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The COVID-19 Pandemic: The Impact on the Economy and Policy Responses— A Review

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8.1 Introduction

Since the SARS-CoV-2 (novel coronavirus disease, COVID-19) virus first appeared in Wuhan in the center of the People's Republic of China (PRC) around early December 2019, it has quickly spread around the world. As of 12 August 2021, it had infected 204.6 million people and claimed 4.3 million lives in 219 countries, areas, or territories and is turning into one of the worst global pandemics in human history.¹ The COVID-19 pandemic is an unprecedented shock to the labor market. It is simultaneously a negative supply shock and a demand shock (Guerrieri et al. 2020). It is a supply shock in the sense that firms' productivity is reduced by the pandemic, either because their workers are infected by the virus, or because their workers need to engage in social distancing to slow down the spread of the virus, or because the supply chains for the necessary intermediate inputs are disrupted by the pandemic. For many sectors, particularly the service industry, including travel and tourism, hotels and dining, among others, the COVID-19 pandemic presents an unprecedented negative demand shock, as customers stay at home either voluntarily for fear of being exposed to the virus or involuntarily because of lockdown restrictions. However, for some sectors, such as online entertainment, social networking, e-commerce, and particularly

¹ <https://www.who.int/emergencies/diseases/novel-coronavirus-2019> (accessed 12 August 2021).

high-tech industries in general, the pandemic has offered great opportunities for expansion. The pandemic has also significantly altered our mode of working, as millions of workers are restricted to working from home via telecommuting tools such as Zoom or Microsoft meetings, on a scale that was unimaginable and technically infeasible just a decade ago.

The COVID-19 pandemic is also a huge negative shock to consumers' and firms' confidence about future economic prospects; moreover, it has also created an enormous uncertainty shock. Both the impacts on confidence and on uncertainty are arguably larger than the shock of the collapse of the subprime market associated with the global financial crisis of 2008–2009, and probably more similar in magnitude to the rise in uncertainty during the Great Depression of 1929–1933 (Baker et al. 2020). The lack of knowledge about this novel coronavirus, at least at the initial stage of the pandemic, and the uncertainty associated with the timing of an effective therapeutic treatment and an effective vaccine have further accentuated the uncertainty about the likely duration and severity of the pandemic. In addition, the rapid transmission of the virus to almost all economies in the world has further created uncertainty regarding the ability of countries to effectively work together in the fight against this global pandemic. The COVID-19 pandemic has also highlighted the importance of the robustness (or lack thereof) of the global supply chain.

Before we start, it would be useful to summarize some of the lessons that have emerged from the divergent experiences across countries in containing the virus. This novel coronavirus first appeared, or was first reported, in the PRC city of Wuhan (the capital city of Hubei Province), which has a population of 11 million people and is located in the center of the PRC, in early December 2019. The nature of the virus was unknown, and unfortunately it started to spread in the community. By 20 January 2020, it was publicly confirmed that the virus could be transmitted from human to human. On 23 January 2020, just 2 days before the Chinese Lunar New Year, the PRC government imposed a strict lockdown of the city of Wuhan, followed in the next couple of days by the whole of Hubei Province. Fang, Wang, and Yang (2020) showed that the strict lockdown of Wuhan reduced inflows of people to Wuhan by 76.98%, outflows from Wuhan by 56.31%, and within-Wuhan movements by 55.91%. In the counterfactual world in which the city of Wuhan had not been strictly locked down on 23 January 2020, the COVID-19 cases would have been 105.27% higher in the 347 cities outside Hubei Province. Other cities in the PRC with confirmed COVID-19 cases also imposed various lockdown and quarantine measures. By mid-March

2020, the number of new cases had started to turn to zero, and on 8 April 2020, the 76-day Wuhan lockdown was lifted. However, the fight against the pandemic in the PRC is by no means over. The PRC government subsequently imposed rigorous contact tracing based on mobile proximity, and permitted only individuals who did not have symptoms and had not been near anyone who had tested positive in the last 14 days to move, and any domestic cross-city travelers were required to undergo a 14-day quarantine (later reduced to 7 days). The PRC is still fighting to prevent transmissions from overseas travelers at international airports. It could be argued that the government's strict lockdown measures were harsh, but no one should dispute that it was an extraordinary feat for the PRC to bring the pandemic under control domestically, despite the initial fumble in Wuhan.

Similar successes can be found in other Asia and Pacific economies. The Republic of Korea had a serious outbreak in early February 2020, but brought it under control without imposing strict lockdowns, but rather through widespread testing, rigorous contact tracing, and strict quarantine of those who tested positive as well as anyone who had been in close proximity or contact with someone that had tested positive. Australia; Thailand; Taipei, China; Singapore; Japan; and Hong Kong, China all achieved extraordinary relative successes in their fight against the pandemic. Notably, all Asian economies and regions imposed mandatory mask wearing in all public spaces.

Public health scholars will be studying the successes and failures of the fight against the pandemic for many years to come. But it seems reasonable to draw some early lessons. First, when an epicenter or a small number of epicenters of an outbreak can be identified, it is crucial to lock down these epicenters to prevent the virus from spreading to other communities. The lockdowns must be strictly enforced; any half-hearted lockdown measures are not successful in fighting such an infectious disease with many asymptomatic cases. Strict lockdowns of 4 to 6 weeks could result in better outcomes in stemming the spread of the virus; nonenforced lockdowns would only prolong the pandemic. In addition, it is universally accepted that infectious diseases grow exponentially in the initial stage of the outbreak, and the speed of growth depends on a crucial parameter known as " R_0 ," which for SARS-CoV-2 lies somewhere between 2 and 3. If the spread of the virus is left unchecked, the rapid growth of infected patients is likely to overrun most of the healthcare system. Strategies aimed at delaying the spread of the virus, including quarantining infected persons and their contacts, lockdowns and restrictions of human mobility, and social distancing such as prohibiting public gatherings and limiting

public transport, have proved to be effective in flattening the infection curve, which can help alleviate the burdens on the health-care system and save lives.

Second, when large outbreaks are under control after strict lockdowns, it is crucial to institute widespread testing, rigorous contact tracing, and mandatory quarantine measures for anyone who has tested positive or has close contact with someone who has tested positive. This is a crucial step in preventing a new community spread of the virus.

Third, avoiding public spaces and large gatherings, wearing masks, and washing hands are good public health practices that need to be encouraged as long as an effective vaccine is not yet available to all. These simple steps, though sometimes inconvenient, protect oneself and others.

Fourth, infectious viruses know no national boundaries; therefore international coordination and cooperation are essential to contain the COVID-19 pandemic. In our tightly connected global economy, no country can hope to be spared from the virus while standing on the sidelines watching other countries fight it. International coordination and collaboration must be multifaceted; this includes timely sharing of virus-related information and resources across countries. Moreover, just as we need to mobilize idle health-care capacity in one state (or province) to another domestically to fight the spread of the virus, such mutual assistance should occur across nations as well. In the long run, the international community needs to convene an International Health Fund, akin to the International Monetary Fund, that is much better funded and staffed than the current World Health Organization, to coordinate global responses to public health crises, as humanity will likely need to deal with threats from more and more deadly pandemics in the future.

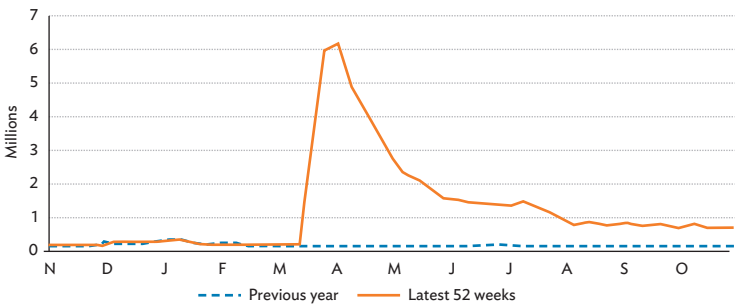
This chapter reviews the recent COVID-19-related research, focusing on the following issues. Section 8.2 discusses the impact of the COVID-19 pandemic on the labor market, particularly on the PRC's labor market. Section 8.3 reviews papers on the labor market adaptation to the pandemic in the form of working from home. Section 8.4 discusses the potential impact of the pandemic on the global value chains. Section 8.5 discusses the impact of the pandemic on the acceleration of the digitization of the economy and the rising importance of e-commerce, as well as its potential impact on small and medium-sized enterprises (SMEs). Section 8.6 discusses some policy experiences from the United States (US) and the PRC aimed at stimulating the economy during and after the pandemic. Finally, Section 8.7 concludes.

8.2 Impact on the Labor Market

The COVID-19 pandemic is a health shock that has negatively affected the labor demand and labor supply. As a result, the havoc it has caused on the labor market has been massive. Figure 8.1 shows that, in the US, at the beginning of the pandemic, the weekly nonseasonally adjusted initial unemployment insurance claims reached historical high numbers of 2.9 million (week of 21 March 2020), 6.0 million (week of 28 March 2020), 6.2 million (week of 4 April 2020), 5.0 million (week of 11 April 2020), 4.3 million (week of 18 April 2020), and 3.5 million (week of 25 April 2020), with the unemployment rate reaching as high as 17%. The US labor market has since recovered to a large extent, with the current unemployment rate at a seasonally adjusted 5.8% (as of 31 October 2020).

This section describes the impact of the COVID-19 pandemic on the PRC’s labor market, focusing on the labor demand side. The results from two papers are discussed here. The first paper by Dai et al. (2020), used telephone interview surveys in February and May 2020 based on the sample of firms in the Enterprise Survey for Innovation and Entrepreneurship in China (ESIEC), focusing on both the challenges and reopening of SMEs in the PRC. The second paper, by Fang et al. (2020), uses actual online job posting data to assess the impact of COVID-19 on the labor market during the pandemic and emphasize the role of the global supply chains.

Figure 8.1: United States Initial Unemployment Claims (3 November 2018–31 October 2020)



Source: United States Department of Labor. <https://www.dol.gov/ui/data.pdf>

It should be noted at the outset that the pandemic hit the PRC hard from late January 2020, through the whole of February, and for a large part of March, but by April 2020 the COVID-19 pandemic had been brought under control and the PRC began lifting many restrictions.

Dai et al. (2020) leveraged an existing firm survey, called the Enterprise Survey for Innovation and Entrepreneurship in China (ESIEC), which has been collecting firm data over the past 3 years, to conduct two rounds of telephone interviews in February and May 2020 with the purpose of understanding the impact of the lockdown on the PRC's SMEs (the February survey) and the extent of their recovery (the May survey). Their phone survey included 2,349 SMEs, which the authors had previously sampled in seven provinces, and the sampled SMEs are largely representative, both at the provincial and major industrial levels, of the PRC as a whole. The authors asked the firms the following key questions in the survey: (1) How long can the firms' current cash flow sustain the firms' survival? (2) What are the most important binding constraints facing enterprises? (3) What are the entrepreneurs' subjective assessments on the economic outlook? They then linked the February survey with firms' background information gathered in the previous ESIEC surveys they conducted from 2017 to 2019, such as export status, firm size, supply chain, and share of workers from other provinces. The advantage of this survey over other online surveys is that it ensures more representativeness of the sample, as well as having the baseline data from interviews prior to the pandemic.

Dai et al. (2020) reported several important findings. First, the PRC's SMEs experienced a V-shaped recovery. When strict lockdowns were imposed in most cities in the PRC in February 2020 in order to stop the spread of COVID-19, SMEs were hit hard. In the February survey, the authors found that 14% of surveyed firms reported that they would be unable to last beyond 1 month on a cash flow basis, and 50% of them could not last beyond 3 months. Moreover, 80% of the surveyed firms were not operating at the time of the survey. The firms also reported in the survey that the barriers to business operations varied according to their positions in the supply chain, where upstream firms were mainly affected by labor shortages, but downstream firms reported more serious challenges related to supply chains and consumer demand. The authors also found that the effects of the pandemic varied across sectors. They found that export firms expressed more negative outlooks than non-export firms because they tended to employ more migrant workers and their suppliers were more highly concentrated; moreover, the export firms also held more pessimistic views on business prospects than non-exporters.

By the May 2020 survey, however, the economic conditions had greatly improved. Most businesses had reopened by then, although

smaller firms reopened at a lower rate across all sectors. In general, the survey showed that the vast majority of SMEs were able to reopen and rehire workers once mobility restrictions were lifted. Yet a substantial number of mostly smaller enterprises closed permanently, leaving many unemployed, particularly in rural areas. In fact, employment among reopened firms reached an average of 86.4% of its pre-shock level, suggesting a clear V-shaped recovery.

Second, the authors found that the COVID-19 restrictions took a heavy toll on SMEs and rural residents. The survey found that around 18% of SMEs closed permanently between the two surveys. Because most employees of SMEs are from rural areas, which account for 57% of the country's population, the closing of the SMEs resulted in large rural job losses. In terms of industries, the authors found that the residential service firms suffered the highest exit rate. Among the manufacturing enterprises, the failure rate for smaller firms (defined as those with fewer than eight workers) was 2.5 percentage points higher than that of larger firms (eight workers or more). Among export firms, smaller ones exited at a rate of 4 percentage points higher than relatively larger firms.

Third, the authors found that the major challenges faced by the SMEs shifted from the supply-side disruptions at the beginning of the pandemic to the demand side in May 2020. In February 2020, logistics breakdowns and labor shortages ranked among the top challenges, particularly for industrial enterprises. In May, more than 70% of firms listed the lack of demand as the top challenge, while most supply-side problems, such as raw-material shortages and labor shortages, had faded away. Apart from agricultural enterprises, smaller firms reported more problems with the lack of demand than their bigger counterparts.

In terms of sectors, the authors found that agricultural enterprises recovered more rapidly than the manufacturing, business service, and residential service sectors, which encountered more serious demand problems. This was expected because food is essential, and its demand is less elastic than other goods and services.

The authors also found that export firms were 10 percentage points more likely to report inadequate demand as their most critical challenge, largely thanks to shrinking international demand as COVID-19 spread to other countries. This is consistent with the findings from the job posting data in Fang et al. (2020), which we will discuss below.

Fourth, the authors found that the PRC government's support policies did not reach a vast number of SMEs. The government policies that were introduced after the lockdown to help the affected SMEs, including rent relief, tax reductions, postponing social security payments for employees, and direct financial support, often did not reach smaller firms. The authors found that only 15% of the SMEs reported accessing

some form of government assistance, which was only 2 percentage points higher than in the pre-pandemic year of 2018. Among self-employed businesses, the coverage rate of government assistance was as low as 9%. The survey also shows that small firms received less policy support than larger ones. In general, SMEs largely relied on themselves through the lockdown. The authors also found that, relative to the government policies that targeted firms, policies that aimed to stimulate domestic demand by targeting consumers (particularly those with low incomes and the vulnerable in rural areas) seemed to be more effective in indirectly helping SMEs and resulted in broader economic benefits.

While Dai et al. (2020) used survey data to obtain a fast overview of the COVID-19 pandemic's economic impact, Fang et al. (2020) used over 100 million actual posted jobs to empirically examine how the COVID-19 pandemic has affected labor demand across a variety of the PRC's cities. Their job posting data came from one of the largest online platforms that provide hiring services in the PRC, and they obtained the data by running a web-scraping algorithm that collected job advertisements posted on the platform from 1 January 2018 to 30 April 2020. For each advertisement, the authors collected information about the basic characteristics of the job, including the job location and the number of vacancies, and some information on the firm, including the firm name, size, and industry classification. In total, they collected roughly 20 million job advertisements, with 104.9 million vacancies being posted by more than 700,000 firms during our sample period.

Fang et al. (2020) found that, due to the effects of the pandemic both in the PRC and abroad, the number of newly posted jobs within the first 13 weeks after the Wuhan lockdown on 3 January 2020 was about one-third lower than that in the same lunar calendar weeks in 2018 and 2019. Using econometric methods, the authors showed that, via the global supply chain, COVID-19 cases abroad, and in particular pandemic-control policies by foreign governments, reduced new job creation in the PRC by 11.7%. They also found that the PRC's firms most exposed to international trade outperformed other firms at the beginning of the pandemic but performed worse than other firms during the recovery as the novel coronavirus spread throughout the world.

The PRC, the country where COVID-19 first broke out, has also been the largest trading nation in the world since 2013. In the first quarter of 2020, as COVID-19 cases peaked in the PRC, total exports fell by 9.3% quarter-on-quarter, the largest fall in 1 decade. To understand the nexus between COVID-19, government pandemic-control policies, international trade, and the PRC's labor market, Fang et al. (2020) employed an empirical model that correlates, at the city-week level, the creation of new jobs with exposure to the pandemic in the city, and the

pandemic in other parts of the PRC, as well as the exposure to foreign countries through value chains. They first examine the impact of new COVID-19 cases in the local city on local job creation, and then separately identify the impact of COVID-19 in other parts of the PRC by using a distance-weighted pandemic exposure measure; they also test whether the pandemic has an impact on job creation through the global value chain. Fang et al.'s (2020) paper is the first to exploit cross-city variations in their exposure to the global pandemic and virus-containment policies through their differential trade linkages with other countries. Specifically, they create trade-weighted measures of exposure to the global pandemic by using PRC customs data to generate weights and to estimate their effects on job creation in a PRC city. Thus, the variations come from the change in global pandemic and containment policies over time and a city's differential exposures to trade with different countries. Further, Fang et al. (2020) follow Campello, Kankanhalli, and Muthukrishnan (2020) to test whether the trade sector fares differently from other firms at different stages of the global pandemic. Empirically, the authors identify trade intermediary firms by examining whether the names of firms contain the PRC's terms related to trade.

Fang et al. (2020) established three main findings. First, they found that COVID-19 cases in the local city and other parts of the PRC had large negative impacts on job creation in a PRC city, and the elasticity of job creation with respect to the latter is slightly larger in magnitude. Their back-of-the-envelope calculation implies that job creation was down by 10.0% due to local-city COVID-19 cases but by 11.7% due to cases in other parts of the PRC in the 13 weeks after the Wuhan lockdown.

Second, foreign COVID-19 shocks transmitted via global supply chains also reduced job creation in the PRC. This impact came mainly from the decline of export demand due to the policy responses by foreign governments to COVID-19. In the same 13 weeks, foreign COVID-19 shocks reduced job creation in the PRC by another 11.7%, which weakened the recovery of the labor market.

Finally, as a piece of direct evidence of the role of international trade in transmitting the COVID-19 shock, the authors found that the PRC firms that rely more on international trade outperformed other types of firms in withstanding the COVID-19 shock when the epicenter was in the PRC but performed worse than other firms during the recovery as the epicenter moved to the rest of the world.

These findings also provide empirical evidence that input-output linkages and global value chains are important propagation channels for shocks such as COVID-19. The COVID-19 pandemic is a global shock and, like the pandemic itself, which may have multiple waves, the COVID-19 shock may hit local economies multiple times via global supply chains.

Understanding the transmission mechanism through domestic and international linkages is crucial for policy making to, on the one hand, contain the pandemic and, on the other hand, speed up the recovery of the global economy. Domestically, Fang et al.'s (2020) finding that the effect of COVID-19 cases in other parts of the PRC was even larger than that in the local city suggests that, for large countries with complex domestic supply chains, such as the PRC, the US, Brazil, and India, a nationally coordinated strategy is important for controlling both the pandemic and economic recovery. With the pandemic under control in the PRC, the impacts of the global pandemic through trade and pandemic-mitigation policies have become more prominent over time. Fang et al. (2020) showed that according to their data, 7 weeks after the Wuhan lockdown, 75% of the loss of new jobs was due to foreign pandemic shocks via the global supply chain, and over the entire 13-week period, foreign shocks accounted for one-third of the 3.9 million "lost" new jobs. These findings suggest that an open economy cannot fully recover unless the pandemic is well under control among all of its major trading partners, and thus international coordination in terms of pandemic control is crucial.

Fang et al.'s (2020) findings regarding the importance of global supply chains in the transmission of the COVID-19 shock across national borders suggest the importance of global cooperation in the fight against the pandemic and the spread of the novel coronavirus. At the writing of this review, the pandemic is still raging in some parts of the world, with a chance of a second or even third wave of infections; as such, for the global economy to recover as quickly as possible from the deep pandemic-induced recession, countries need to work together due to the close linkages of global production. Recoveries in other countries will serve as a force that pulls the rest of the world out of the recession, whereas "beggar-thy-neighbor" policies will only prolong the recession.

8.3 Jobs that Can Be and Are Done from Home?

As the COVID-19 pandemic forced governments to issue broad-based shelter-in-place and closure orders to many nonessential businesses, an unprecedented number of workers were laid off, and for those who were lucky enough to hold on to their jobs, their regular mode of commuting to work became infeasible or unsafe. Telecommuting or working from home arrangements, which were used by a small percentage of workers before the pandemic, became a more widely used mode of work. This section reviews two interesting studies on this development in the labor market. The first paper, by Dingel and Neiman (2020), uses job characteristics description data to ask what jobs can be *potentially* done

from home;² and the second paper, by Bick, Blandin, and Mertens (2020) uses real-time survey data and provides information about what jobs are *actually* done from home. Both papers use data from the US, but to the extent that occupations are similar across countries, the lessons are relevant to other economies as well.

To answer the question of how many jobs in the US can be potentially done from home, Dingel and Neiman (2020) first classify the feasibility of working at home for all occupations using information about the occupations from Occupational Information Network (O*NET) data. The O*NET database is the primary source of occupational information in the US, and contains hundreds of standardized and occupation-specific descriptors on almost 1,000 occupations.³ Dingel and Neiman (2020) classify whether it is feasible to conduct the work in an occupation from home based on the responses to two O*NET surveys: the “work context questionnaire,” which includes questions aimed at capturing the “physical and social factors that influence the nature of work” such as interpersonal relationships, physical work conditions, and structural job characteristics, and the “generalized work activities questionnaire,” which includes questions aimed at capturing the “general types of job behaviors occurring in multiple jobs” such as the input of information, interaction with others, mental processes, and work output. The authors code the occupation as one that *cannot* be performed at home if, for example, the answers to those surveys reveal that an occupation requires daily “work outdoors” or that “operating vehicles, mechanized devices, or equipment” is very important to the performance of that occupation. They then merged this classification of O*NET occupations with information from the US Bureau of Labor Statistics on the prevalence of each occupation in the US as well as in particular US cities and industries. They found that their classification implies that 37% of US jobs can plausibly be performed at home. As Dingel and Neiman (2020) acknowledged, their criterion for classifying an occupation as not being able to work from home is strict, i.e., only job characteristics that clearly rule out the possibility of working *entirely* from home are classified as not being able to work from home; thus,

² Su (2020) also classified the occupations in O*NET as remote-work compatible if the occupation meets all of the following five criteria: (i) work involves frequent use of email; (ii) work does not require physical proximity with other people closer than arm's length; (iii) work involves sitting at least half of the time; (iv) work does not involve significant kneeling, crouching, stooping, or crawling; and (v) work does not involve significant bending, or twisting of the body. He finds that 132 out of 400 occupations were identified as remote-work compatible.

³ <https://www.onetcenter.org/overview.html>

it neglects many characteristics that would make working from home difficult. Thus, they argued that their estimate is likely *an upper bound* on the share of jobs that might be feasibly performed entirely at home.

Dingle and Neiman (2020) also found that there are significant variations in the percentage of jobs that can be worked from home across cities and industries. They found that more than 45% of jobs in San Francisco, San Jose, and Washington, DC could be performed at home, whereas the fraction is 30% or lower in Fort Myers, Grand Rapids, and Las Vegas. Across industries, they found that most jobs in finance, corporate management, and professional and scientific services could plausibly be performed at home, but very few jobs in agriculture, hotels and restaurants, or retail could be. These findings suggest that the impact of the pandemic on employment and wages is likely to be felt differently both across space and across industries. To the extent that high-paying tech jobs and professional service jobs are more likely to be done from home, the pandemic has exacerbated *inequality*.

Bick, Blandin, and Mertens (2020) used Real-Time Population Survey (RPS) data to measure the extent to which US workers *actually* shifted to home-based work in the months after the pandemic outbreak. The RPS is a biweekly online survey of around 2,000 respondents selected to be representative of the US population, with the same core questions as the Current Population Survey (CPS).⁴ The survey was first fielded between 10 and 16 May 2020, but crucially it contains retrospective questions about February, which allowed the authors to analyze the changes in home-based work since the start of the pandemic, as well as the relationship between pre-pandemic commuting behavior and post-pandemic employment outcomes.

The key questions in the RPS that the authors use to answer the question of what percentage of jobs is actually done from home during the pandemic are the following: (1) “How many days per week did you [your spouse/partner] usually work for this job?” and (2) “How many days per week did you [your spouse/partner] usually commute to this job?”, where “this job” corresponds to the main job in the case of multiple jobholders. The authors found that, of the 3,587 respondents aged 18–64 who were employed and at work in February 2020, 75.4% reported commuting to work every workday in February, 16.4% reported commuting on some days, and only 8.2% reported working exclusively from home. The fraction of workers in the RPS that worked entirely from

⁴ The survey respondents are also asked about their spouse or partner if they live in the same household, which means we have information on nearly 5,000 working-age adults. For more information about the RPS, see <https://www.dallasfed.org/research/rps>.

home increased to 35.2% in May 2020. The increase in working from home was mostly driven by the switching behavior of those who used to commute to work every day in February (i.e., the 75.4% of workers in February that reported commuting to work every workday); among the daily commuters in February who were still employed in May, 60% continued to commute daily, 12% commuted on some days, and 28% worked entirely from home.

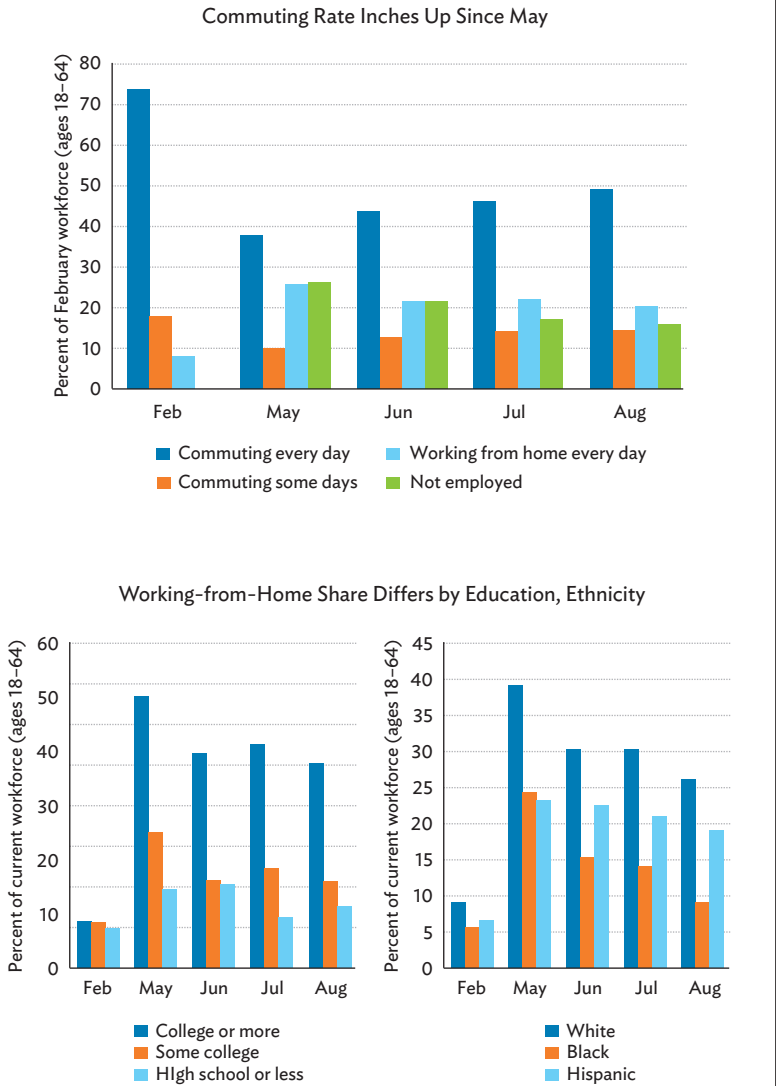
As the US economy reopened to some extent from June 2020, the authors found that the number of daily commuters (as a fraction of pre-pandemic employment) rose gradually to 49.0% in August—still well below pre-pandemic levels of 75.4%. The fraction of entirely home-based workers declined slightly to 24.2% of the employed workers aged 18–64 in August, down from 35.2% in May (see top panel of Figure 8.2).

The authors found that the increase in working from home was particularly pronounced for some categories of workers. While there was no notable difference in working from home by education level in February 2020, the lower panel of Figure 8.2 shows that switching to working from home was more prevalent among workers who were highly educated, white, and had a high income prior to the pandemic. The difference is particularly stark between education groups: 50% (respectively 38% in August) of workers with a bachelor's degree or more worked entirely from home in May, compared to only 15% (respectively 10% in August) of workers with a high school degree or less. In August, 26% of white workers were telecommuting every day, while only 9.4% of black and 19.2% of Hispanic workers were doing the same. Many of the industries with the lowest share of employees working from home were those that usually don't require a college degree—construction, transportation, and warehousing, and hotel and food services—while finance and professional services had the most people telecommuting. These findings again suggest that the pandemic exacerbated inequality.

The COVID-19 pandemic may have finally made working from home a mainstream mode of working, but will this continue beyond the pandemic? A survey conducted by PriceWaterhouseCoopers found that almost one-third (32%) of workers said they did not want to go back to the office even after the pandemic is over, while about half (51%) said they would like to continue working from home at least a few days per week.⁵ Given the unequal distributions of work-from-home options by education, industry, race, and gender, it is particularly important for government policies to address the likely increase in inequality from permanent switches to working from home.

⁵ PWC US Remote Work Survey. (<https://www.pwc.com/us/en/library/covid-19/us-remote-work-survey.html>) conducted in November and December 2020.

Figure 8.2: Commuting to Work and Working from Home, Overall and by Education and Ethnicity, 2020



Source: Bick, Blandin, and Mertens (2020).

8.4 Implications for the PRC's Central Role in the Global Supply Chains

This section summarized the implications of the pandemic for the global value chains. The discussions here follow those in Fang and Yeung (2020). Since the PRC joined the World Trade Organization in December 2001, it has become the world's number one trading country and the world's factory. It is the center of the global supply chain (Bloomberg 2013). Fang and Yeung (2020) discussed how the COVID-19 pandemic may impact the reconfiguration of the global supply chain.

The starting point for any discussion on the global supply chain is the driving forces in a multinational's decisions regarding where to source their intermediate products and configure their production facilities in a global model. Prior to the COVID-19 pandemic, the primary driving force was simple: efficiency, efficiency, and efficiency. Digging into the details, many more specific considerations enter into the calculations. First and foremost, the ultimate goal of the global supply chain is to minimize costs, which include labor costs, the cost of transporting components for final assembly, and the assembly cost itself. From this perspective, it is not difficult to understand, or coincidental to observe, that the global supply chain has increasingly chosen to locate production in economies with abundant capable labor, convenient and efficient infrastructure, and lax environmental regulations. These locations are primarily those based in the PRC; Taipei, China; Viet Nam; and other Asian economies. Second, the global supply chain tends to locate production facilities in proximity to the consumers of the final products, which, as a result of the emergence of the huge middle class in the PRC and their purchasing power, further enhances the PRC as the leading destination for foreign direct investment. The PRC is also close to other successful economies in Asia with a large number of middle-class consumers. These factors combine to make the PRC the central link of the global value chain.

The robustness of the global supply chain to external shocks is part of the consideration. One of the most often repeated illustrations of the global supply chain is how Apple makes its iPhones, which are complicated products with numerous components. In fact, Apple sources its iPhone components from 200 suppliers from more than 800 production facilities located in many countries. Needless to say, with such a complex supply chain, Apple must judiciously manage a variety of risks to ensure smooth production of the iPhone. Before the COVID-19 pandemic, however, the typical risks under consideration by multinational corporations tended to be the more mundane risks, such as exchange rate risks and political stability, as well as natural

disaster shocks such as hurricanes and earthquakes, which can cause potential delays in the delivery of key components. Global value chain management is remarkably experienced and effective in handling these risks via techniques such as hedging, stockpiling of inventories of key components, and multisourcing.

Importantly, global pandemics were not considered an important source of disruption to the global supply chain. This is evident from a survey conducted by the Institute for Supply Chain Management in March 2020. It found that nearly 75% of surveyed companies reported supply chain disruptions in one form or another due to COVID-19-related transportation restrictions, and the figure was expected to rise further as the pandemic worsened. More shockingly, the survey also found that almost half of the companies did not have a contingency plan for their supply chain disruption.⁶ It is clear that the COVID-19 pandemic caught many firms that rely on efficient global supply chains for production off their guard.

There is no question that the COVID-19 pandemic significantly disrupted the global value chain, as is shown in Fang et al.'s (2020) analysis of the local job demands in the PRC in the previous section. The question is, then, how can COVID-19 reconfigure the global supply chain in the future, both in the short and medium run?

It should be pointed out that the ground under the global supply chain featuring the PRC at its center was already shifting before the COVID-19 pandemic. There have been both negative and positive developments. First, the PRC has witnessed a sharp rise in its labor costs since 2011 when the country reached the Lewis turning point both because of the depletion of the surplus labor from its agricultural sector and the rapidly changing demographics induced by the 3 decades of the one-child policy.⁷ The sharp rise in labor costs means that “Made in the PRC” is no longer cheap. Second, the environmental degradation and air pollution because of the decades of rapid economic growth with lax environmental regulations inevitably caught up in many metropolitan areas in the PRC. The public and the central government started to recognize the hitherto ignored environmental and health costs of pollution. The PRC central government has de-emphasized its singular

⁶ <https://www.instituteforsupplymanagement.org/news/NewsRoomDetail.cfm?ItemNumber=31171&SSO=1>

⁷ The Lewis turning point, named after Economics Nobel Prize Laureate W. Arthur Lewis, refers to the point in economic development where surplus rural labor has been fully absorbed into the manufacturing sector, and any further expansion of the manufacturing sector would cause the agricultural and unskilled industrial real wages to rise.

focus on GDP growth and started to advocate green and sustainable development as the mantra of the new growth model in the PRC. The PRC has started implementing ambitious goals of both pollution and carbon reduction. These changes mean that the environmental costs of production in the PRC, which were not considered in the race for the PRC to become the factory of the world, are now finally factored in as a part of the cost. The increase in labor costs and the inclusion of the environmental cost for producing in the PRC means that the PRC is no longer the cheapest place to produce. On the positive side, the purchasing power of the PRC's middle class finally became a reality. For example, the PRC is now the world's largest automobile market, and many multinational corporations are counting the PRC as one of the most important market for products. In fact, the PRC's consumer market is about to overtake the US as the world's largest market (Insider Intelligence 2020).

The rising labor costs in the PRC, however, do not mean that the global supply chain needs to leave the PRC. The PRC is a vast country with uneven development. It is true that the labor costs in the major manufacturing centers in the eastern and southern parts of the PRC have risen sharply in recent years, however the PRC's vast central and western provinces still have inexpensive labor and affordable living costs. The PRC also drastically improved its infrastructure, including highways and high-speed railways, in these areas, which makes them attractive production locations to serve both the PRC's and global consumers. Thus, it would have been a high probability that the global supply chain would shift, but mostly from the eastern and southern coastal areas to the central and western inland areas of the country. However, the trade war between the US and the PRC from 2018 injected geopolitical uncertainty into the picture. Many firms that were contemplating moving their production lines from coastal provinces to western PRC before the US–PRC trade war scaled back their move toward inland PRC provinces. Instead of moving their production facilities to the western or central areas of the PRC, they moved to Southeast Asian countries such as Viet Nam, Cambodia, and Indonesia, which now seemed to be a safer production location as a result of the US–PRC trade tensions. In the short run, the PRC may not feel a large impact yet, as it still enjoys many advantages such as agglomeration efficiency and superb infrastructure, but in the medium term the PRC cannot ignore the impact of the US–PRC conflicts on the global supply chain relocations. These factors were already serving to loosen the screws that held the PRC at the center of the global value chain, and then came the COVID-19 pandemic.

The COVID-19 pandemic, at first glance, seems to add further to the challenges to the dominant position of the PRC in the global supply

chain. The heightened awareness of the importance of the supply chain robustness would imply diversification of the supply chains. Diversification, given the PRC's current dominant position, would imply diversifying away from the PRC.

However, it should be noted that nations have not performed equally well in the fight against the pandemic. As discussed in Section 8.2, Asian economies, the PRC included, have been more effective at controlling the pandemic, although the effectiveness in different Asian economies is demonstrated differently. In particular, the PRC political system, which is more centralized, has shown its relative strength in controlling the pandemic. Once the government recognized that the virus was highly contagious, with a high mortality rate, the government enforced strict lockdowns of the country's epicenters, facilitated rapid mobilization of resources to assist the epicenters, and implemented technology-based tracing of interpersonal contacts to prevent new waves of outbreaks. Given its efficacy in battling this pandemic, or likely any future epidemic or pandemic, the impact of the pandemic on the desirability of the PRC as a central location for the global supply chains could, somewhat paradoxically, be positive because firms would obviously prefer to locate their factories in an area where disruption from the pandemic has a more limited duration.

Indeed, this argument is likely to be positive for the PRC. The COVID-19 pandemic has brought a new recognition of the importance of supply chain resilience or robustness, which is likely to lead to regionalism in organizing global supply chains. In other words, in response to the pandemic, the future global value chain will likely become multi-centered: with the factory of the world likely be replaced by having one factory for each region. Because currently the PRC is the factory of the world, the regionalism of global supply chains will inevitably diminish the centrality of the PRC in the global value chain.

Ultimately, the PRC's role in the global supply chain will be shaped by a multitude of forces including the increasing middle class, rising labor costs, the new emphasis on environmental protection and carbon neutrality in the PRC, and the pandemic-induced emphasis on supply chain resilience. The first and the last of the above forces tend to strengthen, while the other forces tend to weaken, the central role of the PRC in the global supply chain.

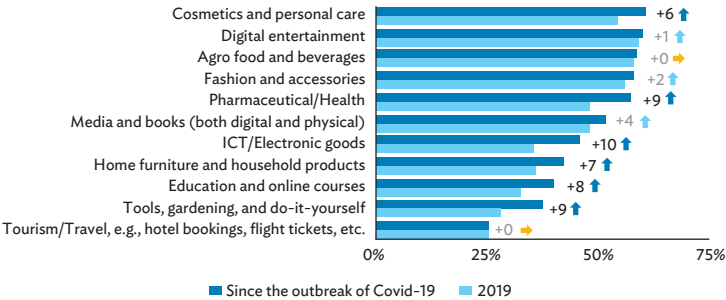
One may wonder how the global supply chain repositioning may be related to the recent shortage of semiconductor chips. The recent severe shortages in semiconductor chips are largely driven by short-term surge in demand, and the chip suppliers' difficulty in ramping up production in the short run. The surge in demand for chips comes from all sectors and all countries including China. First, many firms, particularly automobile manufacturers, pulled back their production, while other sectors such

as laptops, appliances etc. ramped up their production, during the pandemic. The auto manufacturers lost their place in the queue of chips as a result when they decided to ramp auto manufacturing this year. Second, chips are being used in more products and applications than ever before. Third, the recent production/export constraints imposed by US on China have also led to some degree of stockpiling, further contributing to the shortages. On the supply side, installing a new chip production line is extremely costly and typically takes two to three years to complete. The misalignment of demand and supply, not so much the shifting of global supply chains, is the main reason for the recent shortages of semiconductor chips.

8.5 Digitization and the Implications for SMEs

As households are holed up in their homes to avoid being exposed to the coronavirus, online shopping and e-commerce have increasingly become the choice for consumers to maintain business activities, social interactions, and consumption in times of strict preventive measures such as lockdowns. For businesses, digital technologies, online platforms, and smartphone apps, offer alternative channels to connect with their consumers. E-commerce giants such as Amazon, Walmart, Alibaba, and JD.com have become more dominant than ever. The COVID-19 pandemic may have changed online shopping behaviors forever, both in emerging and developed economies.

Figure 8.3: Percentage of Online Shoppers Making at Least One Online Purchase Every 2 Months



ICT = information and communication technology.

Source: UNCTAD and NetComm Suisse eCommerce Association (2020).

A survey conducted by the United Nations Conference on Trade and Development and the Netcomm Suisse eCommerce Association of about 3,700 consumers in nine emerging and developed economies⁸ examined how the pandemic has changed the way consumers use e-commerce and digital solutions. The survey found that, since the onset of the pandemic, more than half of the respondents now shop online more frequently and rely on the internet more for news, health-related information, and digital entertainment. On average, online purchases have increased by 6 to 10 percentage points across most product categories. The biggest gainers are information and communication technology and electronics, gardening and do-it-yourself products, pharmaceuticals, education, furniture and household products, and cosmetics and personal care categories (Figure 8.3).

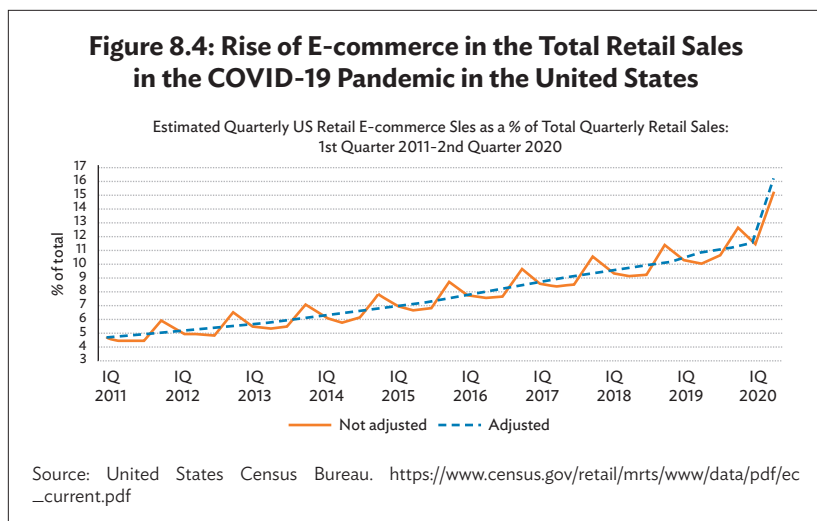
The survey also found that the increases in online shopping during the COVID-19 pandemic differed among economies, with the strongest rise noted in the PRC and Turkey, and the weakest in Switzerland and Germany. The transition of emerging economies from the more traditional in-person shopping is being rapidly accelerated by the pandemic. E-commerce giants such as Alibaba and JD.com in the PRC, as well as the online food-ordering websites such as Meituan.com, have strengthened their dominant market position in online shopping and food delivery services. The survey also suggests that changes in online activities will have long-lasting effects even after the end of the pandemic, as most respondents, especially those in the PRC and Turkey, said they would continue shopping online and focusing on essential products in the future.

The US was not part of the survey, but the picture of the rising importance of e-commerce in its total retail is similar.⁹ The most recent quarterly figure released by the US Department of Commerce showed that consumers spent \$211.5 billion online during the second quarter of 2020, which was up 31.8% from the first quarter. In the US, the first COVID-19 case was confirmed in the state of Washington on 21 January 2020; since then the daily number of confirmed cases has grown exponentially, with no end in sight at the time of writing this review. Note that from mid-March 2020, more than 70% of the US population was under some form of lockdown restrictions, and most of the bricks-and-mortar shops that are considered nonessential were closed under the lockdown restrictions. As a result, many consumers turned to

⁸ The nine countries are Brazil, the PRC, Germany, Italy, the Republic of Korea, the Russian Federation, South Africa, Switzerland, and Turkey.

⁹ US Census Bureau. https://www.census.gov/retail/mrts/www/data/pdf/ec_current.pdf

online retailers for essential goods like paper towels and hand sanitizer, which also led to an uptick in purchases of things like office supplies and electronics. Online grocery orders also surged as many consumers opted to skip trips to the supermarket. It can be seen from Figure 8.4 that e-commerce now accounts for 16.1% of all US sales, up from 11.8% in the first quarter of 2011. This illustrates that the pandemic has led to more spending online in the US.



Even as many businesses reopened their doors in July 2020, the July Census data showed that online shopping has continued to attract among consumers. This is consistent with the findings of the consulting company Kantar, which found that more than half of millennials and Gen Z consumers surveyed stated that they believed their lockdown habits would continue post-pandemic.

While many retailers quickly adapted to the pandemic environment and made their presence felt in the online retail space, the major retailers like Amazon, Walmart, and Target, have benefited the most from the rapid shift to e-commerce during the pandemic. E-commerce enjoys important network effects. The larger the platform, the more likely a consumer is to find the products they want. A larger online retailer can also negotiate better procurement prices for its products. Moreover, larger and more established retailers have more data about

their customers, which gives them an advantage over smaller online competitors. The larger retailers can also invest more in warehousing, automation, and shipping, which gives them a further advantage over their competitors. Given the survey findings that the online shopping habits formed during the pandemic will likely persist, the bricks-and-mortar stores will face significant barriers in their recovery after the pandemic is over, even for those who manage to survive the prolonged losses of revenue from the pandemic.

Given the distinct economies of scale and network effects in e-commerce, leveling the playing field for SMEs against the e-commerce giants is more important than ever. The big platforms have further consolidated their market dominance during the pandemic, and if unchecked, a large proportion of SMEs is unlikely to survive in the post-pandemic economy. These considerations suggest that government has an important role in supporting SMEs' drive for digitization; for example, the government can provide a public option of affordable cloud services and anonymized data warehouses that all firms can access, among others.

8.6 Recovery and Government Policies

Asian economies have been more successful than the US and Europe in controlling the COVID-19 pandemic, although all countries remain extremely vigilant in guarding the hard-won victory against the novel coronavirus. Several vaccines are now approved for emergency use authorizations and a growing fraction of the population is being vaccinated; the world is finally on a path to return to pre-pandemic normalcy. For the economies that have successfully wiped out the virus or limited the virus to no more than isolated “bubbles” (see Section 8.1 for discussions about strategies for doing so), economic recovery will take center stage. This section reviews some of the government policies.

In the US, the government's main COVID-19 stimulus bill is the Coronavirus Aid, Relief, and Economic Security (CARES) Act, which was signed into law on 27 March 2020, shortly after a large part of the US was locked down. This \$2 trillion stimulus bill is the largest ever in US history and provides government funding to support large and small businesses, industries, individuals and families, gig workers and independent contractors, and hospitals.¹⁰

¹⁰ A second round of the COVID-19 Economic Relief Bill, with a total package of \$900 billion, was signed at the end of December 2020.

The main stimulus for small businesses in the CARES Act is the \$659 billion Paycheck Protection Program (PPP). The PPP is administered by the Small Business Administration (SBA), and it is intended to provide loans to businesses to guarantee 8 weeks of payroll and other costs to help those businesses remain viable and allow workers to pay their bills. In addition, the CARES Act also authorized a \$500 billion fund for loans to large business, overseen by an inspector general and a congressional panel.

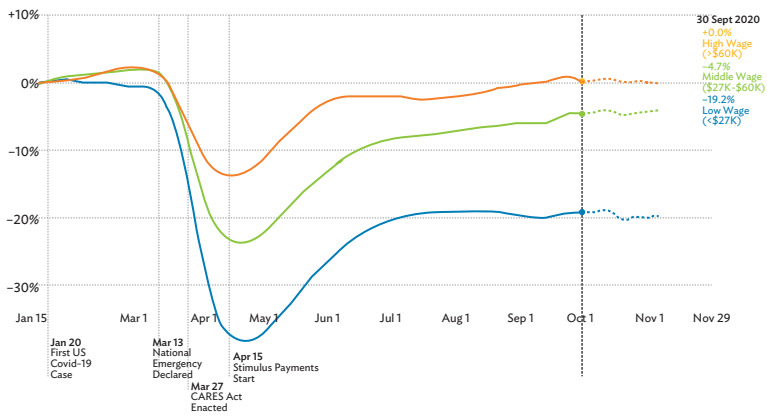
There are two major components in the CARES Act, which provides income support to households. The first is the Pandemic Unemployment Insurance, which extends both the eligibility and the benefit amounts for unemployment related to the current emergency. The plan dramatically expands the eligibility for unemployment benefits to include people who are furloughed rather than laid off, gig workers, and freelancers, and increases the unemployment insurance benefits by \$600 per week for a period of 4 months. The plan extends the duration of regular unemployment benefits from the normal 26 weeks to as long as 39 weeks for affected workers. The second support targeting households creates a tax rebate of \$1,200 per taxpayer plus \$500 per child. The amount of the rebate is gradually reduced for incomes above \$75,000 per year for individuals, \$112,500 for heads of households, and \$150,000 for joint filers.

Another major component of the CARES Act provides support to industries that are hardest hit by the pandemic, including over \$130 billion to hospitals, healthcare systems, and providers and cash grants of \$25 billion for airlines (in addition to loans), \$4 billion for air cargo carriers, and \$3 billion for airline contractors (caterers, etc.) for payroll support.

To assess the impact of the COVID-19 pandemic and the unprecedented government stimulus packages on the economy, Chetty et al. (2020) created a real-time economic tracker using anonymized data from several private companies, such as credit card processors and payroll firms, to construct statistics on consumer spending, employment rates, and other indicators by county, industry, and (precrisis) income level, and assess how the pandemic has impacted consumption and employment at an unprecedented granular level. They also used these data to assess how government policies have impacted the recession and recovery.

Chetty et al. (2020) found several useful insights into how the pandemic induced recession in the US. First, the pandemic resulted in sharp reductions in employment in all income groups, but the low-wage workers were hardest hit; for high-income workers their

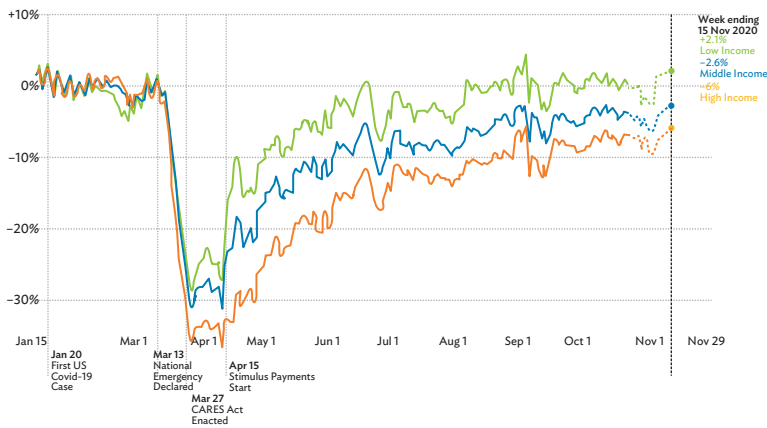
Figure 8.5: Changes in Employment Rate by Income Group in the United States



CARES = Coronavirus Aid, Relief, and Economic Security.

Source: Opportunity Insights. Economic Tracker. <https://tracktherecovery.org> (accessed 15 November 2020).

Figure 8.6: Changes in Consumption by Income Group in the United States



CARES = Coronavirus Aid, Relief, and Economic Security.

Source: Opportunity Insights. Economic Tracker. <https://tracktherecovery.org> (accessed 15 November 2020).

employment rate has already fully recovered to the pre-pandemic lockdown level, but the low-wage workers' employment rate is still 21% lower than the pre-pandemic level (Figure 8.5). Second, in terms of consumption, most of the reduction resulted from reductions by high-income households. As of 31 May 2020, two-thirds of the total reduction in credit card spending since January had come from households in the top 25% of the income distribution. Meanwhile, households in the bottom 25% continued to spend at the same levels they had before the crisis, as illustrated in Figure 8.6. They also found that high-income households cut spending primarily because of health concerns rather than a loss of income or purchasing power. Spending fell most on services that require in-person interaction and thereby carry a risk of COVID-19 infection, such as transportation and food services. The cut in spending by high-income households led to large job losses in the service sector in high-income zip codes. Third, by comparing the trajectory of early-opening states to similar states that remained closed, they found that reopening increased spending and revenues only modestly. This finding suggests that the fear of COVID-19 itself, rather than government orders restricting business activity, was the primary cause of reduced economic activity and job losses. Fourth, they found that stimulus payments increased spending substantially, especially among low-income households. But they did not lead to large gains for the businesses most affected by the crisis or to increases in employment. They found that the nearly \$300 billion in direct payments to households allocated in the CARES Act, the majority of which arrived on 15 April 2020, increased spending sharply and immediately following these deposits, especially among low-income households. However, they found that most of the additional spending induced by the stimulus went on goods that require no in-person contact (e.g., orders of durable goods). The businesses most affected by the crisis, in particular, small businesses in the service sector in affluent areas, received relatively little of the revenue from this surge in consumer spending. As a result, employment growth has significantly lagged spending growth, leaving employment rates recovering at slow rates, especially in affluent areas. Fifth, they found that the \$500 billion PPP loans to small businesses had little impact on employment rates. In order to be eligible for PPP loans, firms must have fewer than 500 employees. By comparing the employment patterns at firms above and below the 500-worker eligibility cutoff, they found that both hours worked and changes in payroll were very similar for smaller and larger firms, implying that the PPP has had little effect on small business employment to date.

In the PRC, after the pandemic was brought under control in mid-March 2020, local governments introduced some innovative policy tools, namely “consumption coupons”, in order to stimulate consumption to kick-start retail spending. As of 4 June 2020, more than 210 cities had issued more than CNY34.5 billion worth of digital consumption. Liu et al. (2020) studied the effectiveness of such consumption coupon stimulus programs. The program is novel in that it departs from other commonly adopted fiscal stimulus programs such as cash payments or tax rebates in several salient ways. First, the coupon typically takes the form of saving with a certain amount of spending, e.g., “spend CNY40, get CNY10 off,” and hence has the nature of “use-it-or-lose-it.” Second, unlike the previous government-initiated shopping coupon programs, which involve a relatively large coupon amount in hundreds of dollars and a redemption period of several months, this coupon program was carried out with a small amount per voucher and typically a much shorter duration of 1 or 2 weeks. For example, Liu et al. (2020) evaluated the effectiveness of the coupon program rolled out in the city of Hangzhou in Zhejiang Province on 27 March 2020, where the coupon packet is valued at CNY50 (\$7) with five separate “spend CNY40, get CNY10 off” vouchers, and is only valid for 7 days. In this case the government subsidy is CNY10 per voucher, conditional on redemption. Third, the method of disbursement of the coupons is unconventional in that the coupons are distributed through major mobile payment platforms.

The key idea for the consumption coupon stimulus program is to leverage the subsidy from the government to generate more consumption. However, whether such a program can generate a “fiscal multiplier” effect is an empirical question. Theoretically, if the subsidy was used to purchase only necessity goods, the government coupon program may not even generate any additional consumption; but if the subsidy pushes the consumers to purchase goods that they otherwise would not have purchased, then the subsidy could generate a large multiplier effect. Liu et al. (2020) used high-frequency transaction-level data on more than 1 million deidentified consumers and exploited a difference-in-differences approach to estimate the causal effects of the program on consumption; they found that an effective government subsidy of CNY1 can drive excess spending of CNY3.4 to CNY5.8. This multiplier effect is an order of magnitude larger than those estimated in the literature. This suggests that such an innovative government stimulus program can be much more effective in stimulating consumption than traditional cash transfers.

8.7 Conclusion

The COVID-19 pandemic presented an unprecedented shock to the global health and global economy. Asian economies were among the earliest epicenters of the epidemic, but they also demonstrated more effectiveness in controlling the spread of the virus. In this essay, we review some of the rapidly growing literature on how the pandemic impacted the labor market, both in the labor demand and in how work is performed during the pandemic; we also discussed the implications of the pandemic for the reconfiguration of the global supply chain, the digitization of retailing, and various government policies to stimulate the economy during the pandemic.

The COVID-19 pandemic will likely end with the development and rollout of one or more effective vaccines. However, its impact on how our economy operates, namely the digitization of retail commerce, the virtualization of business meetings and conferences, the widespread work-from-home arrangement, and the reconfiguration of the supply chains, among others, is likely to stay with us. Small and medium-sized businesses lacking the technical resources of the large companies, are vulnerable to these rapid changes in how the economy operates. Government policies must display full awareness of these challenges faced by SMEs in order to prevent large internet giants from becoming the inefficient monopoly. The pandemic is also likely to further exacerbate income inequality in the economy, especially between the rural and urban areas, and between the highly educated and less educated. Governments around the world must take concrete measures to address the worsening inequality due to the COVID-19 pandemic.

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