

Effect of Rising Cost and Worker Shortage on Industry

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Abstract

COVID-19 pandemic has affected technology, manufacturing, healthcare, education, tourism, and other service industry globally as well as in the US. The pandemic has caused supply chain disruption, chip shortage, worker shortage, etc. Nowadays chips aren't used in computers and smartphones only, but in automotive and various other products. In response to the pandemic, the US government has issued stimulus packages to help workers, employers, and economy. All this has resulted in an increase in inflation and cost. Workers are retiring or changing jobs for higher wages which has created another issue, i.e. workers with tribal knowledge are leaving the industry they used to work with. Now industry not only needs to hire replacements but also train them for right qualifications in order to keep up with productivity. On the positive side, the US government is investing in chip manufacturing in the US which goes in line with the Made in America effort, making policies to help global supply chain to reduce backlogs, and pushing for vaccine mandate. As a result, manufacturing, tourism, and service industries are returning gradually to the pre-pandemic level.

Keywords

COVID-19, chip manufacturing, worker shortage, supply chain disruption, and tribal knowledge.

1. Introduction

Since the start of the COVID-19 pandemic in early 2020, many sectors such as healthcare, education, etc. have been affected (Ferdous et al., 2021, Bhandari et al., 2021). The pandemic has left its footprint in every sector: technology, manufacturing, healthcare, education, hospitality/tourism, and other industry (ASEE, 2021; NPR, 2021). One of the biggest concerns caused by the pandemic is worker shortage in manufacturing, healthcare, hospitality, and other service industry globally as well as in the US. Another concern is chip shortage which is making a challenge to have the production of many items on-time such as automobile (Wu et al., 2021). Nowadays chips aren't used in computers and smartphones only, but in automotive and various other products. Further, the pandemic has created supply chain disruptions all over the world. Another concern is the inflation which is causing the rising cost of commodities. Worker shortage, supply chain disruption, and rising costs – all are interlinked and causing an unprecedented situation all over the world.

US government in 2020 and 2021 provided economic impact payments such as stimulus checks, child tax credits, unemployment benefits, etc. to public. It allowed more cash inflow to help economy. At the same time, workers became reluctant to find jobs because of having enough cash from government benefits. Many workers became sick due to the pandemic too. In addition, workers are leaving companies in order to find jobs with higher wages. Thus companies are losing workers who had tribal knowledge (Lin et al., 2016), and new workers are not filling in all the vacancies. This is also causing the disruption in supply chain. All these events have contributed toward skyrocketing of the prices of commodities which is described with a common term called 'inflation'.

1.1 Objective

In this paper, we will summarize the key effects that have been reported of COVID-19 on major public and private sectors. To address these disruptions, a re-evaluation of the long-standing operations management practices and production strategies in a global economy and supply chain setting is deemed inevitable. The ultimate solution lies with better employee training that both increases productivity of the current workers and minimizes the impact of labor force fluctuation.

2. Demand of Chip and Chip Shortage

The influence of electronic devices is enormous in daily life. Cell phone, laptops, calculator, and many households are equipped with electronic devices. As an example, more than one hundred electronic chips are required in modern cars because of vehicle sensing and control needs. Besides that, the electronic chip facilitates power management, data storage, healthcare and medical device, manufacturing, defense, energy and many other sectors. The demand of chips in 2020, based on the end use, is shown in Figure 1.

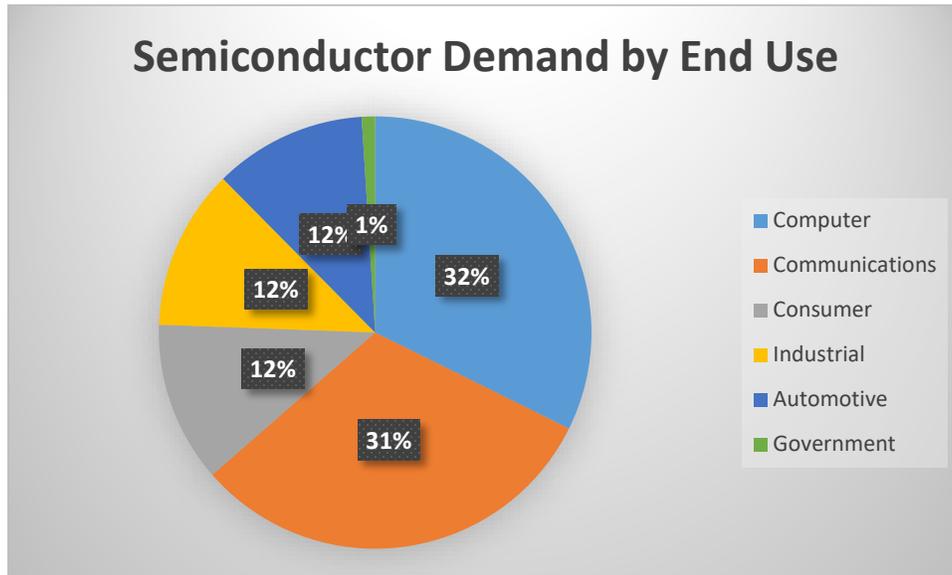


Figure 1. 2020 Demand of chip according to end use (SIA, 2020)

The demand of chip has increased enormously in computer based industry as many schools and offices have been conducting their activities online during the pandemic. In addition, new demands have been created for remote healthcare, medical devices, Covid testing and tracing, etc. The demand was initially dropped for a short time at the beginning of the pandemic in January 2020 but bounced back substantially which was unanticipated. Sales growth was higher in recent trend as shown in Figure 2.



Figure 2. Monthly chip sales growth of major consumers (Source: SIA, 2020)

Currently, the chip manufacturing companies are struggling to meet the high demand because of many reasons including manufacturing facilities, worker shortage in industry, disruption throughout the supply chain, etc. Many countries went in lockdown during pandemic which interrupted the semiconductor supply. Again, the chip manufacturing capacity has been reduced in USA from 37% to 12% within last 30 years as shown in Figure 3. Now-a-days, almost 75% of the chip manufacturing capacity is concentrated in East Asia. Thus, the manufactured chips need to be transported to many desired locations throughout the world. Because of the lockdowns and different situations in different countries, the supply chain is disrupted. The increasing demand also sky-rocketed the prices of consumer products. Because of the supply chain disruption yielding chip shortage, the US government is investing in tech-manufacturing to boost chip-making in the US (ASEE, 2021).

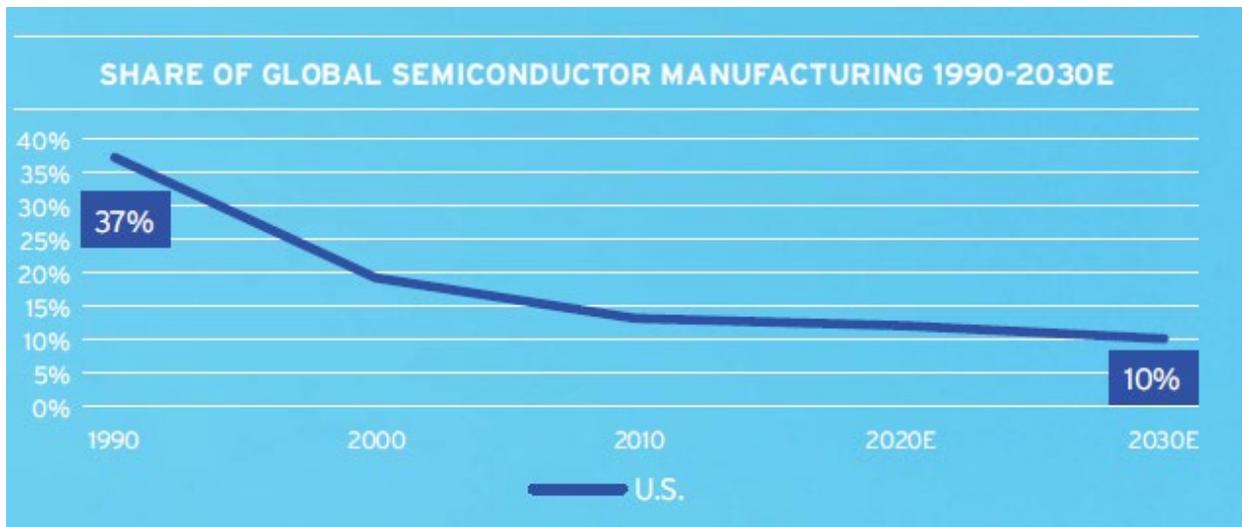


Figure 3. Global chip manufacturing capacity (source: SIA, 2020)

2.1 Chip Shortage in Automobile Industry

Modern cars highly depend on chip because of many safety and other important features. But the pandemic prevention measures such as lockdowns, flight controls, etc. disrupted the shipment and supply chain. So, the chip makers also reduced their capacity to harmonize the supply chain problems. As a result, sales of automotive chips had reached the bottom in April and May, 2020 (Wu et al., 2021) as displayed in Figure 4. Unit on the y-axis is % whereas x-axis shows the months.



Figure 4. Monthly sales of automotive chip in 2020 (source: Wu et al., 2021)

Chip manufactures have moved their resources to other consumer products as the demands of laptops, mobile phones, computers, tablets, etc. have skyrocketed because of the online schools and offices. At the same time, unemployment benefits, stimulus checks increased the purchasing ability of buyers. All these created unexpected swing in market demands of consumer products. As the economy received unexpected cash flows and demands despite of safety measures for covid, the prices have skyrocketed. The demand of cars has also increased, the car companies have struggled to get chips for them as the chip makers already allocated their resources for other consumer products. Now, it requires a substantial effort to allocate new resources such as technology, manufacturing facility, and trained workers.

3. Worker's Shortage

Workers are leaving companies either to save themselves from COVID-19 or to find higher-wage jobs (NPR, 2021). This has created a vacuum of workers who had tribal knowledge about specific products or services in a particular company (Lin et. al, 2016). In November 2021, a record 4.5M workers in the US left their jobs. This is because there are more job openings in the labor market than those who are searching for jobs (ASEE, 2022). This may be a sign that the job market is recovering from the first year of recession (i.e., year 2020) due to coronavirus. This has created an opportunity for workers to ask for better pay and improved work-environment.

Qualified workers are necessary for a better productivity rate (Freivalds and Niebel, 2013). One of the classical operations management strategies is the so-called learning curve strategy/experience curve strategy, where it is recognized that the production costs decline as workers gain more experience with the requirements of a particular process or the process is improved over time (Nahmias, 2009; Newnan et al., 2020). This justifies the necessity to train new workers at the earliest, and with proper tools (Freivalds and Niebel, 2013). Since workers want to leave for higher wages, they are also thinking of getting additional certifications or two-year college degrees. This is where quality education and affordability come into play (Shahhosseini et al., 2020). Employers like Macy's, Chipotle, Walmart, etc. are increasing benefits in the form of free tuition to its employees (NPR, 2021). This serves as an investment in employees as well as a good PR. Local, state, and federal governments and private industries are pushing for vaccine mandates. As vaccination helps fight or reduce the pandemic effect, the vaccine mandate will make improve the worker shortage crisis.

4. Supply Chain Bottleneck

As mentioned before, the pandemic has affected workers as well as manufacturing, shipping, and other service industries. This has led to the bottlenecks in the supply chain (NPR, 2021). The US government is discussing with international countries to resolve the global supply chain bottlenecks. The government is looking into making policies that will minimize or prevent such supply chain issues.

5. Rising Cost

All the aforementioned issues: manufacturing, lack of workers, and supply chain disruptions all are interlinked. These plus stimulus checks due to COVID-19, child tax credits, and almost zero interest rate all have contributed to the rising cost or inflation. It's estimated that the inflation reached above 6% in 2021 which is the highest in 40 years or so (NPR, 2021). This has added pain to making ends meet for workers who can't leave their current jobs because they are in sectors where demand isn't such great. For such workers rising prices pose additional hardship (ASEE, 2022). The Federal Reserve is considering increasing interest rate and other measures to reduce the inflation to the range of 2%.

6. Conclusion

The pandemic has affected all sectors: public and private, manufacturing and leisure, healthcare and education, and other service industries. Although there have been a few studies in the last two years on the economic impact of COVID-19, we emphasize the significance of the loss of tribal knowledge due to the workforce disruption, and the importance of preserving such knowledge for training new employees to maintain productivity. Many factors, which include but are not limited to supply chain issues, labor shortage, government's COVID-19 relief programs, contribute to the rising production and consumer costs. The pandemic has challenged both scholars and industry to revisit many decade-long operations management practices and production strategies, and to propose new ideas to balance efficiency and flexibility, not just at the individual business level but also national level, in a global economy. It seems vaccines and boosters combined with vaccine mandates will help navigate through this pandemic.

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