Carmakers and semiconductors  
Pinned by chips  
Carmakers are rethinking supply chains for the electric era  
1.The sudden unavailability a decade ago of cars in “tuxedo black”, “rugged brown” or “royal red” highlighted the vulnerability of the industry’s global supply chain. The abrupt closure of the only factory making a vital pigment because of its proximity to the tsunami-hit Fukushima nuclear plant in Japan affected most of the world’s big carmakers. A side-effect of a global pandemic has denied carmakers a more vital component.  
2.A shortage of semiconductors has left car firms unable to install the electronics that control entertainment systems, safety features and driving aids. Many have cut assembly-line shifts. Some have temporarily closed factories. Ferdinand Dudenhöffer of the Center Automotive Research, a German think-tank, reckons the bottlenecks will dent forecast worldwide production in 2021 by 5.2m cars, to 74.8m.  
3.Ford’s net profit fell by half in the second quarter, year on year, mainly owing to the chip crunch. Jaguar Land Rover expects sales in the three months to September to be 50% lower than planned. On August 3rd Stellantis, created by the merger of Fiat Chrysler and psa, which owns Peugeot and Citroën, said it would make 1.4m fewer cars in 2021 than expected. (A big Stellantis shareholder is a part-owner of The Economist’s parent company.) The next day General Motors warned the chip crunch will weigh on results in coming quarters. Though car bosses agree the worst is over, shortages are likely to dent output in 2022.  
4.Expecting weak sales, in 2020 carmakers pared back orders of electronics, and then underestimated the rapidity of recovery this year. When the pandemic boosted demand from makers of electronic devices for those locked down at home, car firms found themselves low in the semiconductor pecking order: although they spent $40bn or so on chips in 2019, that accounted for only a tenth of global demand.  
5.Established car firms also long ago outsourced development of most technology, including electronic subunits, to big suppliers. These “tier 1” suppliers, such as Germany’s Bosch or Denso of Japan, buy circuit boards and microcontrollers to make components from suppliers in the next tier down, which in turn buy semiconductors from chipmakers. This has kept chip firms and car firms at arm’s length. Deloitte, a consultancy, talks of a “lack of visibility up and down the value chain”.  
6.Carmakers’ initial response has been to make more vehicles that require fewer chips, or to use the scarce resources to build their most profitable models. In the long run, the changing nature of the car will force them to think more creatively. Fully electric cars are packed with twice as many chips by value than fossil-fuelled ones, says kpmg, another consultancy. As Pedro Pacheco of Gartner, yet another firm of consultants, points out, software will become a significant source of profits as cars move from a disparate collection of chips to a centralised “brain” connected to the internet that can be updated remotely. In 2019 Tesla made an average of nearly $1,200 per vehicle from selling software updates, Mr Pacheco notes.  
7.To ensure that the hardware woes don’t stymie this ambition, carmakers may need to take another leaf from Tesla’s book. The Californian firm has been designing its own chips since 2016, which lets it launch new software-enabled features quickly. Volkswagen’s boss, Herbert Diess, has said that the German giant will develop its own chips and software for autonomous driving: “Software and hardware have to come out of one hand.”  
8.For now Volkswagen would like closer relations with chipmakers. So would its rivals. Few have the resources—or inclination—to design chips. Some will still need help developing their own software. Big suppliers, fearful of losing out as carmakers cosy up to chip firms, are being forced to up their game. Bosch, the world’s biggest car-parts maker, has invested €1bn ($1.2bn) in a factory that will start to produce advanced chips for cars later this year. A hiccup over paintwork is one thing. As the industry braces for a more electric and electronic future, it can ill afford to leave its fate in someone else’s hands.