Why is there a shortage of semiconductors?

The shift to working from home has created a surge in demand for electronics

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CAR MANUFACTURERS need more chips. A shortage of semiconductors is delaying production lines. Ford, General Motors and Fiat Chrysler (now merged with PSA under the name Stellantis) are among the firms that have temporarily shut factories this year. The scarcity of silicon components has caused a slowdown that will delay production of almost 1m vehicles in the first quarter of 2021, according to IHS Markit, a data firm. But it is not just carmakers that are hurting: Microsoft, Nintendo and Sony are running out of semiconductors for their gaming consoles. Samsung, one of the world's leading chip manufacturers, has warned that smartphones could be affected. Joe Biden, America's president, has signed an executive order mandating a review of critical supply chains, including that for semiconductors. Why is the world running low on chips?

The semiconductor industry is notoriously cyclical: gluts and shortages are not uncommon. But the pandemic has

magnified the problem. Workers stuck at home rushed to buy kit. Personal-computer sales rose by 11% last year, the highest growth in a decade, according to Canalys, a research firm. Data-centre demand spiked as people turned to video-calling, video-streaming and video gaming. The car industry slashed sales forecasts during the first lockdowns then boosted them again as vaccines were developed. Other events have compounded the problem. Microsoft and Sony launched a pair of new video-game consoles, placing bumper orders with big chipmakers. With the soaring price of cryptocurrencies, "miners" have been willing to pay inflated prices to get their hands on certain kinds of chips useful for minting new digital coins.

Supply, meanwhile, has been running flat-out. Asian chip foundries did not shut even during the first wave of covid-19. South Korea and Taiwan registered few deaths and avoided stringent national lockdowns. Even Chinese factories stayed open. In Wuhan, where the virus was first discovered, employees at semiconductor plants continued working in hazmat-style suits. But adding more capacity is not easy. State-of-the-art plants, used to make cutting-edge chips for smartphones and games consoles, cost tens of billions of dollars to build. Even cheaper factories designed to use older technology rely on specialised equipment available from only a handful of suppliers. The car industry, used to working with flexible "just-in-time" supply chains, seems to

have been caught out particularly badly.

The shortages have boosted the political salience of an industry that was already in the spotlight thanks to America's technological cold war with China. Around 80% of the world's chip-making capacity is in Asia. As the costs of keeping up with the technological Joneses have spiralled, the number of firms able to offer the most modern technology has fallen, from nearly 30 at the turn of the century to just two now: Samsung, based in South Korea, and TSMC, headquartered in Taiwan. Sensing an opportunity, American chipmakers have stepped up a lobbying campaign for subsidies to boost the industry at home and minimise reliance on Asia. Twenty EU member states have pledged to increase the continent's semiconductor production through their covid-19 recovery plans. Meanwhile, those benefiting from the supply crunch are trying to make the most of their position. TSMC plans to spend $28bn on new factories next year. Taiwan's chief trade official says Western governments will no longer be able to "ignore Taiwan" under pressure from mainland China.

Car companies are belatedly trying to boost their resilience. In the short term, stockpiling of whatever parts are available risks making the shortages worse for everyone else. In the longer term, managers are considering how to shorten supply chains, or even whether they can buy chips directly

from manufacturers. Some are doing better than others. Toyota pioneered just-in-time supply chains half a century ago. But after the Tohoku earthquake and tsunami in 2011 (which, among other things, caused the nuclear disaster at Fukushima), it began to build stock and pay more attention to supply chains. It appears to have paid off. This month the company raised its full-year earnings forecast by more than 50%.