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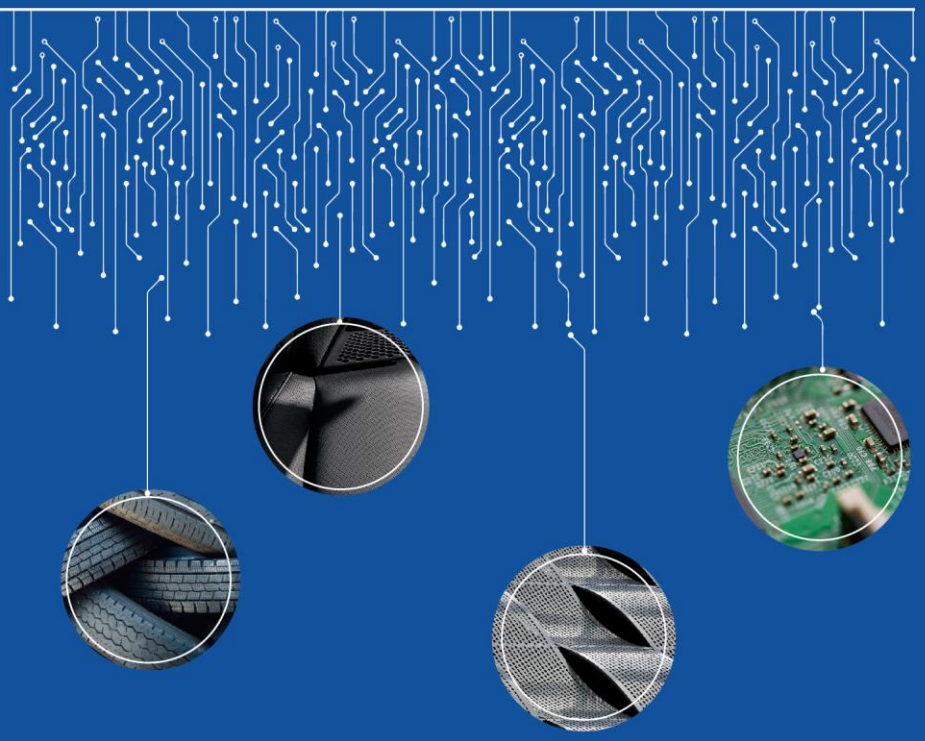

Material shortages disrupt automotive supply chains

How OEMs are mitigating Covid-19 and bullwhip effects

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How OEMs are mitigating Covid-19 and bullwhip effects

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1. Executive Summary: Turning Covid Supply Chain Chaos into Order

The rapid spread of Covid-19 in 2020 cut down automotive production in its tracks. The scale of the shock also led supply chain planners at OEMs and suppliers to adjust forecasts drastically down and reduce forward purchasing. As it turned out, many cut too much, for too long.

OEMs quickly cancelled, delayed and postponed supplier orders. Many Tier-1 suppliers ended up with unsold inventory and high outgoings, with little recompense. They also turned to *force majeure* clauses to cancel materials orders, leading Tier-2 suppliers to make further cancellations upstream, which stalled production of raw materials including rubber, steel, silicon, and chemicals. Mining became sporadic for raw materials such as iron ore, while leather production, crude oil and other chemical refining were also impacted.

But even if production across the supply chain remained stuck in neutral after economies began to move, consumer demand went faster than many anticipated. Economic recovery, at least in some regions and sectors, was above expectations in the second half of 2020, with especially strong spending in many consumer goods and electronics, housing as well as car sales in markets like China and the US. More workers kept their jobs, while government furlough and stimulus measures allowed companies to maintain workforces and for many consumers to continue spending.

Even after ongoing waves of the pandemic with renewed social and economic restrictions, lumpy vaccine rollouts and the ongoing threat of virus variants, 2021 has continued to see recovery in many regions.

The automotive industry has by no means seen uniform growth. Sales and production have recovered faster in China and the US compared to Europe, where more restrictions have remained in place for longer. Nevertheless, almost all automotive manufacturers have felt significant supply chain strains. The semiconductor shortage has been the highest profile and most damaging to new vehicle production. But the issue stretches across many materials, including metals, rubbers and fabrics, where production has not been able to make up for earlier disruptions, or where labour has been in short supply following pandemic-related protocols. Such issues have also been evident in the logistics sector, too, most notably in container shipping, but also in shortages of truck drivers, warehousing and port workers.

The automotive supply chain continues to face this 'bullwhip effect', with dramatic swings in demand and mismatches in prognosis. The semiconductor shortage has led OEMs to cut production for many units that they will be unlikely to recover this year.

In contrast to the semiconductor crisis, impacts from commodity shortages, freight and transport bottlenecks have so far had bigger impacts on prices than on reducing production volume. However, the combined impact of these issues has caused significant uncertainty in production forecasting, leading to a lack of reliable volume plans from OEMs even in the very short term.

As a result, suppliers including finished vehicle transport and freight companies are struggling to know where to position assets and equipment. In markets like the US, where vehicle inventory is now at its lowest levels for more than a decade, OEMs are increasingly at risk of missing sales if they cannot move finished vehicles on time. As sales recover further in Europe, and production remains constrained and uncertain, a similar challenge is likely to emerge.

The situation looks set to last for much of 2021 and may be felt well into 2022. However, OEMs have responded and are in many cases making notable changes, especially to production and distribution strategies, particularly by prioritising higher-margin vehicles and those with strategic imperatives, such as electric vehicles. As carmakers reorganise production schedules to pull such vehicles forward – and 'de-prioritise' lower value, high volume models – overall output is likely to remain lower compared to pre-Covid. However, these strategies should also help manufacturers to mitigate supply and price disruptions, getting production back on a more stable footing.

2. Automotive Supply Chain under Strain

Shortages and bottlenecks persist across the automotive supply chain. The most notable and consequential for vehicle production remains the lack of semiconductor and computer chips. But multiple commodities are in short supply, impacting many automotive suppliers, including for tyres, seating, interior materials and container shipping.

These shortages have impacted supply chain costs. Prices for some commodities are up by 100% or more compared to last year, putting pressure on OEM purchasing. According to officials at the Volkswagen Group, such disruptions in the supply chain could lead to further price increases.

It remains a challenging time for automotive supply chain and logistics managers, who are facing many concurrent disruptions, compounded further by weather incidents or extraordinary situations such as the Suez Canal blockage or closures in southern Chinese ports. Ultimately, these issues have impacts on the stability of European production.

2.1 Semiconductors and Chips Shortages

European vehicle production continues to be hard hit by the global shortage of semiconductors. The crisis is expected to extend into 2022 as the consumer electronics industry sees steady demand for chips, and new production cannot come on board fast enough.

The issue looks to be prolonged especially in North America and Europe, where vehicles use more chips per vehicle than counterparts in other production regions. The automotive industry in Europe accounts for 40% of total semiconductor demand in the region, compared to the automotive industry representing around 10% of semiconductor demand globally.

Automakers producing cars in Europe also source around 70% of the semiconductors they need from Taiwan and China, compounding regional shortages.

The rising use of electronics, sensors and compute power in vehicles looks set to keep chips in high demand. According to the European automotive suppliers' association, CLEPA, advanced driver assistance systems (ADAS) have increased the value share of electronic and semiconductor systems to 35% of a car's cost. The association estimates that the ratio will increase to 50% with the further development of autonomous driving technologies and electrification.

Semiconductor and chip manufacturers such as TSMC are adding new production capacity, but many have also increased prices by as much as 25%. OEMs have realised their technological overdependence on these parts and have increased orders to include volume for reserves, as well as making strategic moves to be more closely involved in chips supply chains.

2.2 Metals Rise in Price

Prices for industrial metals have risen by over 70% in the year to June 2021 because of ongoing shortages in mining, while demand has risen across industries for both raw materials and finished products. Iron ore prices have increased by 101%, which has resulted in a 41% increase in the price of steel.

These price increases have significant impacts on the automotive market, which uses around 900kgs of steel per passenger car. Producers of automotive steel, such as South Korean companies Posco and Hyundai Steel, have already announced price rises.

Meanwhile, carmakers with production bases in Europe face a backlog of orders for automotive grade steel because of stalled steel production during lockdowns and Covid restrictions. Currently only 10% of automotive grade steel is imported into Europe, but with the current shortage OEMs have looked to import more. However, the EU extended its 2018 tariff rate quota system for a further three years, with imports of steel still liable for a 25% duty. The UK has also extended tariffs for another year.

ACEA, the European automotive manufacturers' association, has warned that steel tariffs further escalate the ongoing shortfall in the industry and warns that these restrictions will ultimately cause harm to vehicle production recovery in Europe.

2.3 Impacts on Upholstery and Interior Materials

The automotive industry has also seen higher prices and short supply of upholstery and other materials for vehicle interiors. The price of leather has risen by around 30% year-on-year, highlighting the impact lockdowns had on leather production. This increase has contributed

to a surge in interest in alternative leather materials. Meanwhile, there is a shortage of automotive foam used as fillers in seats.

External factors have also contributed to the issues. Freak winter storms in February in Texas led to shutdowns in the refineries where key chemicals for foam production are centred. The US accounts for around 25% of global supply of propylene oxide, for example, which had already seen reduced production in 2020.

These shortages are impacting prices and supply. As with leather, more OEMs and suppliers have sought alternatives, including materials made from recycled and sustainable materials.

2.4 Rubber Supply Diverted

Natural rubber prices continue to rise and have led to a significant hike in car tyre prices.

Rubber production centres around countries in Asia, where migrant labour is often the main workforce in extracting the sap from trees. The pandemic disrupted much of this labour force. Meanwhile, the surge in demand for personal protection equipment (PPE), including disposable rubber gloves, has led to rubber supply being re-routed to the healthcare industry. Tyremakers claim their suppliers have maintained stock but with the demand for PPE remaining high, there may be further disruptions in the upstream supply chain.

Automotive supplier Continental told ECG Business Intelligence that current supply shortages and the resulting "substantial" price increases for certain raw materials have impacted its tyre business. However, the company has had less of an issue with natural rubber suppliers, which have mainly been able to supply Continental within the framework of agreed contracts.

2.5 Container Shipping Crisis

Container spot freight rates continue to soar with 40ft box prices now up by more than 500% year-on-year for the Shanghai to Rotterdam journey, while on average rates are more than 300% higher compared to a year ago.

The crisis stems once again from the mismatch in demand and supply in 2020, which led to many cancelled services and blank sailings. As demand returned, many ships were in the wrong ports. Covid-19 protocols also led to shortages of dock workers at the ports, with cargo backing up for processing. Further disruptions, such as the blockage of the Suez Canal, led to more delays and additional price rises.

In June, the ports in Shenzhen in southern China, including Yantian and Shekou ports, reported a surge in Covid-19 cases resulting in the facilities being closed for disinfection and new quarantine measures. Logistics companies reported at least two weeks of new delays to already overburdened congested traffic.

3. A New Normal in Production: 'SKU Rationalisation'

With supply of key parts and materials still constrained, and forecasts so uncertain, OEMs have adapted supply chain strategies to maximise revenue in production.

Initially, many carmakers in Europe and North America took a 'retrofitting' approach, building vehicles unfinished and storing them to sit idle until the necessary components and semiconductors arrived. The approach has its advantages in terms of plant utilisation but is also inefficient as incomplete vehicles tie-up capital and take up costly real estate.

Instead, most OEMs have since been adapting production schedules and realigning supply chains to maintain production. Carmakers such as General Motors and Stellantis have removed certain digital features on vehicles that required additional chips, such as automatic stop-start features or digital speedometers.

Most importantly, OEMs have been reprioritising production schedules to put value over volume, pulling forward output of higher-margin vehicles and strategic growth areas. This approach is commonly referred to among supply chain experts as 'SKU (stock-keeping-unit) rationalisation', which is the practice of optimising supply chain orders and production based on the most valuable products.

This approach has been evident in a market where new and used vehicle prices have risen. Even where recovery has been slower, such as in Europe, there has been evidence of a broader 'premiumisation' in the vehicle market, with OEM production and supply chains orientating around it. In the US, where demand has recovered more strongly, OEMs have put high production priority on high-margin vehicles, such as pick-up trucks, while they have cut lower margin crossovers and sedans.

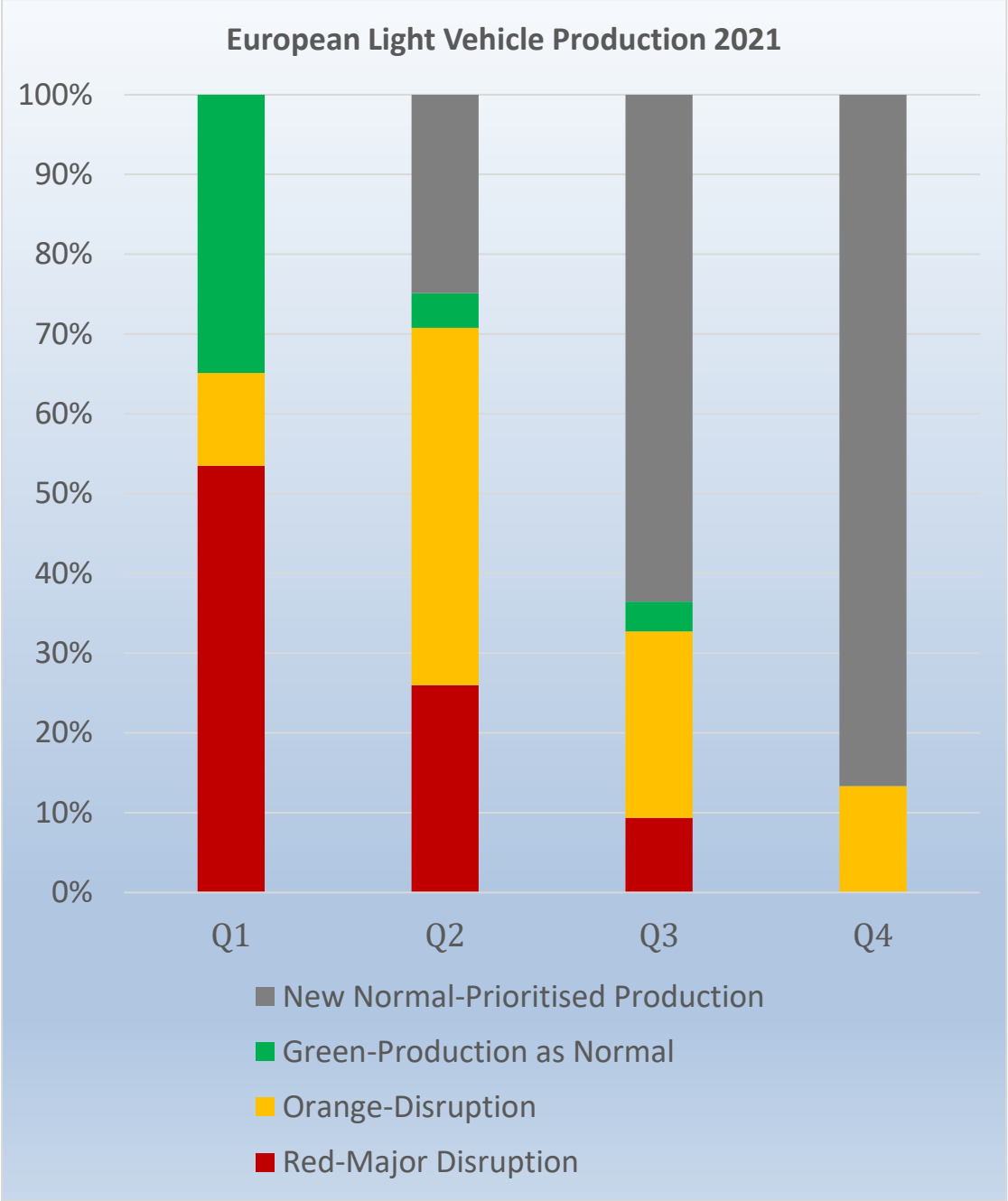
This reprioritisation has also been evident in strategic growth segments for electric vehicles, including plug-in hybrid and battery electric vehicles, which have grown dramatically in the wake of the pandemic, promoted by stricter emission regulations and higher incentives. In many cases, OEMs are prioritising PHEV and EV production, while putting internal combustion engine vehicles on the 'back burner'.

With structural mismatches evident, shortages of components and high supply costs continue to impact OEMs, especially for material with long lead times. To mitigate impacts, OEMs are accelerating SKU optimisation to gain more revenue even as production schedules are delayed. The approach is fast becoming the 'new normal' in production planning.

3.1 Estimating the Mismatch: How OEMs Mitigate Impacts

Over the course of 2021, we expect that OEMs will increasingly prioritise higher-margin vehicles across the European supply chain, and that it will become the dominant approach in production planning, even as extreme supply disruption recedes.

Figure 3.1 Share of European Light Vehicle Production Shifting to New Normal



Source: ECG Business Intelligence

Through the first quarter of 2021, EU and UK vehicle production was around 20% lower than the levels seen pre-Covid in 2019 across the region, with both demand and production lagging pre-crisis levels. Even as demand starts to recover, production has been snagged by chip shortages. According to ECG Business Intelligence research, the shortages led to shutdowns at 50.1% of vehicle assembly plants in Europe, ranging from a few days to a few weeks, to

staff being put on furlough. Another 11% of European production plants managed to keep production going but only at the expense of other plants from the same OEM closing, by severely reducing production and in some cases by stopping production of certain models.

In the same period, 32.9% of plants in Europe said they were not as yet affected by the crisis, as OEMs such as BMW, Toyota and Hyundai claimed to have had adequate stocks of the necessary chips.

By the second quarter, those carmakers who had higher buffer stocks of chips going into 2021 also ran into trouble replenishing supply. In response, most OEMs turned away from retrofitting and instead reprioritised production to focus on higher-value vehicles to mitigate previous declines and continuing supply chain shocks.

This approach continues a trend already noted at several OEMs in 2020 following the Covid disruptions, including Volkswagen Group. Mercedes-Benz also revealed a strategic initiative to prioritise value across its production in October 2020. This shift also follows on from the trend towards more 'built-to-order' vehicles according to confirmed customer sales as is common for premium vehicles, as opposed to 'built-to-stock' vehicles more common for mass volume passenger cars.

This switch is moving along with the overall rise in vehicle prices and 'premiumisation' across the sector. The push for value is evident in German passenger vehicle and component exports, for example, which rose sharply in value by 15.65% in the first quarter of 2021, while volume rose just 3.25% compared to the same period last year.

We expect this shift to value to continue throughout the year, impacting a large share of production. According to ECG Business Intelligence analysis, OEMs reprioritised as many as 1.7m units of production in the first five months of 2021. According to current forecasts, carmakers will have some scope to increase production in the third quarter of 2021, however as a result of supply chain shortages and prioritising vehicles, European production is likely to remain lower than pre-Covid levels even if demand begins to recover more strongly in the second half. We estimate that up to 2.6m units in Europe will have been deprioritised by the end of the year, keeping production levels around 20% lower than pre-Covid.

It will likely only be in 2022, when chipmakers have been able to ramp up production, that carmakers will have more scope to catch up volume lost in 2021. However, even then most OEMs are likely to focus on higher-value vehicles, and many lower margin vehicles lost to supply constraints may not be recovered.

For service providers such as the vehicle logistics sector, this shift in supply and production prioritisation has several implications. On the one hand, price rises across the material and

freight sector, along with an emphasis on higher-value products, will mean lower overall production and vehicle sales volumes across Europe over a longer period.

However, 'SKU rationalisation' and focus on strategic model segments, should also help the sector to maintain more supply chain stability and reliable production planning. That would support better supply chain and logistics capacity planning as well, with the potential for improved lead time and utilisation. If planning is shared and coordinated across suppliers and providers, the shift to higher-margin production should contribute to better profits in the vehicle logistics sector, despite lower volumes.

4. Credits

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