GLOBAL AUTOMOTIVE SUPPLIER STUDY 2022

The industry went into the third consecutive year with volumes below pre-pandemic levels – Automotive suppliers at the edge?

LAZARD Roland Berger

Contents

Source: Roland Berger/Lazard

Global crisis have brought growth to a halt but not changed the overarching technology trends and the future challenges for automotive suppliers

Executive summary

1. Due to Covid-19, semi-conductor and raw-material shortages, Ukraine war and Covid-19 relapses in China in 2022, **global automotive production volumes will reach pre-crisis levels only in the mid-term**
2. Although the growth of the global automotive supplier markets has come to a halt, **average supplier margins came back to 2019 levels in 2021**. However, **margin pressure from cost inflation expected to further increase**
3. Profits are allocated across the supplier landscape very selectively. While most traditional automotive suppliers have difficulties, **many electronics, software and aftermarket players are realizing above average margins**
4. Overall, the **uncertainty about the development in the near- to mid-term future has never been as high as today** – From a global recession or a collapsing of chip supplies with further volume declines to a steady volume recovery everything is possible
5. On the back of substantially rising interest rates, **financing will become much more challenging** for automotive suppliers
6. The crises in 2020-2022 have pushed general automotive trends into the background. Nevertheless, **digitalization, automated driving, powertrain electrification or a changing E/E architecture are the top challenges for automotive suppliers in the mid-term**
7. Price inflation, volatile production volumes and unevenly distributed profit levels indicate, that **the general market dynamics needs to change**. While OEMs are increasingly willing to share profits, suppliers are expected to provide greater transparency
8. Global pandemics and geopolitical conflicts drive the **necessity to de-globalize supplier footprints and the interconnected supply chains** to increase crisis resilience in the future

Source: Roland Berger

A.

COVID-19, Semiconductor crisis and Ukraine war as operational short-term challenges

The automotive supplier industry is facing another difficult year with volatile volumes and high uncertainty

The **anticipated volume recovery** after COVID-19 and the semiconductor crisis in 2021 **failed to materialize**. Instead, the war in Ukraine and COVID-19 relapses in China put **ongoing burdens on the market**

Nevertheless, some suppliers e.g., aftermarket players, electronics suppliers or process driven specialists from Asia, could outperform the markets pushing the **overall industry to a weighted average margin of 5.3% in 2021**

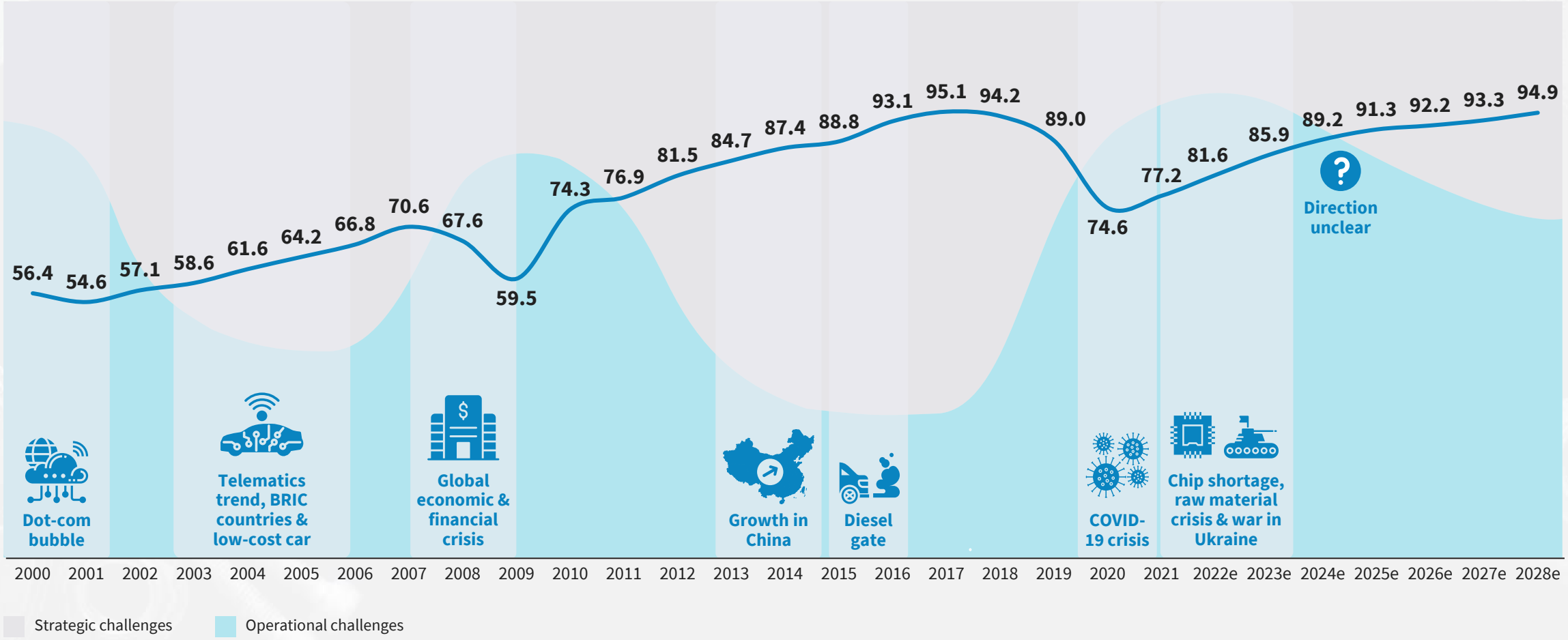
From an overall perspective, **short-notice volume volatilities** are challenging for automotive suppliers making efficient shop-floor operations and the use of cost-reduction levers, such as short-time work or supply-chain management, difficult

With an **increasing fear of recession**, the further development of the industry depends especially on the inflation monetary policies as well as the cost and security of supply of energy throughout Western Europe

Source: Roland Berger/Lazard

The automotive business becomes more and more volatile with operational and strategic challenges alternating

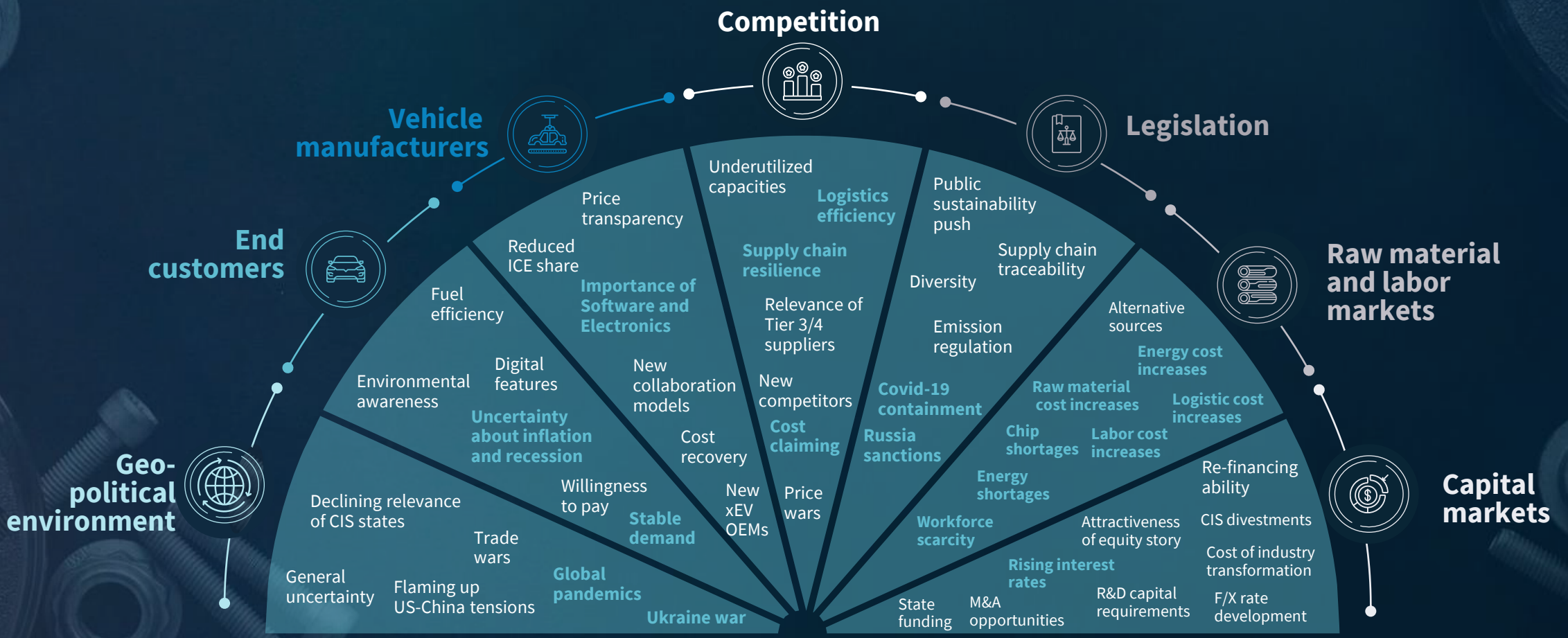
Economic cycles of the automotive industry [production volume, #m]



Source: IHS LV Production Report, Roland Berger/Lazard

Suppliers have many different challenges which impact daily business and require a lot of management attention

Supplier CEO radar screen – Short term implications



XXX = Deep dive on following pages

Source: Roland Berger/Lazard

The Ukraine conflict fuels the COVID-19 aftereffects of volatile volumes, chip shortages, strained supply chains and increasing raw material prices

Economic factors impacting the automotive supplier industry

Short-/mid-term

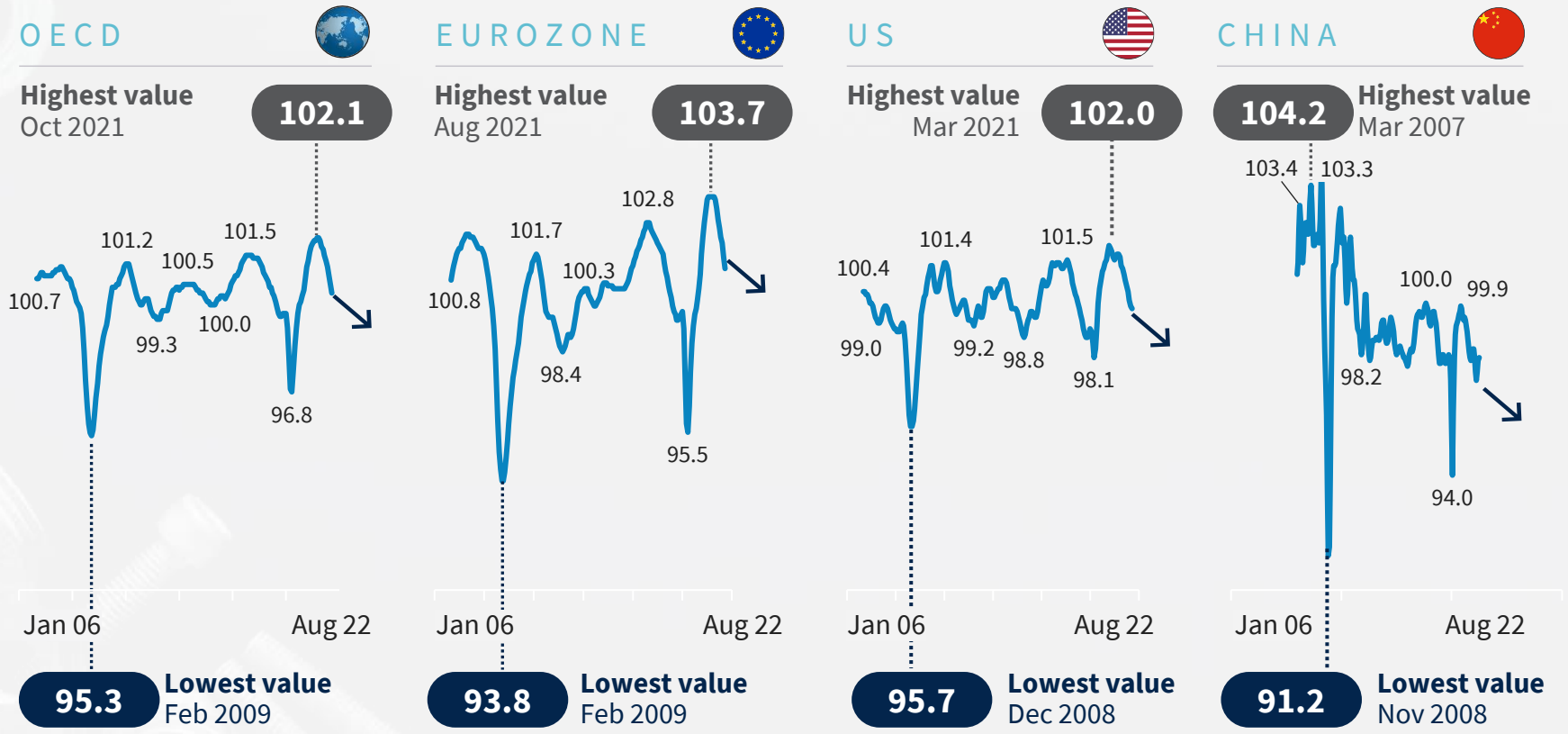
			2020	2021	2022	2023+	Margin impact	Volume impact
A	**Fears of a recession**	• High inflation rates cause increasing prices for consumer goods and cost of living • In combination with long delivery times for new cars, consumers might start to cancel orders if the actual situation persists and fears of a recession raise			High	Medium	Low	Medium
B	**Semiconductor shortages**	• Increasing demand for electronics led to global semiconductor shortage • Suppliers cancel orders and are not able to fulfill OEM requirements • Future availability of neon gas or Taiwan conflict might slow down chip output again		High	High	Medium	Low	High
C	**Raw material shortages**	• Capacities have been reduced during the pandemic • Ukraine conflict leads to uncertainties in raw material availability (Neon, Nickel, Palladium) • Material shortages and demand recovery caused sky rocketing material prices		Medium	High	High	High	Low
D	**Energy shortages**	• Recurring interruptions of gas supply from Russia to Europe and sabotage of pipelines with fear of shortages during the winter season drive spot market prices • Strong price increase for fossil energy sources and subsequently also for electricity			High	High	High	Medium
E	**Lack of personnel**	• OECD country unemployment rates close to pre crisis levels • Millions of potential workers on furlough schemes, being not available for the labor market; significant lack of professionals		Medium	High	High	Low	Low
F	**Pressured supply chains**	• Inventories have been depleted amid supply issues • Supply chain interruptions cause risk of shutting down OEMs • Ukraine conflict tightens supply chain constraints for selected components	Medium	High	High	Medium	Medium	Medium
G	**Volatile volumes**	• High order backlog for vehicles leads to high OEM margins • Ukraine conflict hampers expected stabilization of production volumes • In case of a longer conflict also negative impact on consumer confidence expected	Medium	High	High	Medium	Low	None
H	**Rising interest rates**	• Higher inflation leads to stricter monetary policies • Suppliers are faced with substantially increasing refinancing cost • Funding for tech/startup suppliers increasingly difficult to get			High	High	Medium	Low
I	**COVID-19 relapse China**	• Outbreak of new COVID-19 variants such as Omikron despite "zero COVID strategy" • Short-notice, unannounced lock-downs even in important commercial capitals such as Shanghai		High	High	Medium	Low	Medium

High relevance | Medium/low relevance | No impact | High impact

Source: Roland Berger/Lazard

Ukraine war, Covid-19 relapse and especially increasing inflation brought business confidence recovery to a halt

Business confidence globally [index: long-term average = 100][1)]



1) The index provides information on future developments, based upon opinion surveys on developments in production, orders and stocks of finished goods in the industry sector. Numbers above 100 suggest an increased confidence in near future business performance, and numbers below 100 indicate pessimism towards future performance

Source: OECD, Roland Berger/Lazard

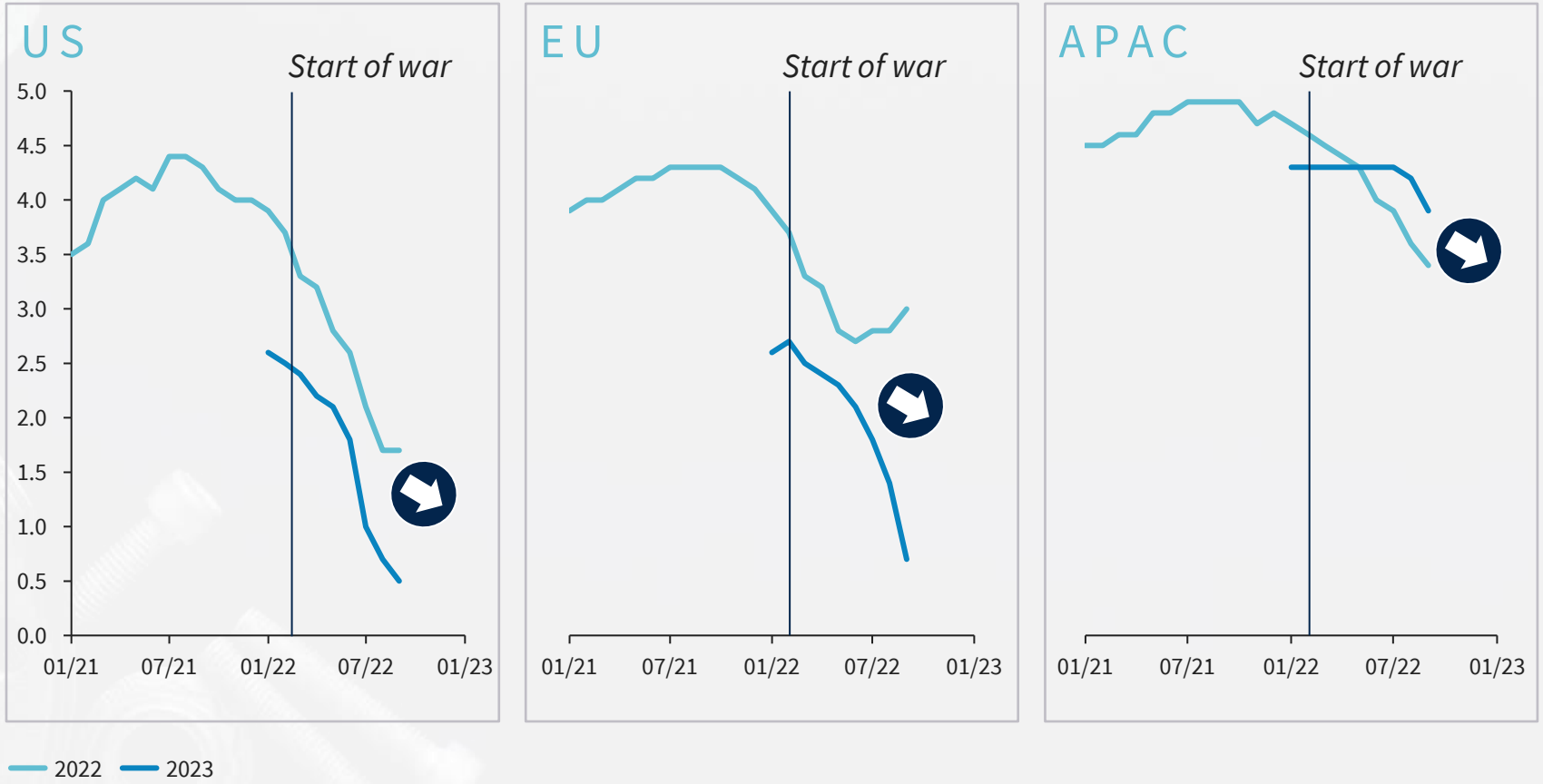
IMPACT ON AUTOMOTIVE SUPPLIER INDUSTRY

- Europe is directly affected by the war in Ukraine causing an increasing consumer uncertainty and thus a consumption reluctance
- OECD and the US consumers show restraint as well but more because of price sensitivity in combination with increasing inflation rates
- Overall, the Ukraine war caught the global recovery off guard boosting raw material shortages, the risk of a longer lasting chip crisis and inflation
- Additionally, the number one growth driver from the past, China, is off due to COVID-19 relapse and local lockdowns resulting from the no-COVID policy in China

Margin impact
Volume impact

The Ukraine war hit the markets in a general phase of uncertainty giving it a clear GDP downwards trend

Monthly updated GDP growth forecast (2022-2023) [%]



Source: Consensus, Roland Berger/Lazard

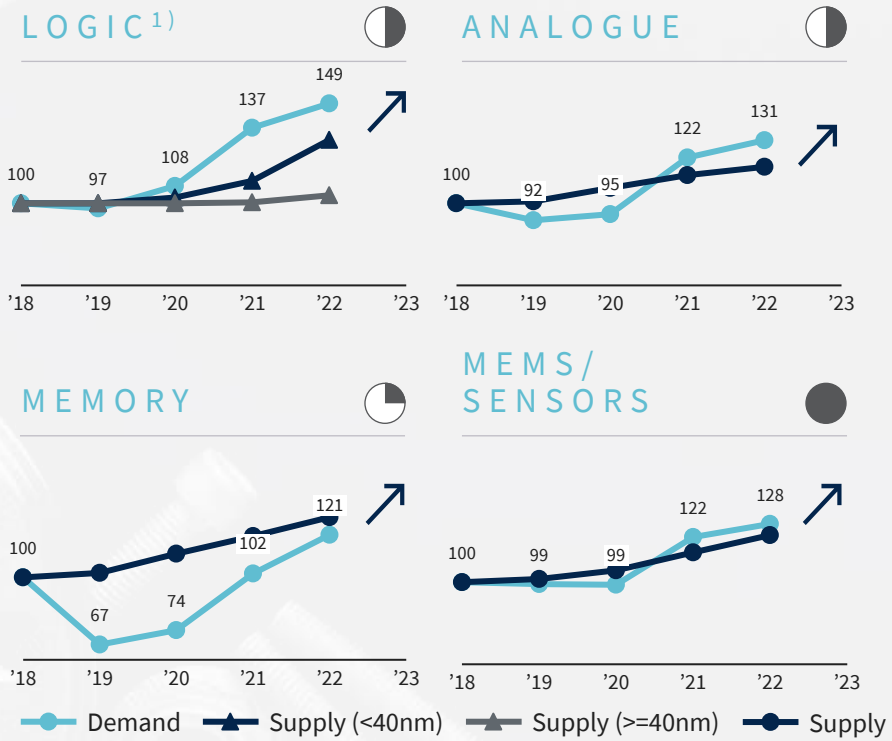
IMPACT ON AUTOMOTIVE SUPPLIER INDUSTRY

- In short term, car prices are expected to further increase due to inflation, ongoing supply chain disruptions and availability constraints for important raw materials
- Further availability of selected raw materials e.g., nickel, palladium or neon gas, will have a significant influence on the automotive business in the next months
- Volume volatility expected in short term especially from Russia and the previous soviet countries
- Europe seemed to show signs of recovery due to increased GDP trend in Q3/2022 but is expected to turn around again due to negative inflation outlook

Although most root-causes have been resolved, supply situation for chips will remain tight throughout 2022

Semi-conductor crisis

A series of coincidences caused the global shortage



Counter measures	Impact	Timeline
Semiconductor taskforce	Low – High	Short – Long
High semiconductor inventory	Low – High	Short – Long
Partnership with semiconductor companies	Low – High	Short – Long
Active reduction of semiconductor content	Low – High	Short – Long
Substitution with nontraditional chips	Low – High	Short – Long
Vertical integration of semiconductor manufacturing	Low – High	Short – Long

1) <40nm and ≥40nm can't be seen additive as technologies don't replace each other

Source: Press research; Roland Berger/Lazard

IMPACT ON AUTOMOTIVE SUPPLIER INDUSTRY

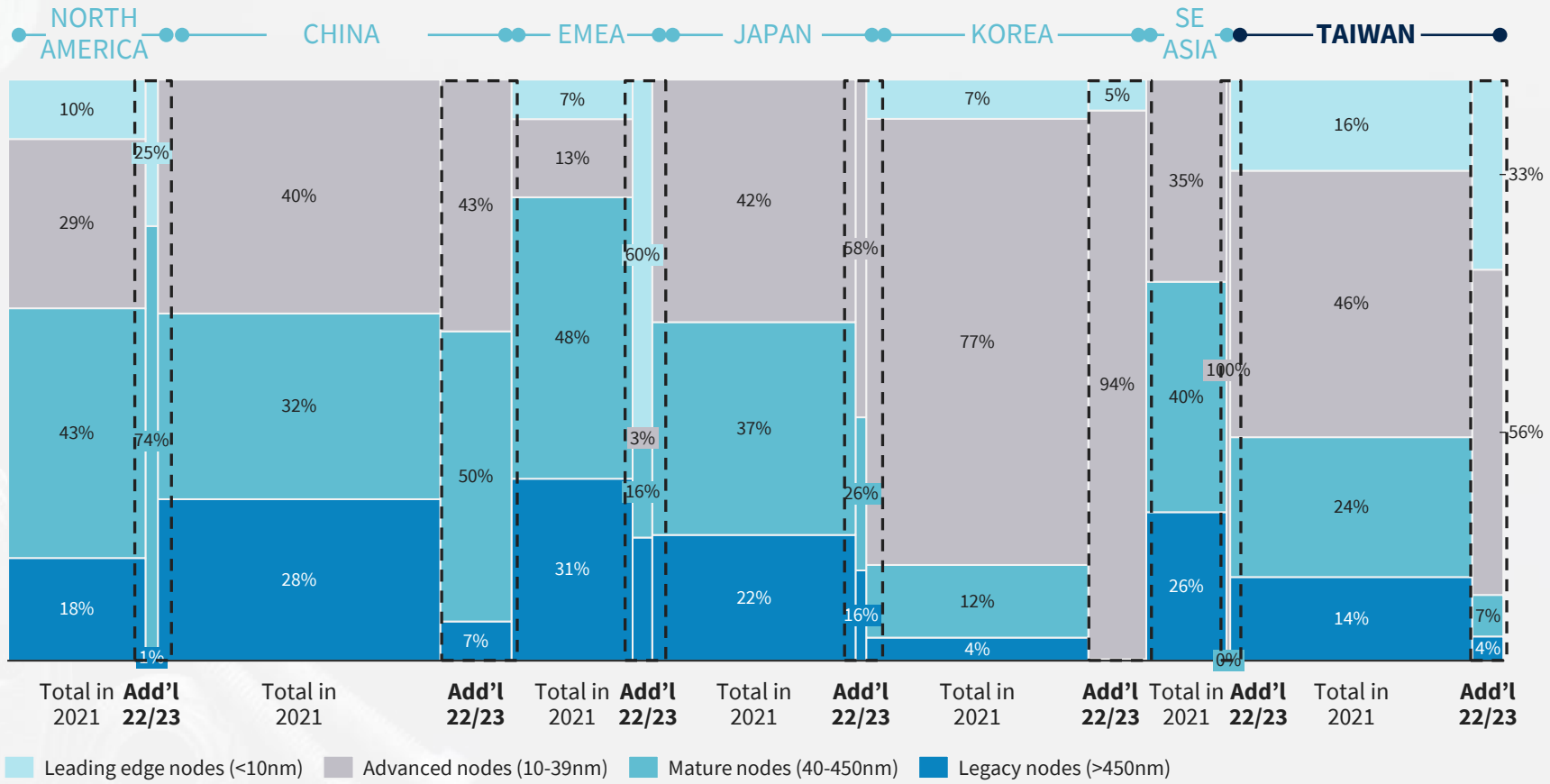
- New technologies, digitalization and the powertrain electrification are further driving the demand for semi-conductors in automotive applications
- Automotive chiplets leading to increased demand for less modern nodes rather than full transition to leading edge, as automotive is usually a bit behind e.g., in comparison to consumer electronics
- Limited additional supply for the mature and legacy nodes anticipated, reducing positive impact of supply relief

Margin impact

Volume impact

A conflict between China and Taiwan is the sword of Damocles due to the prominent role of Taiwan for global chip supplies

Existing capacity/planned supply expansion by node and region [8'' in '20-'23][1)]



1) Total capacity includes all product types (memory, logic, analog, discrete, power, MEMS) and IDMs, dedicated foundries and R&D production capacities

Source: SEMI, Roland Berger/Lazard

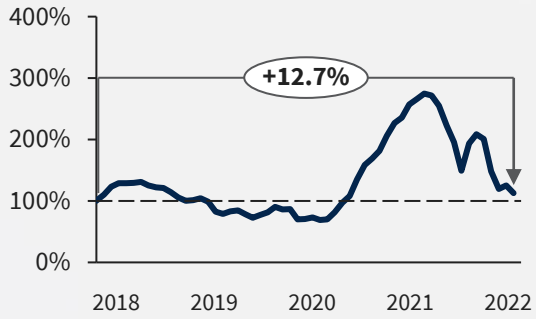
IMPACT ON AUTOMOTIVE SUPPLIER INDUSTRY

- Taiwan has a share in logic semiconductors of ca. 50%, in MCU's for automotive and industrial applications, the market share is >70%
- >50% of automotive electronics use semiconductors from Taiwan, mainly logic microcontrollers (MCUs) which are difficult to replace. Leading SemCos have outsourced MCU manufacturing to TSMC and UMC from Taiwan
- A military conflict would have a very severe impact. Global Automotive production could decline by 90% in the first 12 months in a worst case if Taiwanese chips are not accessible. After that, slow recovery over several years

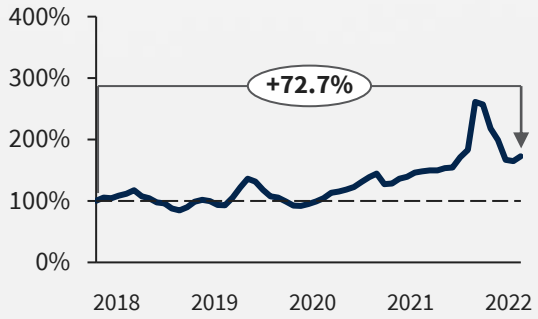
Skyrocketing raw material prices have been increasing the cost base for automotive suppliers in 2021 and 2022

Price developments of raw material – Selected indices

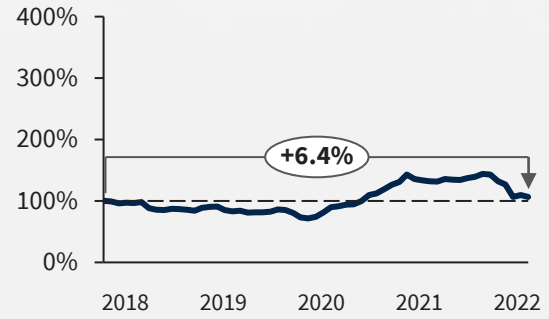
STEEL



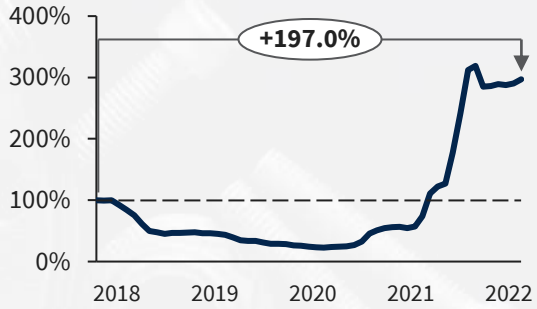
NICKEL



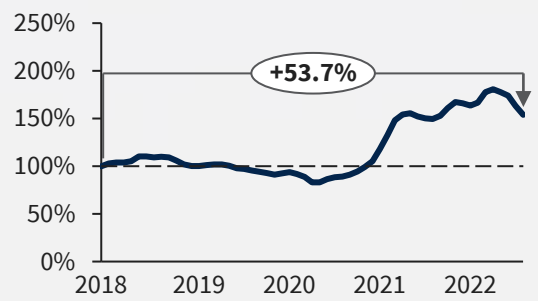
COPPER



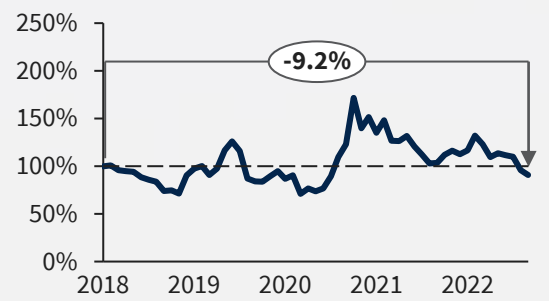
LITHIUM



PLASTIC



RUBBER



ME: Middle East

Source: Bloomberg, indexed at January 2018 = 100%, Index Mundi, London Metal Exchange for Lithium, Roland Berger/Lazard

IMPACT ON AUTOMOTIVE SUPPLIER INDUSTRY

- Large amounts of global steel-making capacity were reduced due to COVID-19
- Recovery of demand – not only from automotive – happened quicker than anticipated, restarting of steel plants was not in time to meet growing demand – steel prices strongly increased from late 2020
- Prices of Lithium are skyrocketing from mid-2021 with negative impacts recently due to Ukraine war
- Ukraine conflict hit in a period where material prices were coming back after record levels in 2021, increasing volatility again

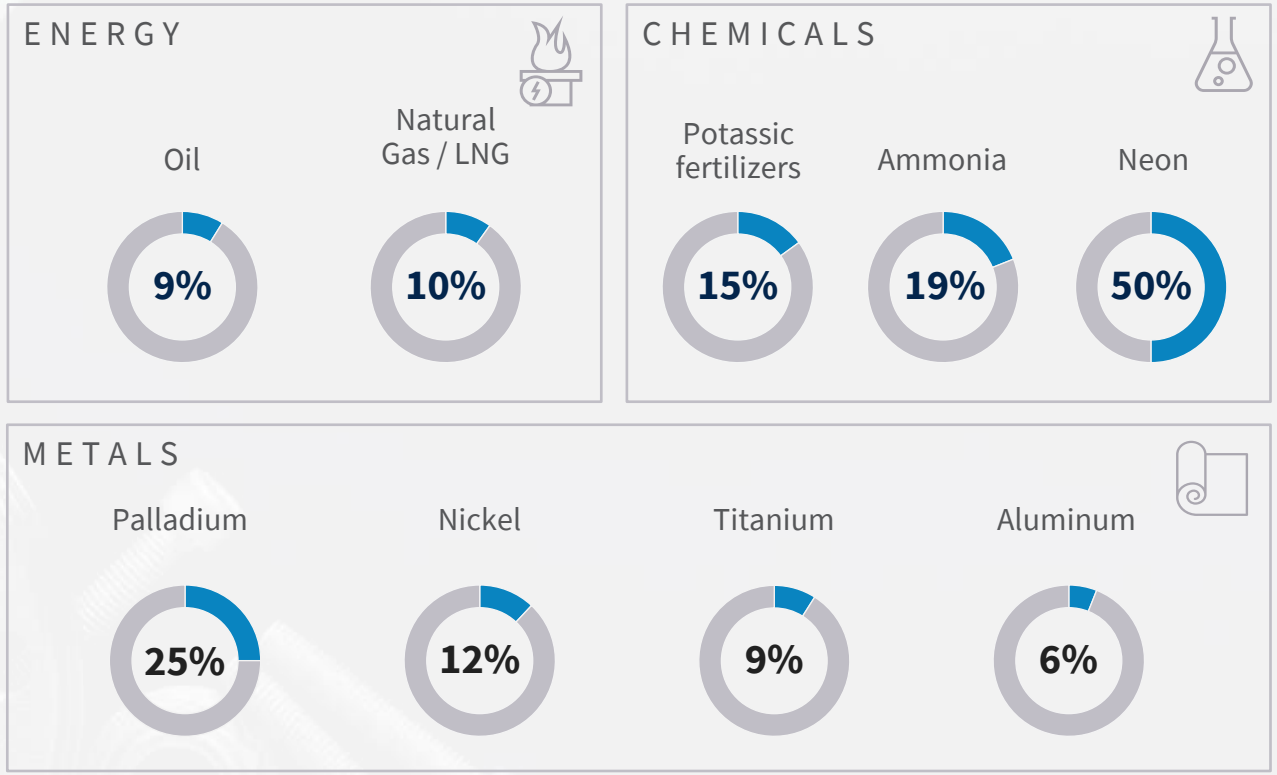
Margin impact

Volume impact

Russia/Ukraine crisis has a significant effect due to the importance of their exports on global trade

Russia and Ukraine export share of global trade in value for key commodities, 2020

ENERGY AND CRITICAL MATERIALS



Global export share of Ukraine and Russia combined

CRITICAL INTERMEDIATES

- Wiring harness
- Electronic and electromechanical products
- Catalytic converter
- Semiconductors
- Fertilizers

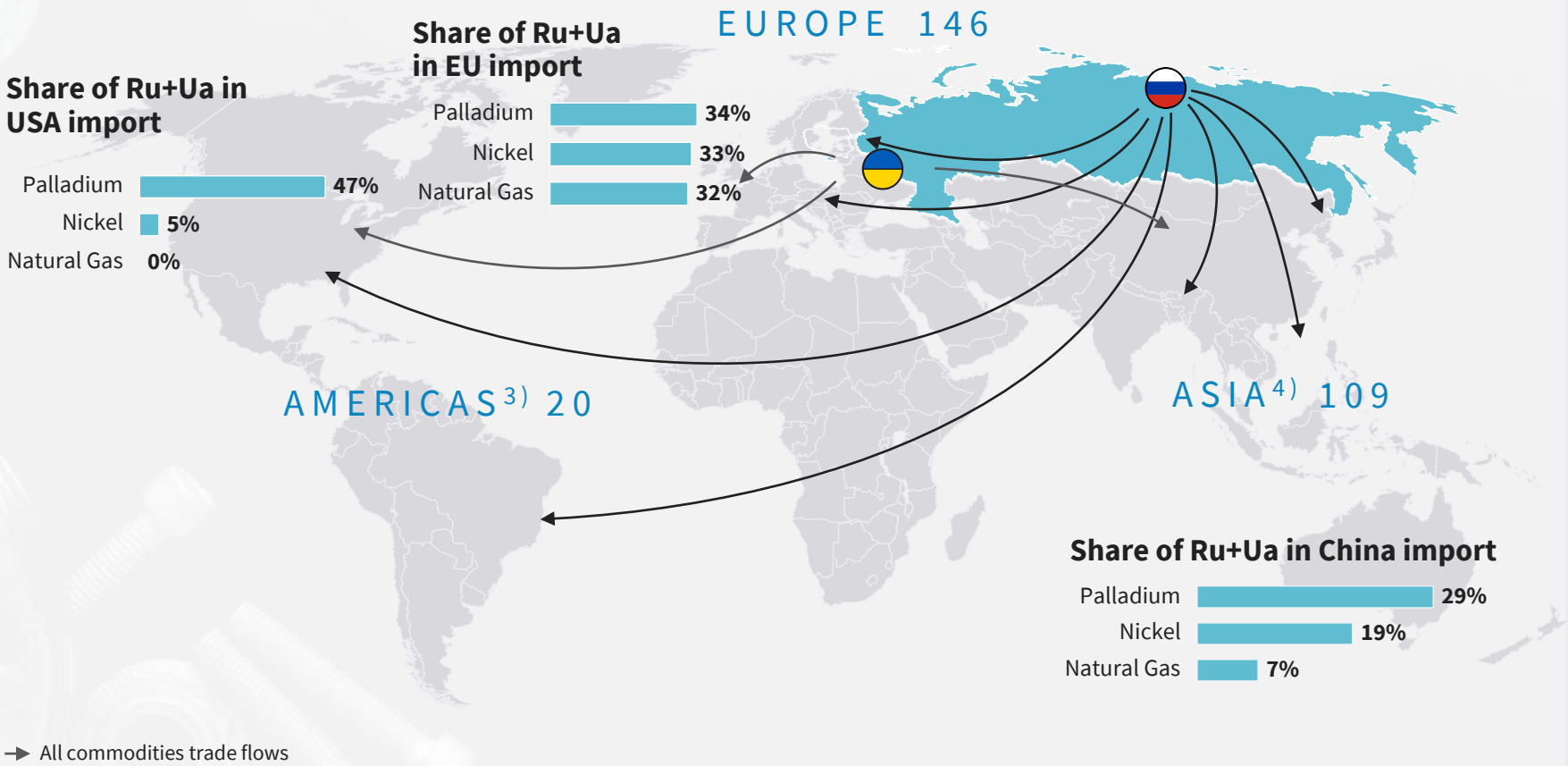
IMPACT ON AUTOMOTIVE SUPPLIER INDUSTRY

- Russia and Ukraine account for a large share of the global exports of key commodities such as oil, natural gas, metals and chemicals
- In addition to the rising fuel costs, port shutdowns and closed airspaces have disrupted the logistics movement and increased freight rates
- Both Russian and European metal output capacities have been hit by increased energy costs, resulting from higher natural gas prices
- Aluminum prices have remained elevated, as the ongoing energy crisis forced the European smelters to cut their output
- Russian share of Nickel supply could impact xEV supply chains, as the growing demand for Nickel is driven by xEV production

Source: Resource trade, UN Comtrade, Roland Berger/Lazard

Impact on the supply chain varies with the dependence on imports from Russia and Ukraine – EU with a high share of imports

Trade flows[1] with Russia / Ukraine and their share in import[2], [USD bn], 2020



1) Commodities; 2) For HS codes Palladium (711021), Nickel (75, 2604), Natural Gas (2711) 3) Northern America, Latin America; 4) Central and Southern Asia, China, Eastern and South-Eastern Asia

Source: Resource trade, UN Comtrade, Roland Berger/Lazard

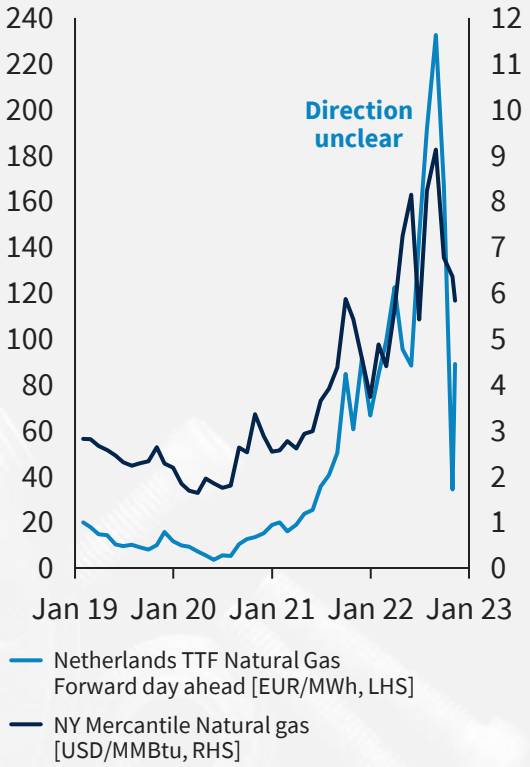
IMPACT ON AUTOMOTIVE SUPPLIER INDUSTRY

- Russia is the world's largest producer of palladium and second-largest natural gas producer
- Onset of the Ukraine war has negatively impacted the global trade and supply chains due to the increasing sanctions from Europe and the United States against Russia
- Supply chain for Nickel, a key material in battery production, is disrupted by Ukraine war due to sanctions against Russia, leading to increased price levels and potential shortages in the future
- Increased Nickel price will drive up the battery cost, as Nickel accounts for 10%-15% of the battery pack price
- Palladium, a key requirement to produce catalytic convertors, has long lead time and its shortage will delay the car production correspondingly

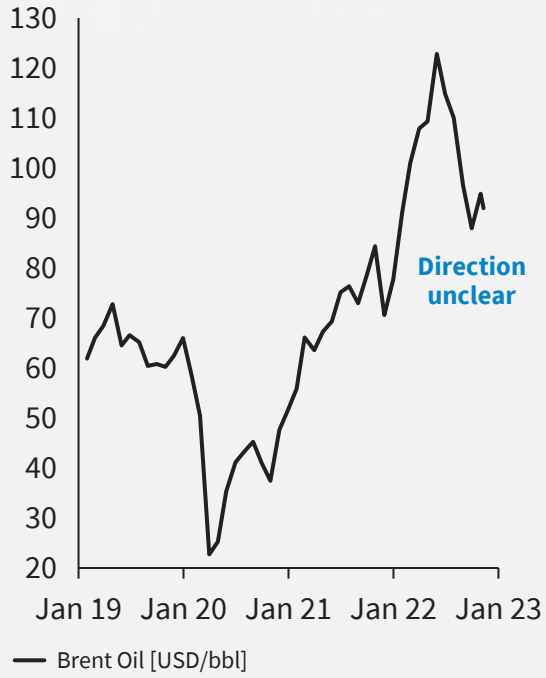
Due to uncertainties arising from the war in Ukraine and apparent economic warfare, energy prices have risen sharply

Price developments of selected energy sources

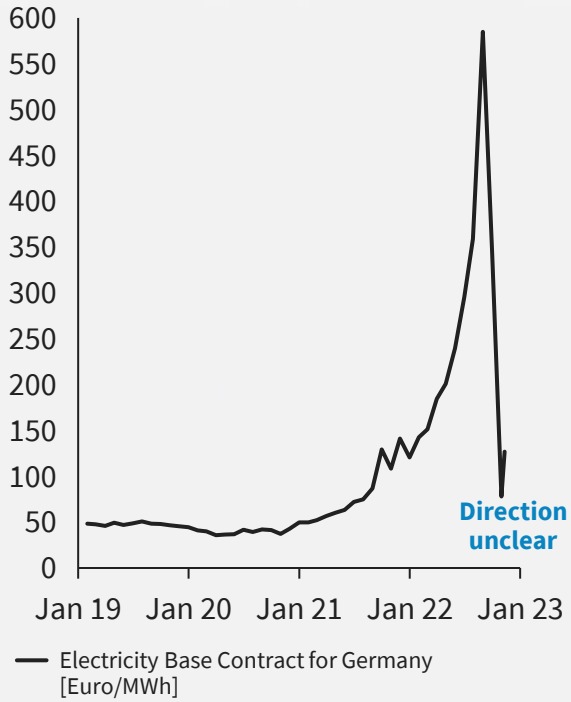
NATURAL GAS



BRENT OIL



ELECTRICITY



Source: Bloomberg, Eurostat, Roland Berger/Lazard

IMPACT ON AUTOMOTIVE SUPPLIER INDUSTRY

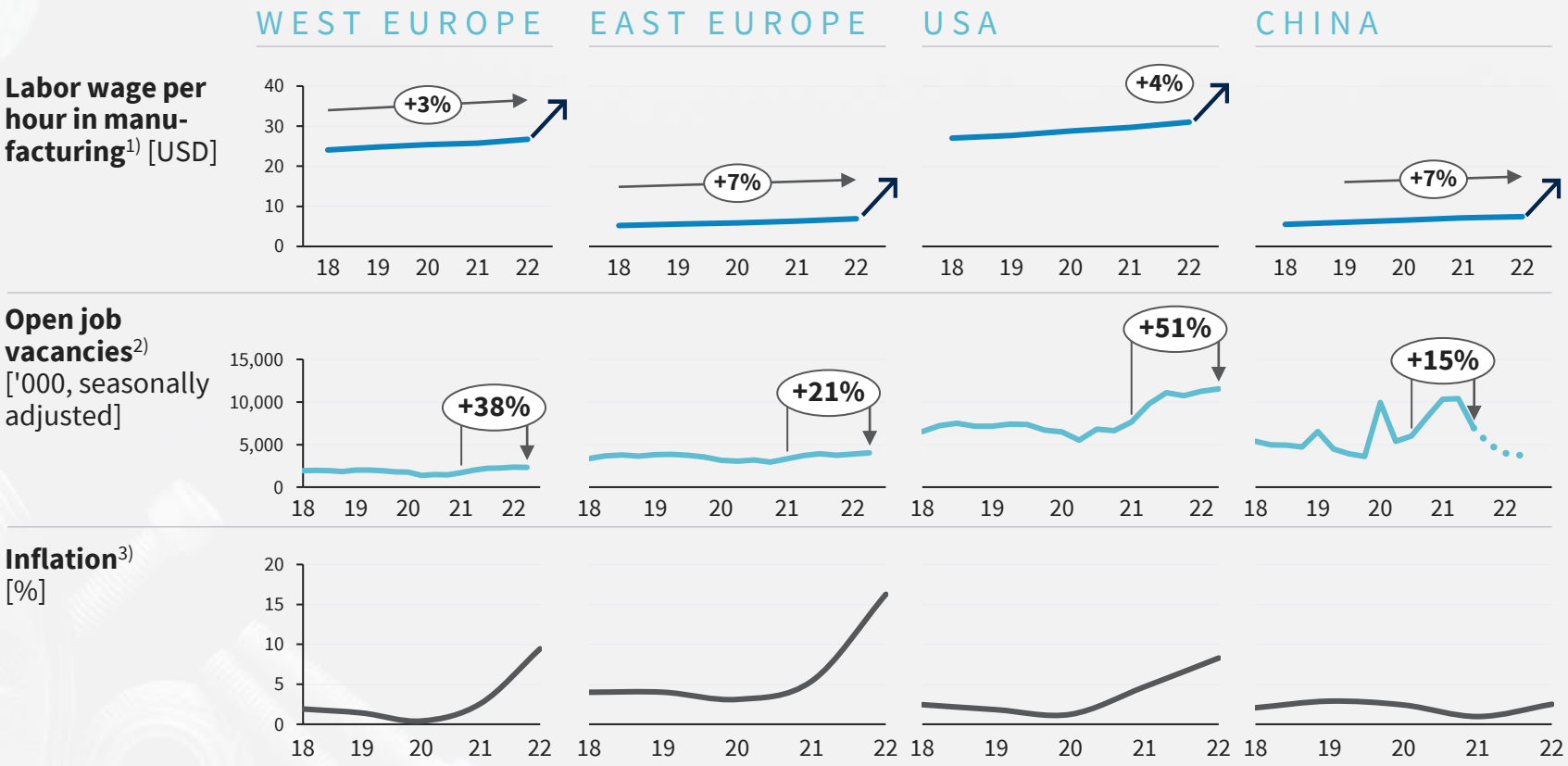
- Energy price increases are caused by unstable deliveries, especially of natural gas from Russia to Europe, and Western sanctions against Russia
- Given geopolitical situation and limited possibilities for short-term extension of alternative energy sources, prices are expected to remain at elevated levels, at least in the near-/mid-term in combination with very high volatilities
- Automotive suppliers are facing increasing factor costs driven by energy price increases
- Many suppliers are struggling to claim energy cost increases at the OEMs, as energy prices are often not indexed in sales contracts

Margin impact

Volume impact

In future, it will become more difficult to find skilled labor and expensive due to inflation and increasing competition for labor

Labor market developments



1) OECD data on a yearly bass 2) The job vacancies data provides estimates of the number of unfilled job vacancies across national economies 3) IMF data, Eurostat

Source: OECD; IMF; Roland Berger/Lazard

IMPACT ON AUTOMOTIVE SUPPLIER INDUSTRY

- Due to inflation, labor wages per hour are on a rise thereby having an impact on the overall production costs and margins
- Additionally, the lack of professionals increasingly becomes a limiting factor for automotive suppliers in terms of growing their businesses
- Support measures such as short time work help to mitigate risks for employers, but also prevent that employees from getting accrued to labor markets
- Increasing age of workforce and shortage of skilled workers are limiting workplace flexibility and requiring new factory setups in the future

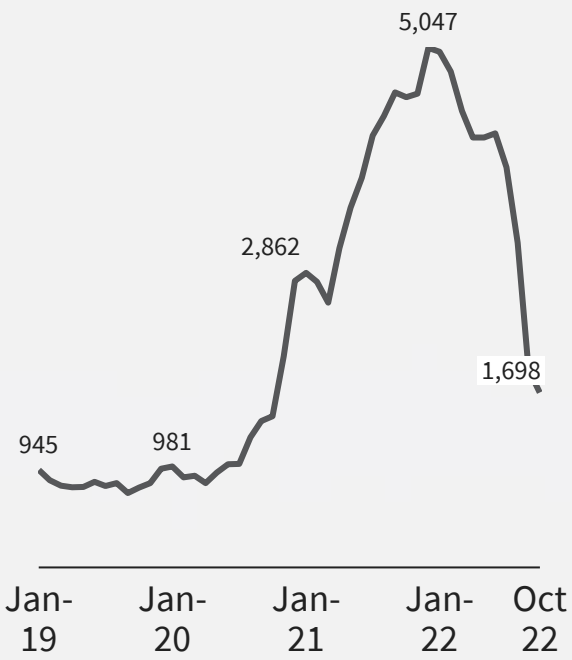
Margin impact
Volume impact

Supply chains are shaken by increasing fuel costs and other coincidences causing many unplanned shutdowns

Overview of selected KPI's and influencing factors – August 2022 values

Supply chain disruptions index

Shanghai Containerized Freight Index (SCFI)



Supply chain frictions

IMPACT ON AUTOMOTIVE SUPPLIER INDUSTRY

- Supply chain interruptions have become a hot topic from 2020 onwards and worsened since 2021
- By then, remaining stocks of selected components e.g., semiconductors, have been utilized and thus, suppliers were facing issues to follow OEM orders
- Subsequently, OEMs started to change their production programs on short notice, fueling the problem
- In parallel, external factors put additional burdens on the global supply chains and prevent a general normalization within industry since 2020

Margin impact

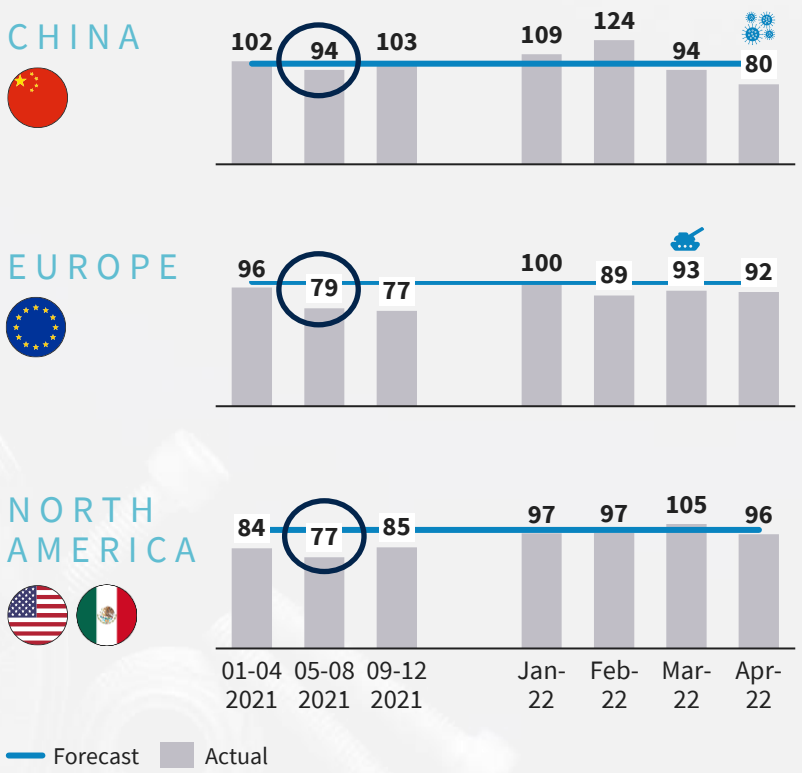
Volume impact

Source: International Monetary Fund – World Economic Outlook Report, CBP World Trade Monitor, Shanghai Shipping Exchange, Statista, Roland Berger/Lazard

Short-term volatility of order volumes are a major issue for automotive suppliers since mid of last year

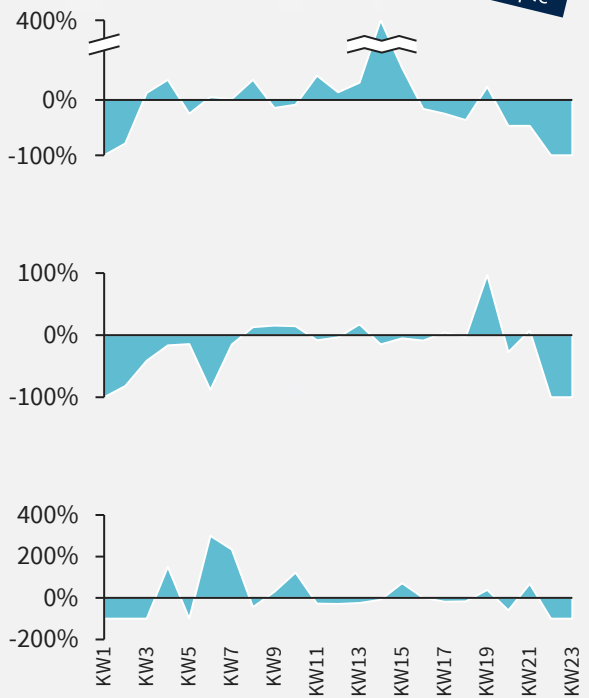
EDI shifts and sales implications – Reference example

Sales volume fluctuation – Actual production vs. forecast [%]



Projects/derivates of European premium OEM: Actual production vs. plan 2022 [%]

Example



IMPACT ON AUTOMOTIVE SUPPLIER INDUSTRY

- Automotive suppliers faced significant short-term deviations in their actual order-volumes in comparison to forecasts they receive
- The volume losses did not only translate into a sales decline but also into an above average EBIT burden due to short term mitigation measures within the manufacturing plants
- In extreme cases, volume corrections were made on a weekly basis e.g., cancellations on Friday for the following week
- Suppliers had difficulties to adjust structures accordingly as they need be able to fulfill contracted volumes
- Effect has eased but is still a challenge for many suppliers

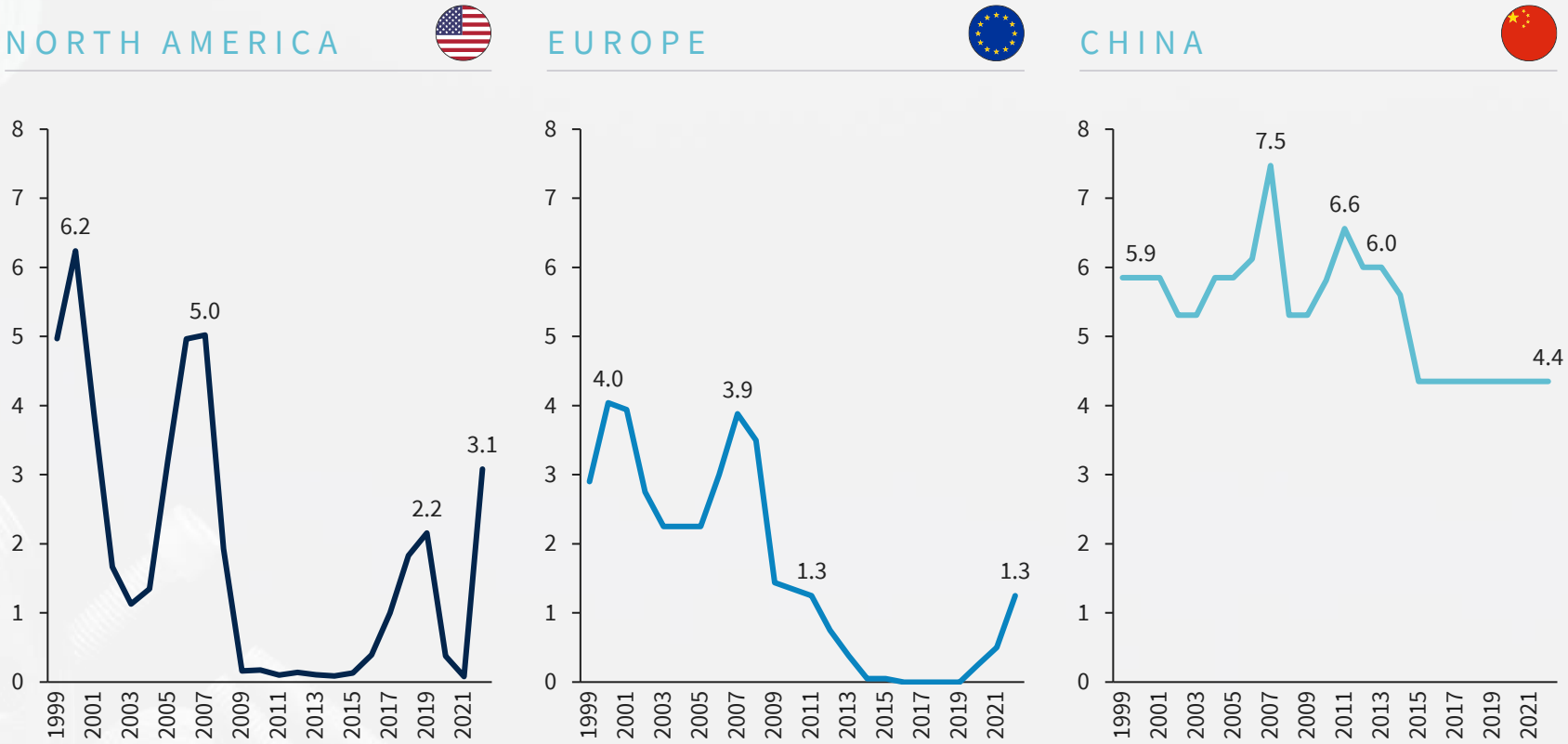
Margin impact

Volume impact

Source: IHS, desk research, Roland Berger/Lazard

Central banks are fighting inflation risks by raising interest rates

Central bank base rates – 1999-2022 [%] – November 2022 values



IMPACT ON AUTOMOTIVE SUPPLIER INDUSTRY

- The trend will make refinancing for automotive suppliers more expensive than in the last years with almost zero interest rates
- Especially the combination of volume uncertainty, fear of recession and potentially resulting downgrades of supplier ratings is a risk for traditional automotive players
- Development is not expected to turn around within the next 12-18 months

Margin impact

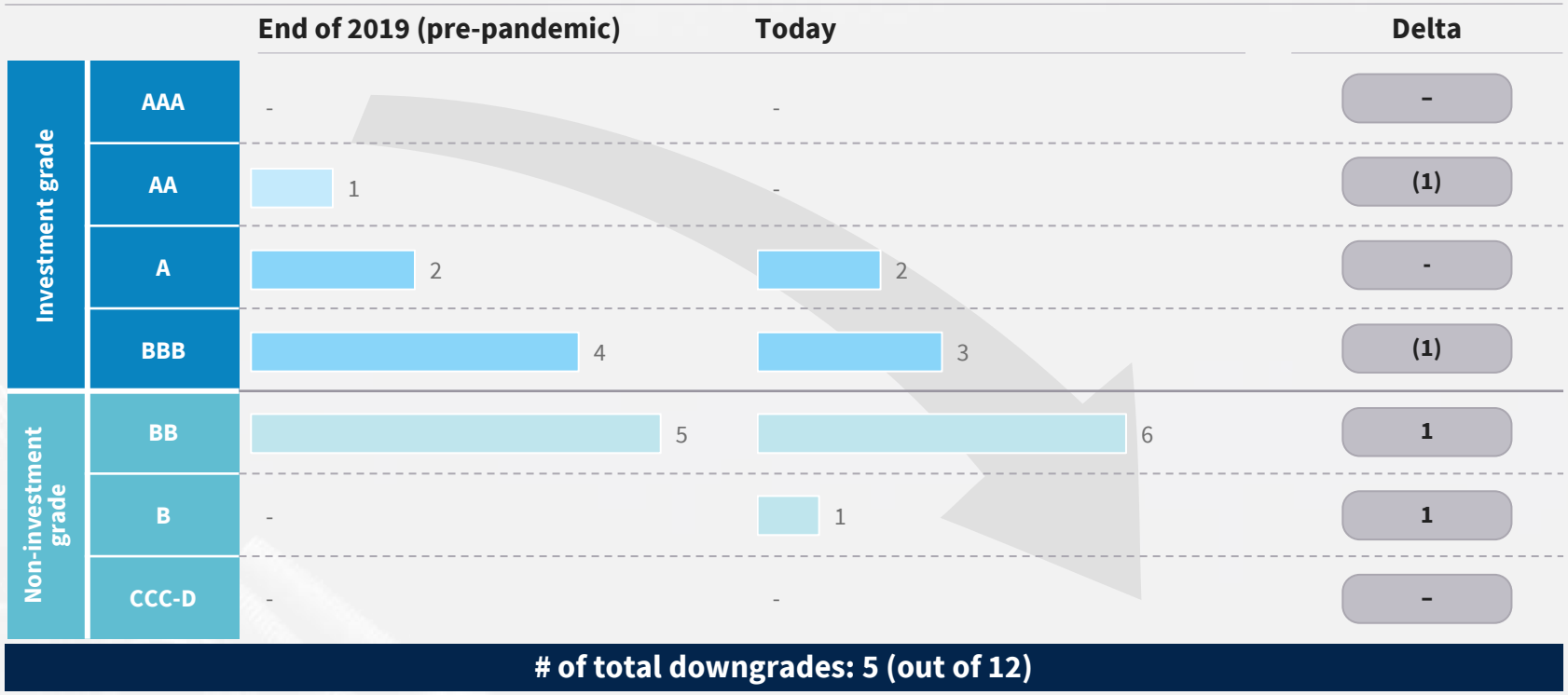
Volume impact

Source: Federal Reserve Economic Data, Statista, Roland Berger/Lazard

Automotive supplier credit ratings deteriorated in the light of current market challenges

Crisis impact on financing

Impact on S&P credit ratings of automotive suppliers[1)]



1) Each rating category includes +/- sub-ratings as per Standard & Poor's credit rating standards
Note: Ratings based on Standard & Poor's for the following set of suppliers: American Axle, Autoliv, Borg Warner, Continental, Dana, Denso, Faurecia, Magna, Schaeffler, Tenneco, Valeo, Visteon
Source: Company information, FactSet, S&P Market Intelligence

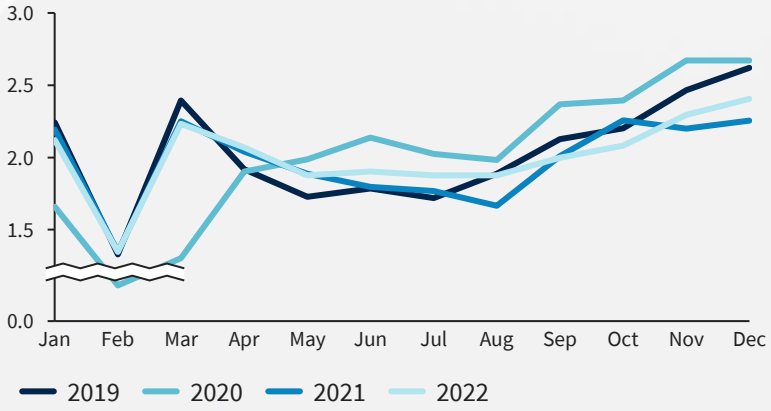
IMPACT ON AUTOMOTIVE SUPPLIER INDUSTRY

- Out of the observed 15 large automotive suppliers, 5 faced a rating downgrade compared to 2019 (S&P), leading to increased cost of debt
- A large number of suppliers are non-investment grade today
- Since rating agencies are cautious regarding the automotive supplier industry in general, it is challenging for suppliers to improve their ratings near-term
- This development is critical for automotive suppliers, as they have to shoulder capital requirements to finance the industry transformation as well as operational headwinds

Given Chinas relevance for global automotive demands, the local COVID-19 relapse is a risk for the industry

COVID-19 in China as per end of August 2022

Monthly production volumes China [m units]



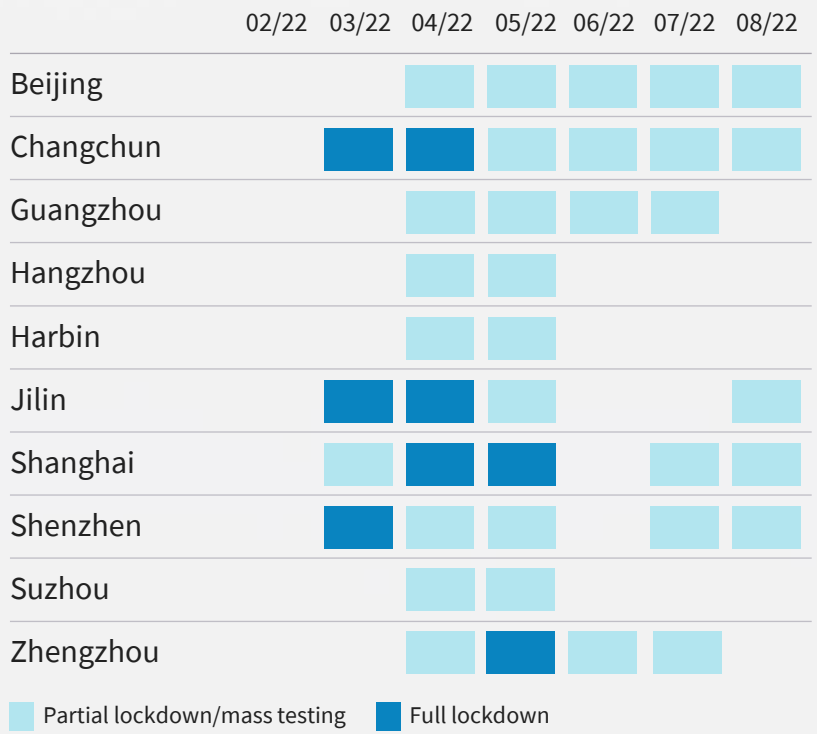
~50% **decline in car sales** for the month of April 2022 compared to March 2022

~0.7 m **less vehicles sold** in month of April 2022 compared to April 2021

~45% **reduction in trucking and goods** handling capacity at Shanghai port since March 2022

~22% **increase** in export container **waiting times**

SELECTED INDUSTRIAL AND TRADE HUBS IN LOCK-DOWN [02/22-08/22]



IMPACT ON AUTOMOTIVE SUPPLIER INDUSTRY

- Potential risk of losing up to 1.5 m units in vehicle production, if China continues strict No-Covid policy
- Closure of own supplier plants
- Closure of harbors in affected locations (e.g., trans-shipping volume in Shanghai harbor has fallen by around 40% during the lockdown)
- Supply chain frictions due to missing parts
- Revenue losses because of shut-down production locations in China and other global locations due to missing parts
- Currency exchange risks, as Yuan plunged to the lowest level since November 2020
- Additional costs for accommodation and food for employees which must partially stay in manufacturing plants

Margin impact

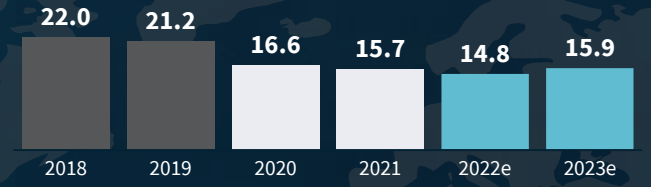
Volume impact

Source: Roland Berger/Lazard, Frankfurter Rundschau, CNN, National Health Commission of the People's Republic of China, Southern China Morning Post, ABC News

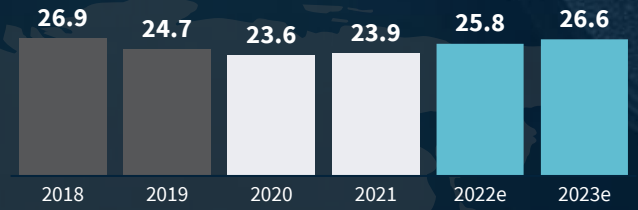
Due to continued bottlenecks in automotive semiconductors and other constraints, global production volumes remain below pre-crisis levels

Production volume passenger cars[1)] by region, 2018-2023e [million units]

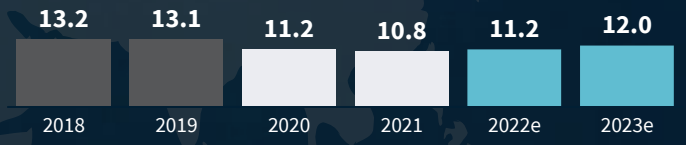
NORTH AMERICA



EUROPE

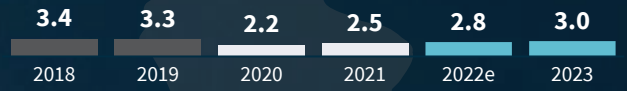


CHINA



JAPAN / KOREA

GLOBAL



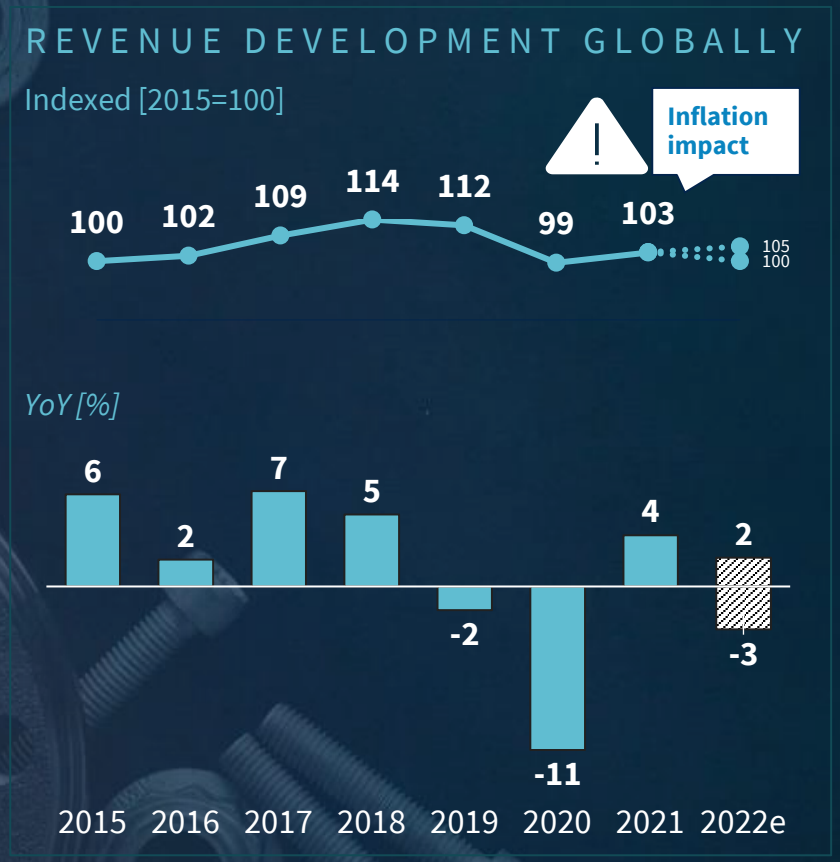
SOUTH AMERICA

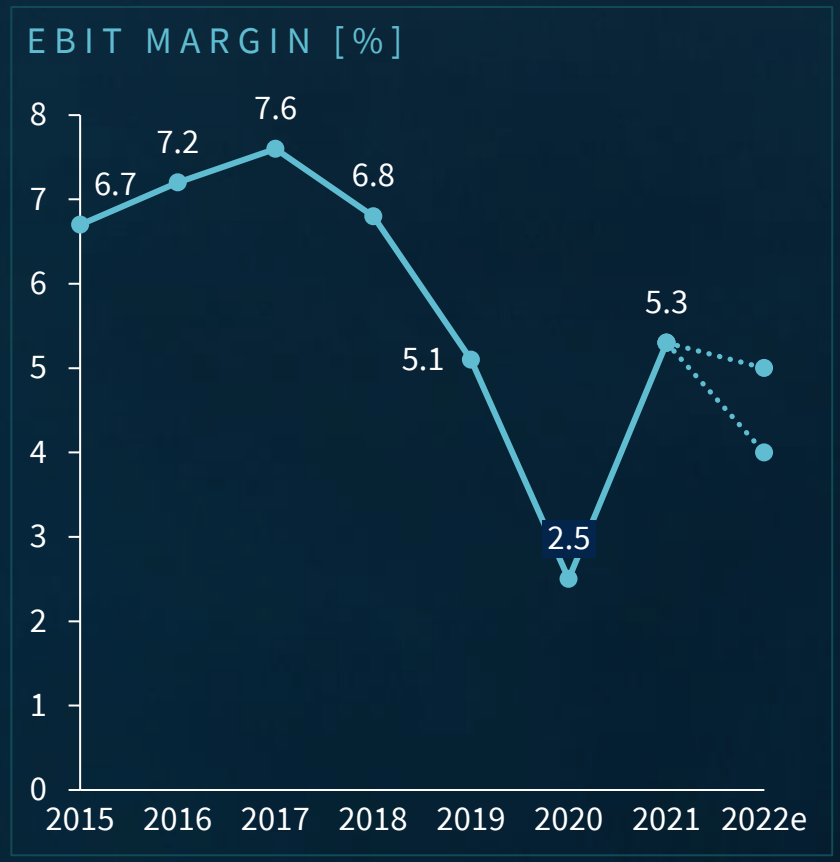
1) Incl. LCV; excl. CIS

Source: IHS LV Production Report; Roland Berger/Lazard

The profitability of automotive suppliers is substantially lower than it was before 2019/2020 and players are expected to face further margin pressure

Key supplier performance indicators 2015-2022e (n=~600 suppliers)





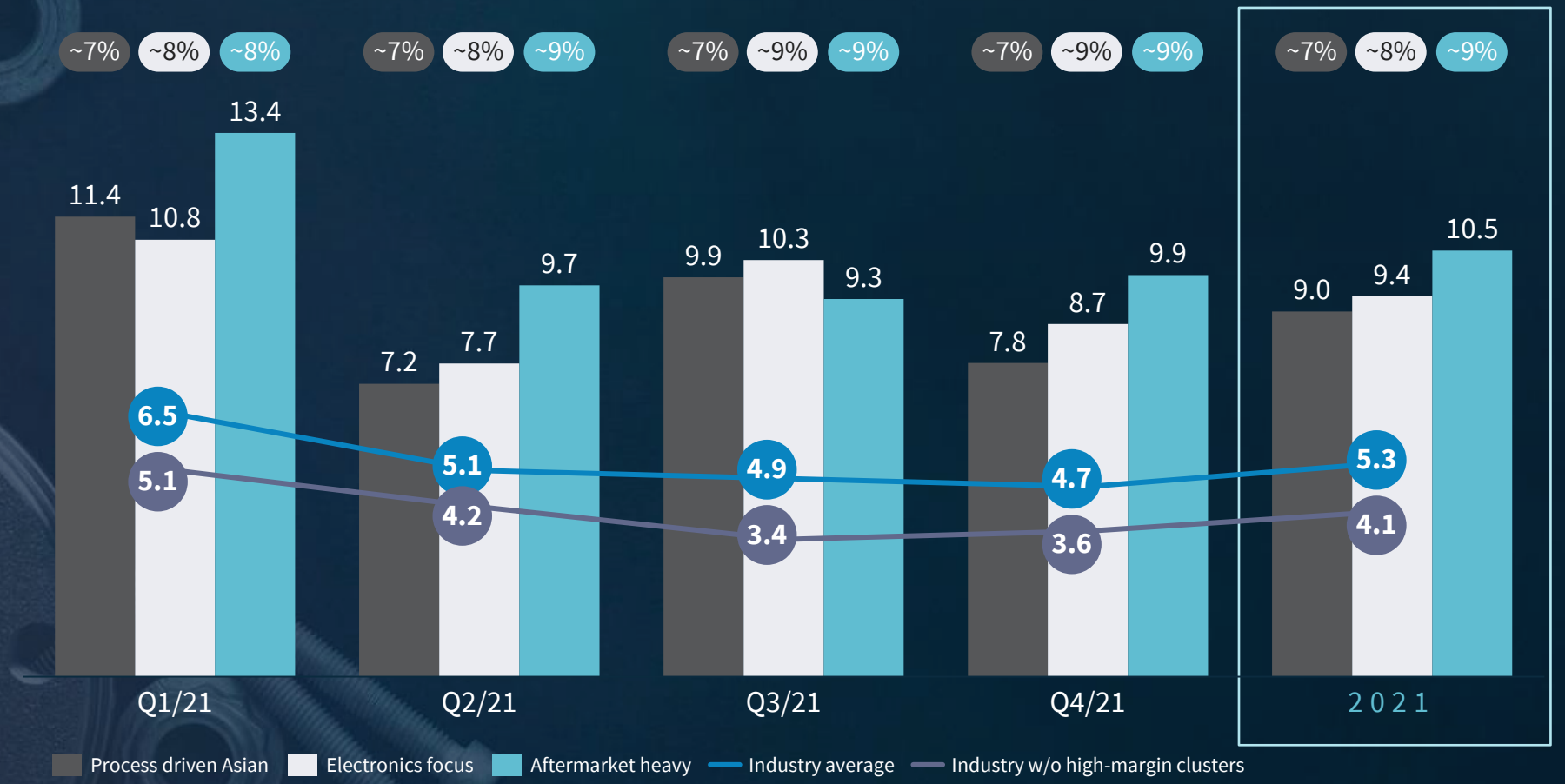
COMMENTS

- The COVID pandemic has erased 5 years of revenue growth in the supplier industry
- Overall industry revenue has slightly recovered in 2021, but is still below the 2017 revenue level and driven by price inflation
- Margin levels recovered in 2021 to pre-pandemic levels, but are still lagging historic comparisons
- The spread of margin levels across different industry segments and regions has increased significantly – Few segments with high crisis resilience achieve healthy margins while many suppliers are facing massive margin pressure
- Overall, profit levels in 2022/2023 expected to come under pressure again

Source: Company information, Roland Berger/Lazard

The annual average in 2021 was driven by an excellent start into the year as well as a group of outperforming players with above average margins

Quarterly supplier EBIT performance 2021 [%, n=~600 suppliers]



COMMENTS

- Players from Asia could benefit from a local semiconductor industry and, thus, a better availability of parts and a more stable market situation
- Additionally, process driven Asian players have used the COVID-19 crisis in 2020 to get rid of legacies and restructure their businesses, making excellent profits over the year
- Aftermarket players benefited from the limited offer of new cars after the COVID-19 recovery and the subsequently caused boom for used cars
- Suppliers with electronics and software focus can leverage their leading technology position into above average margins

Source: Company information, Roland Berger/Lazard

Although margins had recovered in 2021, actual values from H1/2022 are very often back on or even below the values from the 2020 crisis year

Reported EBIT margins

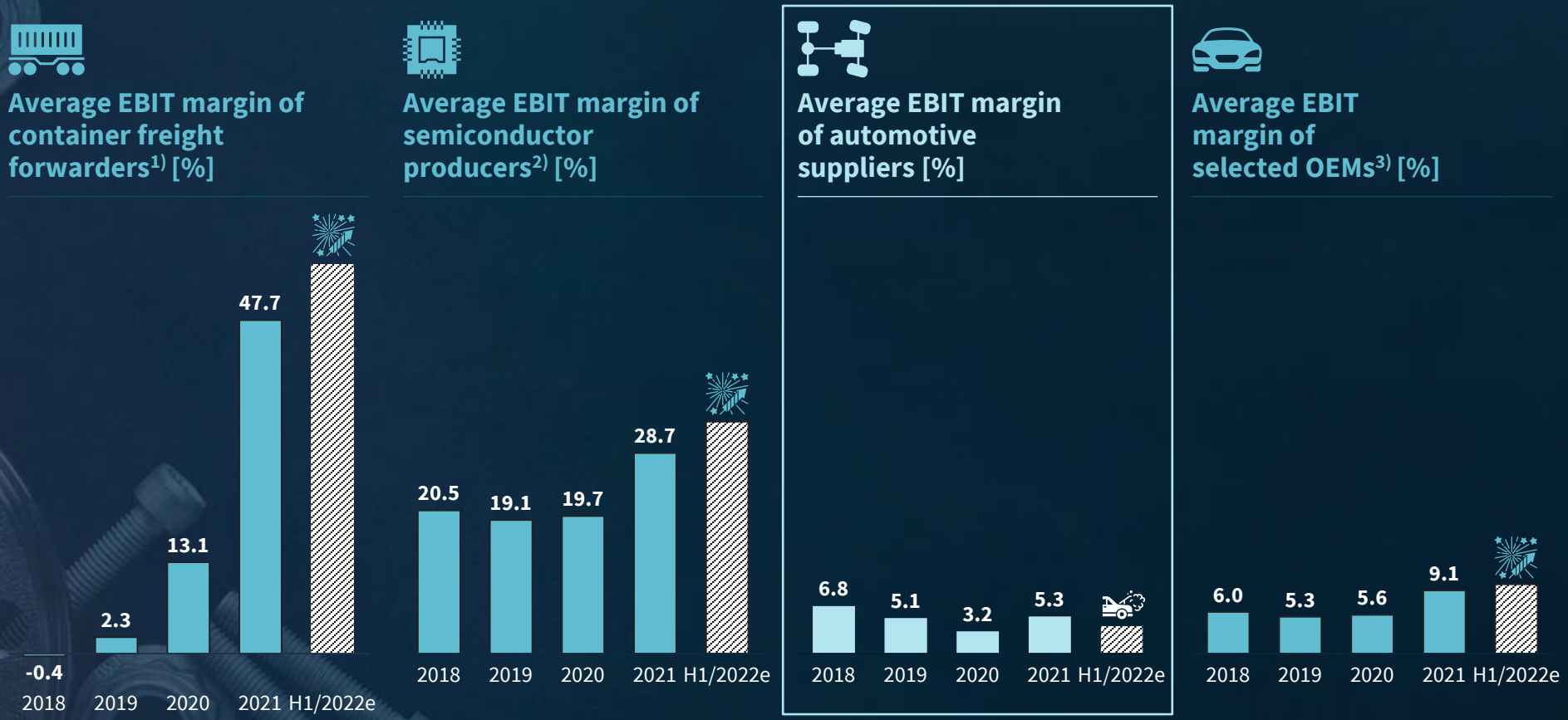
Position	Company	FY 2020	FY 2021	H1 2022	Position	Company	FY 2020	FY 2021	H1 2022
1	Bosch[1)]	-1.6%	0.4%	-	16	Sumitomo Electric	3.9%	3.6%	2.2%
2	Denso	3.9%	7.0%	5.8%	17	Yazaki	-	-	-
3	Continental	-1.3%	5.5%	1.1%	18	Aptiv	6.6%	8.8%	6.5%
4	ZF Friedrichshafen	3.2%	5.0%	4.0%	19	BorgWarner	6.1%	7.8%	8.2%
5	Magna International	5.1%	5.7%	4.6%	20	Adient	2.9%	4.4%	2.3%
6	Aisin Seiki	4.8%	5.6%	3.2%	21	Panasonic[3)]	1.0%	0.2%	-4.5%
7	Hyundai Mobis	5.0%	4.9%	3.3%	22	Goodyear	0.1%	7.4%	6.6%
8	Michelin	9.2%	12.5%	11.5%	23	Marelli	-	-	-
9	Bridgestone	7.7%	12.1%	11%	24	Toyota Boshoku	3.5%	4.5%	2.2%
10	Weichai Power	7.0%	7.4%	4.6%	25	Mahle	-2.0%	1.5%	-3.1%
11	Valeo	2.3%	4%	2.7%	26	Hitachi	9.7%	8.3%	3.1%
12	Lear	3.6%	4.3%	3.6%	27	Schaeffler	6.4%	9.1%	6.1%
13	Faurecia/Forvia	2.9%	5.5%	3.7%	28	BHAP	-	-	-
14	Cummins[2)]	12.3%	11.9%	11.4%	29	Yanfeng Automotive Interiors	-	-	-
15	Tenneco	-4.7%	3.1%	1.0%	30	Gestamp	2.1%	5.1%	4.9%

1) Only Mobility Solutions 2) Mostly Off-highway and commercial vehicle business 3) Automotive segment

Source: Company information, Bloomberg, Roland Berger/Lazard

Looking at the automotive value chain reveals that predominantly suppliers are suffering from the current situation

EBIT development of selected value chain participants [%]



COMMENTS

- Quick recovery in freight transport demand combined with limited supply (Suez Canal blockade, silk road through Belarus) led to sharply rising global freight rates and pushed carrier margins
- Stable semiconductor demands and high prices led to margin increase for manufacturers
- Despite resource scarcity OEMs can benefit from the market situation by focusing on high margin cars and cancellation of discounts
- Since 2019, the margin development of OEMs and their major supply base has been structurally disconnected

1) CMA CGM, COSCO, EMC, Hapag-Lloyd, HMM, Maersk, ONE, WHL, YML, Zim 2) Cree, Elmos, Infineon, Intel, Nvidia, NXP, ON, Panasonic, Renesas, STM, Texas Instruments
3) Volkswagen, BMW, Mercedes-Benz, GM, Ford, Toyota, Hyundai

Source: Freightos Baltic Index, Alphaliner, CSI Market, OEM final reports, Company information, Roland Berger/Lazard

Financial performance of suppliers varied to a certain extent depending on region, size and product focus

Profitability trends in the global automotive supplier industry in the past two years

1 REGION

+

- In 2021, North America showed the highest profitability, closely followed by Europe and Japan
- China with highest profitability in 2020 because of a quick volume recovery after the COVID-19 lockdowns beginning of the year
- Europe with the strongest recovery after COVID-19

–

- Despite a strong recovery from the COVID-19-year 2020, Korea was least profitable
- After strong profit levels in previous years margins in China have structurally come down to average automotive supplier levels

2 COMPANY SIZE

- Contrary to previous years, large mega suppliers with revenues of more than EUR 10 bn were most profitable with an EBIT of 5.9% in 2021
- Large suppliers with revenues of EUR 2.5 – 5.0 bn are the most stable in their margin levels achieving 5.1% EBIT in 2021

- In 2021, small suppliers with less than EUR 0.5 bn in revenues were least profitable with 2.8% EBIT margin
- From a historic perspective, medium sized companies with revenues of EUR 1.0 -2.5 bn faced the largest profit deterioration coming from 8.7% margin in 2018 to 3.7% in 2021

3 PRODUCT FOCUS

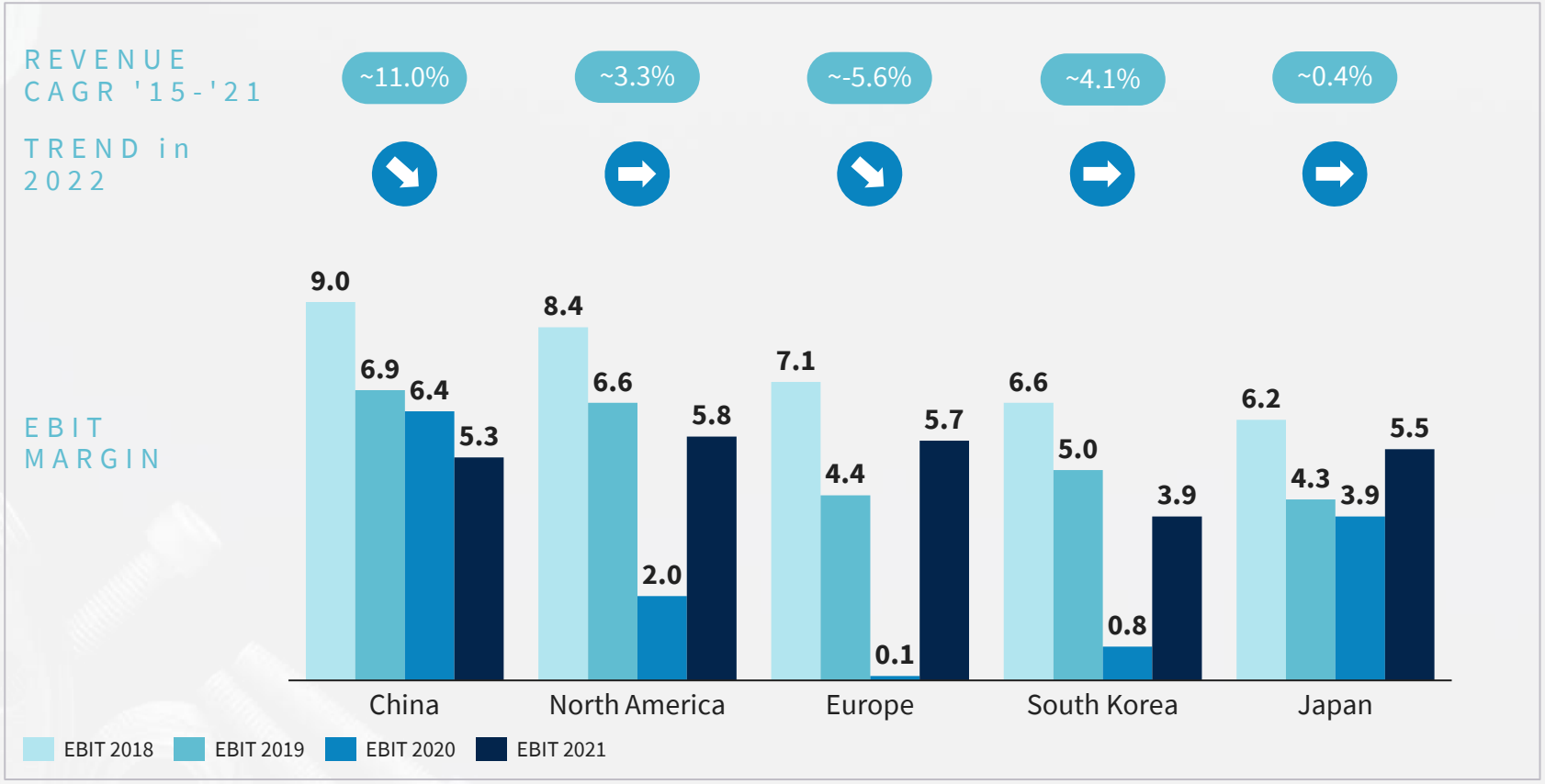
- After a weak 2020, tire suppliers lead the pack again with margin levels of 9.3% EBIT in 2021
- Electrics and infotainment suppliers could defend their sustainable margin levels of more than 6% EBIT margin, achieving 6.2% in 2021

- In 2021, exterior suppliers were least profitable, facing commoditization pressure and increasing raw material costs
- Interior suppliers struggle in translating technology trends into higher margins, being with 4.4% EBIT almost on the same level as exterior players

Source: Company information, Roland Berger/Lazard

Across all regions automotive suppliers recovered partially from the COVID-19 crisis last year

Key supplier performance indicators by region 2018-2021 [%]



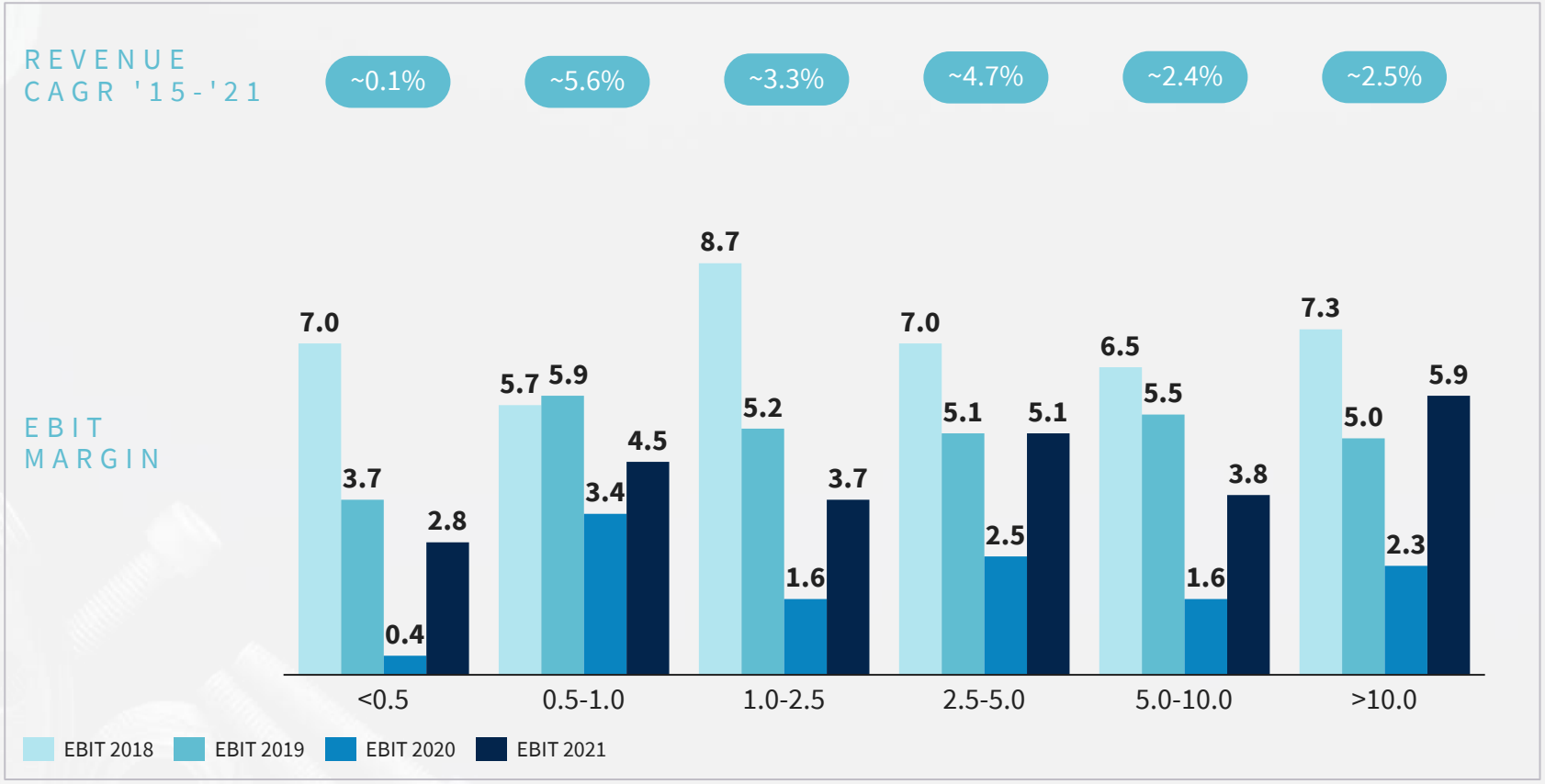
Very positive Very negative

- Japanese players have used the COVID-19 crisis in 2020 to partially restructure their operations and improve performance, especially amongst process-driven players
- Overall, the financial performance across the regions narrowed as the COVID-19 impacts as well as semi-conductor shortages tend to not hit all regions at the same time but with a certain offset
- Due to its strict COVID-19 management and strong demand, China came better through the crisis in 2020 but will be hit in 2022 going forward because of relapses
- 2021 results in China impacted by special effects e.g., impairments and supply chain problems of larger suppliers; in Q4/21, Covid-19 relapses hitting the market
- European suppliers are currently facing severe headwinds from current energy crisis and recession risks

Source: Company information, Roland Berger/Lazard

Especially very large suppliers with a broad product portfolio could successfully maneuver through the crisis

Key supplier performance indicators by company size[1] 2018-2021 [%]



Very positive Very negative

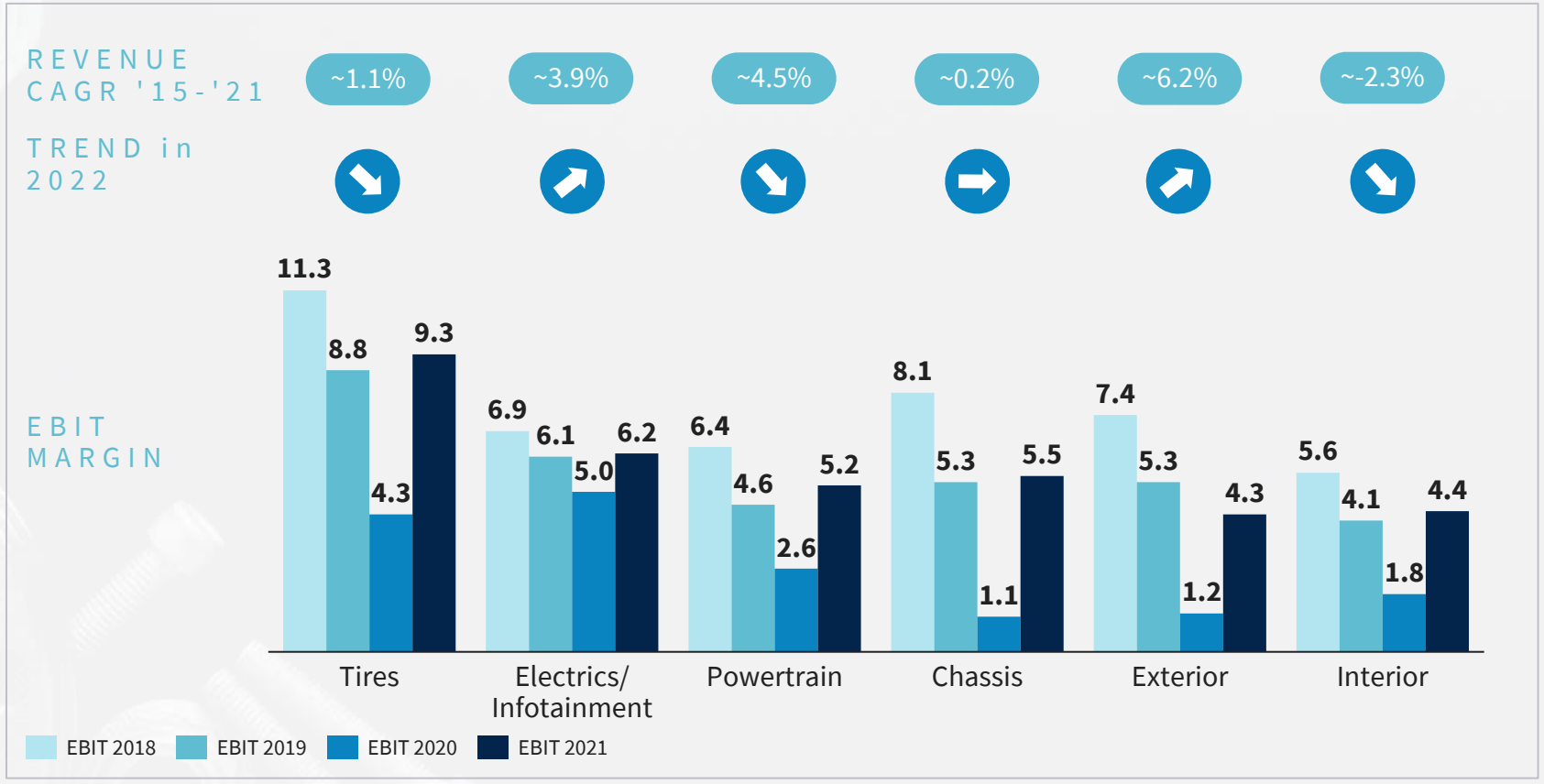
1) Size based on EUR bn of sales

- Larger suppliers are more crisis resilient as they can better leverage regional or product diversification, and financing options
- Small and medium suppliers lacking regional and broad product diversification, were hit the most by volume declines
- In addition, small companies suffered the most due to lost economies of scale from significantly lower production volumes in 2020 and 2021 and reduced financing options
- In 2022, large Tier-1 players challenged by the need to support T2/T3 suppliers while fully not being able to pass through cost increases to OEMs
- Going forward, margin development will be partially disconnected from company size, and more be related to portfolio and regional business allocation

Source: Company information, Roland Berger/Lazard

Automotive components mostly influenced by the overall market development – No crisis resilient domain

Key supplier performance indicators by product focus 2018-2021 [%]

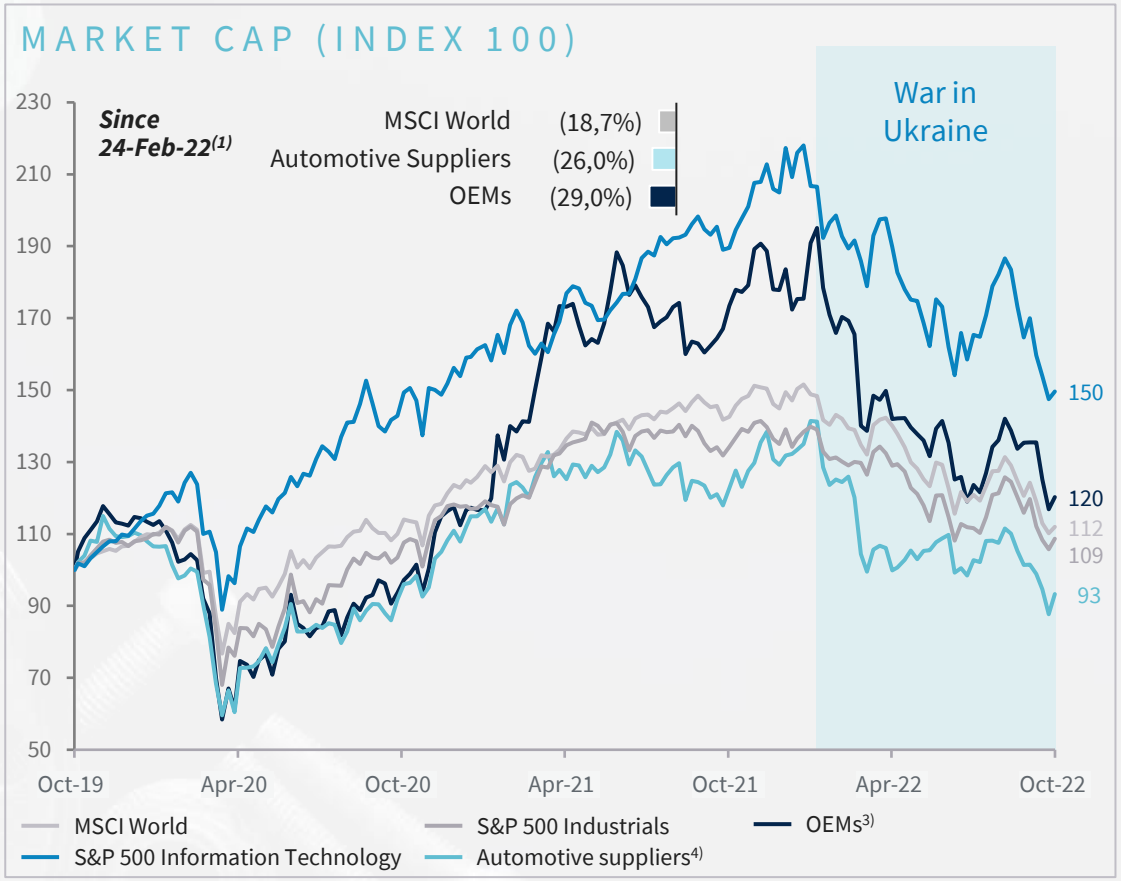


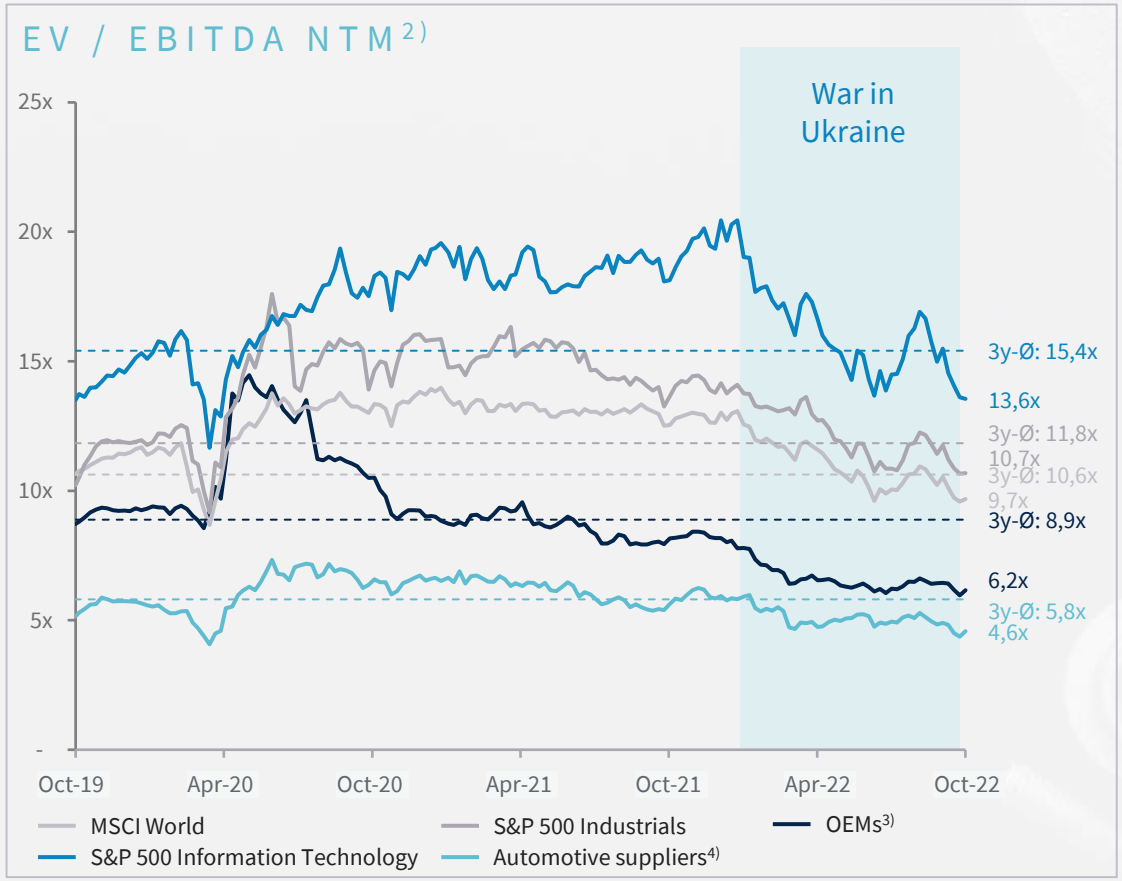
- All product domains, even differentiating high-technology products, have been significantly affected by the COVID-19 crisis in 2020
- Recovery to levels somewhat higher especially for those domains which serve recent short-term trends e.g., aftermarket players benefiting of the run for used cars
- Powertrain players seemed to have managed the COVID-19 crisis rather well but in fact the domain is influenced in 2020 by a group of larger, better performing mega-suppliers as well as companies which also have stakes in non-automotive and CV business
- Interior players suffer the most from commoditization
- Energy intense tire production will put margins of tire makers under pressure in 2022/2023

Source: Company information, Roland Berger/Lazard

Trading and valuation levels of automotive suppliers continue to be substantially weaker compared to other sectors

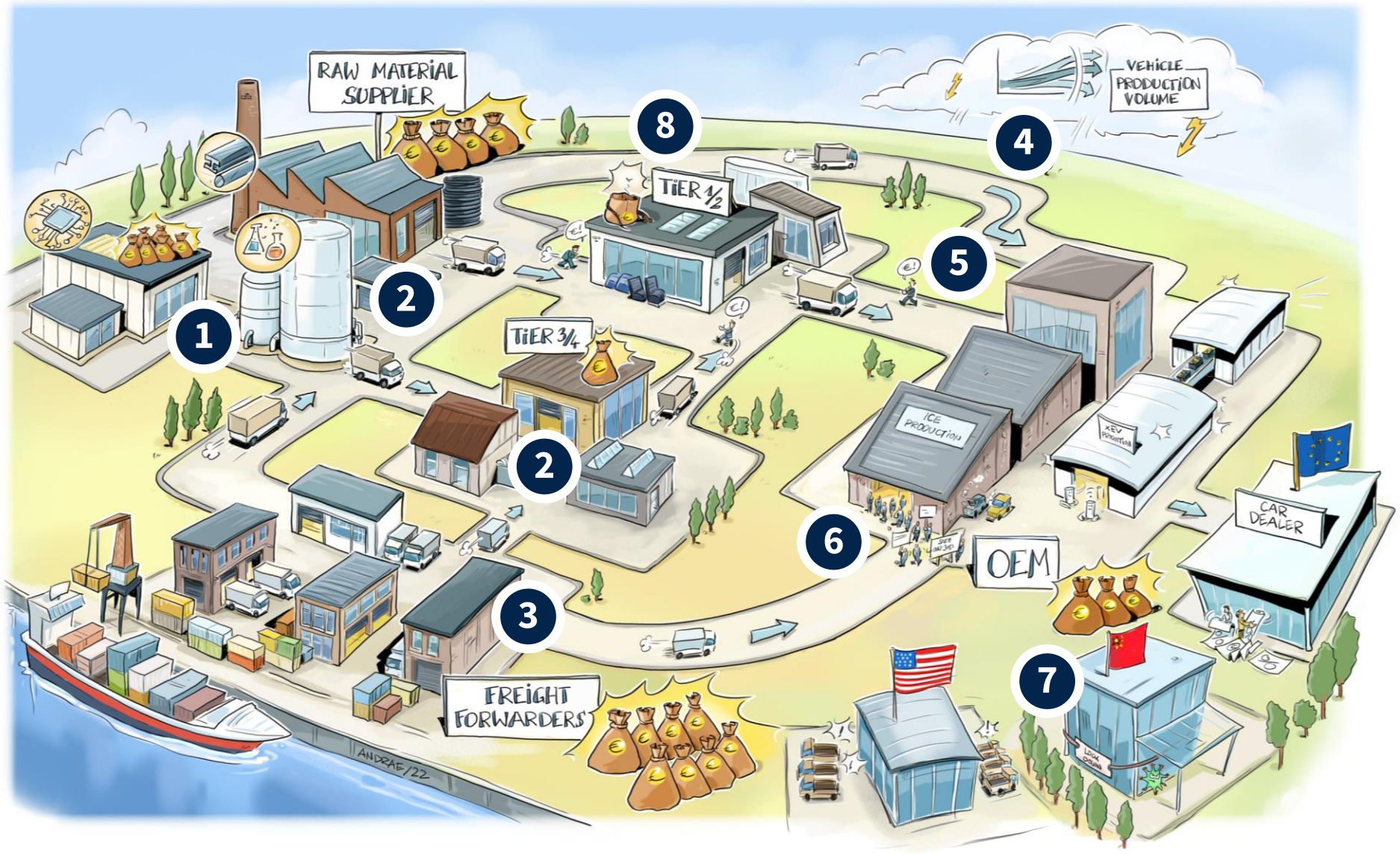
Overview of market dynamics over the last three years





(1) Beginning of the war in Ukraine (2) NTM = Next twelve months (3) BMW, Mercedes-Benz, Ford, General Motors, Stellantis and VW
(4) American Axle, Autoliv, BorgWarner, Brembo, Continental, Dana, Denso, Faurecia, Gentex, Leoni, Magna, Schaeffler, Tenneco, Valeo and Visteon

Source: Company information, Roland Berger/Lazard, FactSet, Bloomberg (as of Oct-22)



Automotive supplier margin squeeze

1. Semiconductor shortage is still holding the industry hostage – No short-term ease expected
2. Geopolitical events and energy cost inflation are pressuring supply chain and increasing cost for raw materials
3. Freight costs were high, cutting into supplier margins but came down the lost months
4. Vehicle production outlook is uncertain for the coming years and short-term orders very volatile, leaving suppliers with unclear volume forecasts. Also, consumer demand may deteriorate if recession becomes reality
5. Facing a significant industry transformation, OEMs are keeping cost pressure on suppliers high
6. OEMs are expected to insource certain systems in new EV generations to compensate for the loss of value-add as compared to ICE vehicles
7. The future of China as powerhouse of the automotive industry is uncertain
8. Financing cost will increase since central banks will fight inflation risks

Source: Roland Berger/Lazard

B.

Sustainability, new technologies and changing industry dynamics as mid- and long-term task

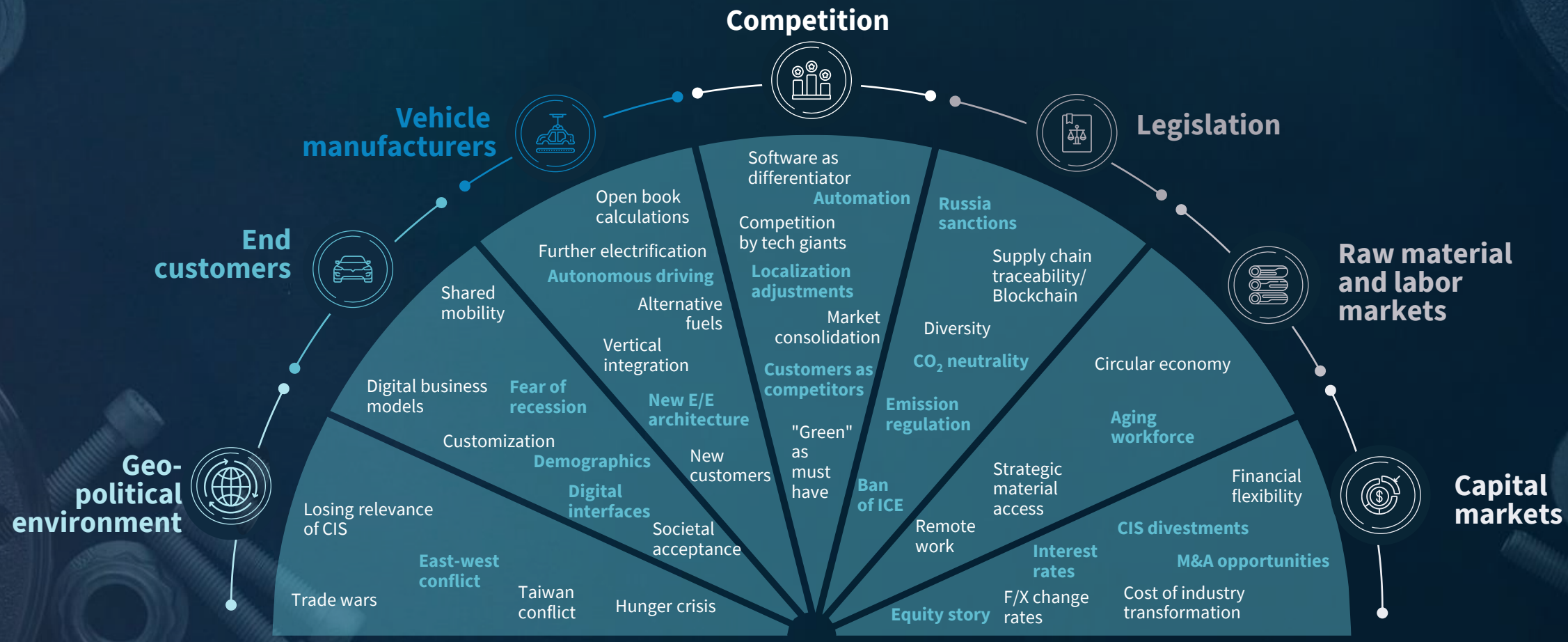
Although having been pushed into the background recently, technology trends play the major role in the mid/long-term

- With increasing electrification, autonomous driving and new vehicle architectures especially **software and electronics gain relevance** as "products"
- Especially **traditional powertrain and exterior products lose relevance** as they will not offer substantial differentiation and growth potential going forward
- Automotive suppliers must deal with a **change in the industry dynamics as well as the manufacturing environment**, meaning that they need to handle an aging workforce, increasing shop floor automation and a strong increase in factor costs
- Alongside, **maintaining financing flexibility is a key prerequisite** to shoulder R&D requirements and burden from increasing interest rates and to realize future growth in parallel
- Due to increasing factor costs, **OEMs and suppliers must redefine their relationships** to equally share the burden, thus, redefining the current industry dynamics towards more collaboration and higher cost transparency

Source: Roland Berger/Lazard

Actual challenges, such as the war in Ukraine or semi-conductor shortages, will be resolved in the mid-term and being replaced by structural topics

Supplier CEO radar screen – Long term implications

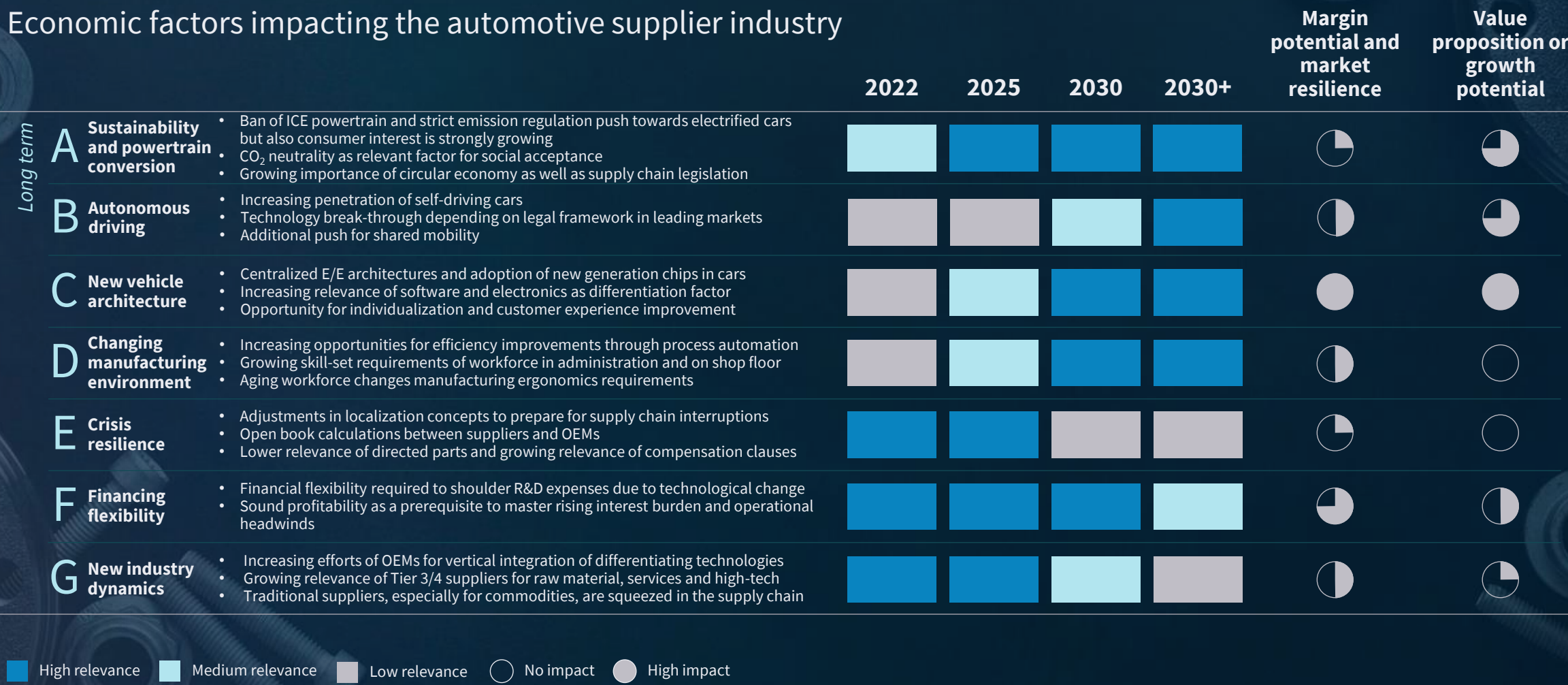


XXX = Deep dive on following pages

Source: Roland Berger/Lazard

In the long-term, suppliers will have to equally deal with trends which impact their product portfolio and their business environment itself

Economic factors impacting the automotive supplier industry



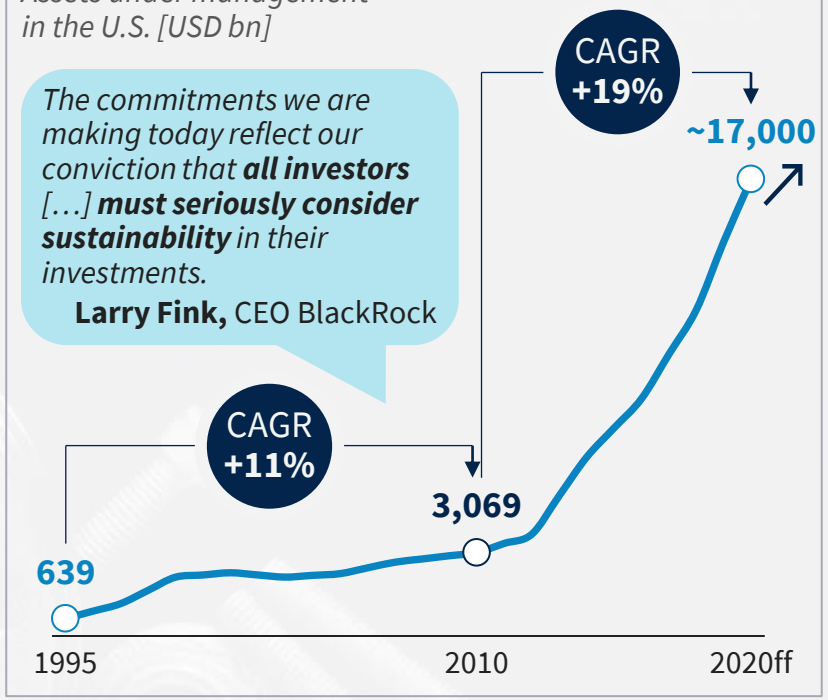
Source: Roland Berger/Lazard

Future investors and customers expected to be "Sustainability minded" – Suppliers need to adapt

Impact of sustainability on investors and end customers

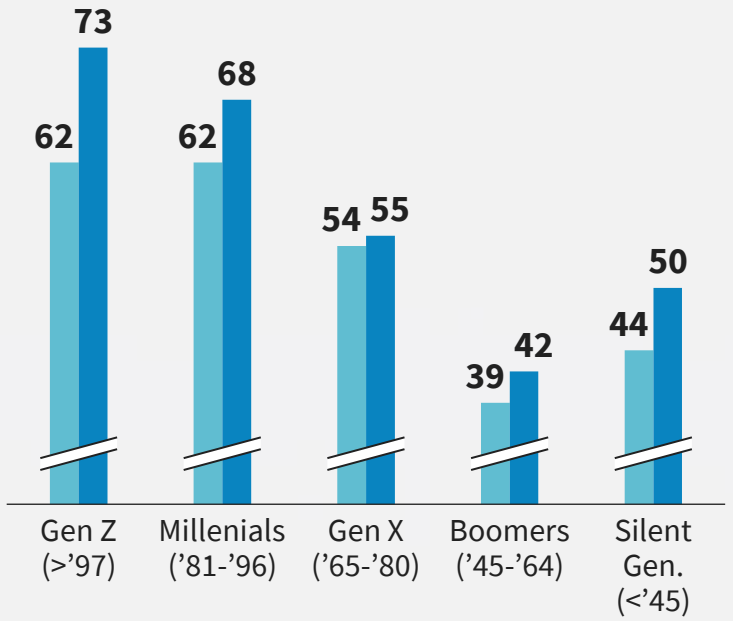
BOOST IN SUSTAINABLE AND RESPONSIBLE INVESTING[1)]

Assets under management in the U.S. [USD bn]



SOCIAL PRESSURE AND CHANGING CONSUMER BEHAVIOR

Preference and willingness to pay for sustainable brands and products [%]



Prefer to buy from sustainable brands [%] | Willing to pay more for sustainable products [%]

1) This includes assets whose managers apply various ESG criteria in their investment analysis and portfolio selection as well as assets held by institutional investors or money managers that filed or co-filed shareholder resolutions on ESG issues

Source: BlackRock; US SIF Foundation; First Insight; Roland Berger/Lazard

IMPLICATIONS

- Sustainability and CO_2 neutrality to shape the future of automotive industry
- OEMs and suppliers to focus on designing products and processes around these two trends
- Every player in automotive industry to focus on CO_2 neutral process operations
- Component manufacturers to focus on cyclic economy and use of eco-friendly material as a part of their offerings

Tighter regulations on emissions, circular economy and diversity by EU – China and US as followers

Overview of current and upcoming relevant regulations

IN FORCE

- **Emission targets for new cars** at 95 g CO_2/km since '20
- **Zero emission vehicle (ZEV) rules:** Mandatory production of a number of ZEVs and plug-in hybrids per year
  - California and 11 further states
  - China on national level (based on California's ZEV regulations)
- **NMOG and NOx[1] standards** are stricter at 0.03 g/mile in the US than in Europe
- **Circular economy law** tackling increased product responsibility (end-of-life vehicles)
- Legally binding and persecuted **women quota[2] in 6 EU states**
- **Female supervisory board ratio** at 30% for all publicly listed companies[3] and **min. 1 woman** in exec board of publicly listed companies

CONFIRMED AND UPCOMING

- **Emission targets for new cars** lowered to 59 g CO_2/km[4] by '30 – Revision of these targets by '23
- **Zero and light emission vehicles** Target of 35% by '30 – Emission targets relaxed or increased dependent on manufacturer's target fulfillment (crediting system)
- European Commission to impose **quotas** to ensure women have at least **40% of seats** on the boards of listed companies
- **China NOx emission targets** at 0.035 g/km for '23 are lower than as-is EU levels – Tightening stance on heavy duty ICE vehicles in cities
- **European Green Deal**: Net zero GHG emissions by '50 in EU
- **ICE powertrain ban** for **new vehicle** sales in EU **by '35**
- **Greenhouse gas emission neutrality** targeted until '45

UNDER DISCUSSION

- **European green deal**
  - Revision of regulation resource efficiency and circular economy
  - Revisions on end-of-life and sustainability requirements for batteries
- **Reduce the limit for emissions from cars and vans** by 15% by 2025; followed by a 55% reduction for cars and 50% for vans by 2030 and to reach zero emissions by 2035
- Germany aims to generate **100% electricity from renewable sources** by **2030**

Environmental regulation Social regulation

1) US standards regulate Nitrogen Oxide (NOx) emissions in combination with Non-Methane Organic Gases (NMOG); 2) Women quota at various levels, e.g., supervisory and/or management board; 3) Companies that are listed on the stock exchange and/or have employee board level representation; 4) EU 2019/631

Source: EPA; NHTSA; CARB; Dieselnet; The ICCT; European Commission, Roland Berger/Lazard

IMPLICATIONS

- Environmental regulations are expected to become significantly stricter as they are as of today although Ukraine war slowed regulatory processes partially down
- OEMs and suppliers must adjust to potential limitations of current product portfolios with regards to regulatory constraints
- Societal standards and expectations gain relevance in parallel to legal restrictions making an achievement of environmental targets a must to avoid proscription

Large automotive players and cross-industry leaders have already committed and taken action

Examples of automotive and cross-industry ESG activities

ENVIRONMENTAL

Michelin

With its 4R strategy, Michelin pushes to "close the loop" of its tires' lifecycle with a comprehensive set of measures

Mercedes-Benz

Committed to reduction of scope 1&2 emissions by 50% and new vehicle emissions during use phase by >40% until 2030

Porsche

With its first fully electric sports car, the Taycan, Porsche implemented a CO_2 neutral production

Microsoft

Aims to be carbon negative by 2030 and remove all carbon the company has emitted since it was founded in 1975 from the environment by 2050

SOCIAL

Scuderia Ferrari

Amongst other F1 teams and together with IIT, Ferrari developed a ventilator system to fight COVID-19

Continental

Continental enhances internationalism by striving for 50% international managers at all locations

Renault

Handi@renault collaborative network aims to change the way people see disabilities (already 1,400 members)

Telekom

First Dax 30 with a female quota of 30% until end of 2020 (middle to top management)

CORPORATE GOVERNANCE

Stellantis

Public Code of Ethics for responsible lobbying/public affairs practices and disclosure of lobbying expenditures

Mercedes-Benz

Piloting a sustainability blockchain within cobalt SC measuring GHG emissions, share of recyclate and adherence to sustainability standards

Siemens

In December 2019 Siemens adapted the management board compensation policy to also include sustainability targets measured by an ESG-Index

Walmart

Introduced blockchain to track origin and path of products - Rollout to all suppliers of leafy greens started 2019

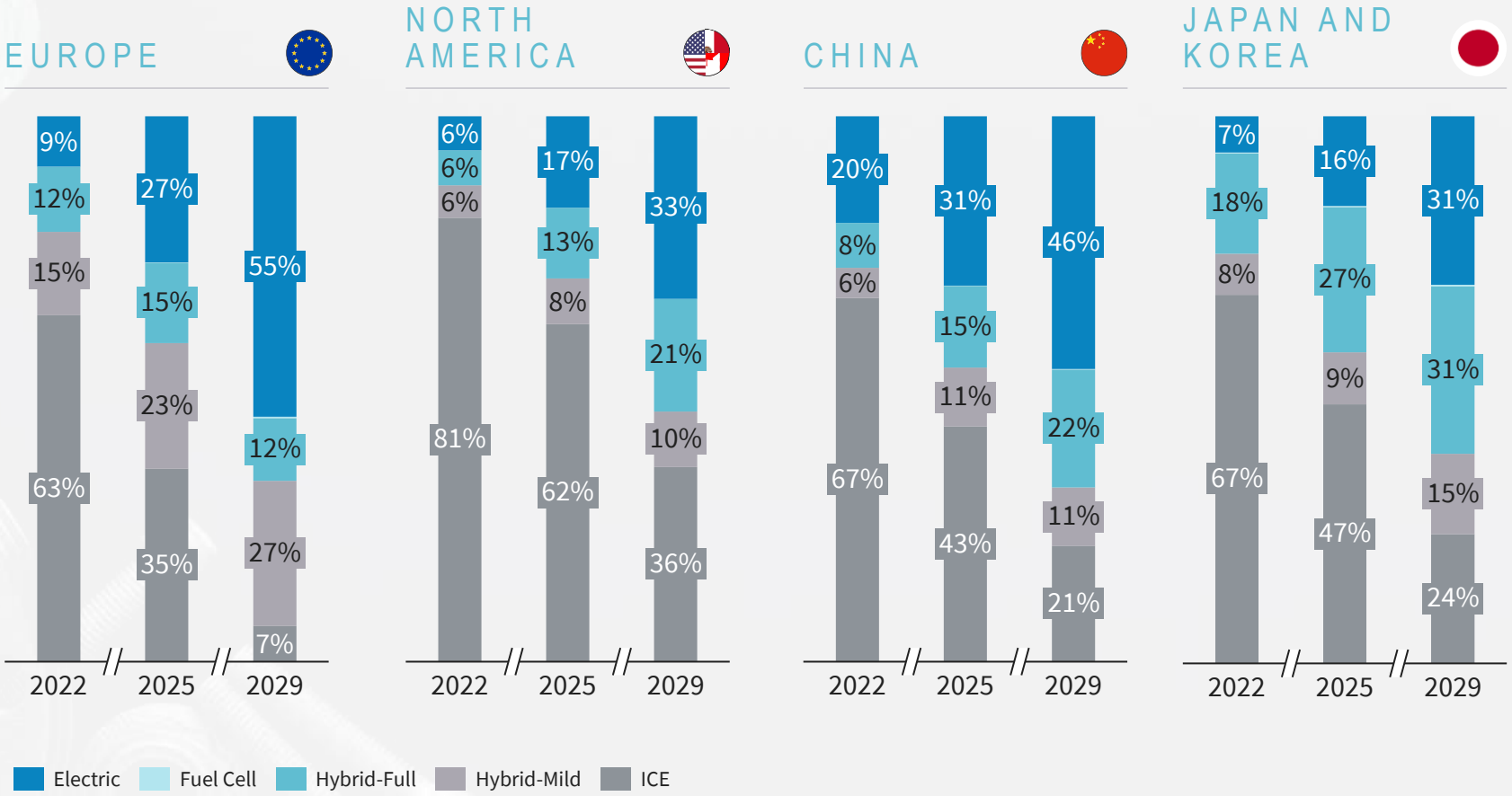
IMPLICATIONS

- Raw materials production and processing along with the subsequent sustainable sourcing expected to be the fundamentals to drive sustainability in auto industry
- ESG factors to be important to the fundamental credit strength of companies in the automotive sector
- Integration of ESG framework to be a crucial criterion for suppliers to stay attractive and competitive in future

Source: Roland Berger/Lazard, press announcements

Powertrain electrification has accelerated due to increasing customer acceptance and regulatory push

EV penetration forecast by region [%]



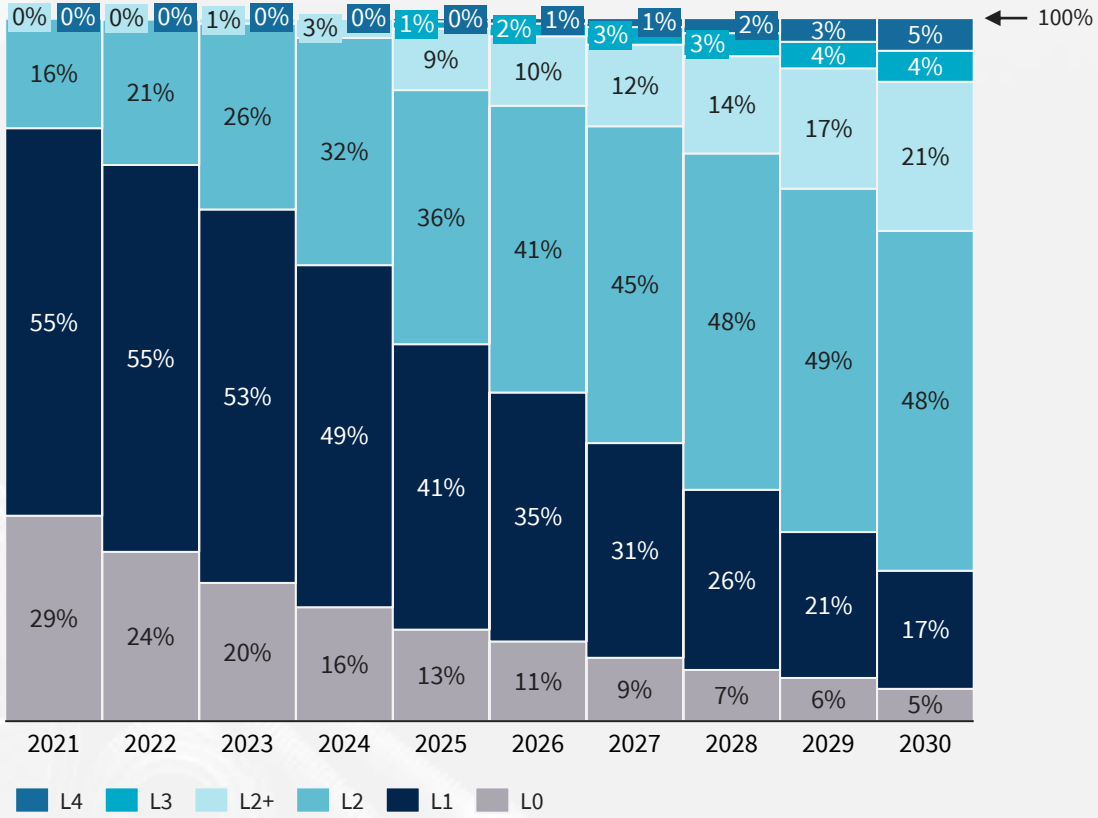
Source: IHS, Roland Berger/Lazard

IMPLICATIONS

- Europe to leverage the regulatory push and customer acceptance and overtake China with the highest EV penetration in 2029
- North America to lag in EV adaption due to lower customer acceptance, driven by range anxiety and regulatory disparity among states/regions
- Despite increased customer acceptance, EV penetration in China to fall behind Europe due to a weaker regulatory push
- Japan and Korea to retain the highest hybrid-full powertrain penetration and lower EV penetration, resulting from cautious/conservative EV adoption trend

Autonomous driving is expected to play a more significant role, achieving a breakthrough in the 2030's

Market penetration rates per level of autonomy, light vehicles



North America

For North America, L0/L1/L2 currently account for 100% but with increasing shift to L2+ and beyond this is expected to reduce to <70% by 2030

Europe

Among all the geographies, Europe has currently the highest penetration for L1 and beyond at 95%. L2+ and beyond is expected to account for c.40% of the total vehicle sales by 2030 with most of the transition taking place 2025ff

Greater China

Greater China currently has the highest penetration of L0 at c.53%; however, this is expected to progressively reduce to 10% by 2030

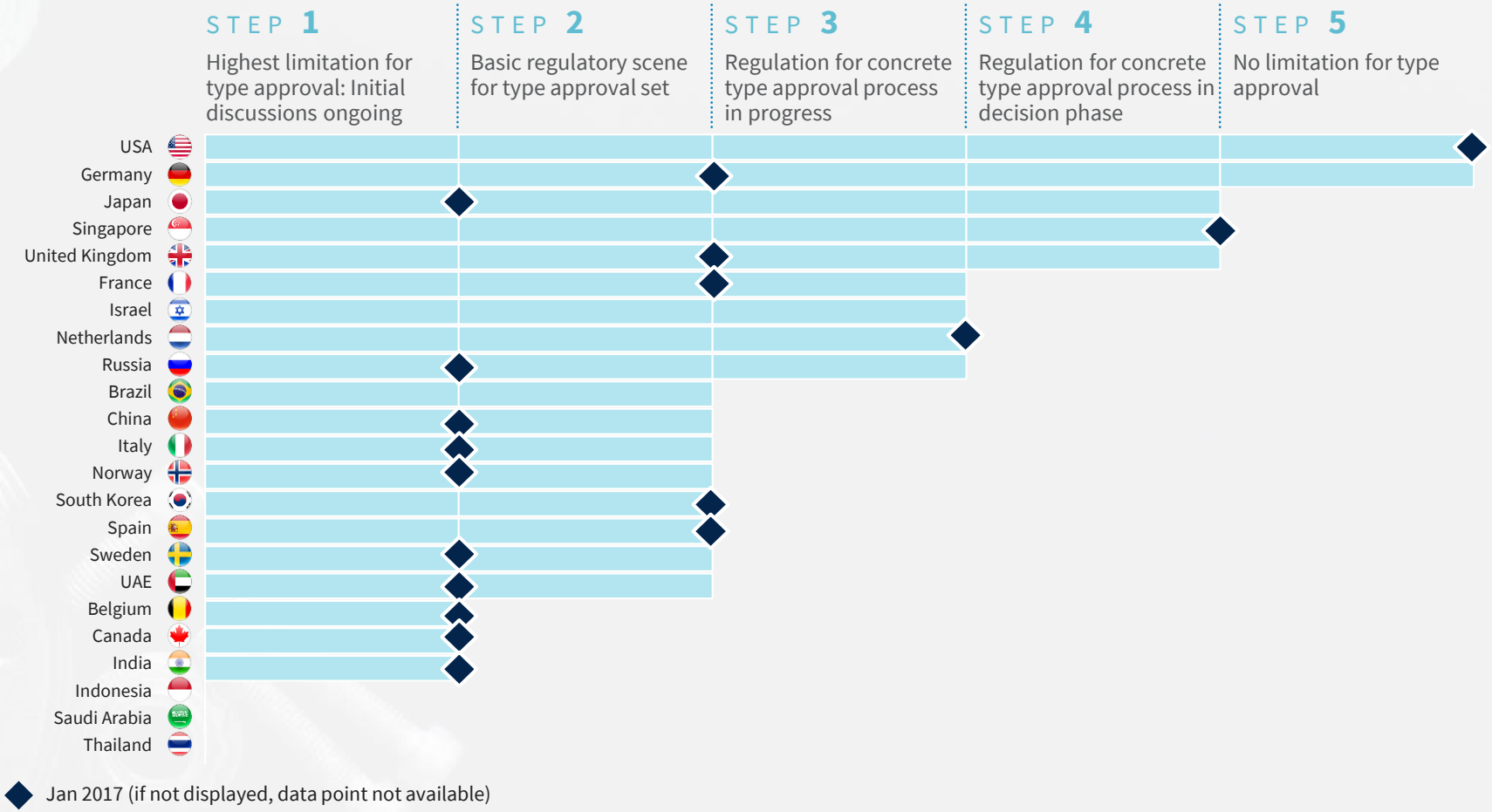
IMPLICATIONS

- Increasing penetration of self-driving cars reshaping ownership and usage of vehicles
- OEMs and supplier required to adapt to new requirements from customers of autonomous vehicles, e.g., flexibility of interior design and usage modes
- Short-term impact only limited due to long lead times until significant penetration of autonomous vehicles can be expected

Source: Roland Berger/Lazard

Regulations for autonomous vehicle commercialization has globally progressed over the last 5 years

Approval process for L4 & L5 – Jan 2022



Source: Automotive Disruption Radar, Roland Berger/Lazard

IMPLICATIONS

- Regulatory environment developing towards readiness for unlimited autonomous vehicle commercialization
- Authorities are reacting on increasing customer demand and technological advancements by adjusting their regulations
- Stronger demand from end-customers to be expected by OEMs and suppliers – Risk of losing business to new autonomous (EV) vehicle players which adapt new technologies faster
- Preparation required today to provide autonomous vehicles once more markets reach step 5 and full-scale market demand hits
- COVID-19 slowed down the increasing interest of customers into shared mobility and thus automated cars, but effect expected to be overcome in the mid-term

Future vehicle generations need to provide more consumer features while handling a higher complexity

Drivers for the change in vehicle architectures

CUSTOMER EXPECTATIONS EVOLVE

- Consumers expect a seamless journey with integrated features of third parties (e.g., Apple Car Play)
- Strong development of vehicle applications towards consumer electronics industry, e.g., purchasing of apps / subscriptions from a dedicated application store
- OEM to defend ownership of the consumer interface

Understand the impact of 'consumer electrification' on Tier-1 products

MORE COMPUTING POWER

- New features and digital features require a higher computing power
- Centralization of computing power on few computing units drives separation of HW and SW developments
- Software supply is gaining in importance, creating dedicated suppliers for both middleware and front-end applications

Anticipate future technological developments and standards

OEMs RETHINK THEIR ROLE

- OEMS are taking more control over the value chain, integrating critical functions
- Shift from domain-responsibilities towards an integrated network of functions and features
- Separation of HW and SW sourcing exposes Tier-1 suppliers to new competitors (EMS, SemCos)

Position for a changing supply chain setup against new competitors

HW = Hardware SW = Software

Source: Roland Berger/Lazard

IMPLICATIONS

- Cross-domain centralized E/E architecture to lower system complexity coupled with a simultaneous increase in security allows for development of consumer electronics-like features
- Separation of HW and SW sourcing changes the competitive dynamics for established Tier-1 system suppliers
- Technology champions and true innovators to play a major role in providing solutions in this field

OEMs implement subscription-based features, aiming for additional monetization of the consumer interface

Subscription-based vehicle features offered by Automotive OEMs

	FUNCTIONS ON DEMAND	ANNUAL FEATURE SUBSCRIPTIONS	"AUTOPILOT/ FSD"
Description	• BMW offers **seat heating, high-beam assistant, remote engine start** and other features on subscription for 1 month / 1 year / 3 years • Features are offered through BMW's ConnectedDrive Store as part of **'BMW Functions on Demand'** program	• Mercedes-Benz offers **additional rear-wheel steering** functionality for the EQS on an annual subscription in China • By default, EQS models allow for **4.5 degrees** of lock on rear wheels while hardware has capacity for **10 degrees** – subscription is offered for the additional capacity	• Tesla offers its advanced driver assistance systems, **Autopilot and Full Self-Driving (FSD)** on monthly subscription (alternative one-time purchase possible) • Autopilot has 2 versions – **Basic and Enhanced** while FSD is an enhanced version of the Autopilot modules with additional features
Pricing	• Prices vary **between EUR 10 and EUR 20 per months**, depending on the specific feature	• Annual subscription **fee of EUR ~730** in the Chinese market	• FSD for vehicles with **Basic Autopilot**: **EUR 199** / month • FSD for vehicles with **Enhanced Autopilot**: **EUR 99** / month
Availability	• **Vehicle**: Available for vehicles based on hardware compatibility • **Geography**: Feature availability tailored to local markets (e.g., Australia without seat heating but remote engine start subscription)	• **Vehicles**: Available only for EQS models • **Geography**: Subscription offered in China; previous offering in Germany has been discontinued	• **Vehicles**: Available for Tesla vehicles with FSD Computer 3.0 or above • **Geography**: FSD in USA and Canada; enhanced Autopilot in USA, Canada, China, Australia and New Zealand

IMPLICATIONS

- OEMs are increasingly offering subscription-based features for different vehicle features to establish new monetization concepts
- Several features such as heated seats, high beam assist, rear wheel steering etc. are offered as subscription
- Further extension of direct-to-consumer offering will be driven by new interfaces and applications within the vehicle
- Technology champions and industry leading suppliers will support OEMs in developing differentiating features that can be offered for subscriptions
- Feature differentiation and monetization is becoming an increasingly important capability for suppliers who have so far maintained full system responsibility

Source: BMW country websites, Mercedes-Benz country websites, Tesla website, Roland Berger/Lazard

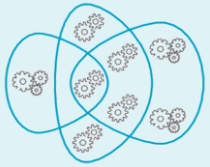
The future vehicle architecture expected to be characterized by a SW-central plus a zonal E/E concept

Software defined vehicles: E/E and SW architectures

SOFTWARE

Monolithic architecture

Single units

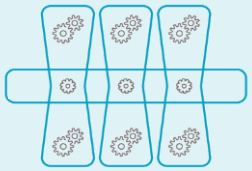


E.g., based on Autosar Classic

With monolithic, tightly coupled applications, all changes must be pushed at once, making continuous deployment impossible

Service-orientated architecture

Fine-grained components

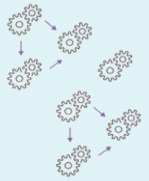


E.g., based on Autosar Adaptive

Traditional SOA allows you to make changes to individual pieces, but each piece must be carefully altered to fit into overall design

Microservice architecture

Superfine

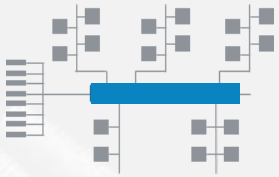


Used by tech companies for large applications developed in agile mode

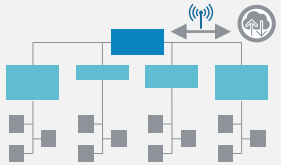
With a microservice architecture developers create, maintain and improve new services independently, linking into through shared data API

HARDWARE

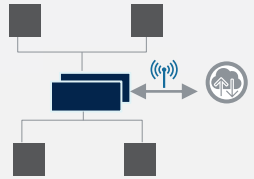
Distributed E/E



Domain-centralized E/E



Central+ zonal E/E



Gateway | DCU | ECU | Zonal ECUs (domain-independent) | Central/vehicle computer | Cloud/ backend

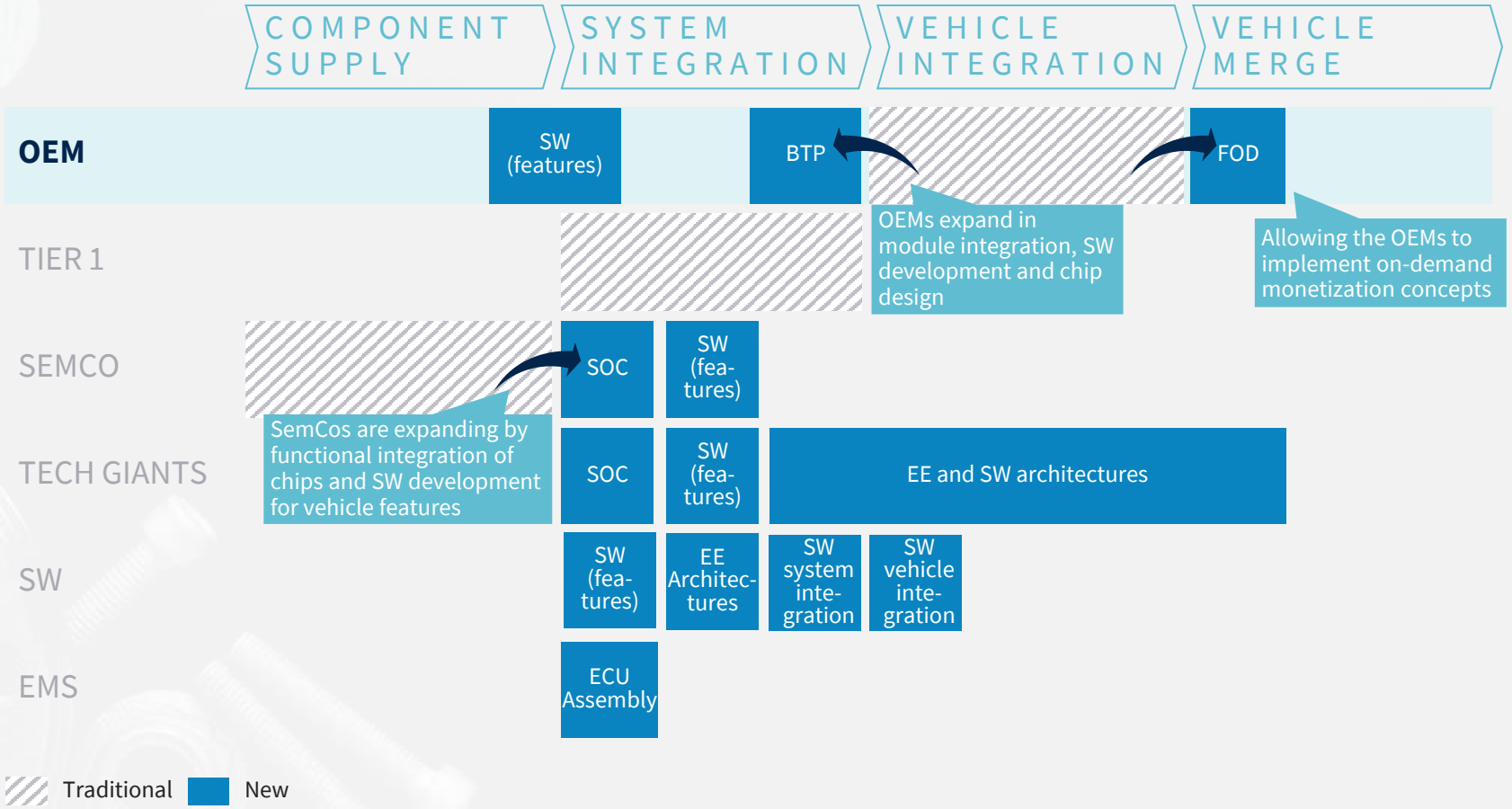
IMPLICATIONS

- Software expected to become the differentiated element of a vehicle, while the underlying hardware is continuously streamlined and commoditized
- The monolithic architecture is reflecting the current split in R&D responsibilities along traditional automotive components e.g., separate teams for powertrain and interior applications
- A microservice approach reduces maintenance and integration efforts and enables a continuous deployment of SW updates
- A zonal E/E and a microservice software architecture allows for a separate sourcing of software and hardware and partially also allows for hardware complexity reduction e.g., for wiring harnesses

Source: Insided community, Roland Berger/Lazard

Subsequently, Tier-1 system suppliers are under attack from new players with different backgrounds

Changes in the Automotive Value Chain (Focus electronics)



FOD – Function on demand, BTP – OEM designs system and uses manufacturing service provider or supplier for manufacturing, SW – Software, SOC – System on chip

Source: Roland Berger/Lazard

IMPLICATIONS

- OEMs are insourcing system integration competencies e.g., for infotainment systems
- Tech giants are venturing into Automotive SW and features, offering full operating system solutions
- HW-SW separation enables growth of dedicated software suppliers and exposed Tier-1 suppliers to competition with Electronics Manufacturing Services (EMS) for the hardware supply
- Overall, OEMs are disintermediating the hardware suppliers' control over the system, restricting the value share of conventional Tier-1 suppliers
- Traditional suppliers have a high risk for further commoditization of their product portfolios as they might be reduced to a supplier of the mechanical content

Production footprints and workforces are increasingly shaped by advancements in automation technology

Trends shaping automotive supplier production

TECHNOLOGY ADVANCEMENT

- Extension of automation due to ongoing technological development
- Diminishing of competitive advantage of LCC manufacturing; allowing for more HCC localization
- Higher infrastructure requirements for IoT driven production setups

Need to rethink the footprint and localization strategy

AGING WORKFORCE

- Declining birth rates in HCC results in a growing average age of the workforce
- Manufacturing processes need to be tailored accordingly
- War for talent as blue-collar workforce will become a scarce resource

Need to make blue collar jobs more attractive to younger cohorts

EVOLVING SKILL SETS

- Increasing automation and product complexity requires different and more elaborate competencies
- New backgrounds and qualifications will be needed, driving the share of indirect positions
- Suppliers need access to new talent pools (e.g., SW engineering)

Need to think about future competency profiles within manufacturing

DE-GLOBALIZATION

- Diminishing interdependence and integration between countries due to geopolitical and institutional factors (e.g., Ukraine war, trade conflicts)
- Value chains are becoming more regional and less global
- Building resilience will be a high priority among supply chain executives

Need to focus on resilience and regional supply chains

HCC = High-cost country LCC = Low-cost country

Source: Roland Berger/Lazard

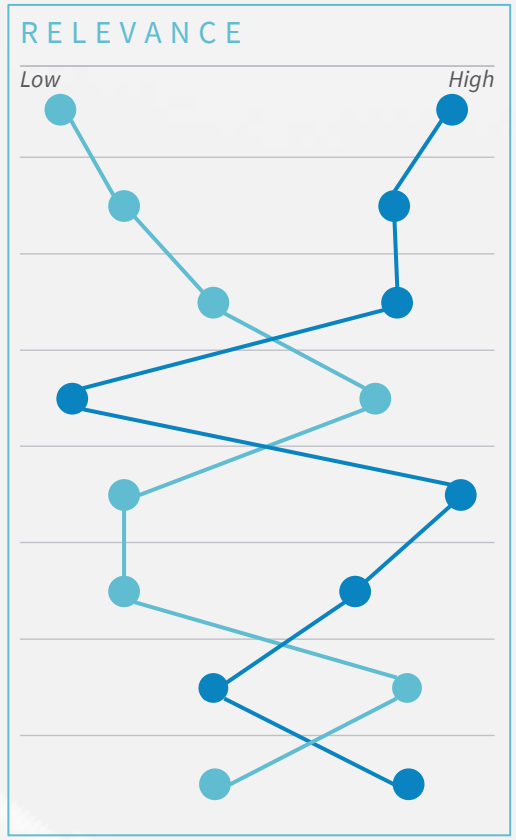
IMPLICATIONS

- HCC production may maintain its position, driven by higher degrees of automation and lower manual labor share
- At the same time, HCC production labor becomes a scarcer resource
- New technologies also require different talent and skill sets
- Suppliers need to re-adjust their production footprint and rethink their employee strategy to prepare for the new production reality

Industry trends are driving automation, digitalization, localization and new workforce requirements

Actual vs. future production setup

	CRITERIA	RELEVANCE (Low – High)	COMMENT
Technology advancement	digitalization		Digital solutions will change the future of manufacturing as well as engineering and planning processes
	Automation		Automated solutions will further replace manual work, especially in indirect processes (e.g., logistics) and advanced operations (e.g., wiring harnesses)
Aging workforce	Workforce age		Declining birth-rates in established markets but also HCC localization will come with an aging workforce, which requires different manufacturing processes as today
	Attractiveness shop floor jobs		With increasing relevance of technology, blue collar jobs expected to lose in reputation and less people expected to be willing to work in shop floor operations
Evolving skill sets	Qualification requirements		Increasing automation and digitalization increase workforce qualification requirements, a challenge especially for the elderly workforce which grew up in a less technical environment
	Indirect jobs		More automated solutions on the shop floor expected to increase the share of indirect jobs; relevant for administrational functions as well as shop-floor indirect workforce
De-globalization	Global sourcing		Based on the crisis experiences in 2020-2022, globalization expected to be turned back towards more local for local sourcing to strengthen supply chain resilience
	Production localization		Increasing localization of supply chain to increase crisis resilience, based on the experiences made during and post the COVID-19 pandemic and geopolitical conflicts; automation and digitalization solutions help to localize in HCC[1)]



1) HCC = High-Cost Country

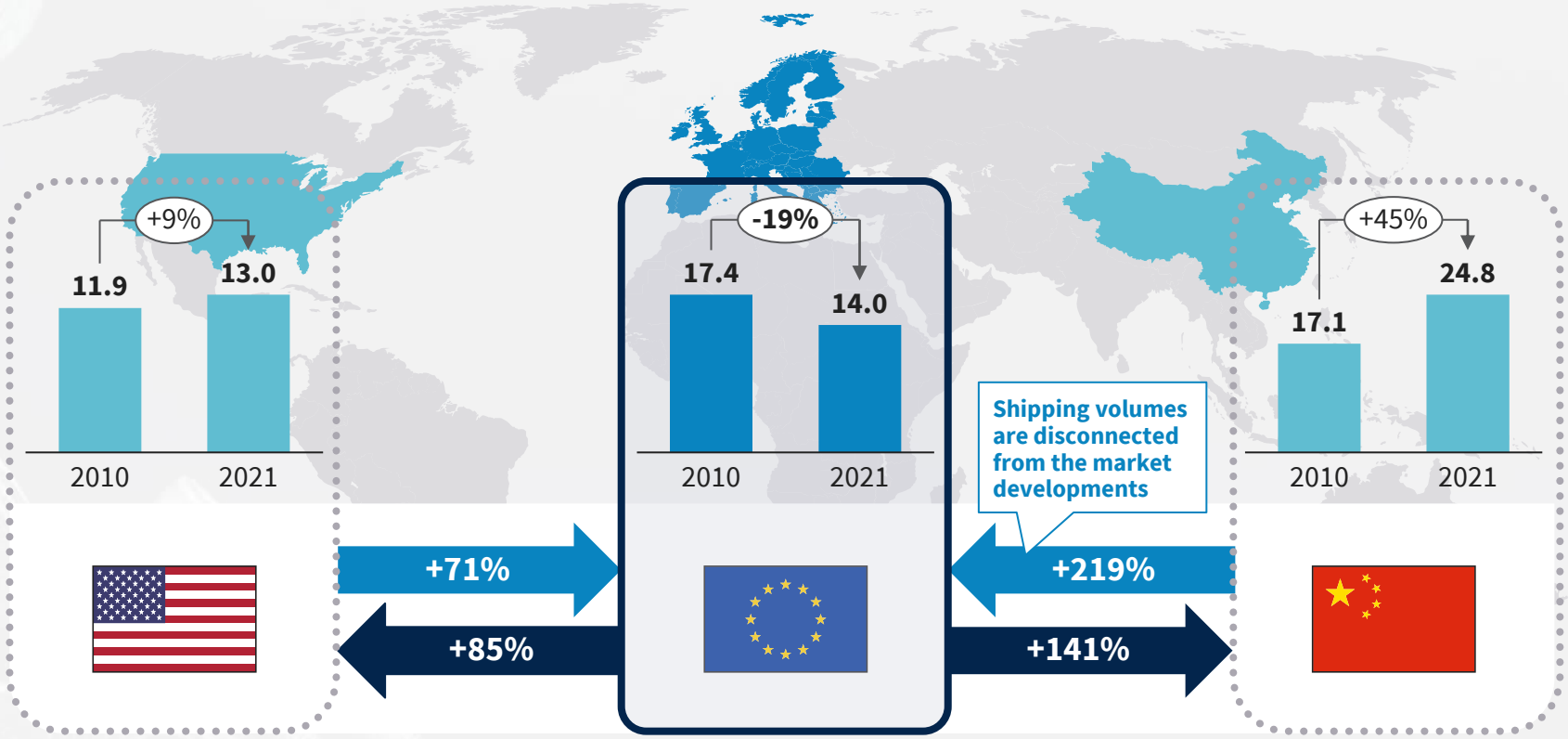
Source: Roland Berger/Lazard

IMPLICATIONS

- Production automation unlocks new efficiency potentials such as lower degree of manual labor which reduces cost and increases quality
- Higher degree of automation supports supply chain resilience as well as emission reduction as it allows partial localization also in HCC countries, closer to OEM locations
- However, suppliers need to prepare for an ever-aging workforce, thus workplace ergonomics and smart interactions of humans and machines will gain in importance
- To master automated production setups, a high-skilled workforce with new competency profiles (e.g., software engineering) will be required

Cross-regional shipping volumes do not reflect the local production volume development

Import/export volume development Europe – 2010 vs. 2021



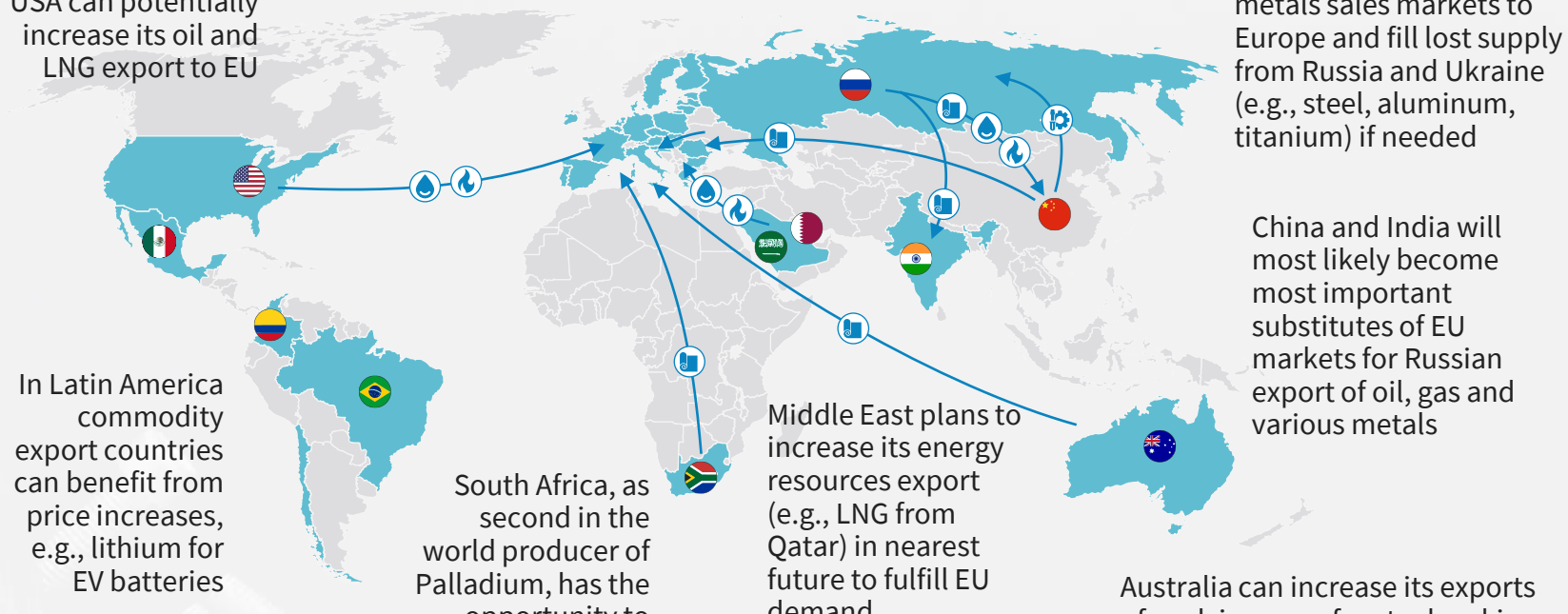
Source: WTO, IHS, Roland Berger/Lazard

IMPLICATIONS

- The growth of import/export volumes from Europe to China or the US and vice versa has outpaced the the growth of the regional production volumes
- Especially between Europe and China the interdependencies have drastically increased over the past decade indicating that suppliers have not localized their manufacturing lines to the maximum extent
- Hence, local vehicle production continuous to be vulnerable for any form of global supply chain disruption
- Going forward, suppliers and OEMs need to jointly assess a de-globalization of supply chains to strengthen their supply chain crisis resilience

Global sourcing shift of key raw materials is expected, along with an ongoing re-localization of supply chains

Potential growth of trade flows



IMPLICATIONS

- Global tensions expected to change supply chain dynamics, new trade relations to be established in coming decade
- Component manufacturers in different clusters to rethink and reorganize supply chain to hedge against future disruptions
- Localization expected to increase to avoid future disruptions and ensure supply chain security

Source: Roland Berger/Lazard

The industry transformation will require massive investments in future technologies

Selected announcements reg. OEM's investments and goals

Announced electrification target	**50% by 2030**	**50% by 2030**	**100% by 2030**
Investment in future technologies	**89 bn by 2026** in EV and digitalization	**30 bn by 2025** in EV and automated driving	**60 bn by 2026** in EV, digitalization and automated driving
Quote	*"[…] By the end of the decade we anticipate our **share of BEV** sales will rise to around **50% worldwide**."*	*"[…] Up to **2025**, we intend to invest more than **30 billion Euro** in research and development to underscore our position as an **innovation leader**."*	*"[…] The EV shift is picking up speed. We will be ready as markets switch to **electric-only** by the **end of this decade**."*
	Dr. Herbert Diess Former CEO of Volkswagen AG	**Oliver Zipse** CEO of BMW AG	**Ola Källenius** CEO of Mercedes-Benz Group AG

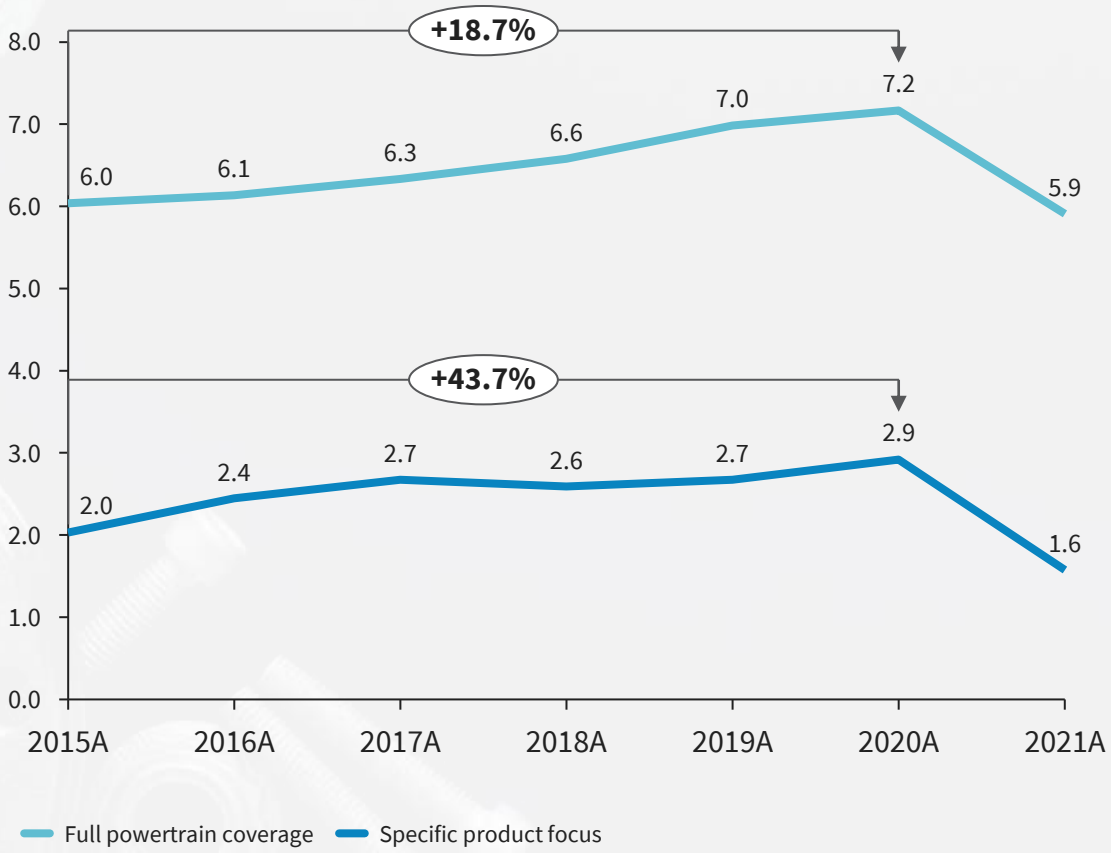
IMPLICATIONS

- New technologies are key to the future of mobility
- Electrification, digitalization and automated driving are expected to become key differentiators for automotive OEMs
- To succeed, incumbent OEMs have announced major investments in talent and capability building for future key technologies that allow them to differentiate themselves for their offerings
- OEMs are extending their vertical reach and extend their capacities for EV production

Source: Desk research; press clipping, Roland Berger/Lazard

Subsequently, also automotive suppliers have to increase their spendings into new technologies

Selected example – R&D ratio of powertrain suppliers [% of sales]



FULL POWERTRAIN COVERAGE

Broad portfolio of powertrain components, incl. products for electrified powertrains

FOCUSED SPECIALISTS

Focused product portfolio, often with a strong background in mechanics and limited exposure to the electrified powertrain

IMPLICATIONS

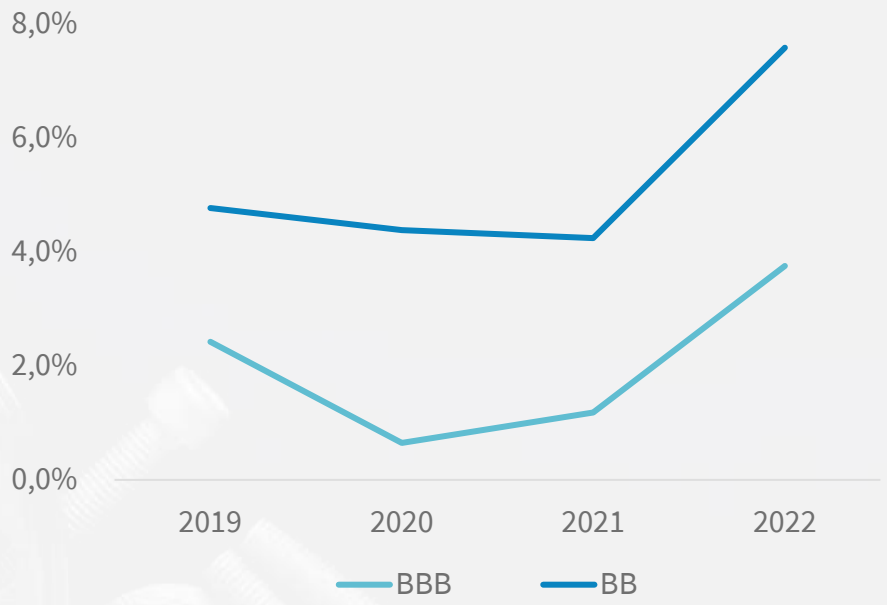
- Powertrain focused suppliers had to significantly increase their R&D expenses since 2015 to keep up with the powertrain electrification and avoid losing ground in the future
- Full powertrain suppliers have a higher resilience in comparison to the focused specialists which generate their business with a smaller set of products
- Thus, focused specialists had to increase their R&D spendings from a relative perspective more than players with broader portfolios
- The trend is expected to continue, 2021 reductions are likely results of cost down activities in 2020 due to Covid-19 and semiconductor shortages in 2021

Source: Roland Berger/Lazard

Refinancing for automotive suppliers has become more costly, leading to additional pressure on earnings and cash generation

Impact of rating and raised interest rates on refinancing costs

APPROXIMATED COST OF DEBT[1)]

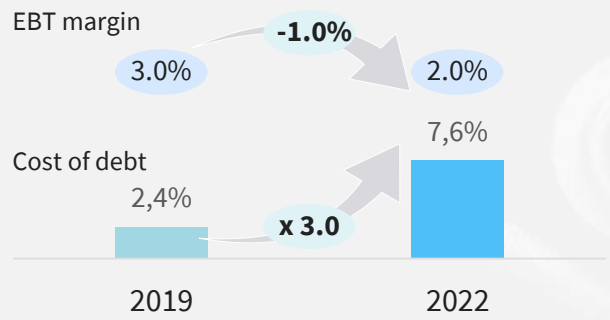


LEVERAGE[1)] OF SELECTED AUTOMOTIVE SUPPLIERS

≥3.0x	AAM, DANA, FORVIA faurecia, LEONI, TENNECO
1.0-2.9x	Autoliv, BorgWarner, brembo, Continental, SCHAEFFLER, Valeo
<1.0x	DENSO, GENTEX CORPORATION, MAGNA, Visteon

ILLUSTRATIVE CASE: IMPACT ON FINANCING COST/MARGIN[4)]

Assumed Metric	2019	2022
Sales	€5,000m	€5,000m
EBITDA margin	8%	8%
Net debt	€1,000m	€1,000m
Rating	**BBB**	**BB**
Pro forma interest	€24m	€76m



1) Cost of debt was approximated based on the median year-end Yield-to-Maturity (YTM) of the outstanding bonds of BorgWarner and Continental (BBB) and American Axle, Dana and Faurecia (BB), respectively
2) Leverage defined as Net debt (incl. leases and excl. pensions) / EBITDA 2022E
3) Interest cost increase for an auto supplier today vs. 2019 which faced a downgrade from BBB to BB, D&A of 4.0% of sales assumed

Note: Analysis assumes constant sales and EBITDA levels for illustrative purposes

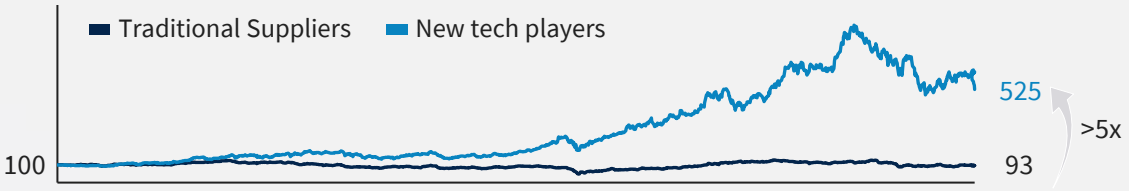
Source: Company information, FactSet, Roland Berger /Lazard

Traditional suppliers face new, financially much better capitalized competitors in the race of acquiring future technologies

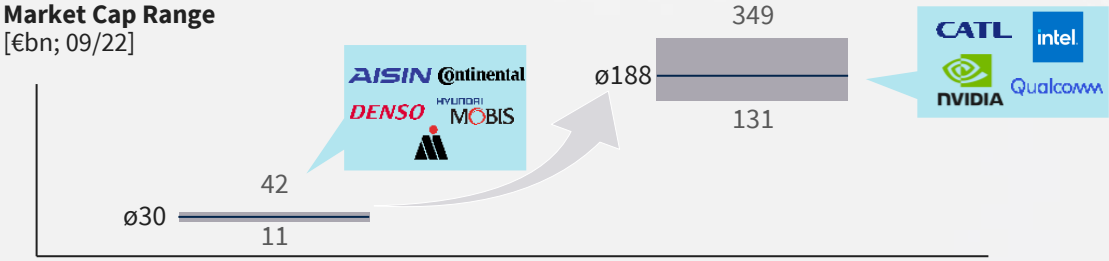
Comparison of traditional and new automotive players

NEW TECH DISRUPTORS WITH HUGE ADVANTAGE ON THE EQUITY SIDE VS. TRADITIONAL SUPPLIERS...

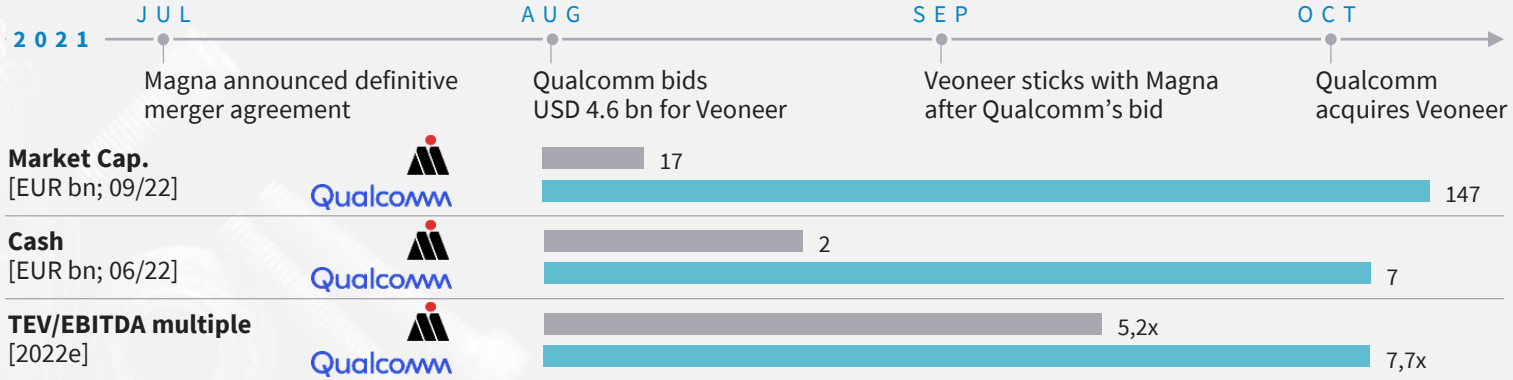
Indexed Stock Price Development
[01/17 – 09/22; rebased to 100]



Market Cap Range
[€bn; 09/22]



...AS DEMONSTRATED IN QUALCOMM's ACQUISITION OF VEONEER



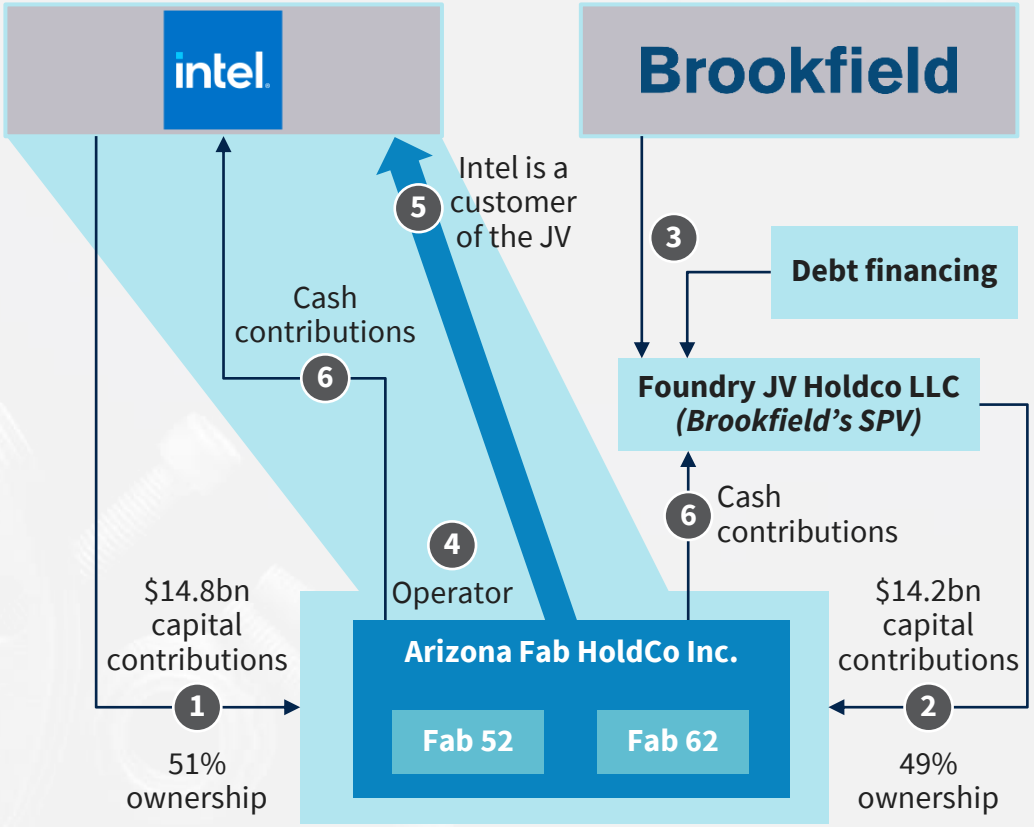
- **Magna** tried to acquire **Veoneer** by announcing a definitive merger agreement with the target in July 2021
- On August 5, 2021 Qualcomm made a **competing proposal**
- Qualcomm's offer exceeded Magna's by **USD 5.75 per share**, for a **total of USD 0.8 bn,** a nearly **20% premium vs. Magna's offer**
- The U.S. company, which made an **all-cash offer**, financed the transaction solely with **cash on its balance sheet**

Source: Company information, Roland Berger/Lazard

Innovative ways needed to maintain or expand financial flexibility – Intel and Brookfield case study

Intel's approach to fund major growth investment

TRANSACTION STRUCTURE



1. Intel contributes $14.8bn of capital (cash and in-kind) for a 51% ownership stake in the JV
2. Brookfield contributes $14.2bn of capital for a 49% ownership stake in the JV
3. Brookfield's JV stake is financed by both equity and debt through an LLC
4. Intel acts as operator and maintains full control of the fab, construction, operations and IP
5. Intel is a customer of the JV through an off-take agreement
6. The JV makes quarterly cash contributions to Brookfield's legal entity and Intel

IMPLICATIONS

- Innovative funding model to the capital intense semiconductor industry shouldering up to $30bn investments into leading edge factories
- Allows Intel to tap into new pool of capital below its cost of equity, while protecting its cash and debt capacity for future investments and dividends
- Opportunity for Brookfield to leverage its access to large-scale capital with industry leader Intel to invest into semiconductor production representing the long-term digital backbone of the global economy
- Approach may offer traditional participants in the automotive sector (OEMs/suppliers) a new way of financing to shoulder the industry transformation in selected infrastructure-like cases

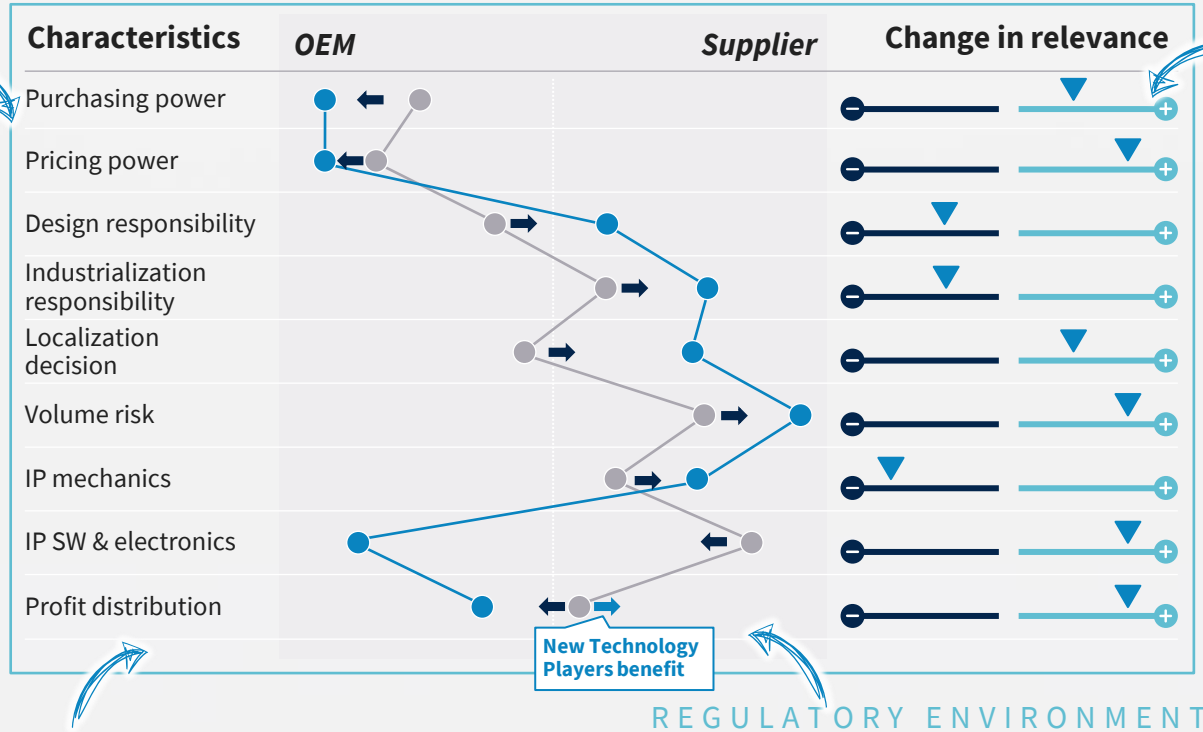
Source: Company information, Roland Berger/Lazard

The relation between Automotive OEMs and suppliers is expected to change as a reaction to macro-economic shifts that impact the industry

Changing relevance of automotive market characteristics for traditional suppliers

RAW MATERIAL MARKETS

- **Inflation is questioning** the conventional **logic of** stable material cost and **annual price down clauses**
- **Geopolitical events** are **putting** established **supply chains** of critical raw materials **at risk**
- **Cooperative approaches** are **needed** to manage raw material scarcity and supply chain disruptions
- **OEMs are vertically expanding** their know-how and access to critical raw materials e.g., for battery materials



END CUSTOMER MARKETS

- **OEMs are shifting** from vehicle-as-an-asset distribution **to vehicle-as-a-subscription models**, thereby monetizing multiple usage cycles
- With OEMs monetizing the vehicle across user generations, **hardware individualization is expected to go down**
- **Future product differentiation** and individualization is **expected to be driven by software** (e.g., on demand feature subscription)
- **Electrification** of vehicles **reduces** the **differentiation of powertrain** components
- **Uncertain volume outlook** due to overall economic situation

TECHNOLOGY

- Centralization of control units **separates hardware and software** supply and **questions the value proposition of automotive systems suppliers**
- **Regulatory drive towards electrification and ADAS/autonomous** driving requires higher integration capabilities

REGULATORY ENVIRONMENT

- **Powertrain regulation** in key markets **accelerated the vehicle electrification**
- **ESG requirements and carbon pricing mechanisms require** suppliers to gain a holistic **understanding** of sustainability **along their value chain**
- Increasing **ADAS** and autonomous driving penetration partially **driven by pedestrian safety regulations**

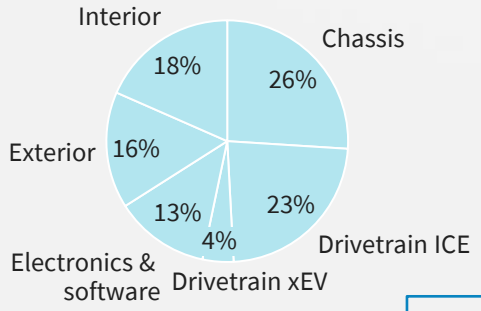
Today Future

Source: Roland Berger/Lazard

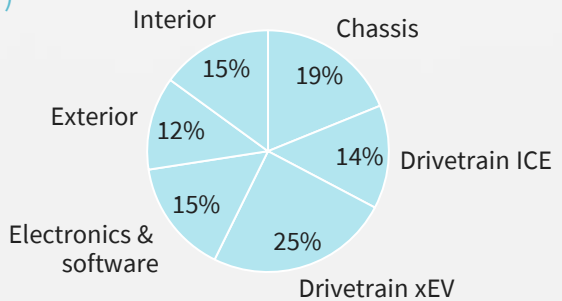
Growth throughout the next years can only be realized in combination with new product technologies

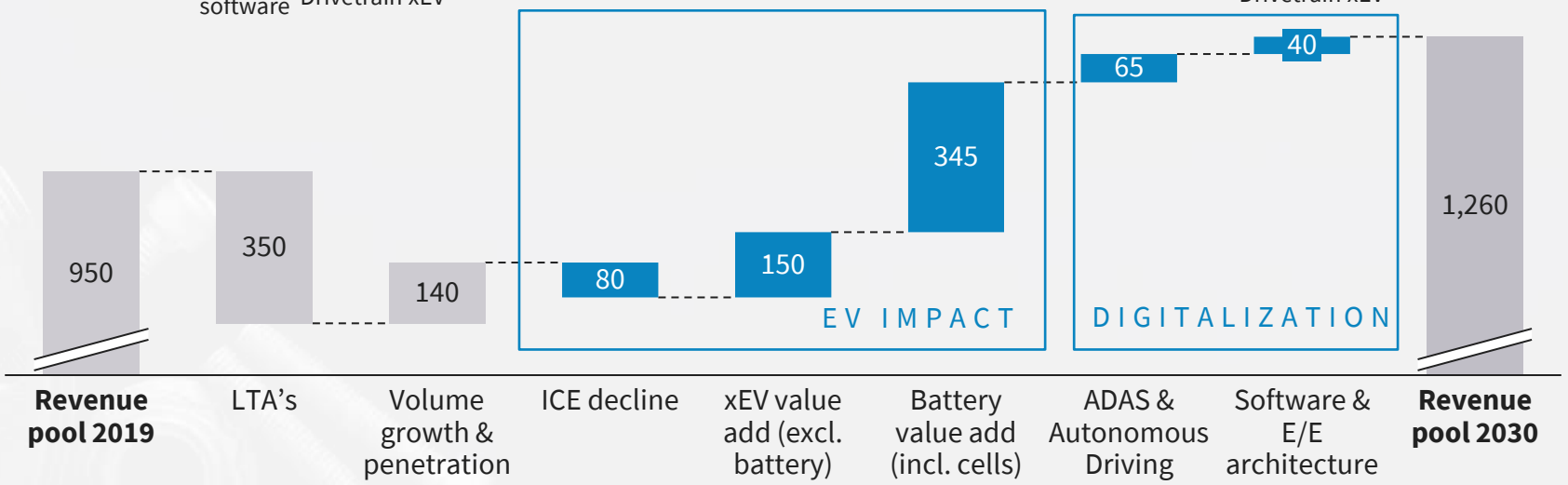
Global automotive component market development 2019 vs. 2030 [EUR bn]

MARKET SHARE BY COMPONENTS (2019)



MARKET SHARE BY COMPONENTS (2030)





Footnote: assuming constant material prices

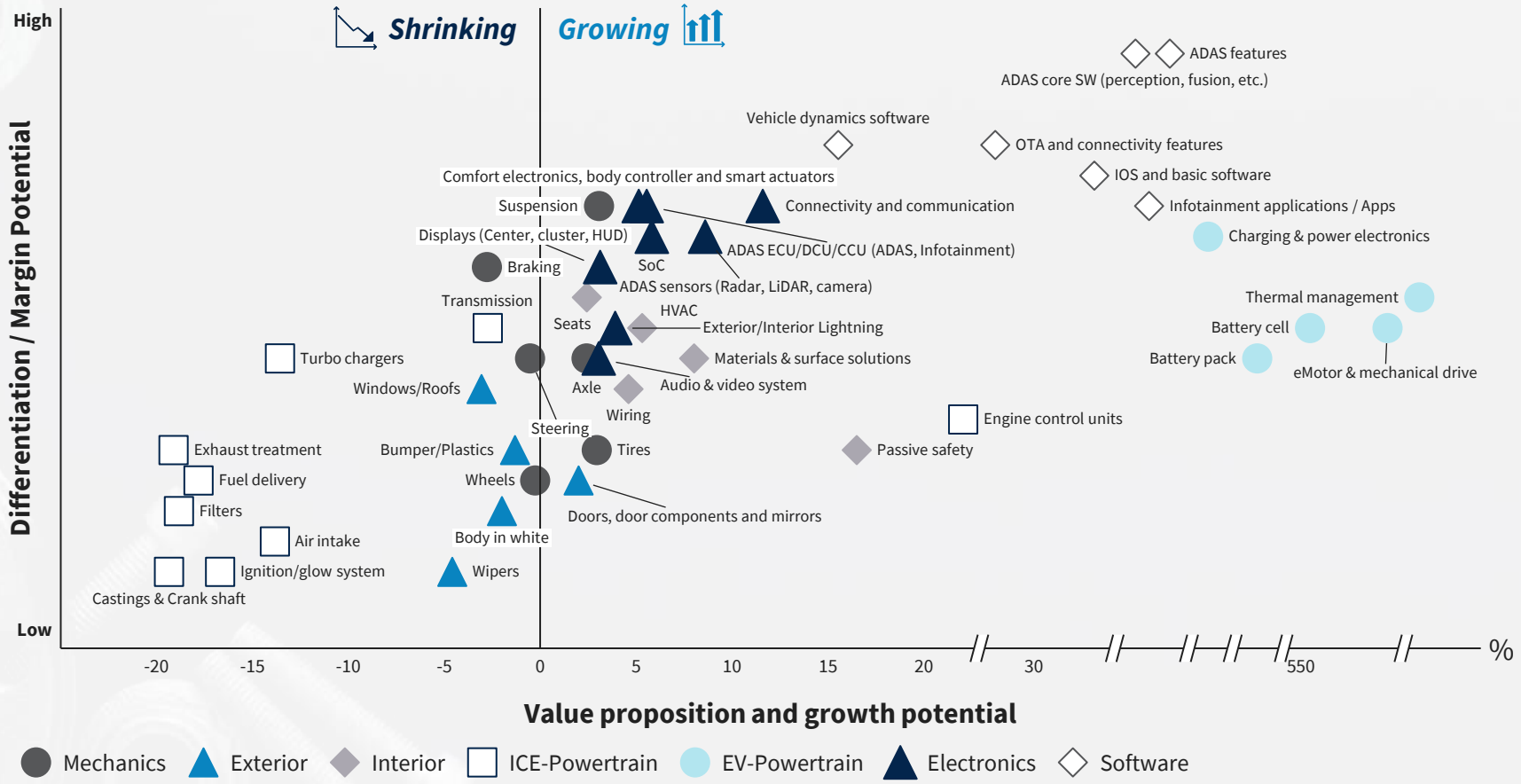
Source: Roland Berger component market model

IMPLICATIONS

- More than 80% of EV value add is driven by the battery, thereby restricting the opportunities for traditional suppliers to participate in the electrified powertrain growth
- Other winning components within the powertrain are inverters, onboard chargers or thermal management components
- Beside ICE components, especially small center displays, analogue instrument clusters, HID or halogen headlamps are amongst the losing components

While future USP are mainly linked to software products, EV-components expected to be growth outperformers

Growth and differentiation potential – Selected components



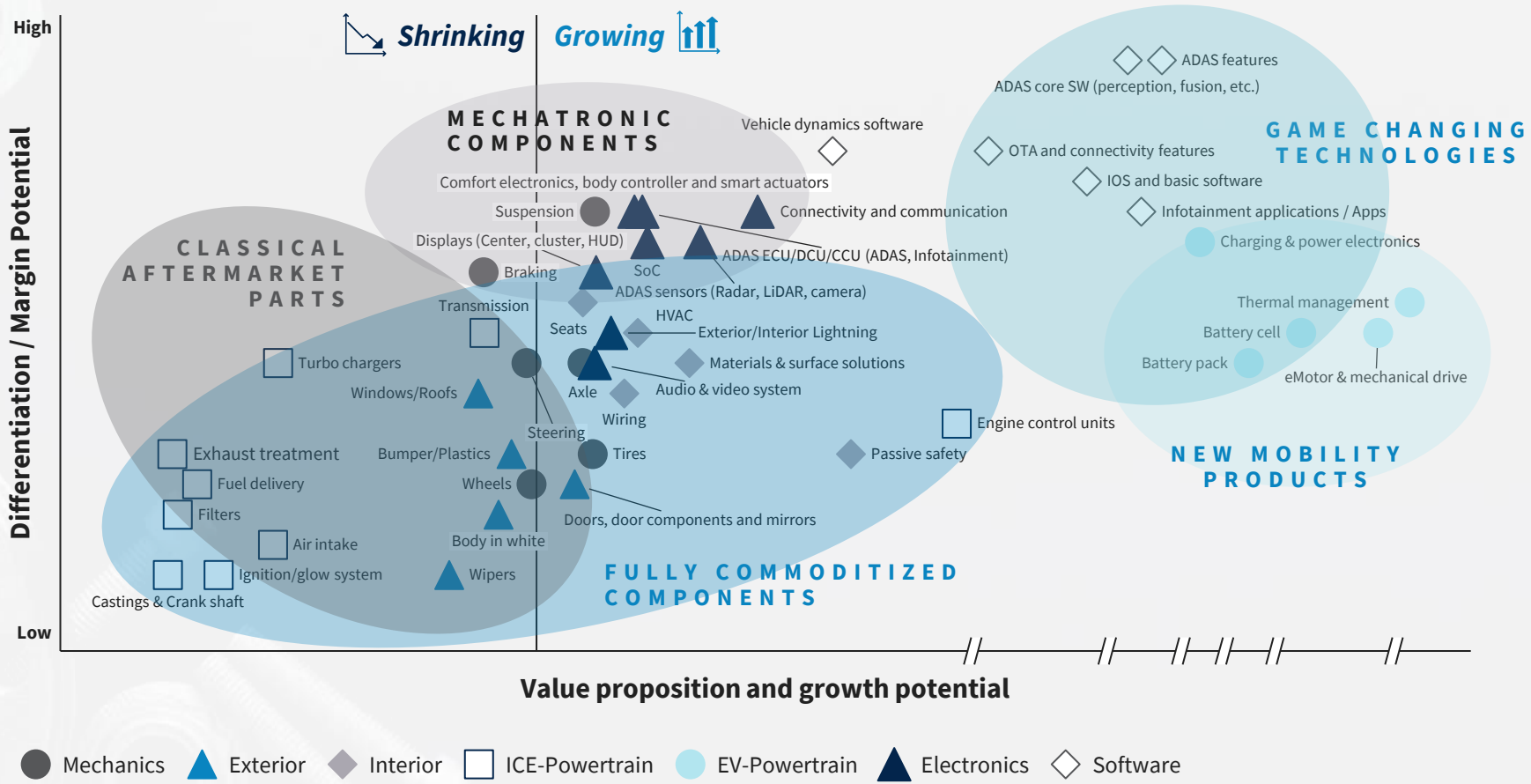
IMPLICATIONS

- True innovation and strong USPs mostly related to software, electronics and battery components
- Battery and other xEV-components are expected to outperform the market due to the powertrain shift until 2030 but have a high risk for future commoditization
- Traditional components for ICE powertrain or without an electronics element expected to fall behind in the margin potential and differentiation they offer
- Even smart products, traditional components with electronics element, offer only limited growth potential due to strong competition within these segments and many suppliers targeting the same portfolio areas

Source: Roland Berger/Lazard

Based on the component growth and the differentiation potential, five overarching groups can be derived

Component clusters



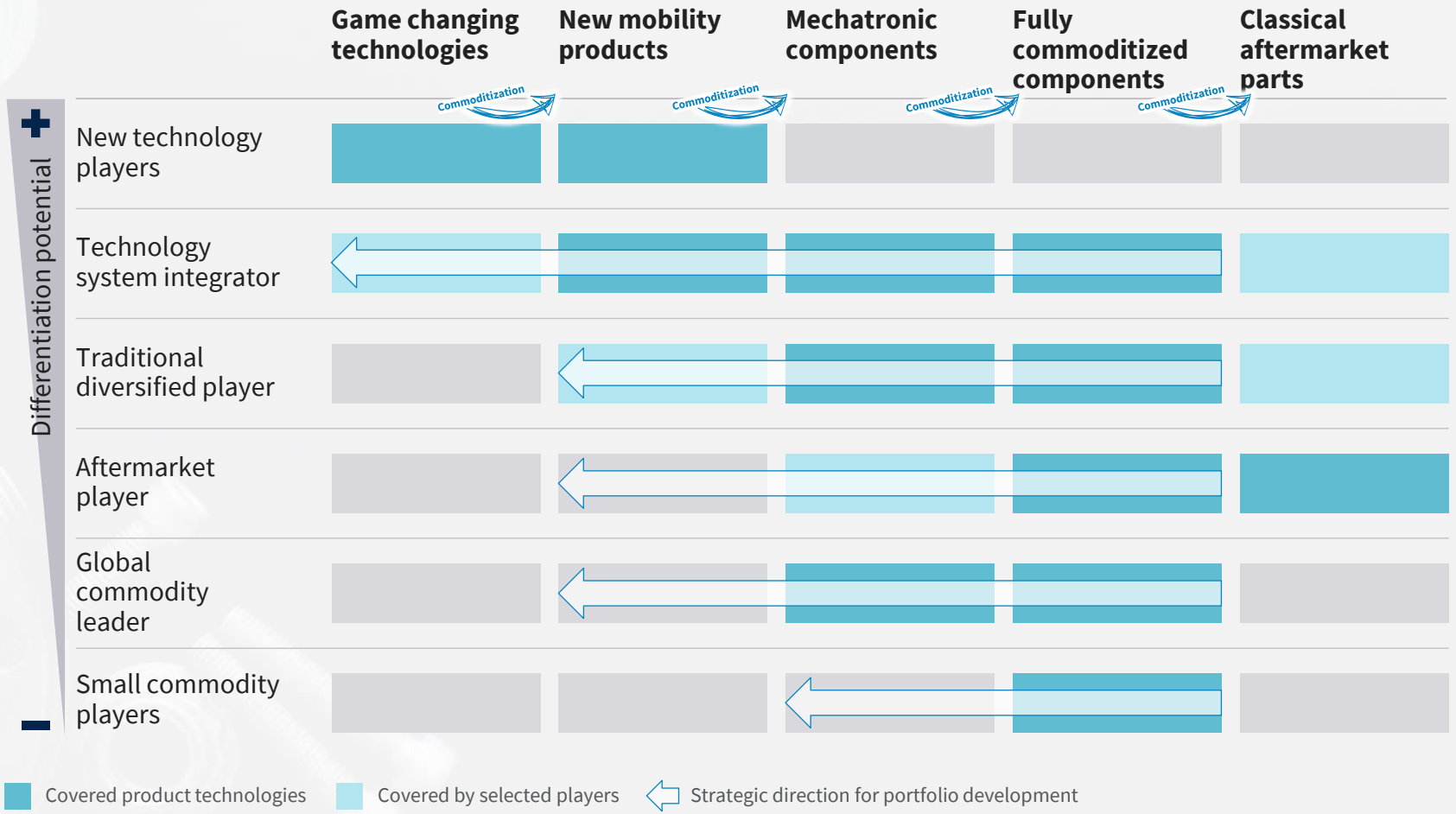
IMPLICATIONS

- The more components are related to the electrified powertrain and digitalization the better is the future growth perspective
- Hardware loses more and more relevance and doesn't offer differentiation potential from a technology perspective anymore
- Especially for aftermarket players, the commoditization trend offers possibilities to extend their portfolios
- Game changing technologies as well as new mobility products are often dominated by players which entered the automotive field only recently such as battery suppliers

Source: Roland Berger/Lazard

Most supplier archetypes try to develop their portfolio towards future mobility technologies

Portfolio coverage based on supplier archetype



- New technology players mostly focused on software applications and electrified powertrain technologies – Players often coming from business segments outside automotive
- Almost all players try to extend their portfolios by software and electronics contents to defend against commoditization
- The more concentrated and the more commoditized the actual portfolio of an automotive supplier is, the more difficult it will become to defend a successful positioning in the future
- All product technologies commoditize by time

Source: Roland Berger/Lazard

Automotive suppliers are clustered into six groups based on their margin potential and value proposition that drives future growth

Definition of supplier clusters

Supplier archetype	DESCRIPTION	Margin potential and market resilience	Value proposition or growth potential
New technology players	Players being focused on software and electronics products as well as electrified powertrain components with a leading technology position		
Technology system integrator	Large suppliers with a very broad product portfolio, global presence and a system relevant positioning for the OEMs		
Traditional diversified player	Larger traditional players with smart products e.g., mechatronics, which can leverage their know-how partially into new technologies but mainly fight commoditization		
Aftermarket player	Suppliers with a broad portfolio of single parts and less complex systems which target mainly the end-customer market and thus have a stronger pricing power		
Global commodity leader	Commoditized portfolio but yet with more complex parts and systems and often a leading market position but limited capabilities to access growing technologies		
Small commodity player	Small players often focused on fully commoditized single parts and simple components with limited ability to leverage scale effects		

Source: Roland Berger/Lazard

Each supplier cluster proves different sensitivities to prevailing long term economic factors indicating focus areas & need for action for supplier CEOs

Impact of CEO radar long-term implications on component clusters

		SMALL COMMODITY PLAYER	GLOBAL COMMODITY LEADER	AFTERMARKET PLAYER	TRADITIONAL DIVERSIFIED PLAYER	TECHNOLOGY SYSTEM INTEGRATOR	NEW TECHNOLOGY PLAYER
A	Autonomous driving	O	−	+	−	+	++
B	Sustainability legislation	−−	−	−	−	−	O
C	Changing manufacturing environment	−	O	O	+	++	O
D	New vehicle architecture	−−	−	O	−−	+	++
E	New industry dynamics	−−	−−	−	−−	−	+
F	Crisis resilience	−−	−	++	−−	O	++
G	Financing requirements	−	−	O	−	−−	++

−− Very negative O Neutral ++ Very positive

Source: Roland Berger/Lazard

C.

Supplier CEO agenda – Setting the direction for lasting success

The key actions of supplier CEOs to navigate through the next years depend on today's strategic positioning

Due to the change in powertrain technologies and the increasing penetration of automated driving, **New technology players and Technology system integrators expected to gain relevance** compared to today's industry structure

In parallel, **commodity players, independent of their size, expected to lose relevance** and thus need to work on portfolio adjustments as well as operational performance

Sustainability legislation as well as crisis resilience have a very high relevance for almost all supplier archetypes while automated driving trends impact mostly the technology suppliers

Traditional diversified players have the highest need for action – Either because it is a matter of survival or because the window of opportunity is wide open

Source: Roland Berger/Lazard

The strategic positioning and the change in the industry relevance of automotive suppliers is predetermined by their product portfolios

Supplier archetypes

	SMALL COMMODITY PLAYER	GLOBAL COMMODITY LEADER	AFTERMARKET PLAYER	TRADITIONAL DIVERSIFIED PLAYER	TECHNOLOGY SYSTEM INTEGRATOR	NEW TECHNOLOGY PLAYER
Relevance today						
Relevance tomorrow						
Drivers for change	• Drivetrain electrification • Technology phase-out • Volume deterioration	• Drivetrain electrification • Technology phase-out • Volume deterioration	• Drivetrain electrification • Aging ICE car park • Vanishing of traditional component players	• Drivetrain electrification • New E/E architectures • Automated driving • Volume deterioration • Interior individualization	• Drivetrain electrification • New E/E architecture • Automated driving • Relevance for vehicle efficiency	• Drivetrain electrification • Automated driving • New E/E architecture • Software as differentiator
Supplier CEO focus topics	• Improve performance and reduce working capital • Claim damages caused by suppliers and OEMs • Assess portfolio adaptions • Elaborate collaboration or consolidation options • Drive decarbonization and sustainability initiatives	• Improve operational performance and streamline overheads • Define claiming strategy towards OEMs • De-globalize footprint • Elaborate aftermarket opportunities • Drive decarbonization and sustainability initiatives	• Expand into alternative sales channels • Extend product and service portfolio • Elaborate M&A options • Streamline logistics processes • Adjust product pricing and improve pricing transparency	• Improve E/E capabilities and E/E scale • Adjust product portfolio for new E/E architecture • Extend software skills • Define claiming strategy towards OEMs • Pursue active portfolio realignment • Ensure talent availability • De-globalize footprint	• Invest in software development and integration capabilities • Divest commoditized segments and legacy business • Elaborate M&A options • Push for decarbonization • Ensure talent availability • De-globalize footprint	• Drive product and industry standards • Secure capital availability for R&D/industrialization • Focus on project acquisition and growth • Elaborate M&A options • Assess vertical integration potentials • Assess hardware product elements regularly

○ No relevance ● High relevance

Source: Roland Berger/Lazard

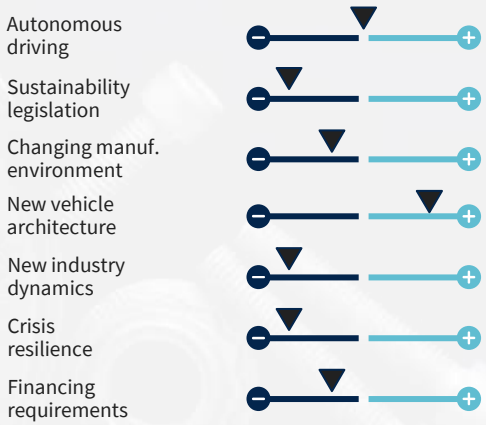
Smaller players with a commoditized portfolio have a very high need to improve operational performance as basis for a future right to exist

Actions and recommendations – Small commodity player

CALL FOR ACTION

- Product portfolio does not offer sufficient growth potential
- Margins expected to further deteriorate, competition to grow with increasing xEV penetration
- Non-product related trends with high relevance and thus high company vulnerability for market and legal framework changes

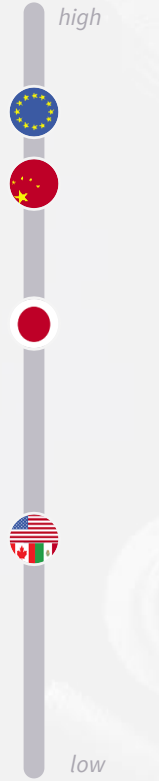
TREND IMPACT



Strategic actions

Performance and working capital improvement	• Execute performance improvement programs to ensure competitiveness in shrinking markets • Streamline company overheads and manage skill-set transformation • Reduce working capital requirements
Setup claiming initiative	• Setup task-force to address raw-material and energy inflation claims • Ensure comprehensive tracking of achieved compensation • Push for recurring compensation instead of one-time payments • Put everything on the table in client negotiations
Elaborate M&A or consolidation opportunities	• Assess consolidation potential with similar suppliers (ensure scale) or within adjacent areas (extend portfolio) • Achieve system critical size despite declining volumes
Drive decarbonization and sustainability initiatives	• Push for carbon-neutrality of the company • Ensure adherence of ESG and other sustainability regulations • Utilize ambitious targets as differentiator towards clients and employees • Adjust product portfolio to participate in sustainable technologies
Assess portfolio adaptions	• Extend product portfolio towards new powertrain components • Assess opportunities in tomorrow's commodities

Regional relevance



Source: Roland Berger/Lazard

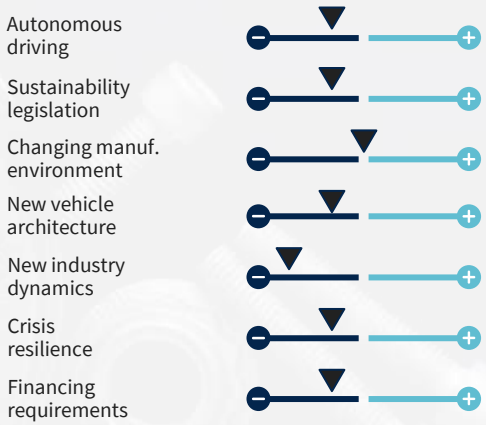
Suppliers with a commoditized portfolio but still sufficient growth perspective need to focus on performance improvement and portfolio adjustments

Actions and recommendations – Global commodity leader

CALL FOR ACTION

- Margins expected to further deteriorate due to limited differentiation potential and missing willingness of OEMs to pay for potential product innovations
- Non-product related trends with high relevance and thus high company vulnerability for market and legal framework changes

TREND IMPACT



Strategic actions

Improve operational performance	• Drive plant performance in terms of efficiency and quality • Reduce supply chain costs • Reduce R&D expenses analogue to technology phase-outs of OEMs • Reduce high-cost-country exposure and improve plant utilization
Setup claiming initiative	• Setup task-force to address raw-material claims at OEMs • Ensure comprehensive tracking of achieved compensation • Push for recurring compensation instead of one-time payments • Put everything on the table in client negotiations
De-globalize footprint	• Adjust localization of projects to minimize cross-regional and intercompany-deliveries • Redefine production strategy towards multi-centric manufacturing concepts • Develop flexible plant concepts to shorten relocation times
Elaborate aftermarket opportunities	• Extend aftermarket offerings beyond contractual agreements towards OEMs • Partner with established aftermarket players to open additional sales channels
Drive decarbonization and sustainability initiatives	• Push for carbon-neutrality of the company and ensure adherence of ESG and other sustainability regulations • Adjust product portfolio to participate in sustainable technologies • Avoid negative impacts out of fines or lost business

Regional relevance

Source: Roland Berger/Lazard

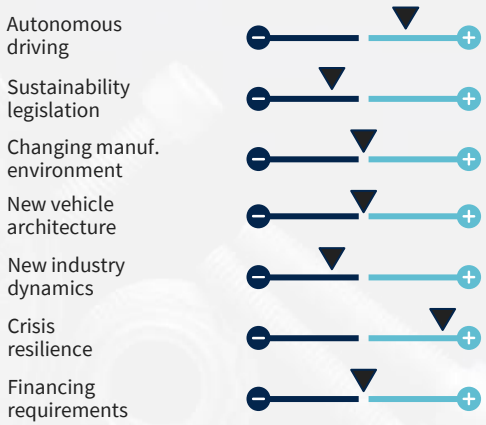
With a focus on aftermarket business the current market environment offers chances for portfolio extension both in traditional or new technologies

Actions and recommendations – Aftermarket player

CALL FOR ACTION

- Change towards new powertrain technologies can be a chance to extend business in traditional ICE components which lose relevance for established suppliers
- Digital technologies offer new opportunities for service and sales channel extensions e.g., data driven business models

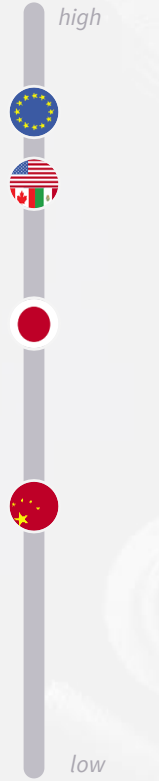
TREND IMPACT



Strategic actions

Extend service portfolio	• Elaborate data-based business models e.g., for part replacement predictability • Assess growth potential through digital sales channels • Assess service potential for automated cars
Extend or adjust product portfolio	• Assess growth potentials in traditional components which lose in relevance for Tier 1/2s • Identify portfolio extensions in new technologies and more complex components
Elaborate M&A options	• Leverage financial performance to drive and benefit from consolidation • Evaluate carve-outs for selected traditional businesses • Cooperate with software suppliers to position as partner for mechanical components
Adjust product pricing and improve pricing transparency	• Leverage market positioning and direct interaction with end-customers to increase margin potential • Improve transparency regarding profit- and loss-making product offerings • Maximize benefit out of regional market differences
Streamline logistics processes	• Assessment warehouse automation potentials • Increase transportation network efficiency and truck fill levels • Implement local warehouses to avoid cross-border shipments

Regional relevance



Source: Roland Berger/Lazard

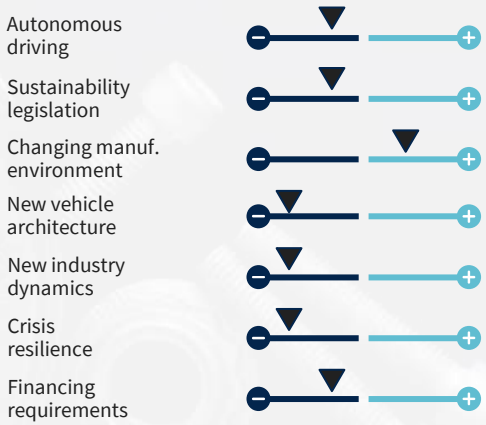
With a more diversified portfolio including smart products, a further increasing of E/E and software content as well as to attract sufficient talent gains relevance

Actions and recommendations – Traditional diversified players

CALL FOR ACTION

- Relevance of portfolio still given
- Automated driving and changing drive-train technologies can be a driver for further growth
- High dependency on a successful portfolio transformation
- Risk for being left behind and/or cannibalized by tech players

TREND IMPACT



Strategic actions		Regional relevance
Improve E/E and software capabilities	• Assess M&A opportunities of smaller (non-automotive) electronics players • Manage required employee transition from traditional components towards new components • Provide sufficient capital for R&D activities	high
Adjust product portfolio	• Extend product portfolio towards new powertrain components • Extend product portfolio for automated driving functions • Divest underperforming components/product groups • Collaborate with other players to extend E/E and software content	
Ensure availability of talent	• Analyze change in required employee skills on a regular base • Improve employer branding and company recognition within target employee group • Assess R&D localization in global start-up hot spots	
Define claiming strategy	• Ensure transparency regarding customer caused damages and raw-material price increases • Decide claim values and process incl. escalation level per customer based on future growth and margin potential • Avoid mechanisms with future down-side potential e.g., index-based pricing	
Pursue active portfolio management	• Target OEMs outside of the current customer portfolio • Identify additional growth opportunities specifically with new OEMs • Approach clients outside traditional home regions	low

Source: Roland Berger/Lazard

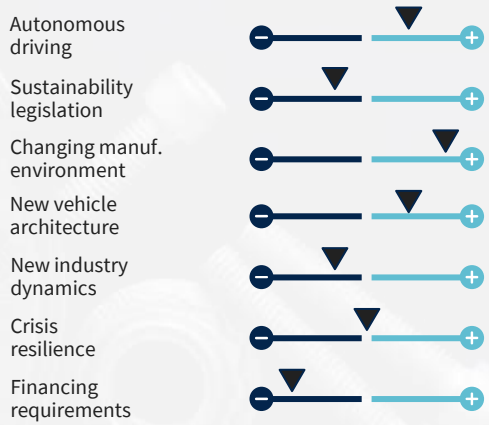
Large system integrators need to defend their technology position against OEMs and new market entrants to avoid losing relevance in the future

Actions and recommendations – Technology system integrator

CALL FOR ACTION

- OEMs behind in know-how for certain electrified or software/ electronics components
- Nevertheless, high margin pressure and strong new tech entrants as new competitors
- Often, players have a legacy business which limits their ability to act and transform quickly

TREND IMPACT



Strategic actions

Invest in software development and integration capabilites	• Bundle internal software capabilities within joint organization units • Standardize software products to avoid escalating complexity and multiple competing modules • Collaborate with partners to defend relevance and avoid insourcing
Divest commoditized segments and legacy business	• Cut-off legacy business units to be able to keep up with the speed of new technology penetration • Avoid lengthy union and workers council discussions in the future • Keep financial performance and flexibility high
Elaborate M&A options	• Increase level of vertical integration in future growth segments • Accelerate inorganic growth into adjacent fields and key-technologies • Evaluate investment opportunities into start ups
Push for decarbonization	• Participate actively in associations and other lobby groups to ensure that electrification stays high on the industries agenda • Ensure compliance with sustainability legislations globally
De-globalize footprint	• Adjust localization of projects to minimize cross-regional and intercompany-deliveries • Redefine production strategy towards multi-centric manufacturing concepts • Develop flexible plant concepts to shorten relocation times

Regional relevance

Source: Roland Berger/Lazard

Players with a focus on state-of-the-art technology should leverage their actual positioning for further growth and a system relevant role in the industry

Actions and recommendations – New technology player

CALL FOR ACTION

- Technological change is chance to gain system-critical positioning in the supply-chain for the next years
- Strong competition in terms of know-how, financial capabilities and insourcing initiatives by OEMs
- Early risers expected to mop up the majority of project opportunities

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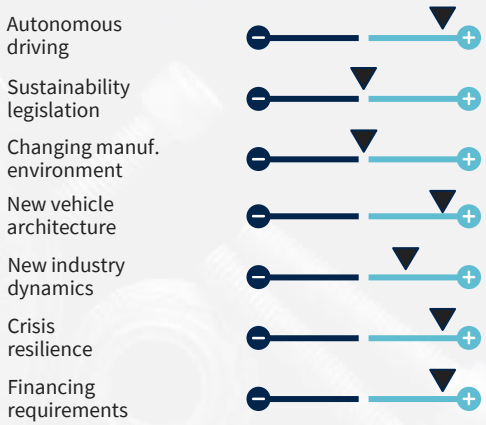


Strategic actions

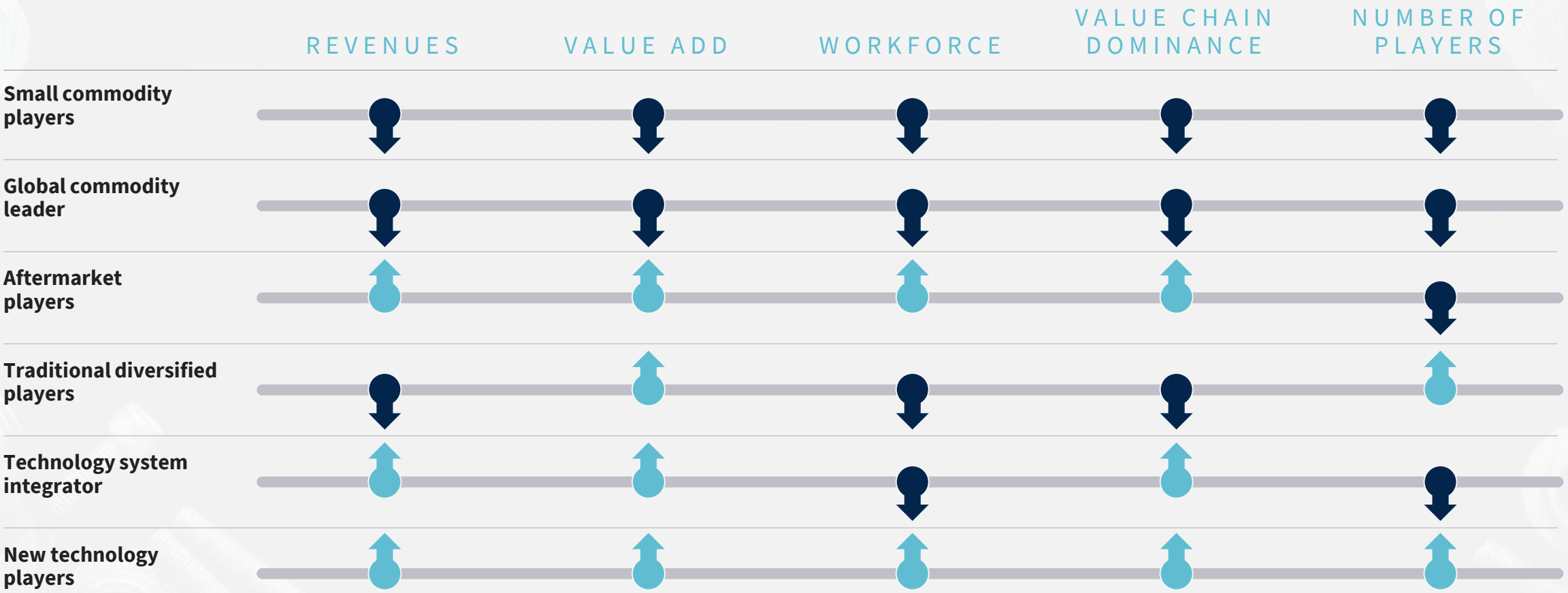
Drive product and industry standards	• Achieve cost-reduction potentials through cross-client standards • Collaborate with other suppliers to reduce component variance • Evaluate opportunities to keep R&D expenses at a healthy level • Participate actively in associations to define favorable industry standards
Secure capital availability	• Improve working capital management to free-up cash • Ensure availability of external financing opportunities e.g., credits/investors • Assess minority shareholders e.g., strategic partners
Focus on project acquisition and growth	• Attack new clients and new markets • Leverage growth and market penetration into margin potential • Develop follow-up business through software maintenance and updates
Elaborate M&A options	• Collaborate with non-automotive technology players • Realize additional growth through M&A • Screen investment opportunities in start-ups and small technology players
Assess hardware elements	• Assess vertical integration potential to position as system partner • Defend against hard- and software separation • Develop ways for cross-generational collaboration

Regional relevance

Source: Roland Berger/Lazard

Going forward, new technology players, technology system integrators and aftermarket players expected to be the leading pack in the supplier industry

Supplier relevance



Increasing relevance/importance Decreasing relevance/importance

Source: Roland Berger/Lazard

D.

Your contacts to discuss the insights

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Source: Roland Berger/Lazard

Roland Berger

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