy, numeracy, creative problem solving and emotional intelligence were increasingly in demand in the era of 4IR. APEC policymakers should explore partnerships between ministries and private sector firms focusing on jobs and skills data to update and make timelier upskilling initiatives as well as align with the needs of the post-pandemic market. Partnerships could include a focus on credentialing, lifelong learning, online/distance learning, and involve greater burden sharing from the private sector with respect to the costs of delivering technical and vocational training at scale. Specific segments of the labour force who are hit hardest will require particular attention, including older workers and the youth as well as women.

Upskilling efforts should factor in potential demographic effects of the COVID-19 crisis where those who can work remotely have likely retained their jobs, while lower-skilled workers with less flexibility have been furloughed from jobs that are subsequently eliminated. In the case of youth, hardships at the start of careers could have consequences that last for years. One study of the effect of recessions on younger workers found that it takes about ten years for cohorts that enter the labour market during a downturn to catch up with cohorts that did not.³¹

³¹ <https://wol.iza.org/uploads/articles/281/pdfs/do-youths-graduating-in-recession-incur-permanent-losses.pdf>;
<https://www.economist.com/business/2020/05/23/zoomers-zeros-and-gen-z>

Issues related to the gender digital divide will also need to be addressed.³² Women are already less likely to have the requisite skills and access to technology to participate in a digital economy, and post-COVID pressures are likely to exacerbate this divide.

Promote Human-Centred 4IR Ecosystems.

APEC economies should support long-term investigation into the developing 4IR ecosystems around the world to identify opportunities and challenges while engaging as many stakeholders as possible. This would include viewing 4IR not as a purely technical challenge but a challenge to human systems and potentially to the economic, social, moral, and philosophical underpinnings of human existence. APEC policymakers should delve deeply into this question and recognise that technological changes have profoundly disrupted and transformed human society even before their implications were entirely understood. One example is the automobile, which led to the radical reorganisation of cities and reduced communal spaces and public transportation – a transformation many would argue is only now being understood and reimagined for the better towards a more human-centred perspective.

Regional Cooperation Towards Resilient, Innovative Economies.

APEC economies need to invest in human capital, social protection, and innovation policies that lead to more inclusive, diverse, innovative, and resilient economies which can withstand future pandemics and the related economic shocks. This would include policies that promote economic diversification and competition. Other important reforms should target the formal education curriculum in ways that address the evolving needs of workers in a post-COVID-19, 4IR era, and map to a future of increasingly innovative economic development.

Some work is already underway, for example, APEC's Human Resources Development Working Group has already identified needed reforms in STEM as well as foundational skills such as literacy, numeracy, digital literacy, critical thinking, creative problem solving, and emotional intelligence. APEC Leaders have also called for the strengthening of social safety nets in the region in line with the International Labour Organization's Recommendation 202 on Social Protection Floors.³³

Finally, APEC economies should recognise that 4IR technologies – when managed effectively – can help economies reach higher levels of productivity

³² <http://www.oecd.org/internet/bridging-the-digital-gender-divide.pdf>

³³ https://www.apec.org/Meeting-Papers/Leaders-Declarations/2017/2017_aelm/Annex-A

at lower input costs while making entirely new industries and jobs possible. The pressures of the COVID-19 crisis is an opportunity for APEC to rebuild better for the future in ways that will create new space for business dynamism and innovation while ensuring that economic growth is inclusive, sustainable, and resilient.

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The views expressed in this Policy Brief are those of the authors and do not represent the views of the APEC member economies.

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