

STUDY

Automotive Outlook 2040

Pace yourself
for the marathon ahead

Roland
Berger

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The automotive industry is in the midst of a lengthy period of disruption, a storm that is unlikely to subside any time soon. Over the next decade and a half, new technology and geopolitical events will continue to radically transform markets and disrupt supply chains. At the same time, the center of gravity of the industry will shift – but in which direction remains to be seen. Will Asia be calling the shots in 2040, or will Western players manage to stage an effective comeback?

The uncertainty over what lies ahead makes it vital for those in the industry to understand the trends driving this prolonged process of transformation over the next decade and a half. Our research shows that the previously identified shift towards innovative, shared mobility solutions that we thought would be a global phenomenon will in fact largely be limited to metropolitan areas, which account for **less than ten percent** of the distance traveled by private vehicles overall. What, then, does the road ahead hold for the automotive world?

We identify four directions of change that stand out from the many trends in the market – four megatrends that we believe will shape the transformation of the industry through 2040. Their initials form the acronym **PACE**: The automotive world is becoming more **Polarized**, with regional nuances and added complexity making globalization more challenging, forcing players to make choices.

Automation is growing, with the rise of autonomous vehicles and use of AI all along the value chain. Vehicles are increasingly **Connected** and digitalized. And **Electrification** continues apace – indeed, our base-case scenario assumes a battery-electric vehicle share of **71 percent in 2040**, while our downside case assumes a share of 64 percent, subject to regional variation.

In terms of market dynamics, sales volumes and revenue pools are shifting to China and the Global South, while Western markets have already reached "**peak auto**" in terms of new vehicle sales. The following pages include detailed forecasts for future revenue pools in each region, plus specific recommendations for automotive manufacturers and suppliers.

The road ahead will be a long one, with unexpected twists and turns along the way. This is a marathon, not a sprint – and players must pace themselves accordingly.

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PACE 2040 - Our core beliefs

- **Four PACE megatrends are driving the transformation**
The automotive industry in 2040 will be polarized, automated, connected and electrified
- **The world is becoming more Polarized**
Auto players need a regionally differentiated approach and potentially a new global market focus
- **Automation and AI are transforming the industry**
Automation is creating new profit pools, while AI technology is key to improving performance
- **In 2040, the automotive industry will be more Connected**
Players should prepare themselves for a paradigm shift in the structure of the industry
- **Electrification is growing fast everywhere**
Although recent market developments have called into question current BEV adoption forecasts, the overall direction of change cannot now be reversed
- **Private vehicles will remain part of the equation**
Shared mobility concepts are reshaping customer behavior, but only in large urban areas
- **Tomorrow's vehicles are electrified, automated and connected**
But major regional disparities at a product level will persist through 2040
- **Market dynamics vary from region to region**
Western markets are reaching peak auto, but growth will continue in China and the Global South
- **The balance of power is shifting towards China**
The question is, can Western automotive manufacturers revitalize?
- **Suppliers face structural change**
Strategic priorities will depend on suppliers' domain, regional focus and growth expectations

The automotive world is changing, but probably not how you were expecting



The automotive world is in the midst of a major transformation, a radical redefinition of the balance of power in the industry. New entrants are aggressively seizing market share from established players, vehicle technology is evolving at an unprecedented pace and the macroeconomic and geopolitical landscape is gaining previously unseen layers of complexity. Now is a crucial time for the automotive industry to revisit its strategic priorities. How will the industry evolve over the next 15 years? What forces will drive the transformation? And how should car manufacturers and suppliers prepare for the marathon ahead?

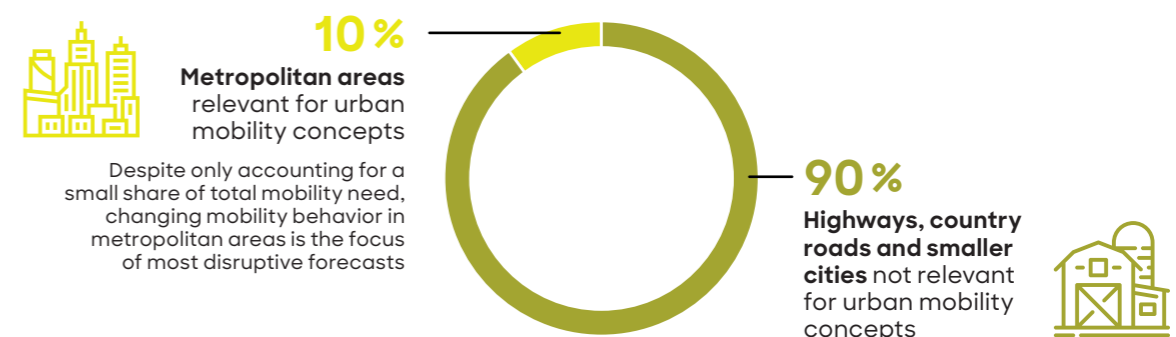
Traditionally, automotive players base their long-term strategies on the changes they expect to see in mobility behavior – changes such as an overall decrease in the use of private vehicles or the transformation of today's automotive players into mobility service providers or commodity suppliers for other mobility players. Indeed,

the assumption that innovative, shared mobility solutions would replace demand for private vehicle-based mobility lay behind many views on the long-term outlook for the industry, particularly those developed in the mid-2010s.

Our analysis of the global automotive industry finds that the expected disruption in mobility has occurred at much slower pace than anticipated. Current changes in mobility patterns are mainly restricted to large urban areas, which account for less than ten percent of the distance traveled by private vehicles overall. Even in these large urban areas, the hype around new mobility offerings has not delivered on its promises and has proven overoptimistic with regards to the speed of change. It is now clear that major disruption of the sort that was widely predicted is not likely in the period to 2040: It will happen, but not at the pace expected. We need a more differentiated approach to shifts in mobility behavior – one that distinguishes behavior in urban areas from that in rural or suburban areas. ▶ A

A Importance of private vehicles in urban vs. rural/suburban areas, 2023

Share of total mileage driven by private vehicles by type of road [%]



Note: Data based on average across Germany, USA and China

Source: Roland Berger

Demand for mobility, as reflected in the total number of miles traveled, is forecast to continue growing in most regions of the world at a rate of two to three percent a year in the period to 2040. The main drivers of this increase are economic and demographic development. Factors relating to changes in technology or society, such as more remote work or more online shopping, only have a minor impact on overall demand for mobility.

In large urban areas, new modes of transportation such as urban air mobility and autonomous driving, plus the increasing penetration of micromobility (bicycles, e-bikes, electric scooters) and shared mobility services, will have a negative impact on vehicle usage over the coming decade and a half. However, the overall impact on vehicle sales will be minor. In the case of new modes of transportation, this is due to the small scale of these new offerings and the limited areas in which they operate. Micromobility will grow in terms of the number of trips made, yet our research shows that this type of mobility complements trips in private vehicles rather than replacing them. Regulation, such as congestion charges and no-car zones, will likely have a stronger impact on vehicle usage, but here the situation differs widely from city to city and region to region. The United States, for example, currently has no

cities with major restrictions on vehicles, whereas several European cities have completely banned private cars from entering downtown areas.

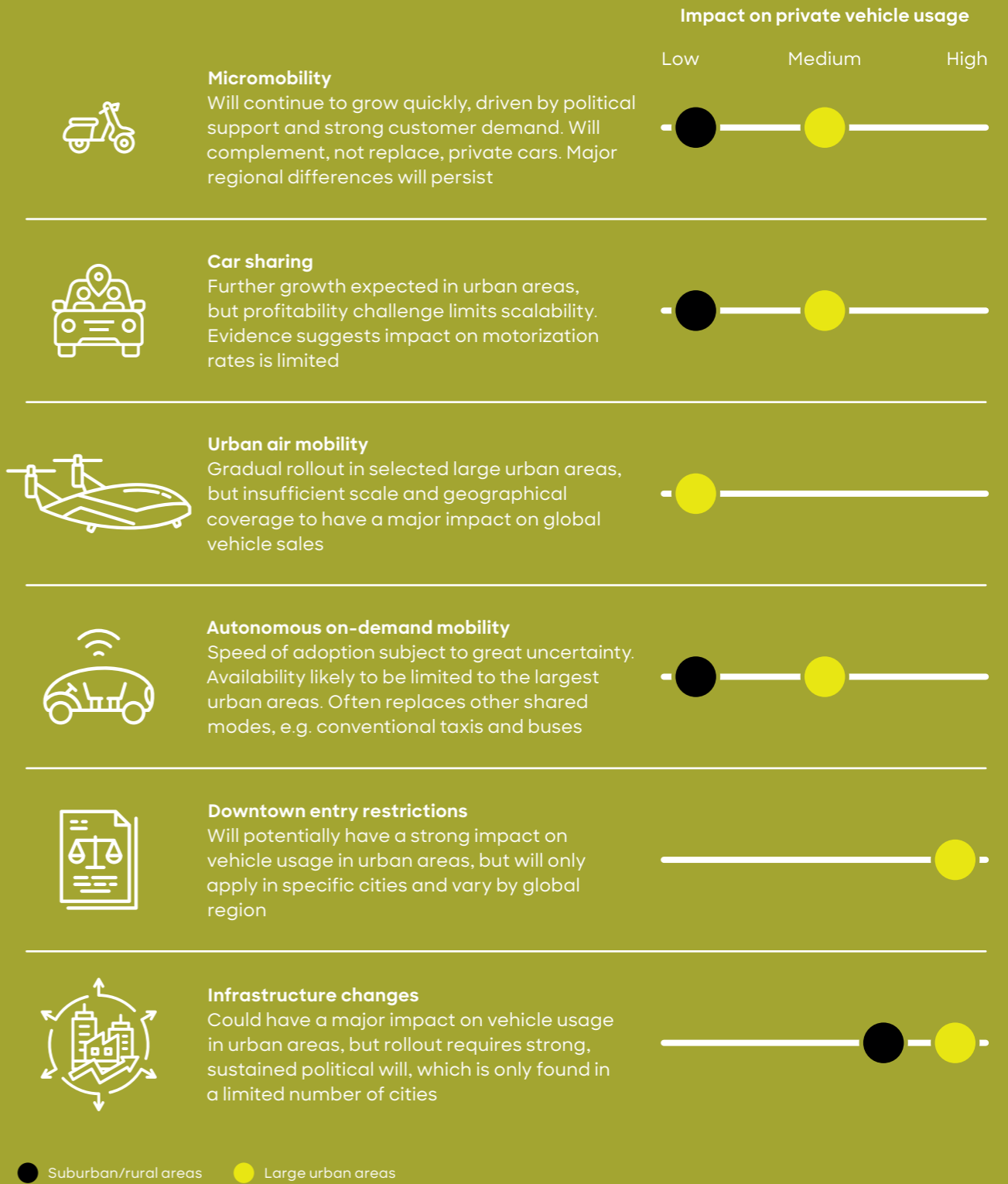
In the coming decade and a half, we do not expect to see any major change in the fact that suburban, rural and long-distance travel account for the vast majority of miles traveled by car. In Germany, for example, travel in large urban areas is around 35 percent by private vehicle and 20 percent by public transit, while in rural areas the split is 70 percent private vehicles to just five percent public transit. We expect the situation in Germany and elsewhere to remain largely constant in the period to 2040, with only a slight decline in private vehicle use in large urban areas. Globally, micromobility is not relevant in rural areas, nor are restrictions such as congestion charges, and consumers will continue to show a strong preference for private vehicle-based mobility. Automotive players would therefore be wrong to build their long-term strategies on the expectation of a sudden shift in overall mobility behavior. While automotive players must, of course, keep an eye on ongoing developments in mobility behavior, the more fundamental, prolonged changes in the automotive industry through 2040 will occur elsewhere – as we discuss in the following chapter. ► **B**

Four megatrends will shape the transformation of the industry through 2040. Their initials form the acronym **PACE**.



B Many factors affect private vehicle usage

Key drivers influencing private vehicle usage across urban, suburban and rural areas



Source: Roland Berger

Four developments reshaping the auto industry



If, as we have seen, mobility behavior will not be the cause of major disruption in the industry, what is it that will trigger the transformation and shift in balance of power in the period to 2040? Which developments will shape the auto industry over the next decade and half? And where should automotive companies be focusing their resources in this ongoing marathon?

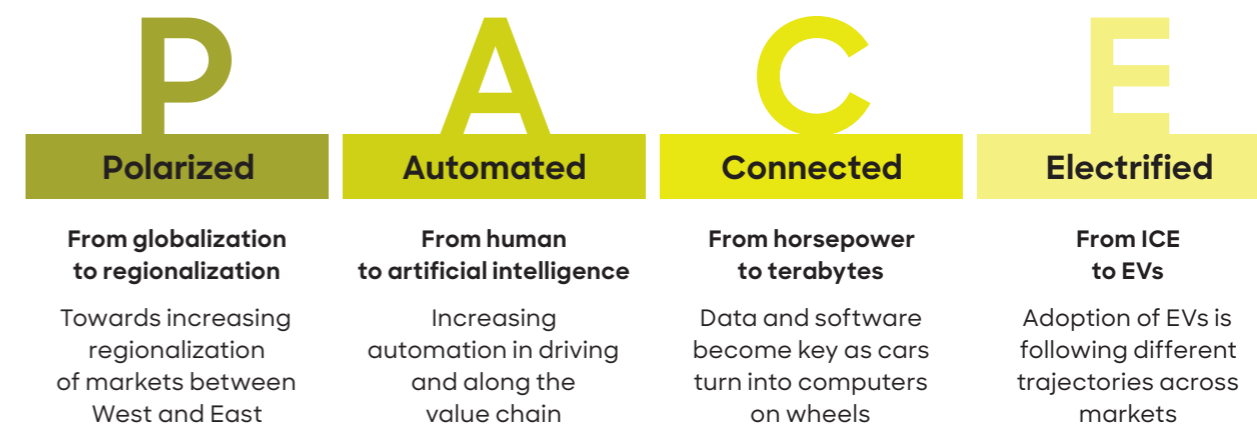
To answer these questions, we carried out an in-depth analysis of current trends in the global automotive industry and their likely development through 2040. We draw on this analysis, in addition to insights from our global team of experts and extensive discussions with industry professionals and executives, in the discussion below. Our chief finding is that four key developments stand out as megatrends shaping the industry through 2040: The future will be **PACE** – Polarized, Automated, Connected and Electrified. ▶

2.1/ Polarized – From globalization to regionalization

Different regions are set to develop in different directions and at different speeds in the marathon ahead. A range of factors is driving this variety: geopolitical developments, differences in regulation, technological differences, customer preferences and macroeconomic shifts. For example, China is on a trajectory from being the growth engine for European OEMs to being a largely fully electric vehicle market dominated by domestic players, while most of North America will remain an internal combustion engine (ICE) market for many years to come. As different regions diverge and develop at their own pace in the period to 2040, the industry will become more polarized. This stands in radical contrast to the wider trend towards globalization seen in previous decades.

C Driving forces

Four developments shaping the auto industry through 2040



Source: Roland Berger

Polarization will not only impact value chains but also largely determine where future sales markets and revenue pools are located. Automotive players therefore need to follow a regionally differentiated approach, potentially redefining their global market focus. Below, we identify three key developments that automotive players will need to react to in order to remain competitive.

NORTH AMERICA, EUROPE AND CHINA WILL REMAIN THE CORE AUTOMOTIVE MARKETS, DESPITE STRONG GROWTH IN THE GLOBAL SOUTH

Economic growth in the United States and Canada, while stronger than in most other Western markets, is expected to be around 1.8 percent a year in the period 2024 to 2030, falling to 1.5 percent a year from 2031 to 2040. In Europe,¹ economic growth will be just 1.1 percent between 2030 and 2040, well below the global average of 2.1 percent. Similarly, China is not expected to reach its former economic growth rates, with rates down to 3.8 percent between 2024 and 2030 and 2.9 percent in the decade after that. This contrasts with strong GDP growth in markets in the Global South,² at 3.9 percent in the period 2024 to 2030 and 3.1 percent from 2031 to 2040. Some large emerging markets, including India, will even reach growth rates exceeding 5 percent between 2024 and 2040. Despite this, the Global South will account for just 34 percent or so of global GDP growth, and purchasing power will remain significantly lower than not only in the West but also in China.

Populations, especially working-age populations, will grow by 25 percent in the Global South over the next decade and a half, while shrinking in Europe (by nine percent) and China (by ten percent). However, motorization rates and infrastructure levels in the Global South will remain lower than in developed markets and China. The current high share of entry-level and volume segments in the Global South will also persist, reflecting lower income levels in these regions. All in all, the Global South will see

above-average market growth, but mostly for high value-for-money vehicles. ▶D

REGULATORY DRIVE FOR SUSTAINABILITY WILL PERSIST, BUT WITH REGIONAL DIFFERENCES

Regulators have pushed for a reduction in greenhouse gases, even if net zero targets are not likely to be reached as soon as planned. Behind these efforts is strong popular support and a desire on the part of governments to achieve competitive advantage for their industries. Industry has made clear commitments; however, the strength of efforts will continue to vary from region to region. At the same time, political parties in some countries are now questioning the feasibility of targets such as the EU mandate for 100 percent of new vehicle sales to be zero-emission by 2035, or arguing that there should be exemptions for e-fuels.

DECISION-MAKERS CAN NO LONGER RELY ON A STABLE GEOPOLITICAL ENVIRONMENT

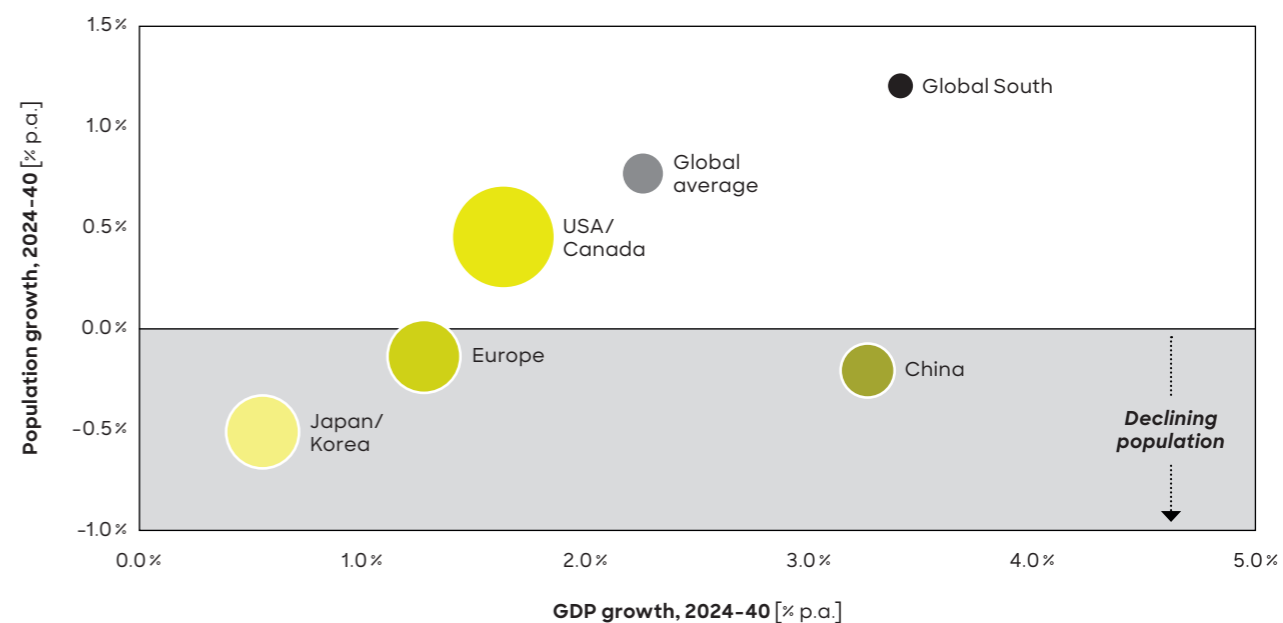
We are witnessing an increase in the level of global political instability, with the highest number of violent conflicts currently taking place since the end of the Second World War and growing rivalry between the United States and China. In 2018 we saw the start of an international trade war and a surge in protectionist measures around the globe: In 2024 alone, more than 3,300 protectionist measures adversely impacted the automotive industry, according to data from the University of Uppsala. This development will affect the environment in which automotive players act and the long-term trajectory of the

¹ The EU-27, United Kingdom, Albania, Andorra, Belarus, Georgia, Iceland, Kosovo, Moldova, Monaco, Montenegro, North Macedonia, Norway, San Marino, Serbia, Switzerland and Ukraine.

² Including developing and emerging markets in Asia, Africa and Latin America, but excluding China.

D Global growth dynamics are shifting

Macroeconomic and demographic development by region, 2024-40 [% growth p.a.]



↻ GDP per capita, 2040

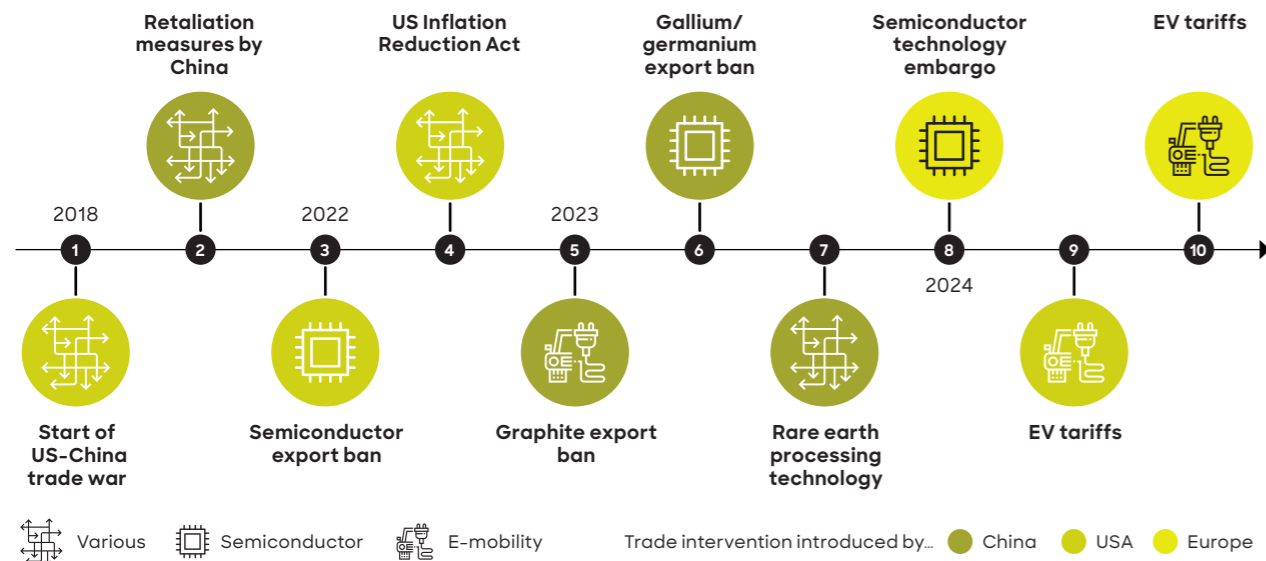
Source: Oxford Economics, Roland Berger

industry. For example, any rise in protectionist measures such as tariffs or export bans will impact the supply of critical raw materials and components, as well as bidirectional access to markets.

The next decade and a half may bring local-for-local production regulations and a continuation of government subsidies, both of which would have strong implications for the setup of global value chains. Ultimately, we expect to see a shift away from globalization dominated by a single region and towards the emergence of different

ecosystems, one dominated by the United States and the other by China. This will limit access to markets and drastically increase the complexity and cost of serving markets around the globe, as well as driving up prices for consumers. To remain competitive among such uncertainty, decision-makers in the automotive industry need to keep geopolitical considerations at the top of their agenda, strengthening their local-for-local strategies and carrying out continuous risk and resilience checks on their supply chains. ▶E

E Major trade interventions affecting automotive players



Source: Roland Berger

2.2/ Automated – From human to artificial intelligence

Automated driving still faces multiple challenges and adoption is taking much longer than expected. While assisted driving (Level 2+) is making progress, car manufacturers are far behind initial forecasts for highly automated driving systems (Levels 3 and 4). In terms of technology, training for uncommon, messy situations such as reacting to early responders or unusual traffic situations remains challenging. Major regional differences in regulation currently limit scalability and add complexity, particularly for the rollout of on-demand autonomous vehicles (AVs) such as robotaxis – although the first driverless taxis have appeared in some cities and are being

rolled out to others in China and the United States, the two countries that lead the way here. Increased customer acceptance will be crucial for the widespread adoption of AVs, yet this trust is difficult to build. Society's willingness to forgive an AV for making a mistake is still significantly lower than for a human driver.

Moreover, the question of economic viability is still not completely resolved. Although some providers have announced that profitability for on-demand AV services is achievable in specific cities in the short term, more generally such services will remain challenging due to the high level of utilization and scale required. For private AVs, customers' willingness to pay presents a further barrier to adoption, also in the premium segment. However, these challenges are not insurmountable, especially if

policymakers improve conditions for testing and market introduction. At the same time, AV companies will need to continuously improve cost efficiency. ►F

Although we expect to see multiple real-life applications of AVs on the roads in 2040, the journey to that point will be gradual and differ widely for different use cases and regions. We identify six major "progress markers" along the path to automated driving:

#1: On-demand AVs are available

On-demand AVs such as robotaxis, robo-shuttles and robo-buses, already operating in some cities in the United States and China, will grow in volume from today's small fleets. By the early 2030s these vehicles will have reached fleet sizes comparable to those of conventional taxis in some large urban areas. By 2040 we expect that scaled fleets of on-demand AVs will form an integral part of mobility in the largest urban areas globally. In some regions, especially within Europe, robo-buses will also increasingly serve rural areas.

#2: On-demand AVs operate profitably

Many players will achieve profitability by 2040 for their on-demand autonomous mobility services. However, in the intervening years, we expect to see fierce battles for market share and operational challenges, the latter severely affecting profitability. The resulting market consolidation may ultimately lead to higher price levels and thus more sustainable margin levels.

#3: Customers can buy AVs for private use

We expect to see significant volumes of AVs on the road in 2040, but they will still largely be limited to the premium segment. The trickle down to the volume segment will be gradual, due to continuing high incremental costs.

#4: Packages are delivered by autonomous trucks

Commercial AVs will achieve substantial market share in long-haul applications by 2040, while penetration for last-

F Challenges for the adoption of autonomous driving



Technological progress

Training for uncommon situations such as reacting to early responders or unusual traffic conditions takes time ("tail effect")



Customer acceptance

Building trust among consumers is challenging



Capital supply

Significant investment is needed for developing and testing autonomous vehicles



Economic viability

Economic viability of autonomous on-demand services is challenging due to high level of utilization and scale required



Regulatory complexity

Strong regional differences in legislation limit scalability and add complexity

We refer to "autonomous driving" when referring to L4 driving without a driver required, while using the broader term "automated driving" when referring to lower ADAS levels | The term "autonomous on-demand services" refers to robotaxis, robo-shuttles and robo-buses.

Source: Roland Berger

G The trajectory to automated driving is incremental

Progress in automated driving, 2025–40

	2030	2035	2040
1 On-demand autonomous vehicles are available	Small fleets in selected cities in US/China	Fleets reach comparable size to taxis with human drivers in selected cities in US/China	Scaled fleets are an integral part of mobility in largest urban areas globally
2 On-demand autonomous service providers operate profitably	Despite progress, most players' operations are still not profitable	Fierce fight for market share and operational challenges affect profitability	Consolidation forces unprofitable players out of the market, but margins remain tight
3 Customers can buy autonomous vehicles for private usage	No relevant market share (pilots only)	First offerings in premium segment, mainly restricted to L4 highway pilots	Slow but growing penetration in volume segment, too
4 Packages are delivered by autonomous trucks	No relevant market share (pilots only)	L4 trucks run on predefined corridors or exit-2-exit	Increasing penetration in long haul, but still a small share of last-mile delivery
5 Customers fully trust the safety of autonomous vehicles	Low trust, most people think AVs are less safe than human drivers	Moderate trust, most people think AVs are just as safe as human drivers	High level of trust, most people think AVs are safer than human drivers
6 Autonomous driving is legal on public roads	Legal framework limited to predefined test roads/areas	Legal framework in place in some regions and use cases	Clear legal framework in place for all use cases, regional variation remains

No progress Strong progress

Source: Roland Berger

mile delivery will remain lower. We expect to see the first significant numbers of autonomous trucks operating on predefined corridors or exit-2-exit in the early 2030s.

#5: Customers fully trust in the safety of AVs

Trust will be largely established by 2040, with the majority of the population convinced that AVs are safer than vehicles with human drivers.

#6: Autonomous driving is legal on public roads

By 2040 the regulatory environment will be mature, with a clear legal framework across all major use cases and regions. However, precise regulations will differ between countries and cities. ►G

Overall, we believe that autonomous driving will have a limited impact on automotive players in the period to 2040: On-demand autonomous vehicles will not disrupt incumbent automotive players' business models and the total number of vehicles sold globally will be unaffected. However, the development of Level 4 vehicles – cars featuring fully autonomous driving but with the option for the human driver to request control – for private use will create new potential revenue and profit pools, especially for premium OEMs. Car manufacturers will continue to move away from in-house full-stack development, due to the high complexity and investment requirement. At the same time, full-stack autonomous mobility providers will only capture a small share of the market, mainly in large urban areas, and they will come under great pressure to consolidate. We expect to see between one and three scaled-up players active in each urban or regional market in 2040.

ADVANCEMENTS IN AI

The automotive sector is still at an early stage when it comes to adopting AI. Yet it is uniquely positioned to benefit from AI-driven step changes in efficiency and

performance. Given the industry's extensive and ever-expanding data pool, encompassing both data from functional units and end customer data, AI is the next logical lever for creating advantage in a highly cost-competitive industry.

We expect to see AI in widespread use by automotive players by 2040. AI-based technology will be used in functional units, from R&D to production, sales and aftersales. It will enable higher efficiency, better quality and improved performance, at the same time as mitigating risk. This will lead to a fundamental change in the structural setup of automotive players. ►H

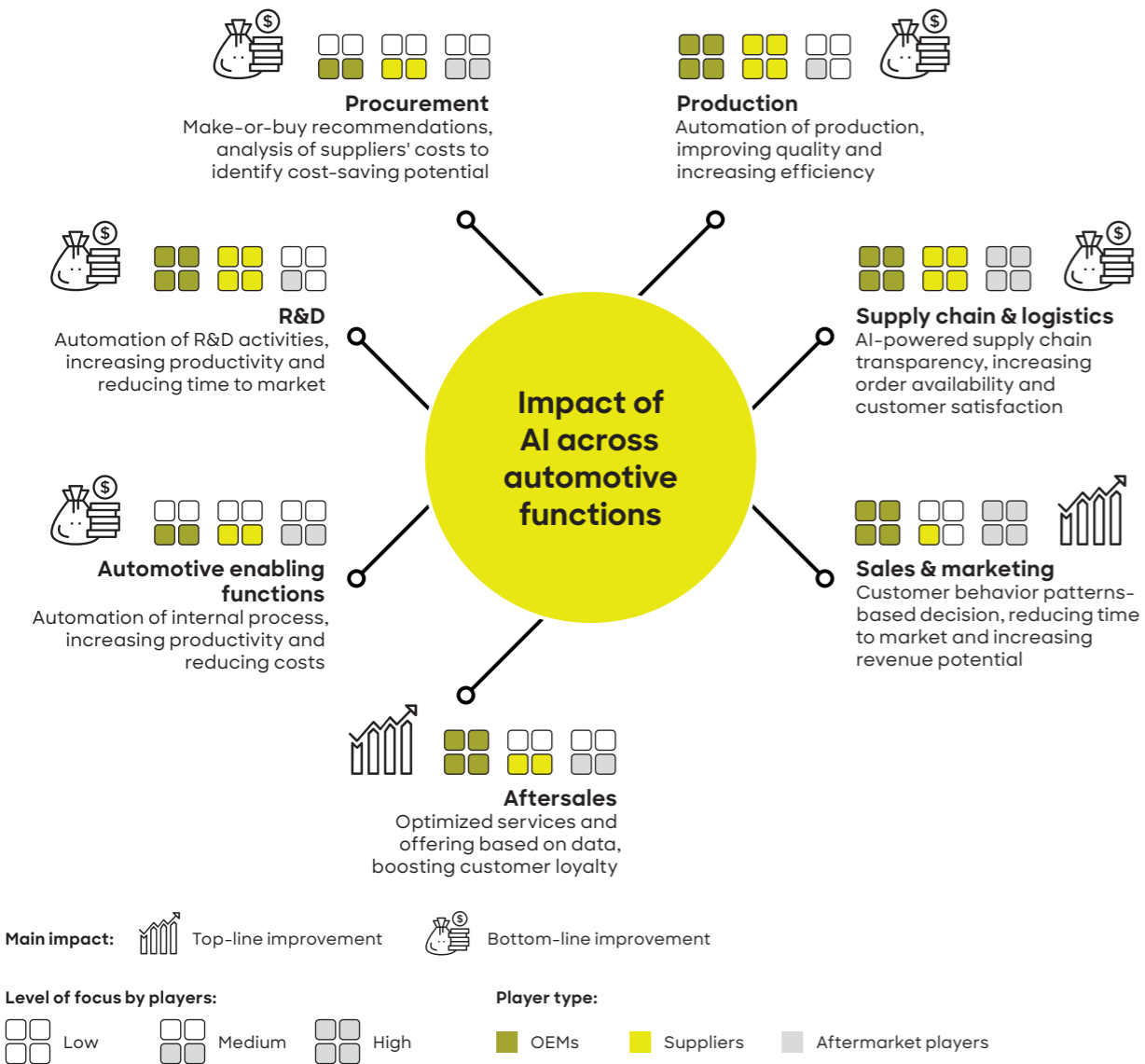
Where can AI create value for automotive companies? The answer depends on the company's access to data and its ability to train AI on proprietary data and processes. Not all players will progress at the same speed and benefit from AI to the same extent.

Regulations determine how companies can access and use data, if at all. This impacts the output quality of AI models and potentially increases the cost of deploying AI across different regions. Regulation, driven by geopolitical considerations, can also affect access to the latest computing technology, which could lead to major differences in AI value creation potential across regions. Access to capital, talent, data and training capabilities is further impacted by players' structural setup. We therefore expect to see significant differences in AI value creation potential depending on the automotive company's size and its position in the value chain.

The rise of AI will affect different types of players differently:

- We expect **OEMs** to deploy AI applications along all functional units, benefiting from additional access to end customer data from their sales and aftersales activities. Effectively integrating customer data into their upstream functions, such as research and development (R&D) and manufacturing, could give them a clear competitive advantage.

H Impact of AI across automotive functions



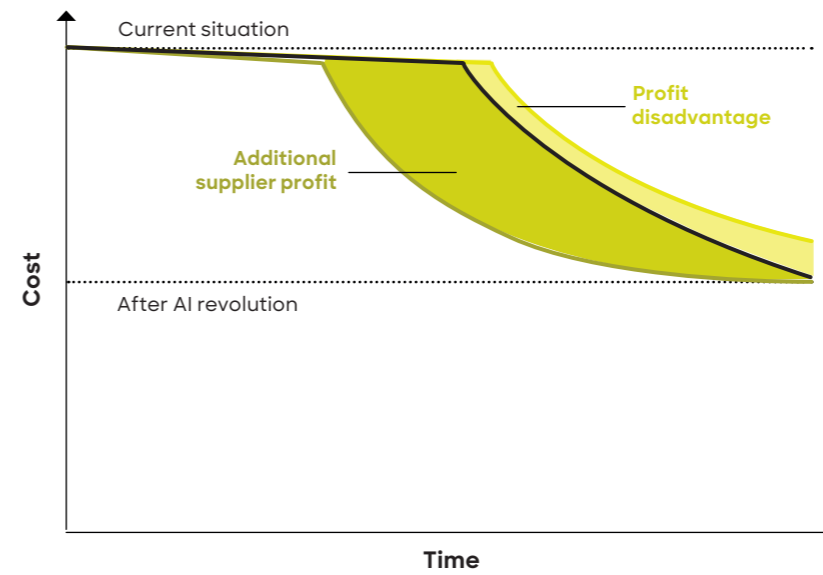
Source: Roland Berger

- For **suppliers**, access to data will be crucial in order to remain competitive in the market. In the short to medium term, early movers with the best data access and training capabilities will set the bar for cost efficiency, outpacing OEMs' cost expectations and thereby earning outsized profits. Suppliers that cannot keep pace with their peers run the risk of becoming uncompetitive.
- The performance of **aftermarket players** will depend heavily on whether they are able to gain access to end customer and vehicle data or not. This data will be crucial for improving operational efficiency and personalizing the aftersales experience. Aftermarket players can also

potentially benefit from new business opportunities by sharing their customer data with other automotive players. ▶

In the long term, these differences in AI value creation potential could have a disruptive impact on the industry. At a regional level we may see different AI ecosystems – a Western ecosystem versus a Chinese ecosystem, say – with different leading players and AI models, resulting in limited exchange and global collaboration. At the same time, all automotive players need to find ways to use AI to make the best use of their data pool and redirect freed-up resources so that they can stay in control of their increasingly complex

I Supplier view - Impact of AI on profits



— Early movers' cost level — Laggards' cost level — OEMs' cost expectations

Source: Roland Berger

Early movers will set the bar for cost efficiency, thereby outpacing OEMs' cost expectations

Laggards will become uncompetitive and no longer be able to meet OEMs' cost expectations

business and further improve their efficiency. It will be crucial for the long-term survival of automotive players that they develop new capabilities and adjust their organizations to maintain competitiveness in the fast-evolving AI game. Today, many automotive players still lack the required capabilities, organizational structures and rich data access needed to exploit the full transformative potential of AI.

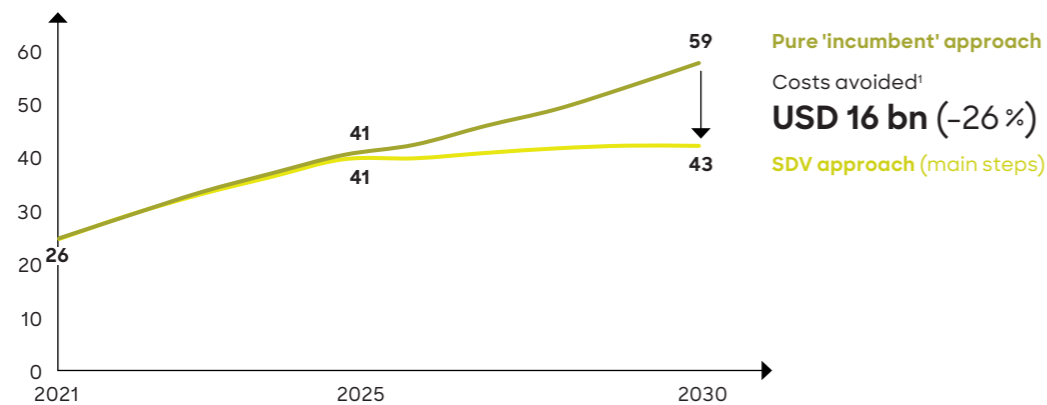
2.3/ Connected – From horsepower to terabytes

By 2040, we expect that all new cars will be based on the software-defined vehicle (SDV) approach, in which the vehicle is built around the software platform rather than vice versa. SDVs offer major benefits for both drivers and OEMs. For drivers, they fundamentally redefine the customer experience as new functionalities and features can be continuously deployed over the vehicle lifetime by

means of software updates – improving safety, comfort, personalization or connectivity. Software-enabled features are, therefore, likely to become even more important as key purchase criteria. To fully enable the SDV approach, car manufacturers will need to adjust their electrical/electronic (E/E) and software architectures holistically. The SDV approach cuts overall software spend by 26 percent compared to the traditional approach: Although the cost of the software is higher, major savings arise from the reduced cost of testing, integration and maintenance. SDVs also offer automakers a faster time to market due to the short, continuous development cycles, reduced downtime and agile development. The new approach will therefore, we believe, be essential for automakers to remain competitive after 2030. ▶ J

Our analysis shows that OEMs still focus on in-house development of proprietary E/E and software architectures. Today, no cross-OEM standards or ecosystems for vehicle

J OEMs' in-vehicle software budget, 2021-30 [USD bn]



¹ Assuming fixed SW feature level in all scenarios

Source: Roland Berger

software exist. This not only creates a need for major upfront investments, it also complicates the integration process. The ecosystems that are currently emerging, however, could help address these issues and lead to greater standardization. We foresee three different pathways for how such ecosystems might develop, but the end result is always the same, namely an industry-wide hardware-agnostic standard:

- **Semiconductor-driven ecosystems:** Driven by the expected centralization of computing power, leading semiconductor suppliers are already pushing their hardware solutions with the corresponding middleware,

thereby creating standards in areas such as advanced driver assistance systems (ADAS) and automated driving or infotainment. These ecosystems could create strong hardware dependency for the software, allowing semiconductor suppliers to capture a large share of the profit pool and locking in OEMs. However, as the financial burden becomes too strong, automakers may respond by joining forces with smaller semiconductor suppliers to come up with a hardware-agnostic standard of their own. To avoid being displaced, leading semiconductor suppliers might try to offer a more hardware-agnostic standard before the OEMs manage to.

K Three pathways for E/E and software ecosystem development

Scenario 1

SemCo-driven ecosystems

- Leading semiconductor players (SemCos) **actively push standards** in ADAS/autonomous driving and partially in infotainment, creating a **de facto hardware-specific standard** and gaining significant power over OEMs and Tier-1 suppliers
- **OEMs react** by joining forces with smaller SemCos to create their own **hardware-agnostic standard**, leading all SemCos to **adjust to the same standard**

Scenario 2

Tech player-driven ecosystems

- **Tech players** develop **hardware-agnostic standard middleware** (e.g. a holistic Android system), providing an **open-source platform** to achieve a strong **competitive position** in the value chain and **increase their share of the profit pool** by leveraging their existing core business of data-driven services/functionalities

Scenario 3

OEM-driven ecosystems

- OEMs (most likely new OEMs or Tier-1 suppliers) introduce **open-source architectures** and middleware either to gain **scale for themselves** (cooperation with other OEMs) or to **sell solutions/features** based on this
- OEM-driven ecosystems emerge fast due to already **high pressure to optimize costs**

Industry-wide hardware-agnostic E/E and software ecosystems

Source: Roland Berger

- **Tech player-driven ecosystems:** Leveraging their abundant capital supply and rich technological know-how, tech players may extend their automotive business to create synergies with their core business (cloud services, navigation or whatever it may be). These ecosystems are expected to be open-source, so for car manufacturers there could be cost advantages but also the risk of third-party dependency and lack of control.

- **OEM-driven ecosystems:** To overcome this dependency on third parties, vehicle manufacturers may start building their own ecosystems, leading to a full abstraction of the hardware and the software. This would allow them to generate major cost savings – through shared development costs or easier re-use of features or apps between OEMs, for example. Examples of leading OEMs doing this already and the success of industry initiatives currently underway suggest that progress in this area will be fast over the coming years. The key question going forward will be which OEMs (or groups of OEMs) will develop and control these ecosystems. ▶K

The adoption of the SDV approach will create a major shift in the value chain for vehicle electronics.

For **OEMs**, the emergence of cross-OEM ecosystems potentially means major cost savings – although they also mean that the multi-billion investments in proprietary platforms that they have already made or are currently planning will have effectively failed.

For **Tier-1 E/E suppliers**, strong pressure will build up on all sides as new players try to capture a greater share of the market. This implies a high risk of Tier-1s being pushed out of the electronics systems supplier business and the need for them to reinvent their business.

For **semiconductor suppliers**, forward integration from component supply only to developing reference designs and software, including the potential emergence of a semiconductor-driven ecosystem, will increase their

importance along the E/E value chain. However, the potential emergence of OEM-driven ecosystems may make it increasingly difficult for them to sustain this favorable market position through 2040.

2.4/ Electrified – From ICEs to EVs

Electrification – not just the rise of battery-electric vehicles (BEVs) but also their role in future green energy systems as energy storage units for vehicle-to-home (V2H) and vehicle-to-grid (V2G) systems – will be a key topic for automotive players. The trajectory of BEVs cannot now be reversed: The share of electric vehicles (EVs) is growing globally, albeit at different speeds in different regions. At the same time, the balance of power is shifting as the growing share of EVs leads to structural shifts along supply chains, in downstream business and in target markets. As the EV fleet expands, new business models are emerging such as V2G systems, which provide cost savings to customers and create new business potential for automotive players.

SHARE OF BEVS WILL EXCEED 70 PERCENT GLOBALLY BY 2040

Although recent market developments have called into question current BEV adoption forecasts, the overall direction of change cannot now be reversed. In China, for example, for the first time in July 2024, new energy vehicles (NEVs) represented 50 percent of all new vehicle registrations. Tightening fleet emission standards, the financial unsustainability of dual powertrain strategies, and new product launches will drive adoption still further in all areas, including entry and volume segments.

Factors shaping the adoption trajectory for BEVs include the battery technology and supply chain (both of which drive the price level) and customer acceptance (availability of chargers, range anxiety and so on). However, perhaps the most important factor at the moment is the

regulatory environment – and how automotive players choose to comply with these regulations.

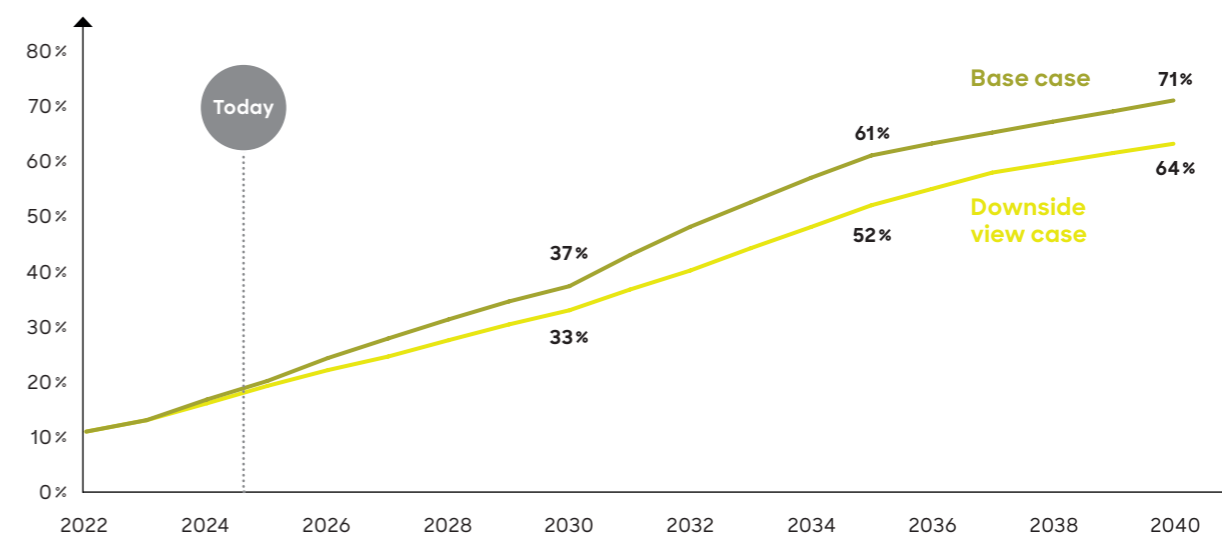
We foresee two possible scenarios for the trajectory of BEV adoption, depending on how region-specific drivers develop. Our base-case scenario assumes a BEV share of 71 percent in 2040, while our downside case assumes a share of 64 percent. The scenarios show different ramp-up speeds for the intervening years. Major differences are seen at a regional level. Thus, Europe is expected to reach a 99 percent BEV share by 2040, with e-fuels playing only a very minor role. This compares to just 42 to 60 percent in North America and 70 to 85 percent in China, depending on the scenario. In the rest of the world, the BEV share is expected to grow to around 50 percent by 2040. ▶L/M

STRUCTURAL SHIFTS IN THE SUPPLY CHAIN, DOWNSTREAM BUSINESS AND TARGET MARKETS

The shift away from fossil fuels in the supply chain will create new dependencies – on the Global South, which controls a large share of the reserves of raw materials for batteries, and on China, which controls a large share of the refining and supply of battery materials. Both the United States and Europe have passed legislation that aims to mitigate this dependency, for example by fostering the buildup of local battery manufacturing capacities.

For the downstream automotive business, electrification brings both challenges and opportunities. On the one hand, BEVs generate an estimated 30 to 35 percent less gross demand for traditional parts than ICE vehicles; on

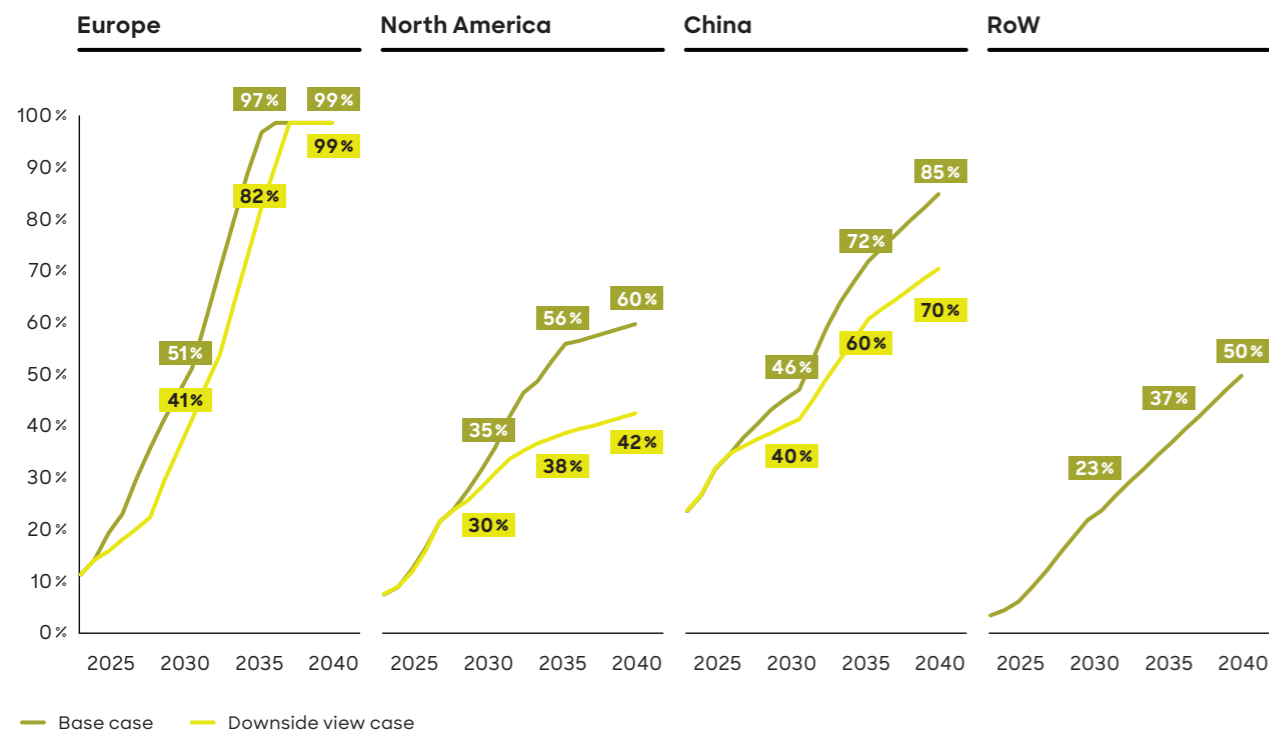
L Two adoption scenarios
Forecast BEV share, 2022-40 [%]



Source: Roland Berger

M Adoption rates for BEVs differ by region

Forecast BEV share by region, 2022-40 [%]



Note: Europe includes EU27 + United Kingdom, Norway, Switzerland; North America includes the United States, Canada and Mexico

Source: Roland Berger

the other, they feature several components not found in ICE vehicles, with the greatest aftermarket potential stemming from high-voltage (HV) batteries, whose high price creates a major new potential revenue pool. However, uncertainty remains about how this market potential will unfold, as average failure rates are already at a low level and many customers may decide – for cost reasons – to scrap their vehicles rather than repairing or replacing the battery.

Global South markets such as Latin America and India offer attractive business opportunities for BEVs. Although developing more slowly than elsewhere, many of these markets enjoy good preconditions, such as a supply of renewable energy and raw materials, and have set clear targets for large-scale BEV adoption. The expected decline in BEV sticker prices will further drive adoption in these countries. At the same time, however, the shift in

automotive technology will present significant challenges for markets in the Global South, as the car parc in these regions is characterized by a high share of used vehicles over 12 years old, imported from the Global North. By the mid-2030s, an increasing number of imported vehicles will be BEVs with aging batteries, possibly obsolete electronic hardware and non-serviceable software. Some of the markets in the Global South also lack adequate charging infrastructure for BEVs. Automotive players, especially in the aftersales and used car segments, will need to develop innovative solutions to tackle these challenges.

NEW BUSINESS MODELS FOR BEVS

The expansion of the BEV fleet will significantly impact electricity grids. Sustainable energy is volatile, depending on factors such as weather conditions, and this causes problems for grid stability. However, BEVs are also expected to play a crucial role in future green energy systems by acting as energy storage units in vehicle-to-home (V2H) and vehicle-to-grid (V2G) systems. V2G technology, for example, helps stabilize the electrical grid by storing excess electricity during periods of low demand and feeding it back in during peak demand. This can balance electricity supply and demand effectively, making the grid more resilient.

V2G technology further offers potential cost savings for BEV owners by allowing them to sell excess electricity back to the grid during peak demand times, earning revenue or credit on their electricity bills. During emergencies or power outages, BEVs with V2G/V2H capabilities can also provide backup power to homes, businesses or critical infrastructure, thus contributing to energy security.

Combined with the massive growth of revenue pools from charging services, the adoption of these technologies is expected to drive new business opportunities, leading to fresh revenue streams throughout the customer lifecycle. However, some limitations due to regulatory environments, particularly in regions such as China, may impact the full potential of these developments.

ALTERNATIVE FUELS WILL NOT GAIN SIGNIFICANT MARKET SHARE IN PASSENGER VEHICLES

We do not expect alternative fuels, in particular hydrogen, to play a major role in the passenger car segment. This is due to their disadvantages compared to BEVs in the areas of technology, cost and infrastructure. Perhaps their biggest drawback is that they have a high primary energy requirement and are, therefore, low on efficiency, a characteristic that is not likely to change significantly in the future. Fuel cells offer advantages where high energy density is required over long distances. We therefore expect their impact to be largely limited to the commercial sector, especially heavy-duty long-haul trucks, where their longer range and faster fueling compared to BEVs might result in a substantial total cost of ownership (TCO) benefit. Regional variation is likely here, with areas where the average trip distance is longer showing a higher hydrogen share. Thus, we could see as much as a ten percent share for hydrogen in heavy-duty and medium-duty trucks in the United States, compared to just three percent globally. China is also an outlier, with around 20 percent of buses expected to use hydrogen.

E-fuels – synthetic fuels produced from renewable sources such as wind or solar power – will not present a viable alternative for the mass market in either passenger or commercial vehicle applications due to their high costs and short supply. Indeed, their price is expected to remain substantially higher than that of gasoline and electricity over the next decade and a half. In addition, they suffer from enormous conversion losses, making alternative technologies such as direct electrification as much as five times more efficient in terms of electricity use, according to recent research by Fraunhofer ISI.

The evolution of products and regions



What will the market look like in the PACE world of 2040? Below we investigate likely developments in terms of different products and regions. ►**N**

3.1/ Move towards local-for-local products

The average vehicle of 2040 will be very different from the cars of today. Some 70 percent of vehicles globally will be BEVs, with a further 20 percent hybrids. Strong regional differences will remain, as Europe and China are moving at a much faster pace towards full electrification than North America and the majority of markets in the Global South. By 2040 almost all vehicles will be based on the SDV approach, allowing for new business models and much closer integration of the vehicle into its environment and the consumer world of smartphones and smart homes.

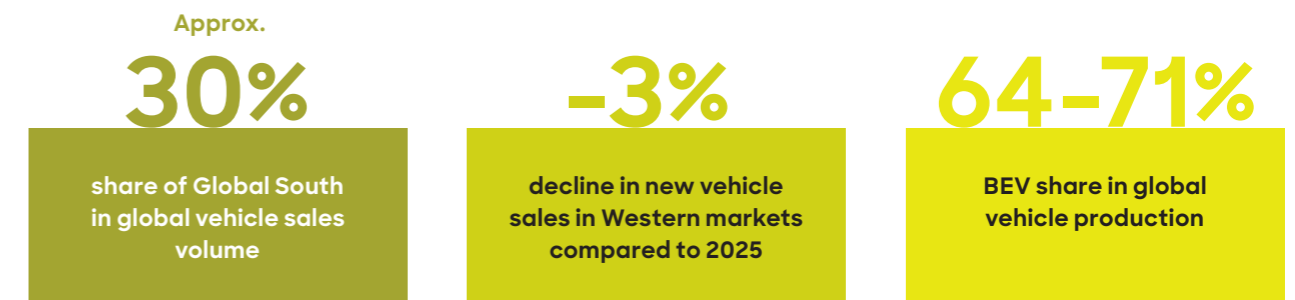
As we have seen, the share of fully autonomous vehicles will only build up gradually, but overall we will see much higher levels of automated driving across all vehicle segments and regions in 2040. Higher degrees

of automation will be largely focused on the premium segment. Autonomous on-demand vehicles will likely see their highest penetration in large urban areas in China and the United States.

Customer purchasing behavior with regard to vehicle type will also continue to differ by region, as no single vehicle model can serve the different requirements of all markets. For instance, as stated earlier, the Global South will continue to have a much higher share of entry and volume segment vehicles, reflecting the lower income levels in these markets. That said, we do not expect to see the widespread emergence of a new breed of frugal cars exclusively for low-income markets in the next decade and a half.

To highlight which product types will be on the road in 2040 and which product characteristics will sway customers' purchasing decisions, we have created eight illustrative consumer archetypes. The infographic below gives descriptions of the future purchasing behaviors of these eight archetypes and an overview of possible top-selling vehicle types by region. ►**O**

N Market dynamics - 2040 at a glance



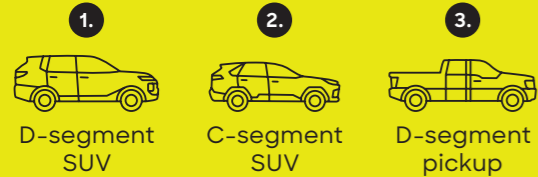
Source: Roland Berger

O The vehicle of 2040

Overview of top-selling vehicle types by region and future customer purchasing behavior

USA and Canada

Top-selling vehicles

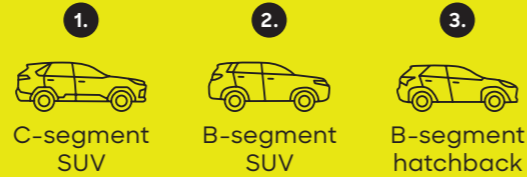


Powertrain mix



Europe

Top-selling vehicles

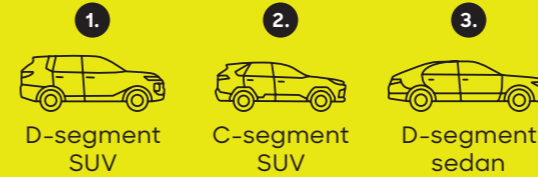


Powertrain mix



China

Top-selling vehicles



Powertrain mix



Global South

Top-selling vehicles



Powertrain mix



James

An engineer in San José (USA)



- James is in his 40s and works at a tech company as a software engineer. He earns a decent salary and has a busy social life
- When choosing his current vehicle, he carefully compared different models but ultimately chose one of the most common vehicles on the road, a D-segment BEV from a US manufacturer
- James loves tech features and takes it as a given that his vehicle is seamlessly integrated with his smartphone
- He subscribes to the highest available ADAS package even though he still takes over the steering wheel from time to time

Frank and Laura

A retired couple in Berlin (Germany)



- Frank and Laura live in Berlin and recently bought a new car to enjoy their free time, make road trips and visit their grandchildren
- After successful careers, they can afford a car from a German premium brand and consider their car a status symbol
- They used to drive a PHEV before but now had no choice but to buy a BEV due to the regulations in place
- Having a high ADAS level was important to them - on longer trips they often subscribe to an L4 feature as well so they can really relax

The Yangs

A two-income family in Beijing (China)



- The Yang family has two kids. Both parents work full-time
- Buying a BEV from a Chinese brand was a natural choice for them and is in line with recent purchasing decisions by their family and friends
- They had very clear priorities when choosing their vehicle: They wanted high-end connectivity to ensure full integration with their highly connected environment
- Automated driving features are important to them, but they decided to choose an L3 vehicle mainly for urban commuting

The Saris

A family in suburban Indonesia



- The Sari family lives in a suburb of Jakarta. They avoid driving into the congested city center but use their cars for shopping trips and occasional visits to their relatives
- The number of BEV cars is steadily increasing in their hometown, but they ultimately decided on an ICE vehicle, as often all the charging points in their neighborhood are busy
- During test drives, the Saris were impressed by the connectivity and ADAS features of the cars they drove. This convinced them to pay a little extra to have them in their car, too

The Smiths

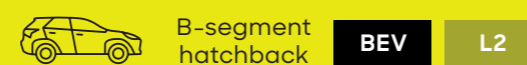
A family in rural Texas (USA)



- The Smiths have three children and live on a farm near Dallas
- They didn't spend long choosing which car to buy - they have driven a pickup from the same US brand for years as they like its brand image, storage space and robustness
- They thought about switching to a BEV but ultimately decided on a PHEV as there are only a few fast charging points in their rural neighborhood
- A high ADAS level was not important for them so they simply chose the default option

Mr. Rossi

A teacher in Milan (Italy)



- Mr. Rossi is a teacher in Milan, living in an apartment not far from the downtown area
- He is not very emotional about his car but he was looking for a reliable, affordable vehicle and finally chose one from China
- His vehicle has basic ADAS and connectivity features, as he wanted to save money. However, he is currently thinking about buying an upgrade to his navigation system - an on-demand function offered by the OEM

Ms. Wang

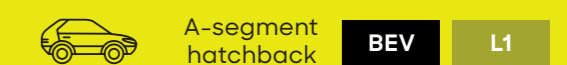
A senior manager in Shanghai (China)



- Ms. Wang lives in downtown Shanghai and does not own a private vehicle
- When she doesn't walk, she often takes a robotaxi to work. Public transit would be much cheaper, but Ms. Wang is willing to pay extra for the convenience and privacy so she can make some business calls during the ride
- During her frequent trips abroad, Ms. Wang is often surprised that the number of robotaxis and robo-buses in foreign cities is much lower than in her hometown

Priya

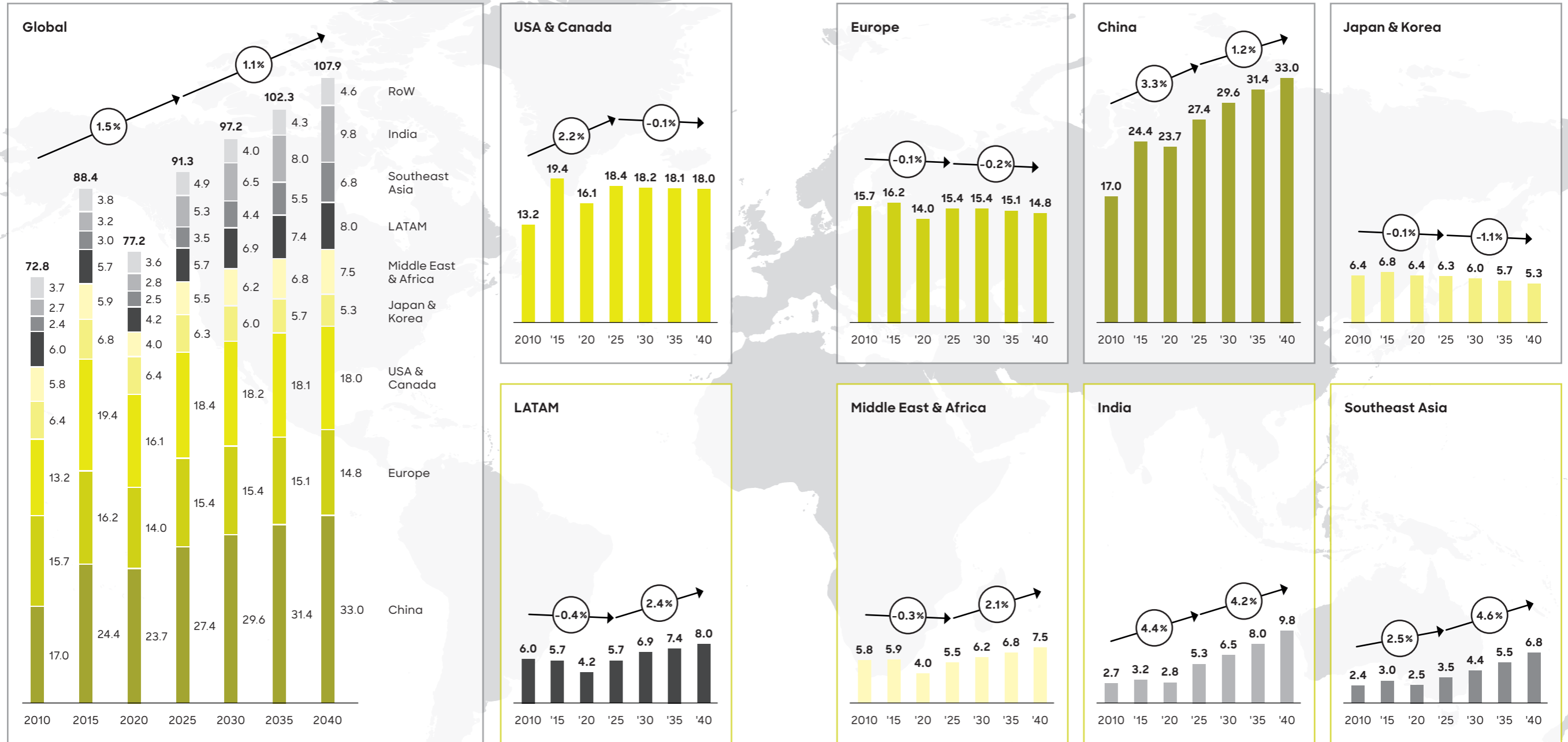
A young professional in Delhi (India)



- Priya lives in Delhi and is a successful young professional. When she was promoted a few months ago, she decided to buy a car - the first in her family to do so
- As her budget was tight, she was looking for a small, affordable car. However, having good infotainment and connectivity in her car was very important to her
- She carefully compared prices and was surprised to find that a BEV was the cheapest option available. Its range was more than sufficient for her typical journeys

P Sales volumes will grow by approx. 1.1% p.a. in the period to 2040 - Strong regional differences will persist

Sales of new light vehicles by region, 2010-40
[million vehicles]



Includes Global South markets

Note: Global volumes include rest of world (countries not shown separately)

Source: Roland Berger

3.2/ China and the Global South on the rise, but Western markets hold firm

The automotive industry has gone through a period of slow growth at a global level. Sales largely stagnated over the past decade, rising from around 88 million vehicles sold in 2015 to an expected 91 million in 2025. One major exception was China, which has shown much more dynamic development, establishing itself as the main driver of the global automotive industry. Going forward, we expect to see continuous but slow volume growth globally, at around 1.1 percent a year. This speed of growth will be subject to major regional differences.

CHINA AND THE GLOBAL SOUTH ARE THE ONLY MAJOR GROWTH MARKETS - NORTH AMERICA, EUROPE, JAPAN AND KOREA ARE REACHING PEAK AUTO

Western markets, Japan and Korea have already reached or will soon reach "peak auto" in terms of new vehicle sales. This will be followed by a phase of slow but persistent decline until 2040. Driving this development is a combination of slow economic growth, aging populations and declining population sizes in many markets. By contrast, we expect vehicle sales in China to grow by around six million through 2040 – although here, too, slower economic growth and declining population size will take their toll, with growth dynamics slowing down in the 2030s. Markets in the Global South are set to establish themselves as growth markets for automotive, thanks to a combination of stronger economic growth and a fast-growing young population. Thus, Southeast Asia will see an increase of 4.6 percent a year, India 4.2 percent, Latin America 2.4 percent and the Middle East & Africa 2.1 percent. ▶P

CHINA WILL DRIVE REVENUE GROWTH, BUT WESTERN MARKETS STILL OFFER OPPORTUNITIES

Of course, sales figures are only one side of the coin. Much more important for automotive players are the resulting revenue pools, particularly as there are large differences in sales prices and the vehicle segment split in different regions of the world.

China offers by far the strongest revenue growth, at around EUR 590 billion³ in total potential new revenue pools in the period to 2040, despite an expected slowdown in sales in the 2030s. Western markets – Europe, the United States and Canada – are expected to grow less strongly but given their current absolute size they still offer significant absolute growth: an estimated EUR 520 billion in the period to 2040. Markets in the Global South are expected to grow in terms of absolute revenue by around EUR 480 billion; however, despite their strong growth rates compared to other markets, their share of the total market will only rise from 14 percent today to 20 percent in 2040. ▶Q

STRATEGIC PRIORITIES DIFFER ACROSS MARKETS

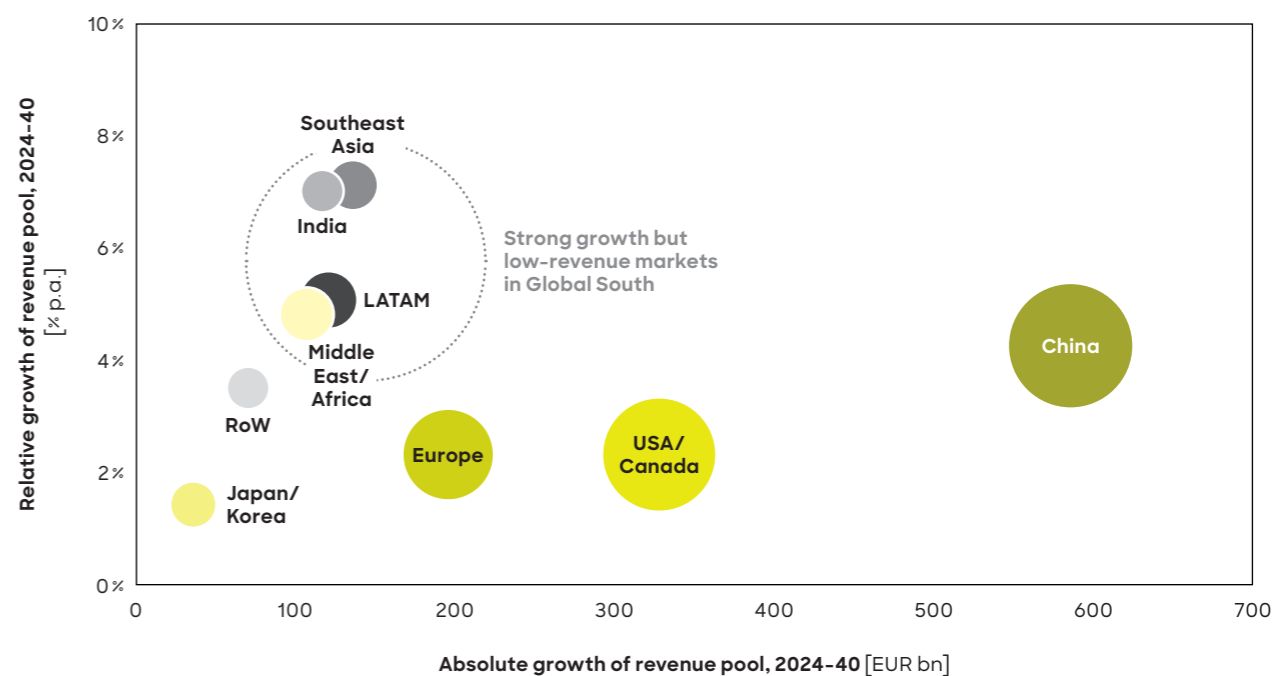
Stagnating or declining volumes in **Western markets, Japan and Korea** mean that revenue growth will only be possible by raising sales prices still further and opening up new revenue streams along the customer lifecycle. For instance, OEMs' growth will depend on their ability to attract customers with new value-adding content and technology (which customers show a strong willingness to pay for), while continuing the shift towards higher vehicle segments.

Unlike in Western markets, automotive players can still rely on sales volume-driven growth in **China** and therefore a fast-expanding revenue pool. Combined with a further shift

³ Revenue pool at manufacturer prices, excl. VAT and inflation.

Q China will drive revenue growth through 2040, but Western markets still offer opportunities

New vehicle sales revenue pools, 2024 vs. 2040, by region [EUR bn]



Revenue pool, 2040 [EUR bn] Note: Revenue pool at manufacturer prices, excl. VAT and inflation

Source: Roland Berger

to higher vehicle segments and increased BEV penetration, there is room for continued growth. By contrast, the high absolute growth in sales volumes in the **Global South** will not be reflected proportionally in revenues, in particular profit pools, due to the much larger share of smaller, less expensive entry-level vehicles sold. Yet, despite the limited profit pools, players would be wrong to ignore these markets. Careful decisions are called for here: Some players

will decide against a bold move, while others will have the necessary commitment and stamina to tap into a fast-growing market and in so doing put themselves in pole position to benefit from continued dynamic development in the Global South after 2040.

Navigating the transformation

4

What are the implications of these shifting dynamics for car manufacturers and suppliers? Below, we look at these two groups of players and what we believe their strategic priorities should be for the next decade and a half. ► **R**

4.1/ OEMs – Chinese dominance or revitalization of the West?

There can be no doubt about it: Automakers have a challenging time ahead. In the period to 2040, pressure from ongoing macroeconomic and geopolitical tensions will grow and technological shifts, especially around electrification and connectivity, will radically reshape OEMs' competitive environment. However, the precise trajectory through 2040 is by no means clear and we believe that OEMs have a chance to shape their own fate by taking decisive strategic action early on.

BALANCE OF POWER HAS SHIFTED FURTHER TOWARDS CHINESE OEMS

Chinese OEMs have grown fast in their domestic market, up 19 percentage points in terms of market share since 2019. They have also achieved notable gains in Europe and several markets in the Global South, thanks to their superior cost position, competitive technology and successful brand development. However, not all players have been equally successful and trade measures and profitability issues persist for many players.

For their part, **European OEMs** have long relied on China as the growth engine of the global industry. However, more recently they have faced severe headwinds and now find themselves down six points in terms of market share since 2019. Especially for BEVs, they lag behind domestic Chinese players. Competition in their European home markets is also increasingly fierce, leading to a roughly four-point loss in market share since 2019.

North American OEMs still enjoy a strong position in their home market, where they benefit from a strong brand reputation and a large established customer base. However, many incumbent North American players have lost market share over the past five years in both Europe (down two percentage points) and China (down four points), mainly to new BEV players.

R Competitive dynamics – 2040 at a glance

25-34%

share of Chinese OEMs in global new vehicle sales revenue pool

58%

share of BEV and E/E domains in global component revenue pool

≥4

battery cell manufacturers in the 20 biggest suppliers

Source: Roland Berger

CAN WESTERN OEMS FIGHT THEIR WAY BACK?

From the standpoint of Western automakers, the outlook appears bleak: Chinese OEMs seem to be firmly on their way to dominating the global market. However, things may yet change. Below, we outline two scenarios for 2040, describing two extremes of future market development. The decisions made by OEMs will be crucial in determining which of the two scenarios is closer to reality in the end.

Scenario 1: Growing Chinese dominance

One of the greatest fears of Western automakers and policymakers alike is that Chinese OEMs will continue to grow their market share both in their domestic market and globally. Not only do Chinese OEMs enjoy technological

leadership in battery technology and customer-centric connectivity solutions, they have also built a dominant position in the EV supply chain. Moreover, they are aggressively expanding into new markets and premium vehicle segments. The United States and European Union have responded with strict trade measures aimed at stopping, or at least slowing down, China's march to global dominance. However, the risk is not yet contained. Not only that, Western automakers may also find themselves at the receiving end of reciprocal trade measures. ▶ S

What would the balance of power look like in 2040 in Scenario 1? Chinese OEMs will have grown fast in all markets globally, reaching a 70 to 75 percent market share in China, 15 to 20 percent in Europe and five to ten percent in the United States and Canada. They will have

been the clear growth engine of the industry since 2024, accounting for more than 50 percent of global growth in car manufacturers' revenue pools. At the same time, Western OEMs will have suffered from stagnating or declining sales volumes. They will have had to deal with a dramatic increase in cost pressure, limited availability of funds for innovation and a major need for restructuring. Indeed, in Scenario 1, the industry may reach a tipping point by 2040 in which Chinese OEMs have won the race and other OEMs can no longer catch up.

Scenario 2: Revitalization of Western OEMs

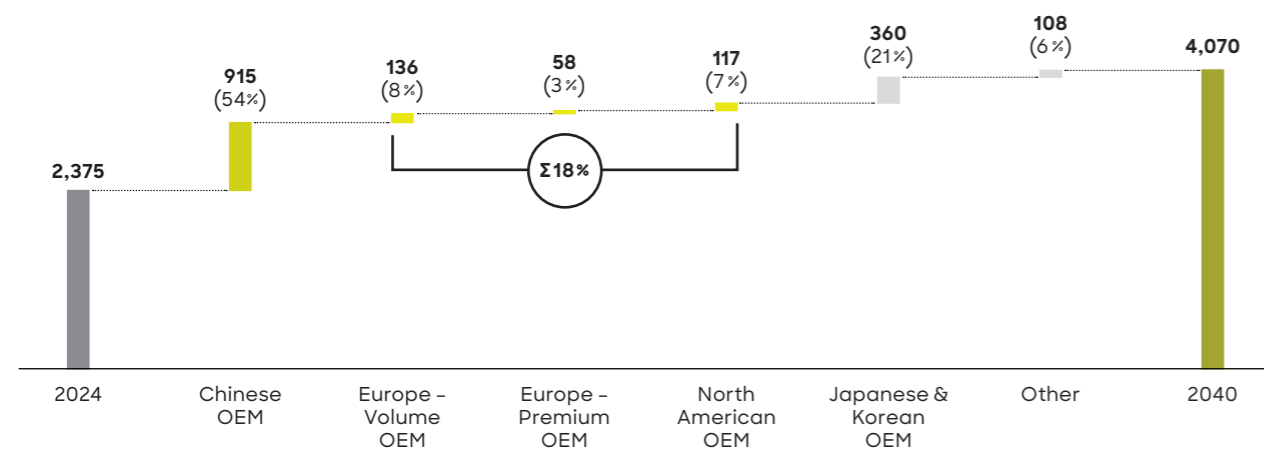
A number of factors could favor a different scenario, in which Western OEMs make a comeback. Players in the West are aware of the challenges ahead and are currently

investing heavily in turning things around in terms of technology, vehicle portfolio and cost competitiveness. Many of them benefit from an established customer base, good brand image and a strong manufacturing and sales network across key markets. At the same time, it is possible that Chinese OEMs will come under severe cost and consolidation pressure, with some new BEV players unable to establish a profitable business model long term, especially if they fail to achieve their growth targets outside their home market.

Scenario 2 can only happen if Western players make major changes to the way they operate, however, moving away from their traditional approach of "integrating software into vehicles" and "integrating batteries into EVs". This way of designing vehicles leads to much more

S Revenue pool implications of Scenario 1 - Dominance of Chinese OEMs

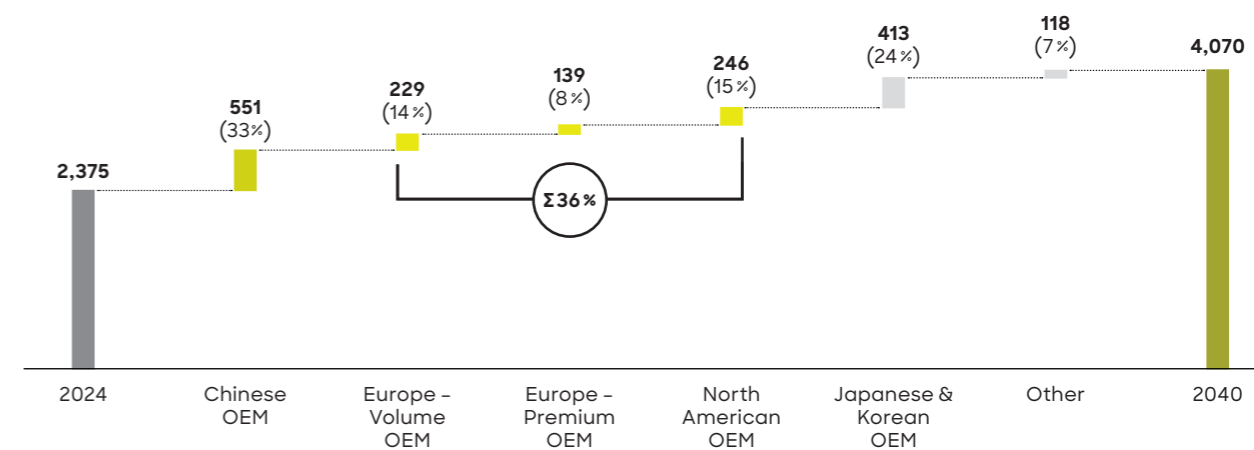
OEM revenue pool 2024 vs. 2040 by player type [EUR bn, % of total growth]



Source: Roland Berger

T Revenue pool implications of Scenario 2 - Revitalization of Western OEMs

OEM revenue pool 2024 vs. 2040 by player type [EUR bn, % of total growth]



Source: Roland Berger

engineering work and a longer time to market than the way some Chinese players work, using standardized hardware and software platforms from leading IT players and heavily standardized battery packs or even rolling chassis from large battery companies, only slightly adapted to the different vehicle specifications. ▶T

If Scenario 2 happens, what would the balance of power look like in 2040? Western car manufacturers would have faced challenges during the intervening years, but by 2040 they would have managed to stabilize their market position at a level comparable to or slightly below 2024, not only in China but in their home markets, too. This will have resulted in decent growth, accounting for around 36 percent of global OEM revenue growth in the period from 2024 to 2040. By contrast, Chinese OEMs would have seen their market share growing much more slowly, at just five to ten percent in Europe and below five percent in the United States and Canada. At the same time, they will remain the clear market leaders in their domestic market, with a share of around 65 percent, and they will have captured a similar share of the global revenue pool growth as their Western peers. In Scenario 2, the global automotive landscape in 2040 will still be marked by a fierce battle for market share, but the outlook will be far less bleak than in Scenario 1: All car manufacturers will be confident they have found a market position that offers them reasonable growth opportunities.

STRATEGIC PRIORITIES FOR 2040

What can OEMs do to prepare themselves for the challenges ahead? Clearly, they must make sure that they manage the basics, such as continuously improving cost efficiency. But they must do more than that. We suggest that they address **five strategic priorities** – crucial tasks for automakers from all regions. If Western OEMs act on these five priorities, they can stabilize their market position and potentially regain lost market share. If they do not act on them, they risk allowing Chinese OEMs to outpace them and solidify their dominance of the future automotive landscape. ▶U

U Strategic priorities for OEMs through 2040



Source: Roland Berger

#1 Follow smart localization strategies

Car manufacturers need region-specific products, business models and manufacturing setups so that they can address varying customer requirements and mitigate any geopolitical risks. Clear strategic decisions about which markets to target, especially in the Global South, will be crucial for capturing growth opportunities. However, defining the right localization strategy will be no walk in the park. OEMs need to identify smart strategies that are not just tailored to local consumer needs but also agile enough to adapt to dynamic market conditions – and optimized for cost efficiency. These strategies must at the same time take into account the resources at OEMs' disposal and their "right to win" in specific markets.

#2 Boost customer centricity

Providing a holistic, customer-centric experience will be crucial for car manufacturers. Collaborations with non-automotive players such as tech giants can help them build new, data-driven models and enhance the customer experience. Partnerships with innovative BEV players can also help incumbents overcome technological gaps and organizational inertia.

#3 Right-size in declining segments

Car manufacturers need to shift their focus from volume growth to profitability, identifying the most lucrative market segments. In stagnant or declining regional markets such as Europe, they need to right-size production to avoid overcapacity. At the same time, in China they should carefully assess their long-term market involvement due to the uncertain returns.

#4 Radically rethink business models and organizational structures

By 2040, car manufacturers will need to have put in place agile product development cycles and revenue generation models focused on the entire customer lifecycle. Adapting

to SDV business models, which exploit comprehensive customer and vehicle data, will require major organizational restructuring on their part. This could represent a major challenge for incumbents.

#5 Limit vertical integration to where it really matters

OEMs should reassess their decisions regarding in-house versus outsourced manufacturing (the "make-or-buy" decision), especially for emerging technologies such as BEV components. Vertical integration may currently offer advantages but as technology matures, collaboration with scaled-up suppliers could offer greater cost efficiency. Players should conduct a clear, unbiased reassessment of their vertical integration strategy and not be afraid to abandon long-held beliefs where necessary.

4.2/ Suppliers – New revenue pools and a shifting balance of power

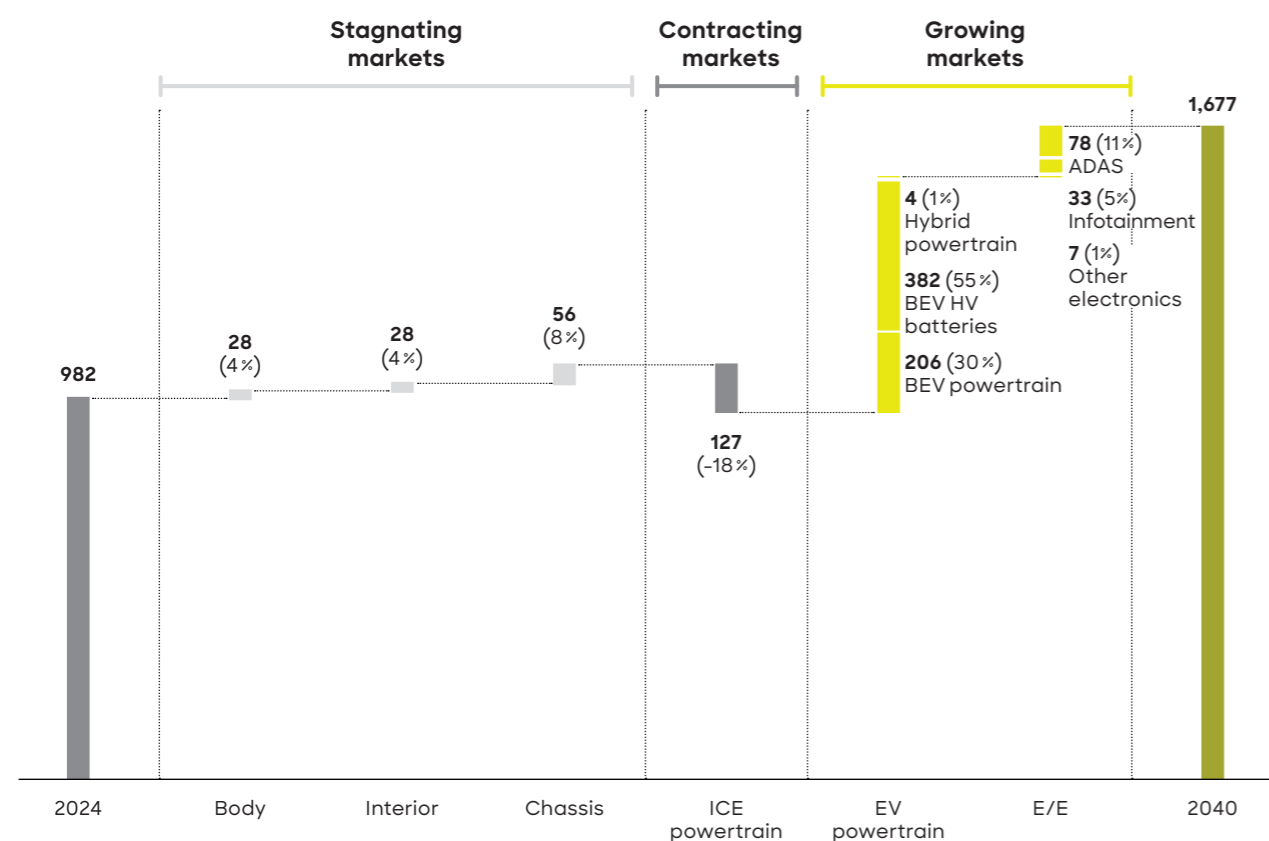
The supplier industry will undergo fundamental structural change in the period to 2040, putting pressure on all types of players to adjust to the new market environment. How great the pressure on suppliers is and when exactly it will be at its strongest will depend on the component domain in which the supplier operates, their position in the value chain and their geographical focus. Strategic foresight and adaptability will be crucial in order for suppliers to maintain their competitiveness and capture any opportunities as they emerge.

REVENUE POOLS WILL EXPAND AT DIFFERENT SPEEDS

First, the good news: We expect the overall supplier industry to enjoy opportunities for growth in the period to 2040. According to our forecasts, the global component market will grow by around 3.4 percent a year. However, unlike in the past, growth will no longer be driven by a continuous volume increase in traditional domains. ▶V

V Component revenue pools will grow by approx. 3.4% p.a. in the period to 2040

Component revenue pool by domain, 2024 vs. 2040 [EUR bn, % of total growth]



Source: Roland Berger

We divide suppliers' market segments into three types:

Contracting market segments: ICE powertrain

The ICE powertrain component market will shrink continuously over the period, with BEVs accounting for an

expected 70 percent of global new vehicle production by 2040. ICE powertrain components will decline by an estimated five percent a year globally, and even faster in Europe and China. The result will be increasing numbers of players moving out of the market, few investments being

made and a slow pace of innovation, with no major research taking place. The current scale advantage that ICEs enjoy over BEVs will be reversed.

Stagnating market segments: Body, chassis and interior

Limited technological advancements and no major increase in content by vehicle mean that these domains will show modest growth rates of around just one to two percent a year. This sluggish development will create challenges for suppliers, with a continuous decrease in OEMs' willingness to pay for these non-differentiating components. Scale and efficiency improvements will be imperative in order for suppliers to maintain competitiveness in these domains.

Growing market segments: BEV powertrain, HV batteries and E/E

Components associated with the BEV powertrain and E/E systems are poised for substantial growth. We expect to see the highest growth from HV batteries for BEVs (around 11 percent a year), e-motor and power electronics (ten percent), ADAS (nine percent) and infotainment (four percent). This market segment will attract new entrants, including technology companies not traditionally associated with the automotive industry, fueling greater competition. Suppliers will need to invest heavily in innovation and scale in order to gain a solid foothold in these new segments.

From a **regional perspective**, we will see a major shift away from Western markets, Japan and Korea, which will account for less than 30 percent of global component value pool growth in 2040. Production volumes will stagnate or even decline over the period, with growth only possible if there is a continued increase in content per vehicle, either for BEV-specific components or for E/E (for example, higher ADAS levels or advanced infotainment solutions). The situation is fundamentally different in China and the

Global South, which will benefit from a combination of production volume growth and higher content per vehicle. Moreover, the decline in the ICE powertrain domain will be much slower in the Global South, at around -0.7 percent a year. Indeed, by 2040 the Global South is expected to have become the largest remaining market for ICEs. ▶ W

CONSOLIDATION IN THE SUPPLIER VALUE CHAIN

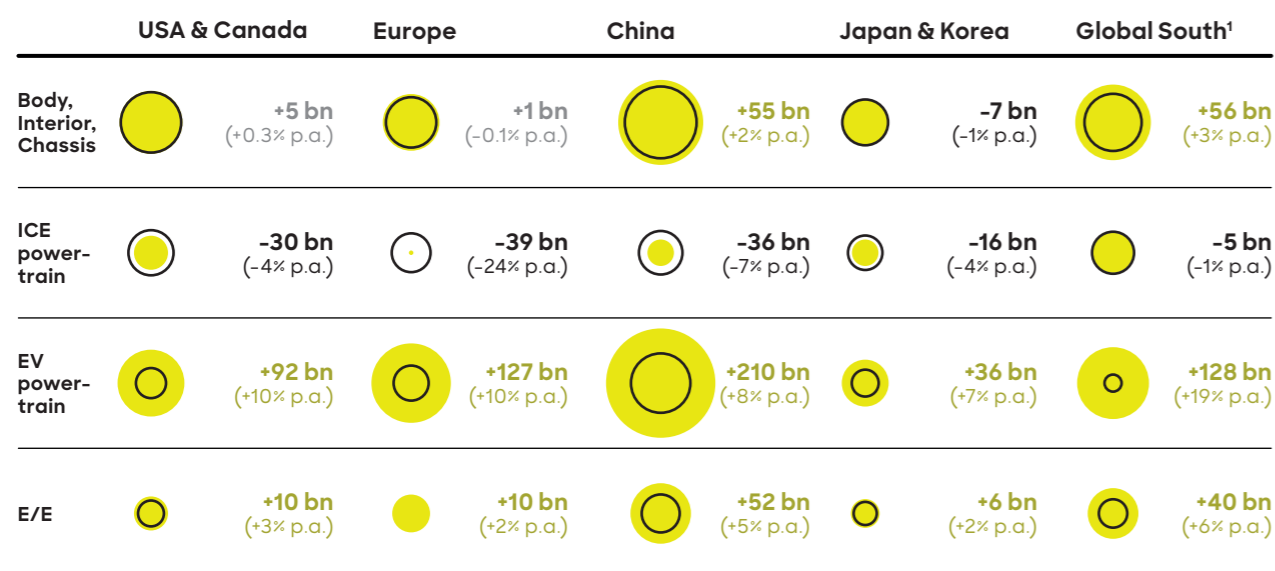
What will be the impact of these developments and how will revenues be distributed between different players along the value chain? In the first place, we expect to see **suppliers in general benefiting from changing sourcing behavior by car manufacturers**. In the immediate future, many OEMs may increase their insourcing to leverage technology-driven differentiation, especially in fast-growing but not quite fully mature domains such as BEV HV batteries, the BEV powertrain and E/E systems. We expect this trend to peak before the end of the current decade as technological maturity increases. Later, many car manufacturers may choose to rely once again on scale, standardization and the resulting cost advantages by sourcing through suppliers. That would give an extra boost to those players best positioned to tap into this fresh opportunity.

It is likely that the **growing system complexity will speed up market consolidation**. Today's Tier-1 supplier landscape is fragmented and in the period to 2040 we expect to see a strong acceleration of ongoing consolidation developments, as scale increasingly becomes the winning factor in a highly competitive market. This will be driven by OEMs' preference for sourcing from a few large system suppliers so as to reduce complexity and costs. In parallel, the required upfront investment by suppliers to develop a competitive solution will grow continuously due to increasing system complexity, giving the biggest suppliers a clear advantage.

New players are currently capturing market share. Established technology players from other industries are

W Traditional components will only grow in China and the Global South

Component revenue pool by domain and region 2024 vs. 2040 [EUR bn; % growth p.a.]



1 Incl. Rest of World ○ 2024 ● 2040

Source: Roland Berger

entering automotive component domains, investing heavily in building expertise and expanding their market share. These players benefit from extensive technological know-how and abundant capital, well beyond the capabilities of many traditional automotive suppliers. Indeed, the head start enjoyed by new entrants in domains such as battery cell manufacturing and E/E technology makes it difficult for traditional players to compete. The initial growth phase in these domains will be characterized by intense competition over price, market share and scale, leading to early consolidation. Automotive suppliers that cannot achieve

significant scale quickly risk being forced out of the market.

The global supplier landscape in 2040 will look rather different from today. We expect that at least four Asian battery players will have moved up the ranks into the top 20 by 2030 – indeed, this shift in the balance of power could happen faster than the industry is currently expecting, with a Chinese battery cell manufacturer potentially becoming the biggest automotive supplier worldwide by 2025. A semiconductor player could also become one of the world's largest automotive suppliers – however, this would require a single semiconductor player capturing a very large market

share in a highly competitive environment. Overall, as in the area of automotive manufacturing, Chinese players are expected to play an increasing role in the supplier landscape in the period to 2040. ▶ X

WINNING STRATEGIES FOR SUPPLIERS

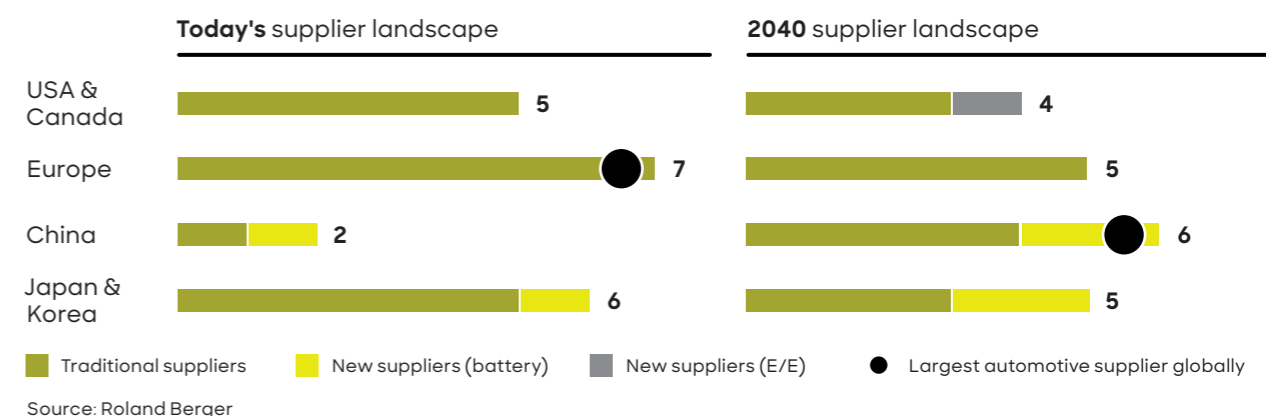
To prepare their business models for the transformation ahead, suppliers need to engage in strategic thinking and take decisive action early on. Doing so will enable them to capture (or defend) a fair share of the market.

Specific strategic priorities for suppliers differ depending on their domain, regional focus and growth expectations. Thus, suppliers operating in **contracting market segments** (that is, ICEs) will need to balance the growing pressure to consolidate with securing sufficient supply for their customers. To some extent this will remain true even beyond 2040, although we believe that only a few suppliers will make it through to 2040 and beyond. Winning strategies potentially include building a regional portfolio accounting for different BEV trajectories, focusing on continuous

performance improvement, pursuing partnerships or mergers and acquisitions (M&A), divesting early in areas where success is at risk or initiating a structured wind-up process.

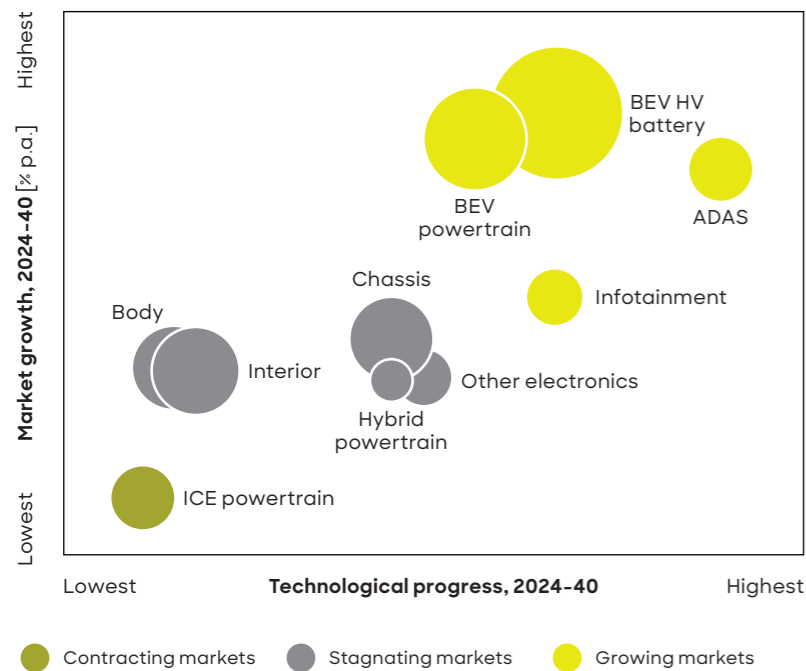
Stagnating segments (body, interior and chassis) form the core of many traditional suppliers' business. However, many of these players already suffer from low profitability, with average EBIT (earnings before interest and tax) margins of just four to five percent – and more pressure expected going forward. We expect traditional business models in these stagnating segments to no longer be viable in 2040. A paradigm shift will occur in how suppliers and automotive manufacturers interact, possibly with much closer collaboration between OEMs and a few suppliers closely tied to them, as we see for instance in the Japanese market today. Winning strategies could include building strong partnerships with manufacturers, focusing on continuous performance improvement, ensuring true local-for-local production and a balanced regional portfolio or pursuing new inorganic growth opportunities in other market segments. ▶ Y

X Number of automotive suppliers in the top 20 by HQ location and type, today vs. 2040



Y Strategic priorities for suppliers through 2040

Expected market growth and technological progress of suppliers per type of market segment, 2024-40



Contracting segments

- Build a regional portfolio considering different BEV trajectories
- Focus on continuous performance improvement
- Focus on partnerships/M&A for remaining competition
- Divest early in areas where success is at risk
- Initiate a structured wind-up process

Stagnating segments

- Build strong partnerships with OEMs
- Focus on continuous performance improvement
- Ensure real local-for-local production and a balanced regional portfolio
- Pursue new (inorganic) growth opportunities in other market segments

Growing segments

- Focus on building global scale in the short term
- Ensure commitment and the financial resources required for growth
- Follow a bold M&A strategy already in the short term
- Form partnerships between automotive and software/tech players

Source: Roland Berger

For suppliers in **growing segments** (BEV powertrain, HV batteries and E/E), winning strategies will be different from those in contracting and stagnating market segments. For battery cell suppliers, we expect many players to be able to continue with their current supplier business model, as the dynamically developing market will enable long-term growth. For E/E and software players, the next few years will be critical: The growth phase will only leave room for a small number of larger players that can afford the huge upfront investments needed to build technology

leadership. Given growing competition from new players, we expect that only a few traditional automotive players active in E/E and software will be successful in the long run. Winning strategies for players in these segments potentially include focusing on building global scale in the short term, ensuring the commitment and financial resources required for growth, following a bold M&A strategy (already in the short term) or forming partnerships between automotive and software/tech players.

The marathon ahead



Credits

The automotive industry is undergoing unprecedented transformation, fueled by major technological advancements, geopolitical challenges, changing regulatory landscapes and the rapid rise of automotive players from China. This ongoing disruption is shaping its growth trajectory for the period to 2040.

For incumbents, the accelerating pace of change may appear daunting. However, resisting emerging trends or rigidly adhering to traditional methods will not bring success. Management teams must adopt a forward-thinking perspective in order to navigate this evolving landscape effectively. We are convinced that all automotive players, irrespective of their origins or position in the value chain, need to carefully consider the following strategic priorities to succeed in the years to the end of the next decade. This is a marathon, not a sprint – and only players with the necessary stamina and the ability to pace themselves will make it through to the long term.

Revise existing business models

Strategies, organizational structures, processes and product portfolio all need to be radically rethought in light of the complexities of an increasingly polarized world. Different ecosystems may emerge and each will produce unique challenges.

Recalibrate the current market focus

Many players need to radically rethink their global growth strategy. Chinese players are in pole position to capture an ever-growing market share in both their domestic market and the Global South. By contrast, in stagnating or declining Western markets, competition for market share will be intense, especially as ambitious new entrants come on the scene.

Accelerate the transformation process

Rather than resting on past successes, players should step up their efforts, adopting AI, BEVs and SDVs as quickly and as broadly as possible. Many established players have yet to take the determined action needed for such a paradigm shift – particularly Western automakers, who will need to drastically speed up their transformation to avoid being outpaced by new entrants.

By focusing on these priorities, automotive players can prepare for the unexpected twists and turns of the marathon ahead, mastering challenges and capitalizing on growth opportunities in a polarized market. However, this will be no easy task, particularly with players under time pressure as the market evolves. The decisive question for the future of automotive in the period to 2040 will be whether incumbent players will be able to transform quickly and radically enough. Will they make a comeback or will new players shape the future of the industry? The imperative for market players is clear: Adapt, or face gradual decline. Embracing change is not just an option – it is a necessity for survival and long-term prosperity.

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