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European auto sector: the EUR100bn cost of missing chips

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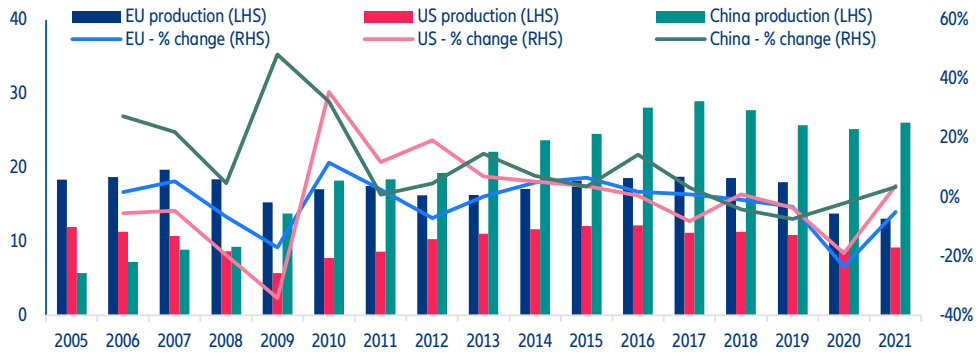
EXECUTIVE SUMMARY

- The automotive industry has been the number one casualty of the global semiconductor crunch: We estimate that it led to a shortfall of about 18mn vehicles around the world.
- Europe's automotive sector has been hit the hardest, and its weak semiconductor sector did not help. We estimate that the semiconductor crunch will cost Europe about EUR100bn over 2021 and 2022.
- As vehicles will only get more 'semi-intensive', the automotive sector will need policy support to avoid more losses in the future. However, support should focus on segments where Europe is both a large manufacturing and final market, i.e. automotive and not consumer electronics.

The global automotive chip shortage has created a shortfall of 18mn vehicles.

The automotive industry has been the number one casualty of the global semiconductor crunch. Bracing for tough times at the beginning of the pandemic, carmakers and automotive suppliers responded with deep cuts in semiconductor inventories and orders. As demand for cars recovered faster than expected in the second half of 2020, the industry discovered that chip manufacturers had reallocated production capacities to end-markets with booming demand, such as computers and data centers, leaving little capacity for the automotive sector. Nearly two years on from the first signals of a semiconductor shortage, car production remains far below its 2019 level, with a cumulated production shortfall of over 18mn vehicles globally. The situation has been comparatively worse in Europe where, unlike in China or North America, vehicle production fell to an unprecedented low of 13mn vehicles in 2021 (Figure 1). After signs of improvement in late 2021 and Q1 2022, the production recovery was again held back by additional supply-chain tensions caused by lockdowns in the wider Shanghai region and Russia's invasion of Ukraine.

Figure 1: Vehicle production (mn units, % change)

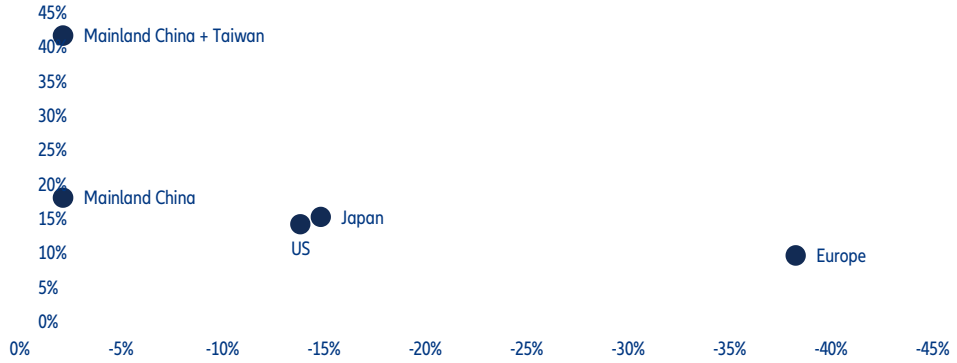


Sources: OICA, Allianz Research

European car production has suffered from the region's tier two position in chip manufacturing.

While the underlying reasons for lower car production globally are common to all regions, we observe significant dispersion in regional performance. Comparing resilience in car registrations with mature semiconductor manufacturing capacities at a regional level, we observe a positive and strong correlation (Figure 2), underlining how critical local chip production is to automotive-production resilience. Europe's vulnerability is even more frustrating because the production of most automotive chips relies on well-established manufacturing technologies. Unlike the computing or memory chips found in smartphones and computers that use the most cutting-edge manufacturing technologies ("nodes") found only in Taiwan and South Korea, automotive chips rely on mature nodes introduced in the 1990s and 2000s.

Figure 2: Share in global mature* semiconductor technology manufacturing capacities (%, vertical scale) and change in passenger car sales (2021-2022 average vs 2019, %)



*Sources: IC Insights, ACEA, Wards, CAAM, JADA, Allianz Research calculations. *Nodes above 40nm*

Chip shortages have cost nearly EUR100bn in lost value added in Europe in 2021 and 2022.

How much has the shortage-induced slump cost the European economy? To find out, we measure lost production by comparing 2021 and 2022 production to 2019 levels. Given the strength of overall consumer spending on goods over the period, we would have expected demand to be similar to 2019 if supply had allowed for it. To convert lost production into lost value added, we then compute the average value added generated for every car produced in Europe.

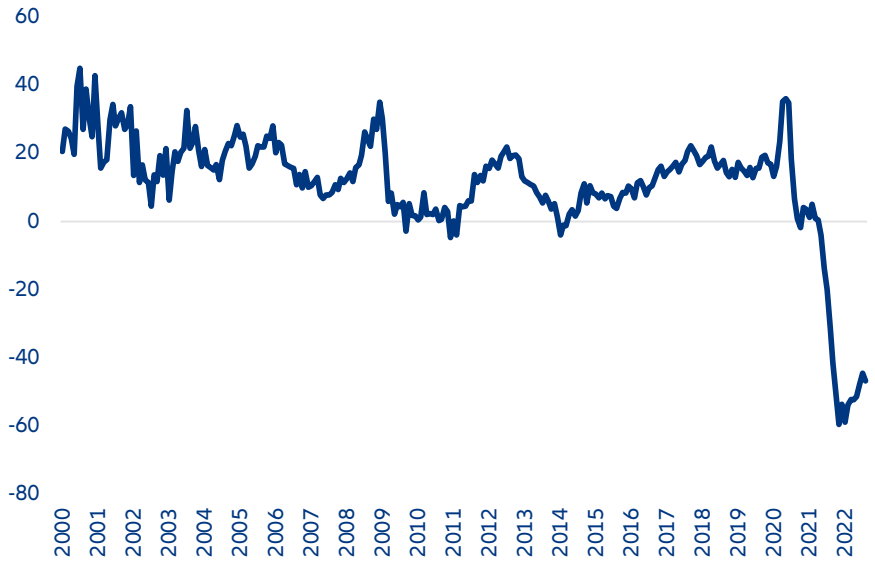
Our calculations show that more than EUR50bn was lost in 2021 already, the equivalent of 0.4% of the region's GDP. Assuming European production recedes by another -1% in 2022, another EUR47bn could be lost, making it a total of EUR98bn. Germany has faced the largest hit (EUR47.5bn in value added lost over 2021 and 2022) because its automotive sector represents a larger share of value added overall. On the bright side, historically low inventory levels at retailers suggest that there could be a large upside potential if production resumes in 2023.

Table 1: Estimated lost automotive value added (bn euros and % of GDP)

	2021 lost automotive value added (bn EUR)	2021 lost automotive value added (% of GDP)	2022 lost automotive value added (bn EUR)	2022 lost automotive value added (% of GDP)	2021+2022 losses (bn EUR)
EU 28	51.1	0.4%	47.1		98.2
France	3.5	0.1%	3.8	0.1%	7.2
Italy	3.3	0.2%	3.2	0.2%	6.4
Germany	25.3	0.7%	22.3	0.6%	47.5
Spain	3.2	0.3%	3.2	0.3%	6.3
Poland	1.4	0.2%	0.9	0.1%	2.2
UK	3.4	0.1%	3.4	0.1%	6.8

Sources: ACEA, Eurostat, Allianz Research calculations.

Figure 3: Inventory levels in the EU, automotive retailers



Sources: Eurostat, Allianz Research calculations

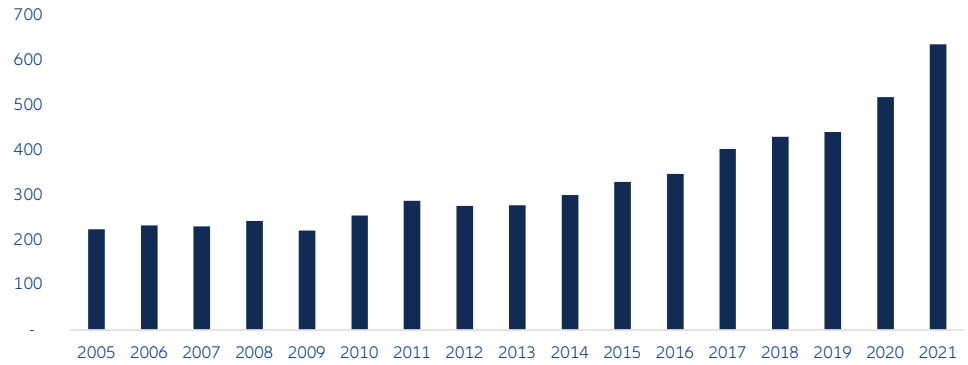
In the long run, European supply chains will remain at risk as semiconductors become ubiquitous.

Cars are becoming more 'semi-intensive' due to three drivers:

- Connectivity (i.e. more chips in order to ensure that cars are connected via WiFi to the manufacturer's network and drivers' phones via Bluetooth etc.)
- Safety (motion sensors, blind-spot detection etc. require chips)
- Electrification (electric cars have twice as many semiconductors as internal combustion engine cars)

Over the past 10 years, the value of semiconductor content per car has more than doubled to over USD600 globally. Given the European mix (safer, more connected, greener than the average car), the European value is most likely higher.

Figure 4: Average semiconductor content per vehicle manufactured (current USD)



Sources: OICA, IDC, Allianz Research calculations

In this context, European support should focus on immediate and reasonable targets.

As we wrote in 2021, semiconductor autonomy is far out of reach for Europe[1]. But policymakers can provide targeted support, keeping the following in mind:

- Support should focus on segments where Europe is both a large manufacturing and final market, i.e. automotive and not consumer electronics.
- As a result, there is little incentive to attract super advanced foundries. However, natural and economically viable incentives are needed to help grow the manufacturing footprint for industrial and automotive grade semiconductors. Europe is home to three of the world's largest auto/industrial semi companies, which have a mix of outsourced (in Asia) and in-house, often European production. Policymakers must tip the scale in the right direction for local investment to be more of value than outsourcing in Asia.
- Existing plans for expanding semiconductor production in Europe will not help solve the continent's issue but the start of joint-ventures is a step in the right direction.

[1] *See Semiconductors realpolitik : A reality check for Europe, May 2021*

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