Future Shocks: Automation Meets the Pandemic

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Abstract
This article surveys the effects of what can be called two confluent agents of economic and societal transformation, digitally enabled automation and the covid-19 pandemic, on the contemporary economy. Examining shifts in work, occupations, labor markets, and consumption, the article ventures some conjectures on the consequences of this confluence, particularly across developed economies. The article contends that, while long-term automation tends to disrupt jobs and occupations which involve screen-facing work and, to a lesser extent, object-facing work, person-facing work is most exposed to the reallocation shocks precipitated by the covid crisis. Where consumption is concerned, both automation and pandemic-driven shocks lead to mutually reinforcing shifts. Seen together, automation and the pandemic phenomena can be regarded as intertwined socioeconomic stressors which will likely lead to even more divergent trajectories between the winners and the losers in the new economy.

Keywords
automation, economy and society, future of work, technology, covid-19

The histories of both automation and pandemics, conceived in the broadest terms, stretch back thousands of years and, in an important sense, are hardly novel phenomena. Automation, understood as the application of labor-saving technology to manipulate objects and processes, has existed for thousands of years even in preindustrial times (Frey, 2019), whereas pandemics such as malaria have ravaged humanity for hundreds of thousands of years at a minimum (Herlihy, 1997; Shah, 2010). However, the simultaneous appearance of a novel global pandemic and the fourth industrial revolution (Schwab, 2016) marks this entanglement as something unprecedented. The

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beginning of the 2020s then can be viewed as the decade when the economy experiences the effects of both automation-induced economic disruption and global public health crises as confluents agents of transformation.

**Digitally Enabled Automation and the Economy**

When we think about new forms of digitally enabled automation—as opposed to the growth-inducing industrial or preindustrial mechanization (DeLong, 2022; Gordon, 2017)—we tend to dwell on the consequences of digital automation for the labor market, whether instantiated in partially mechanized digital systems (robotics) or software-based systems (artificial intelligence [AI], machine intelligence). This fourth wave of digital automation (Brynjolfsson and McAfee, 2014; Schwab, 2016) can be distinguished from the wave of automation which revolutionized manufacturing in the 1990s with robotics (Frey, 2019).

It is important to note that, when the entire economy is taken into account, the most recent wave of AI-enabled automation has had an underwhelming impact on job displacement across the economy as a whole in terms of productivity and output. It has also fallen far short of fulfilling the dark prognostications of a “jobless future” (Ford, 2015). Much of the muted effects of automation on productivity, output, and overall labor market structure has to do with the generalized shift in economic activity from what economists call technologically “dynamic” industries (manufacturing) to technologically “stagnant” (education, construction, health care) industries and firms (Nordhaus, 2008).

However, at the same time, digitally enabled automation has changed production and labor markets in discernable ways, even if it has not yet led to mass job displacement. Automation has amplified the long-term trend toward the polarization of jobs into the higher wage and lower wage ends of the occupational spectrum (Acemoğlu and Restrepo, 2019; Autor, 2022). So long as it generates economic gains which accrue to small portions of the population in economically developed countries (Acemoğlu, 2021), uncontrolled digitally enabled automation will deepen economic inequalities.

From the production and occupational perspectives, the application of digitally enabled automation can be distinguished in terms of three types of jobs: (1) routine “object-facing” tasks and jobs which require the manipulation of physical objects, (2) routine “person-facing” service jobs such as grocery stores, and (3) routine “screen-facing” work mediated by digital devices, particularly office-support jobs involving information (McKinsey, 2021). These three types of tasks and jobs are differentially distributed across the economy, both within firms and industries and across firms and industries.

In manufacturing, the most technologically progressive sector, automation has had an undeniable effect on object-facing work since the 1980s, even though the adoption of robotic production systems has fallen far short of early expectations that it would revolutionize manufacturing (Graetz & Michaels, 2018). Indeed, measured according to net investment rates in new technologies and effects on manufacturing output, the first two decades of the 21st century have actually trailed the last two decades of the 20th century (Gordon, 2017). However, within particular middle-skill object-facing industries such as trucking, the effects of “automation 2.0” on the labor market are highly visible. In this
industry, autonomous trucks are positioned to replace human-driven trucks within the next two decades (Sperry et al., 2022; Viscelli, 2018, 2016). Such a trend has contributed to the hollowing out of many of the “middle-skill” jobs which formed the backbone of the U.S. labor market in the 1980s. As far as screen-facing work and occupations are concerned, many of the routine and “codifiable” cognitive tasks implicated in manual and non-manual jobs—such as warehouse jobs and clerical jobs—have been subjected to digitally enabled automation (“computerization”) such that many of the middle-skill routine tasks have been taken over by intelligent software-based systems (Autor, 2015; Smith, 2020). While the uptake of robots in object-facing work and occupations might be relatively slow, the development and implementation of software automation in screen-facing work has proceeded rapidly. Indeed, within the domain of screen-facing work and occupations, AI systems have both eliminated some jobs and tasks and given rise to emergent jobs and tasks. The automation of screen-facing work and occupations has and will continue to generate both high-paying work for the “coding elite” (Burrell and Fourcade, 2021) as well as low-paid screen-facing “micro-work” around the world (Gray and Suri, 2019; Tubaro and Casilli, 2022; Tubaro et al., 2020; Shestakofsky, 2017). Interestingly, the domain which automation has left relatively untouched is the domain of person-facing work, particularly interpersonal service jobs such as health care, food service, hospitality, and the like, where job functions unfold in a “human environment” demanding physical dexterity, interpersonal skills, and constant improvisation (Autor, 2022; Smith, 2020).

From the consumption angle, automation has come into play in two significant ways. First, if automated systems displace human labor with machinery (Frey, 2019), they may cut down the overall purchasing power of the mass consumer base, particularly the working-class consumer base. This indirect reduction of consumer purchasing power inevitably weakens sectors of the economy dependent on the personal expenditures and consumption of this stratum.

Even as automation hobbles the purchasing power of the working-class consumer base—and the overall level of consumer demand—it also conditions consumer behavior across the class spectrum. Such consumer conditioning is a salient feature of nonphysical systems implementing AI, systems which form the basis for data-driven “surveillance capitalism” (Zuboff, 2019). These platforms have reconstituted consumers as suppliers of the very behavioral data which forms the basis for the more efficient extraction of economic value by capitalist actors (Burrell and Fourcade, 2021). Platform users are induced to contribute user content which forms the raw material used to predict and even condition consumer preferences and behavior with astonishing precision and power. In this way, digitally enabled automation can maximize and shape consumer demand, not only for digitizable services like entertainment, telemedicine, and banking, but also for physical goods and in-person services like delivery services.

The COVID-19 Pandemic and the Economy

If digitally enabled automation continues to restructure labor markets, workplaces, and consumption patterns, the COVID-19 pandemic also has had profound effects on
the economy. However, whereas digitally enabled automation has proceeded gradually over many decades, at least since the early 1990s (Autor, 2015), the COVID-19 pandemic was an abrupt shock to the global economic system, perhaps unprecedented in its suddenness. In the developing world, as of 2022, the pandemic and its aftereffects have caused income and living standards to fall relative to pre-pandemic trends, particularly in Africa, Asia, and Latin America (Egger et al., 2021). Moreover, across the world, the efforts on the parts of governments to cushion the negative economic consequences of the pandemic advantaged the formal economy over the informal economy. By the end of 2020, some $18 trillion of public funds had been pumped into the formal economies of the developed world (Tooze, 2021). While lost income was largely replaced by government aid in the developed world, informal workers in the developing world suffered uncompensated income losses, even in the few cases where governments could afford the resources (Tooze, 2021).

The economic consequences of the pandemic was not limited to the unprecedented infusion of public funds into the economies of the developed world. In developed countries such as the United States, the pandemic transformed the economy through a series of “relocation shocks” (Barrero et al., 2021a) and “structural transformations” (Fassin and Fourcade, 2022) issuing from both the primary and secondary effects of the pandemic. These shocks have temporarily and permanently altered labor markets, the structure of employment, income and inequality, business formation, and consumption patterns. In the United States for instance, the share of jobs in location-based services (leisure, hospitality) has declined since the onset of the COVID-19 pandemic, while the share of jobs in computer-based occupations has increased and will likely continue to grow (Barrero et al., 2021a). To frame this process in slightly different terms, the COVID-19 reallocation shock precipitated a rapid decline in the share of interpersonal service jobs, jobs which tend to be disproportionately attached to small and medium sized employers (Holst et al., 2020). Thus, the post-covid economy is one in which location-based interpersonal services have shrunk relative to both interpersonal variable-location services and “computer-based” work in which workers deal with artifacts rather than people. Indeed, for those workers who can get their work done without face-to-face interaction or interaction with physical objects, remote work has become much more widespread, with modal workers in most countries preferring to work from home at least 2 days per week (Barrero et al., 2021b).

Just as the relative share of different jobs has changed as a result of the covid pandemic in developed economies, the overall size and structure of the workforce has shifted. At the onset of the pandemic, large numbers of workers withdrew from labor markets across the developed world. These withdrawals were both temporary and permanent. With respect to temporary withdrawals, at one point, in January 2022 during the height of the U.S. Omicron wave, the proportion of U.S. workers who missed work because of illness or injury reached the second-highest percentage on record (www.bls.gov). Two years after the onset of the pandemic, the labor force participation rate has rebounded but remains slightly depressed, relative to February 2020. And the rate of labor force volatility, as measured by the “quits rate,” actually rose during the first 18 months of the pandemic, cresting at the highest level recorded since the dawn of the
21st century (https://fred.stlouisfed.org/), suggesting that the pandemic has induced a historically high rate of job churn. This trend, along with the increase in the rate of job openings across the U.S. economy, suggests a growing mismatch between the demands of employers and workers, particularly in the private sector.

In the period beginning in 2022, the economic reallocation shocks and inflation indirectly due to the pandemic have undermined the economic security of already vulnerable individuals, while enriching shareholders and business owners (Kinder et al., 2022). Simultaneously, business owners, shareholders, and others owners of capital are reaping gains in terms of greater profits driven by supply disruptions.

At the same time, the digitization of consumption during the pandemic created emergent “risk divides” between consumers able to shield themselves from the health risks of covid and workers compelled to earn an income through hazardous gig work which requires face-to-face interaction (Grusky et al., 2021). This emergent risk divide replicates income and class divides between the more affluent consumers—often professionals and managers—and low-paid service workers who brave hazardous environments on their behalf. Here we see the confluence of platform-mediated consumption with changes in consumer demand wrought by the covid crisis. At the same time, because the platform economy is dominated by a comparatively small number of oligopolistic firms, the post-covid/post-automation economy is one in which a small handful of dominant firms and private actors come to wield even greater control over both the livelihoods of platform workers and the behavior of consumers (Fassin and Fourcade, 2022).

Automation Meets the Pandemic: Unexpected Conjunctions and Entanglements

During the last 2 years, the conjunction of these two profoundly transformative phenomena have spawned a host of unanticipated developments. Automation contributes to job polarization and deskilling in routinized work across multiple sectors, particularly where screen-facing work and occupations are concerned. On the other hand, the pandemic has weakened the position and prospects of person-facing occupations relative to screen-facing and object-facing occupations. The combination of the gig economy and pandemic-induced transformations in consumption meanwhile have led to the rapid expansion of commerce and consumption mediated through digital platforms and armies of low-paid gig workers. This trend has further enriched a select group of corporate actors and owners (Schor, 2021; Zuboff, 2019). Thus, both pandemic-driven changes and automation-driven changes have disproportionately benefitted the owners of capital and those workers who can command high wages.

Automation exposure (dis)advantages particular jobs, occupations, and workers, while pandemic-shock exposure (dis)advantages others. In the broadest sense, automation disrupts the position and erodes the pay of workers and jobs where work tasks consist mostly of routinizable screen-facing and object-facing activities. This can happen in manufacturing, but also in occupations which may be defined as “services” such as truck driving. But automation will happen much more slowly with respect to those jobs and occupations where person-facing tasks and activities play a more prominent role and
where the workforce is low paid. In sectors, jobs, and occupations where unroutinizable person-facing tasks predominate, automation proceeds slowly if at all. The demand and reallocation shocks of the pandemic, however, have weakened jobs and occupations featuring high levels of person-facing tasks such as leisure and hospitality and health care. It is in these parts of the economy that pandemic-driven shocks in both demand and labor supply have caused job displacement and restructuring across industries and occupations. Finally, some workers and occupations are doubly exposed to both automation-induced and pandemic-induced disruptions. For instance, many low-paid female workers in jobs dominated by person-facing tasks—particularly those in lower paid service sector jobs with staffing shortages—are exposed to relatively high risks of labor-displacing automation and demand-driven labor dislocation at the same time (Chernoff and Warman, 2020).

From a consumption perspective, automation may contribute toward making some goods and services more abundant and affordable for the modal consumer. But the fact that automation leaves the productivity of the more technologically stagnant parts of the economy untouched means that both goods and services like housing and health care have grown relatively less affordable and abundant for the modal consumer across the developed economies. Indeed, in the inflationary wake of the pandemic’s acute phase, housing, health care, and other goods and services emerging from these stagnant sectors have become less affordable, eroding the purchasing power and economic security of both working-class and middle-class households around the world. Longer term shifts in consumption patterns due to the pandemic are more difficult to discern but can be seen in some emergent patterns connected to some important consumption arenas such as housing and education. In housing for example, unlike the period prior to the pandemic, after the pandemic, many white-collar workers have fled the urban core and relocated in suburban areas, leading to a “donut” pattern and shifting economic activity away from cities (Ramani & Bloom, 2021).

Viewed in this light, both automation and the pandemic constitute two large-scale economic and societal disruptors which trace parallel courses but unsettle different sectors of the economy, particularly from a labor market and occupational perspective. To the extent that digitally enabled automation will have a greater impact on the more technologically dynamic parts of the economy, while pandemic shocks will cause greater disruptions to the more technologically stagnant parts of the economy, the two trends are likely to be manifested among distinct occupational groups and socioeconomic classes. Nevertheless, where inequalities are concerned, the two trends will likely act in concert to further deepen the socioeconomic rifts characterizing the polarized economy of the 21st century.

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