



Automotive Semiconductor Trends and Outlook

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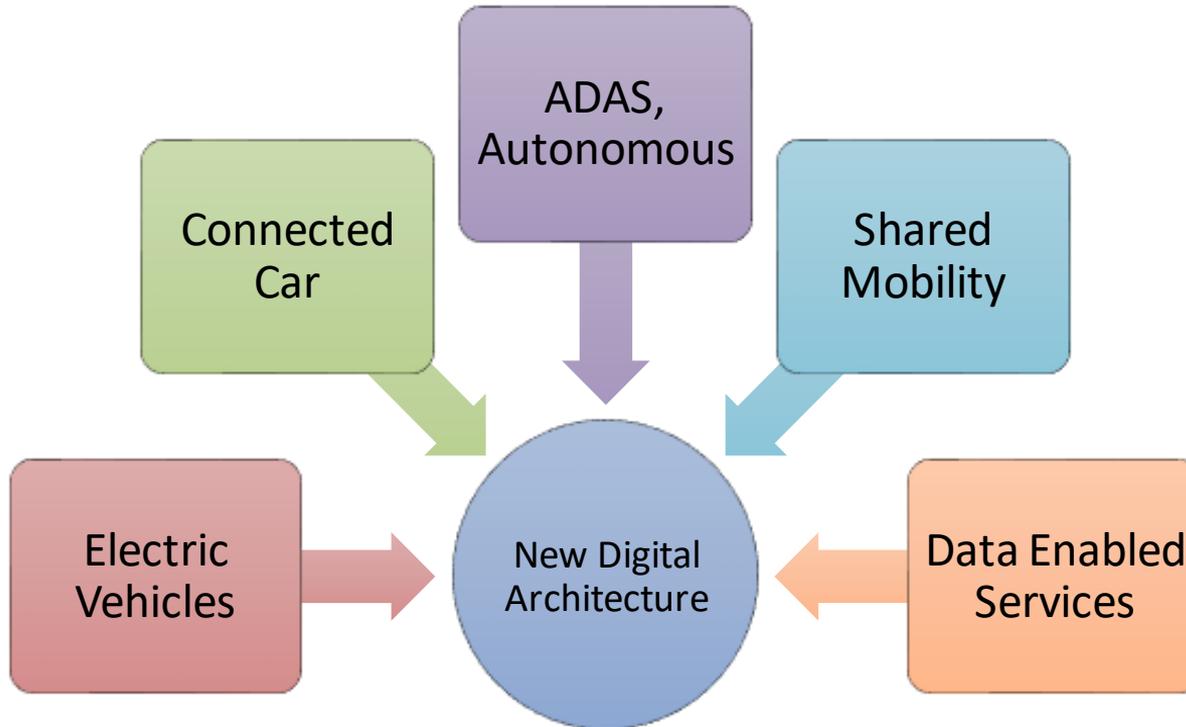


OVERALL INDUSTRY ASSESSMENT

- **Overall short-term market outlook for production / sales far more uncertain and potentially weak**
 - US / China trade war; General China slow-down
 - Brexit uncertainties; German slow-down
 - WLTP issues / ongoing impact of dieselgate
 - COVID-19 !
- **Electronics fundamentals remain strong. Content per car will continue to grow**
- **Key trends**
 - “Domain collision”: everything is interconnected
 - Safety is touching everything
 - The more “silo-ed” your company is, the slower you will be...



FUTURE MEGATREND CONVERGENCE





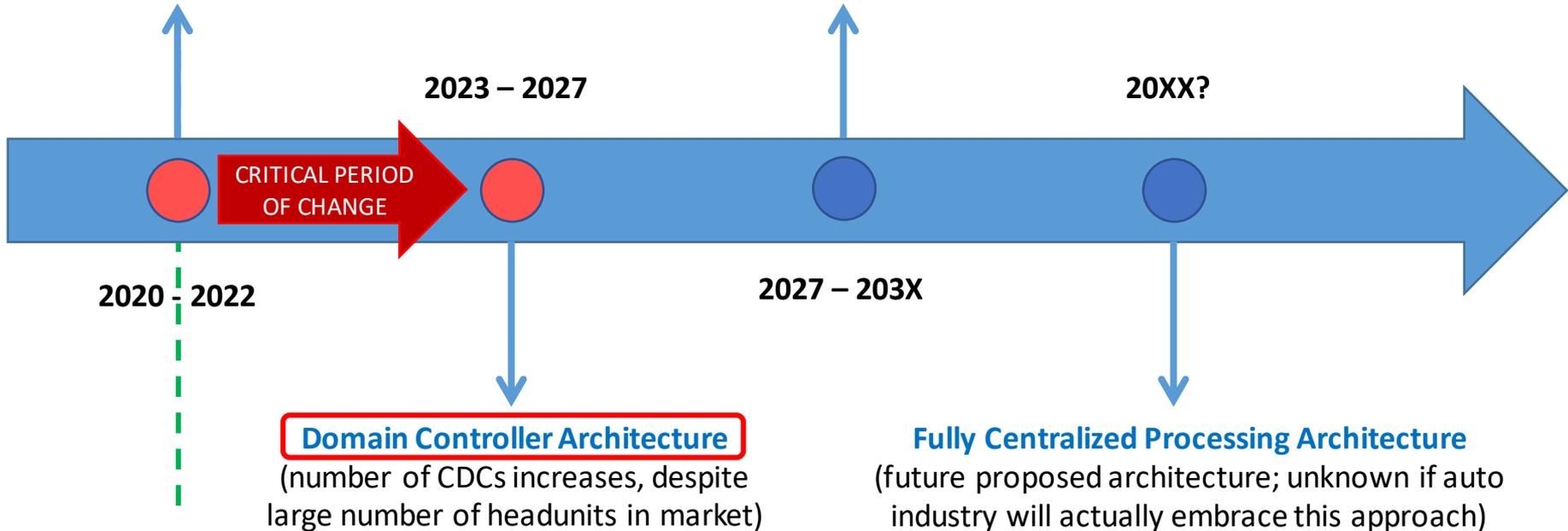
ARCHITECTURE CHANGES

Distributed EE Architecture

(limited domain consolidation, primarily via CDCs)

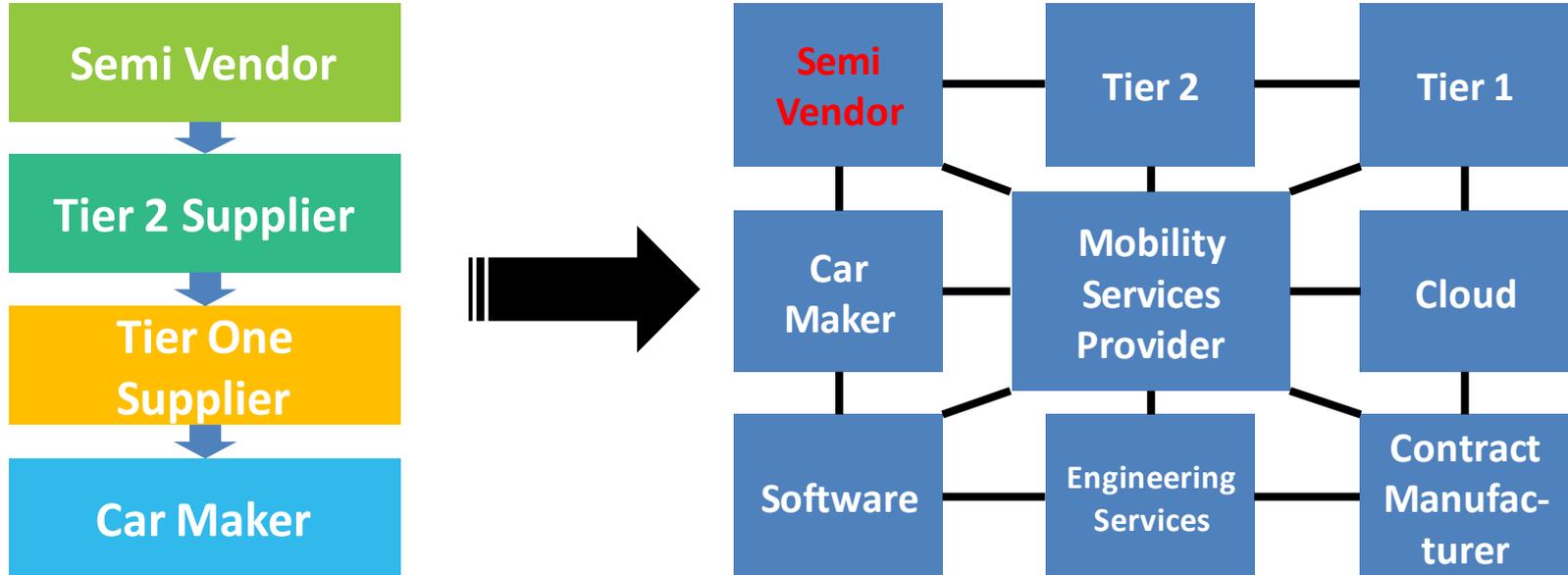
Location or zone-based EE Architecture

(some premium OEMs begin shift to zone-based architecture)



COMPONENT SOURCING

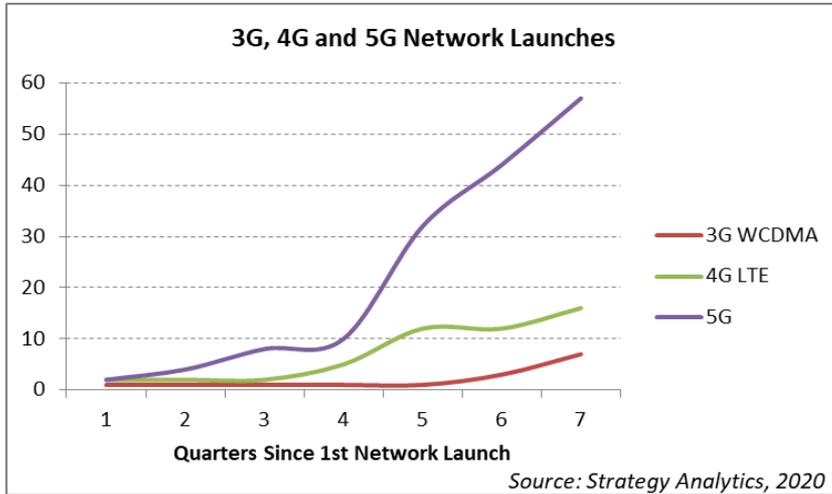
Rising importance of semiconductor technologies will lead to OEMs working directly with the semiconductor industry



- **OEMs choosing IC vendors:** The IC vendor is more involved with software and application providers. Tier 1 role remains essentially the integration task but with less freedom of choice, because the OEM significantly controls the network selection and dynamics



CONSUMER GLOBAL - 5G MOBILE SUBSCRIPTION ESTIMATES

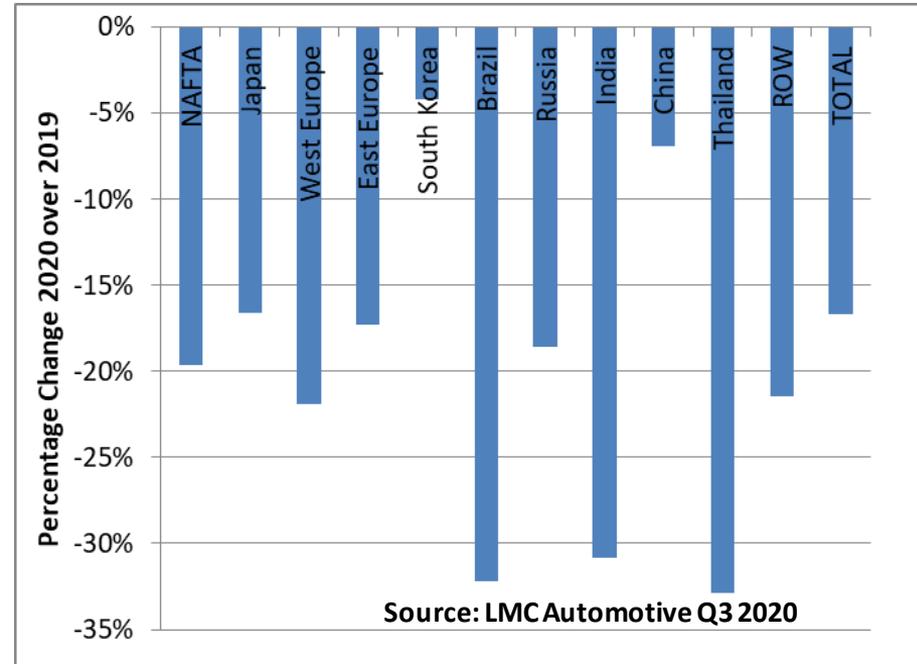
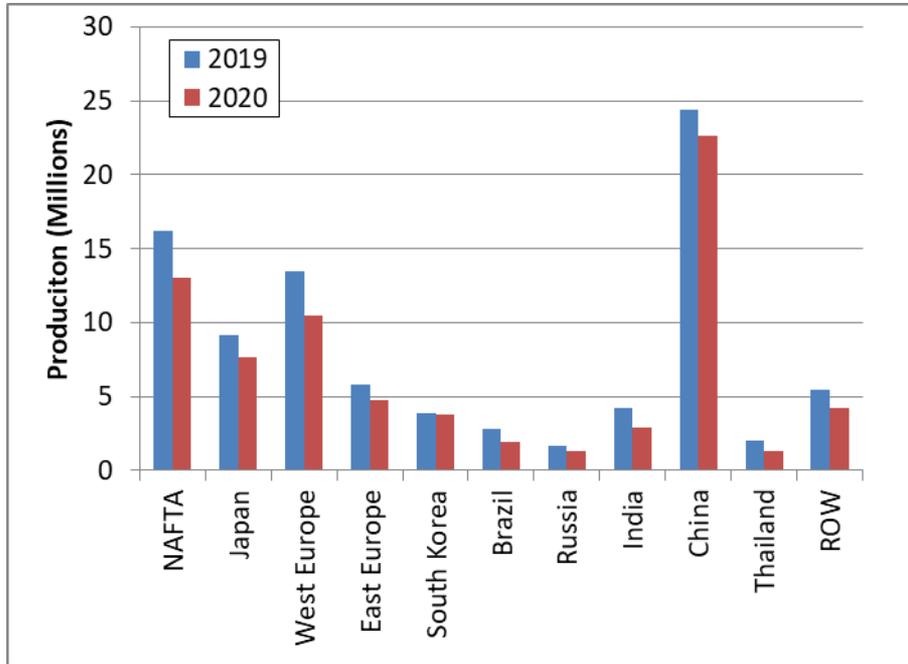


- Strategy Analytics forecasts there will be **2.18 billion 5G subscriptions*** by 2025, accounting for 24% of all subscriptions.
- In North America, 5G subscriptions will reach **137 million in 2025** (63.2% of subscriptions)
- So far this year Strategy Analytics has seen 5G momentum in the United States, China, and South Korea for 5G services, with the latter contributing significantly to global volumes.
- Globally, a total of 57 5G networks had launched by the end of 2019, which was roughly 18 months or six quarters after the first 5G launch (in 2017). This compares to just 16 4G LTE networks at the same time in that technology's life, and just seven 3G WCDMA networks.

5G Share of All Subs	2019	2020	2021	2022	2023	2024	2025
Western Europe	0.1%	2.6%	9.0%	18.1%	28.2%	37.5%	45.9%
Central & Eastern Europe	0.0%	0.1%	0.5%	2.1%	5.1%	9.3%	14.7%
North America	0.4%	10.1%	24.5%	37.8%	48.6%	57.0%	63.2%
China	0.6%	7.7%	16.7%	26.9%	36.2%	44.6%	51.2%
Japan	0.1%	5.9%	14.1%	23.5%	32.7%	40.8%	47.1%
South Korea	10.1%	31.6%	38.4%	43.8%	49.6%	54.5%	59.0%



2020 OUTLOOK – VEHICLE PRODUCTION

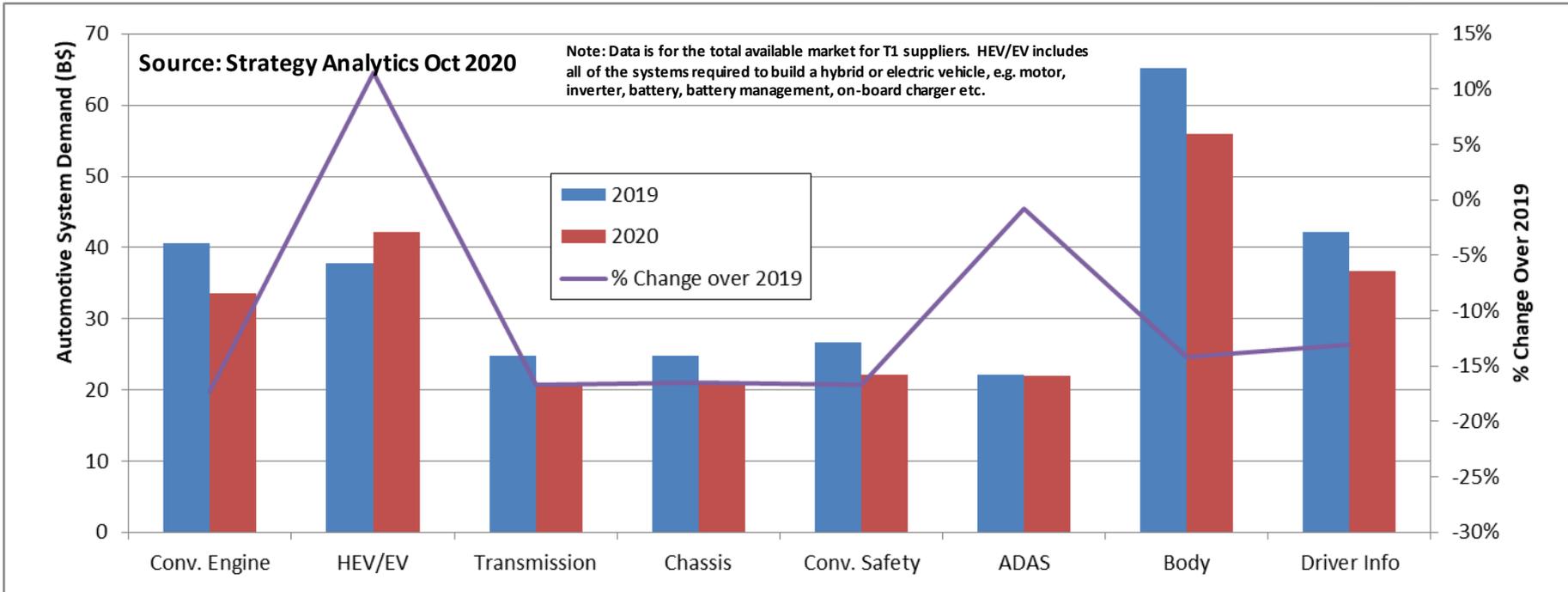


- Steep declines due to COVID-19. Total in 2020 will be 74.1 MU, down from 89.0 MU in 2019 (-16.7% growth)

- All regions impacted. Biggest percentage falls in Brazil, India & Thailand. Biggest volume falls in China, Europe & NAFTA

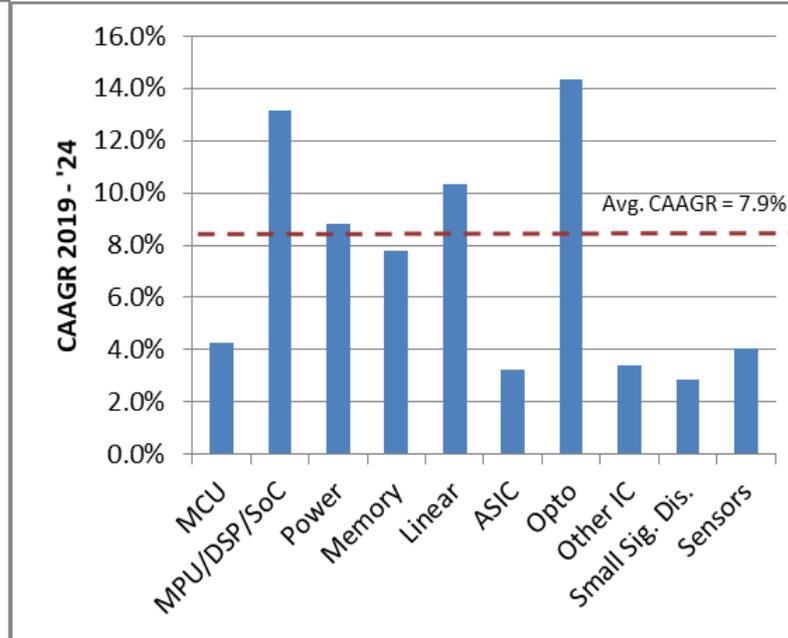
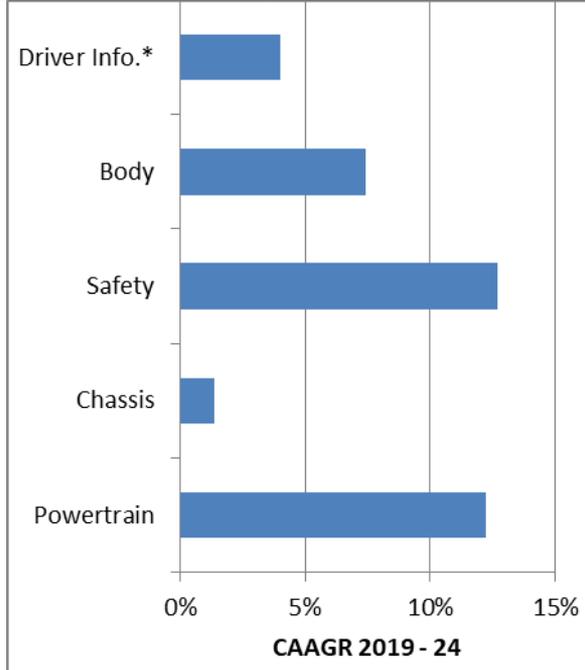


COVID-19 IMPACT BY DOMAIN



- Many areas for 2020 are now showing over 15% decline from 2019 levels
- The exceptions are HEV/EV (actually still up on 2019) and ADAS (down a little on 2019), as these are still growth areas in terms of penetration rates.

AUTOMOTIVE SEMICONDUCTOR GROWTH

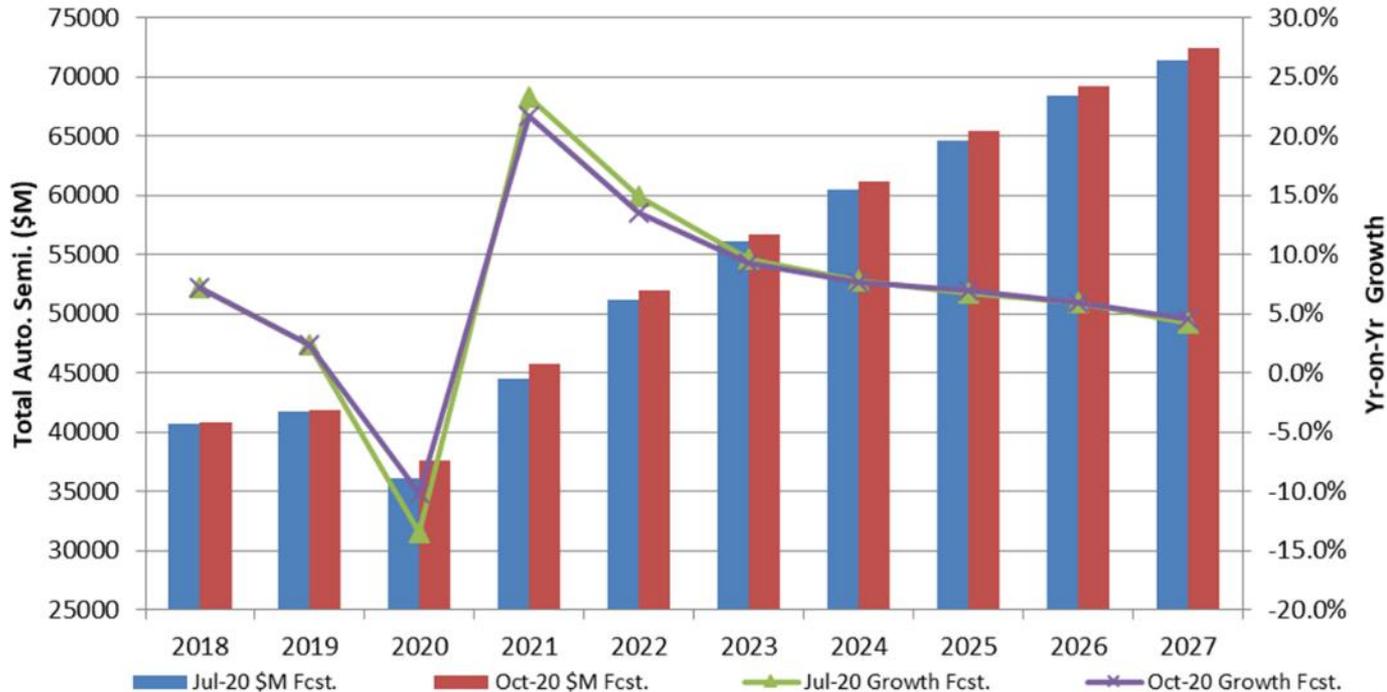


Highest growth: Opto - Driven by external & interior lighting, cluster and isolation for HEV/EV; **MPU/DSP/SoC** - Driven by ADAS, Graphics & Infotainment Platform multi-core SoC; **Linear** - Driven by RF (radar), IVN bus tx., battery cell management; **Power** - Driven by EV/HEV growth; **Memory** - Driven by DRAM & Flash growth supporting ADAS, Graphics, Infotainment;

- **Highest semiconductor growth** from **Safety** and **Powertrain** domains (ADAS, HEV/EV, plus move to GDI and more auto transmission)
- **Driver info** growth helped by move towards more complex clusters and connected vehicles – but also held back by integration trends

STRONG RECOVERY AS SEMICONDUCTOR CONTENT PER CAR CONTINUES TO GROW

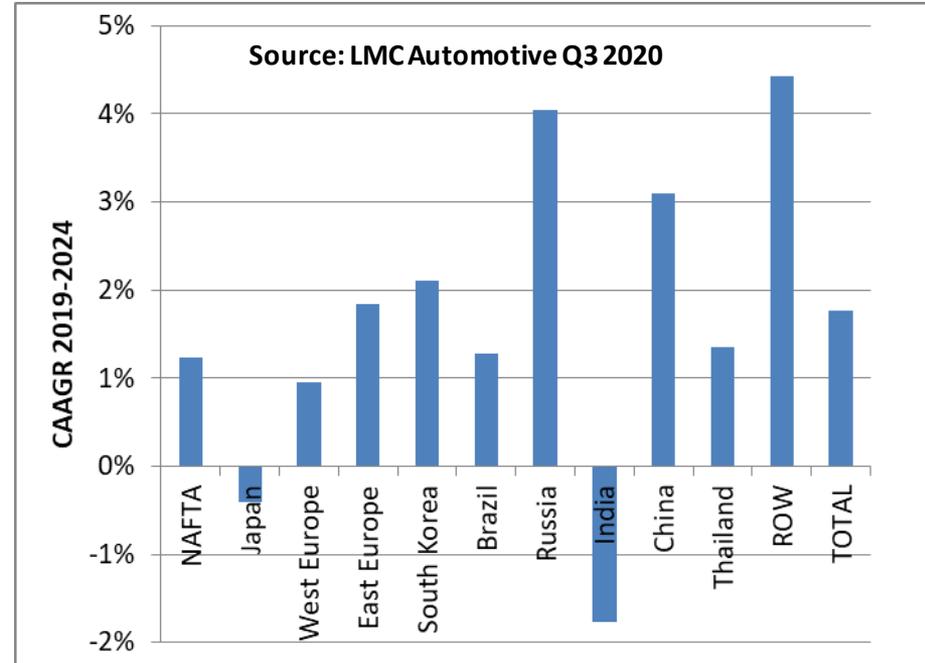
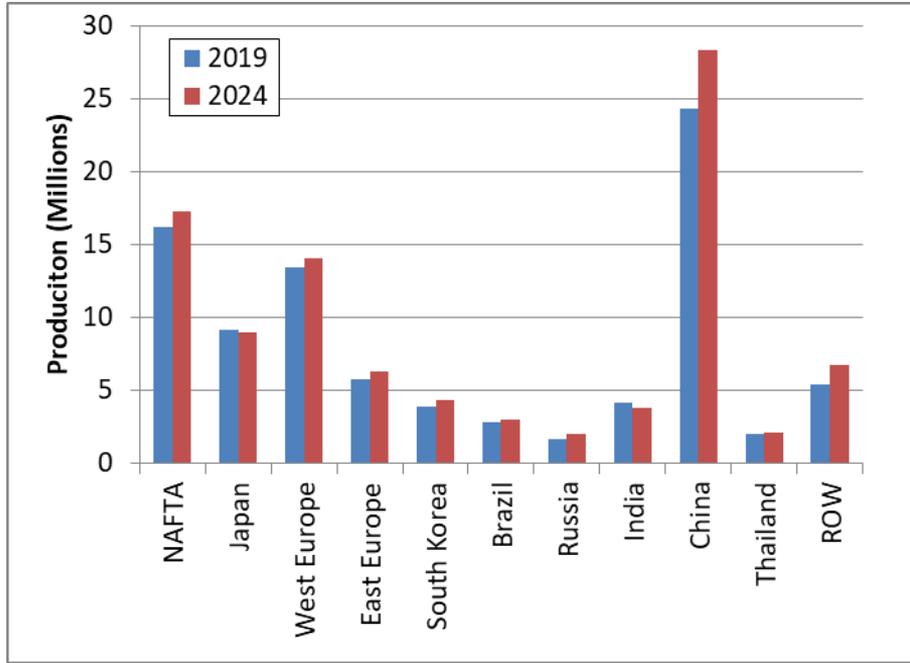
Automotive Semiconductor Demand - Forecast Comparison



Source: Strategy Analytics

In 2020 automotive semiconductor demand is expected to decline by 10.1% to \$37.6 billion, but ADAS and electrification will drive growth from 2021 onwards

2019 TO 2024 OUTLOOK – VEHICLE PRODUCTION



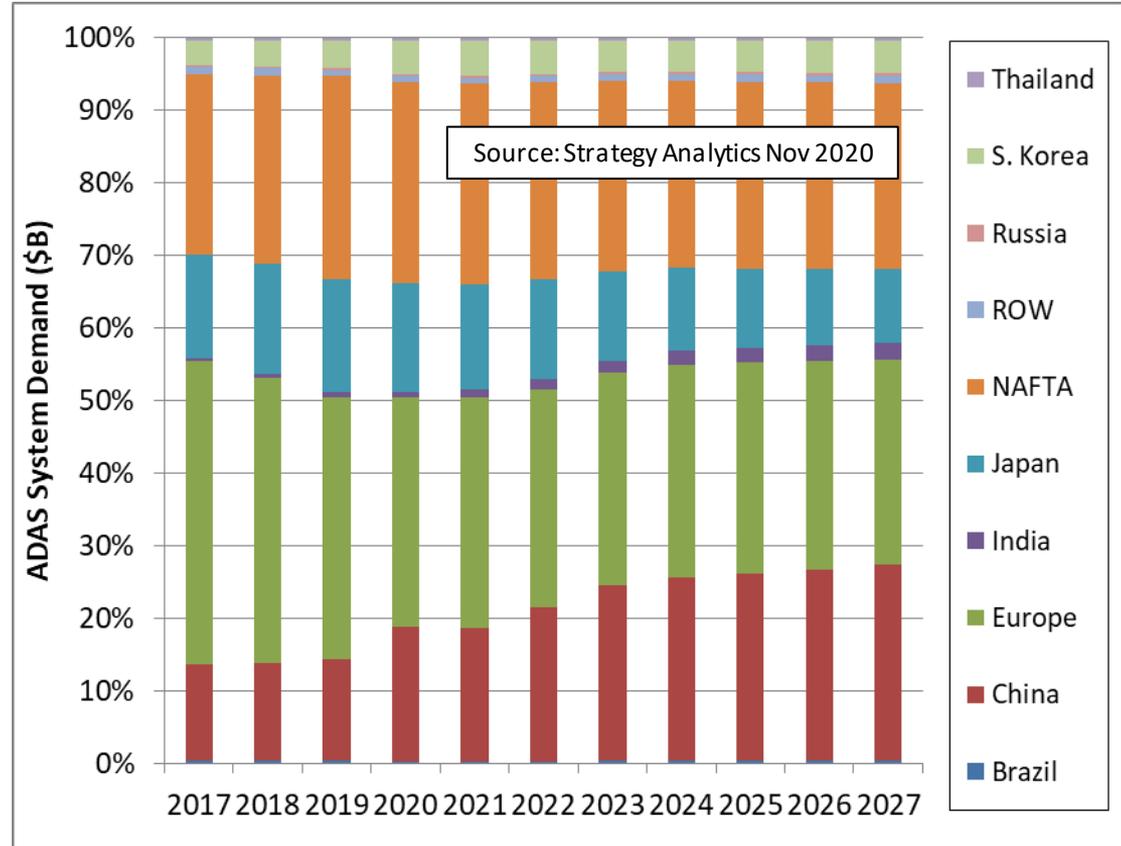
- Recovery expected in 2021. Production to hit 97.1MU by 2024. CAAGR of 1.8% over 2019-24

- Growth over 2019 to 2024 (which thus includes the 2020 falls) is at a very low level (or even negative) in most regions



CHINA ADAS MARKET GROWTH

- **China** growing from 13% of ADAS demand in 2017 to 27% in 2027
 - CAAGR from 2019 to 2024 is 30% - against 15% for total market
 - COVID-19 has accelerated this trend
- Fastest growth still in **India**, but COVID is hitting hard here and market remains tiny
 - CAAGR from 2019 to 2024 is 42%
- ADAS growth from Japanese vehicle production now **less than 10%** CAAGR over 2019 to 2024





CHIP SHORTAGES...GOOD NEWS?

COMPANY NEWS DECEMBER 4, 2020 / 12:52 PM / UPDATED 3 DAYS AGO

Chip shortages could slow automotive production, VW and suppliers say

By Yilei Sun, Brenda Goh, Jan Schwartz

4 MIN READ



BEIJING/FRANKFURT/SAN FRANCISCO (Reuters) - A shortage of chips used in auto manufacturing could disrupt automotive production in China well into next year, industry officials said Friday, with chip companies saying they are raising prices and expanding their production in response.



TIME FOR A CHANGE....?

Plug-in car sales overtake diesels in race to 2030 ban



Britain's first forecourt dedicated to powering electric cars opens today. The site in Braintree, Essex, can charge 36 vehicles at a time



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