

Automotive & Assembly Practice

A road map for Europe's automotive industry

Keeping Europe's automotive industry competitive requires not just a refined focus on existing strengths but also an acceleration of existing efforts.

by Andreas Cornet, Ruth Heuss, Patrick Schaufuss, and Andreas Tschiesner



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The automotive industry is a jewel of the European economy. For decades, the industry has been an important contributor to Europe's economic growth, innovation, and prosperity, accounting for almost 7 percent of the region's GDP and being directly or indirectly responsible for employing almost 14 million people.¹ The industry also carries significant symbolic weight; taglines such as "Made in Germany," "Italian car design," "Euro NCAP for Saver Cars," and "British racing" have come to stand for European innovation and craftsmanship.

However, the status quo is being challenged and the industry faces massive ongoing transformations, such as the shift from internal combustion engines to electrified powertrains and a shift in focus from hardware to differentiation through software. This dynamic has allowed new entrants in Europe and abroad—especially in China, the largest automotive market in the world²—to disrupt the market and win market share. In 2022, China surpassed Germany in light-vehicle exports for the first time, with exports of about 3.0 million vehicles, in contrast

to Germany's 2.6 million.³ These transformative forces overlap with a challenging macroeconomic environment in Europe, including rising energy costs, inflation, and geopolitical tensions. All of these factors have greatly affected the European auto industry and make navigating the sector's transformation challenging. A prosperous future for the European automotive industry will therefore depend on how well and quickly it responds and how European stakeholders can shape the necessary conditions for future success. The need for action is urgent.

To that end, we have sketched a road map that covers seven areas. Executing on this plan will require action from a variety of industry stakeholders. Speedy action from automotive companies will be important, but the regional ecosystem, including the public sector and multiple adjacent sectors, will need to participate in shaping a level playing field and a fertile environment for the future of the European automotive industry.

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¹ "Automotive industry," Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, European Commission, accessed August 15, 2023; "The EU auto industry accounts for 7% of all jobs," ACEA, September 1, 2022; *25 actions for a successful restart of the EU's automotive sector*, CLEPA, May 2020.

² "Automotive industry," China - Country Commercial Guide, International Trade Administration, updated April 7, 2023.

³ "What if Germany stopped making cars?," *Economist*, July 31, 2023.

A multidecade success story

The European automotive industry has been an engine powering prosperity and growth, employment, and innovation and has contributed to Europe's image and perception on the global stage (Exhibit 1).

An economic powerhouse for the region, the automotive industry contributed about 10 percent of Europe's exports in 2022.⁴ The sector's more than 17,300 companies form a network of OEMs and suppliers of all tiers.⁵ Significantly, the industry directly or indirectly employs more than 6 percent of the region's workforce,⁶ creating positive spillover effects outside the sector.

The automotive industry has also been a nexus of innovation. Technical champions and small and medium-size businesses within the ecosystem have continuously innovated, especially in the areas of combustion engine powertrain, chassis, safety systems, and exterior and interior design. Indeed, about 30 percent of global automotive patents originated from European countries, the most of any

region.⁷ Significant investments into research and development have helped European automakers introduce new technologies that have contributed to major advances in sustainability and safety by improving fuel economies and reducing emissions, noise, and accidents.

Progress and investment in the European auto industry over the past several decades have contributed to Europe's global image. German engineering is widely touted,⁸ and our research suggests many European automakers are considered front-runners in sustainability, with some of the most ambitious targets around electric vehicles (EVs), decarbonization, and safety.

Thanks in part to this work, the brand value of the ten largest European auto companies is conservatively estimated at a combined €200 billion; five of the ten most valuable car brands worldwide are European.⁹ The grand challenge now is to maintain and build on these assets in the face of profound and accelerating change.

Exhibit 1

The automotive industry has been an economic success story for Europe.



Prosperity and growth

> €1 trillion

Contribution to EU GDP in 2022

~7%

of EU GDP



Employment

13.8 million

jobs in auto industry

6.1%

of total EU employment



Innovation

~€60 billion

annual spending on R&D

~30%

of total EU R&D spending

Note: Due to data sourcing considerations for continental Europe as a whole, EU data was used for key figures. Source: ACEA; Brand Finance; Eurostat; McKinsey analysis

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⁴ *25 actions for a successful restart*, May 2020; "European Union exports by category," Trading Economics, accessed August 15, 2023.

⁵ "Impact of electromobility on the European automotive industry," HitHorizons, February 21, 2022.

⁶ "The EU auto industry accounts for 7% of all jobs," September 1, 2022.

⁷ McKinsey analysis based on data about automotive industry global patents from IPlytics and Innography by Clarivate, accessed June 12, 2023.

⁸ Dave Taylor, "Who owns the idea of German engineering among German car brands?," Taylor Brand Group, April 8, 2013.

⁹ "Largest automakers by market capitalization," CompaniesMarketcap.com, accessed August 15, 2023; brand value analysis based on 2023 data on European automotive companies from Brand Finance, accessed June 20, 2023; Alex Haigh, "2022 Automotive industry trends: Doubling down on electric and connected cars," Brand Finance, February 22, 2022.

Disruption and transformation

The historic strengths and recently reported record margins of European OEMs may create a false sense of safety for the industry. Accelerated disruptions around electrification, software, and new competitive pressures loom.

Substantial market disruptions have been observed in other industries, with serious outcomes. For instance, European manufacturers lost more than 90 percent of their share of the smartphone market in just six years.¹⁰ McKinsey analysis shows that leading players in the film camera industry lost similar market share over nine years.

Market share data suggest that European OEMs' leadership position is being challenged as new entrants, especially from China, gain traction. Our analysis also suggests that European market conditions for local development and production are becoming less competitive. Analysis from the McKinsey Center for Future Mobility shows that since 2019, European incumbents have lost six percentage points of market share in their home market and five percentage points in China. Meanwhile, Chinese OEMs are gaining ground in both China and Europe, reaching 45 percent market share in their home market in 2022 and octupling

their market share in Europe between 2020 and 2022.¹¹ This dynamic is even more apparent in battery electric vehicles (BEVs): new EV-focused entrants hold 51 percent of the global BEV market (Exhibit 2).¹² Besides market share, European OEMs also face the challenge of running profitable BEV businesses.

A more detailed look at different segments offers a more nuanced picture of the industry. In the premium segment—home turf for many European OEMs—European OEMs still hold 71 percent of global sales. But this segment is also becoming more challenging to hold: newcomers claimed 18 percent of the premium market in 2022.¹³

This shake-up stems from the fast pace of change in the industry. The transition from internal-combustion-engine (ICE) to zero-emissions vehicles is accelerating, with global EV sales growing 80 percent per year since 2020. McKinsey analysis suggests that many global mobility markets will reach near-total EV penetration by the mid-2030s. In response, European OEMs have announced ambitious electrification plans to launch more than 150 EV models through 2030, according to McKinsey analysis.

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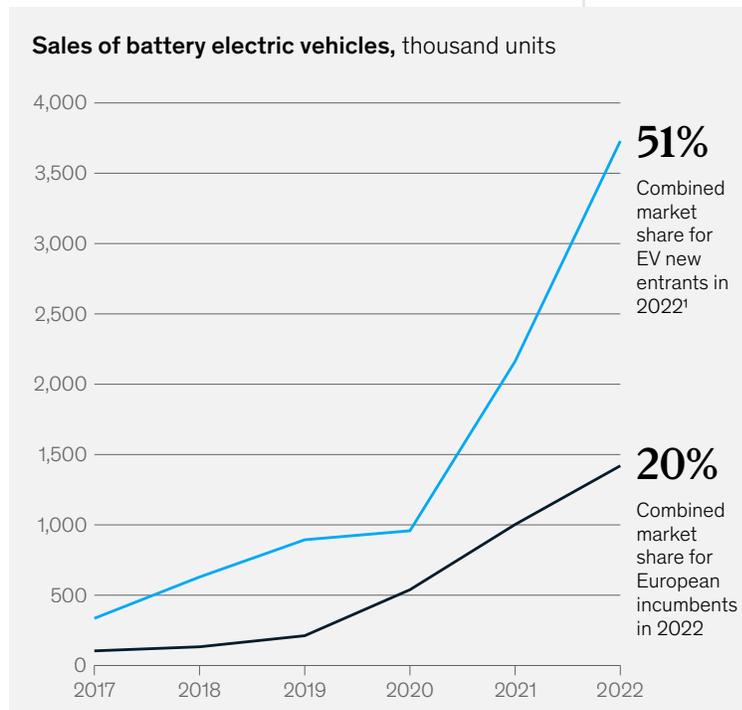
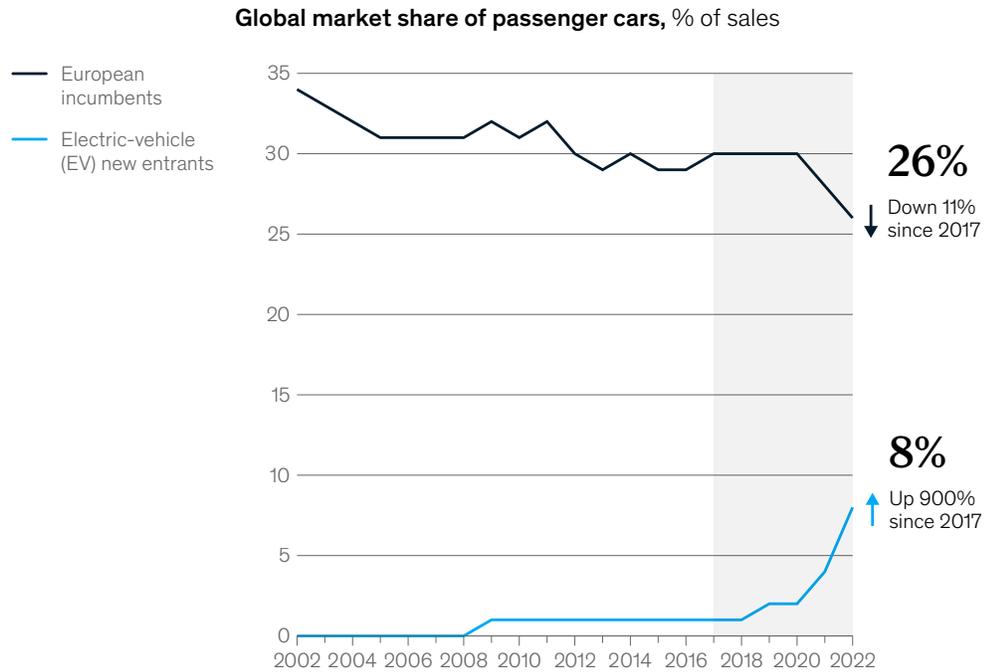
¹⁰ "Global market share held by Nokia smartphones from 1st quarter 2007 to 2nd quarter 2013," Statista Research Department, July 25, 2013.

¹¹ McKinsey analysis based on 2002–22 data on global passenger-car sales from IHS Markit, accessed May 20, 2023.

¹² Ibid.

¹³ Ibid.

European OEMs are losing market share while new entrants are dominating the battery-electric-vehicle market.



¹EV new entrants include BYD, GAC Aion, Hozon, Li Auto, Lucid, NIO, Polestar, Rivian, Tesla, and WM.
 Source: IHS Markit data for EV sales volumes; McKinsey analysis

The EV transition drives the industry's emphasis away from hardware toward software and digital. According to our analysis, EV consumers are more than twice as likely to switch brands for better in-vehicle technology, such as advanced driver assistance systems (ADAS) features and connectivity services. Our research shows that successful automakers are developing cars defined by software, resulting in a tripling of software content per vehicle since 2015.

With electrified, software-defined cars becoming the norm, semiconductors and batteries are the new industry control points. In fact, more than a third of the value of a BEV is associated with the battery. Consequently, the European supplier landscape is changing rapidly, and new capabilities are needed in development and manufacturing.

Recently, software development and hardware development are increasingly decoupling. We've observed that European suppliers have become proficient at the interaction between software and hardware in the context of specific control units that oversee specific components of a car, such as the engine or transmission. Modern vehicles may have as many as 150 control units in a distributed software architecture. Hardware and software will increasingly decouple as software becomes more centralized into domains such as the powertrain and in-vehicle connectivity—and, eventually, into computers that oversee zones of the vehicle rather than components.

As a result of this shift toward more centralized computing, portions of vehicles may become commoditized, and scale and incremental improvements may become the main drivers of competitiveness. As a result, several component markets increasingly resemble the smartphone industry, in which the core differentiator is software innovation—in addition to economies of scale,

industrial excellence, and quality in hardware. McKinsey analysis suggests that the number of build-to-print suppliers (which manufacture products and components to customers' detailed engineering instructions) in the automotive industry that provide components such as power electronics will increase. We've found that about a third of OEMs' requests for quotes in some powertrain components and systems are already build-to-print requests.

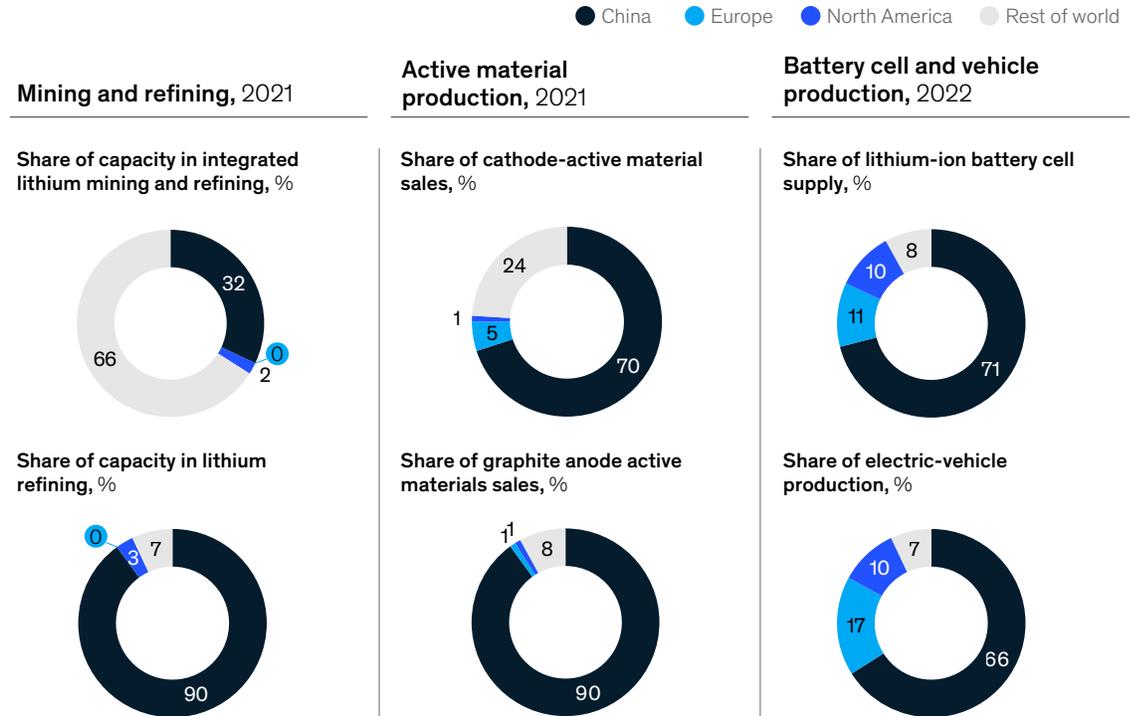
New entrants are moving to supply the automotive market with critical future technologies such as batteries, semiconductors, and software. Traditional suppliers find themselves sandwiched between "high-tech commodity" companies that provide semiconductors and batteries upstream and cost-pressured incumbent OEMs downstream. This dynamic threatens European supply chains. Consider that the current battery value chain is largely controlled by Chinese companies (Exhibit 3).

To counteract these developments and form a strong supply network such as the one Europe created during the ICE era, major industry participants are announcing strategic partnerships to secure access to resources and manufacturing capacity, especially for batteries and semiconductors. For example, some incumbents plan to strengthen their control over critical portions of the value chain by partnering with mine operators or even acquiring stakes in mines.¹⁴ While these actions are steps in the right direction, the projected supply and capacity are not yet enough to meet the region's forecast demand by 2030. Accelerated efforts are necessary.

Finally, these transformative forces overlap with a European macroeconomic environment that has a particularly acute impact on the region's auto industry (see sidebar "Macroeconomic challenges and the European automotive industry").

¹⁴ "Factbox: Automakers accelerate drive to secure battery raw materials," Reuters, April 3, 2023; Victoria Waldersee, "Volkswagen to invest in mines in bid to become global battery supplier," Reuters, March 17, 2023.

Critical parts of the battery value chain are concentrated in China.



Note: We expect the US Inflation Reduction Act to boost US share of activity along the value chain.
 Source: International Energy Agency; McKinsey Battery Insights; MineSpans by McKinsey; McKinsey analysis

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Macroeconomic challenges and the European automotive industry

In a perfect storm for the European auto industry, the current macroeconomic climate is turbulent, with multiple ongoing crises. Compared with other regions, Europe is particularly exposed and affected, and the automotive sector is at a disadvantage compared with other important industries. These challenges fall into five major areas:

Energy and resources. Wholesale electricity costs in Europe have surged to twice the costs in the United States and triple the costs in China.¹ This creates challenges for the auto industry, in which a significant portion of production costs come from energy requirements.

Geopolitical tensions. The European auto industry generates a significant—and higher compared with other regions—share of its revenues through exports,² which means current geopolitical pressures have an outsize impact on European automakers.

Supply chain challenges. Compared with other industries, the auto industry relies more heavily on timely deliveries of parts and components from international markets. The European auto industry is therefore at considerable risk when finely tuned international supply chains are disrupted.

Inflation. Inflation has hit Europe much more severely than the United States or China, with labor costs for European automakers disproportionately affected compared with other industries.³

Productivity crisis. Europe's productivity and economic growth lag behind those of its peers, particularly in areas such as software engineering, in which the auto industry needs significant additional capacity.⁴

¹ McKinsey analysis based on data from "China electricity prices," GlobalPetrolPrices.com, December 2022; "Midwest Information Office: Average energy prices for the United States, regions, census divisions, and selected metropolitan areas," US Bureau of Labor Statistics, accessed August 17, 2023; and "Electricity price statistics," Statistics Explained, Eurostat, data extracted April 2023.

² McKinsey analysis based on data from "International trade in cars," Statistics Explained, Eurostat, data extracted April 2023.

³ "Consumer prices up 4.9 percent from April 2022 to April 2023," *TED: The Economics Daily*, US Bureau of Labor Statistics, May 15, 2023.

⁴ "United States full year GDP growth," Trading Economics, accessed August 15, 2023; "Priority reforms key for sustaining growth and achieving China's long-term goals - World Bank report," World Bank, June 14, 2023.

In service of helping the industry remain globally competitive, we outline a road map of seven pillars for stakeholders to act on.

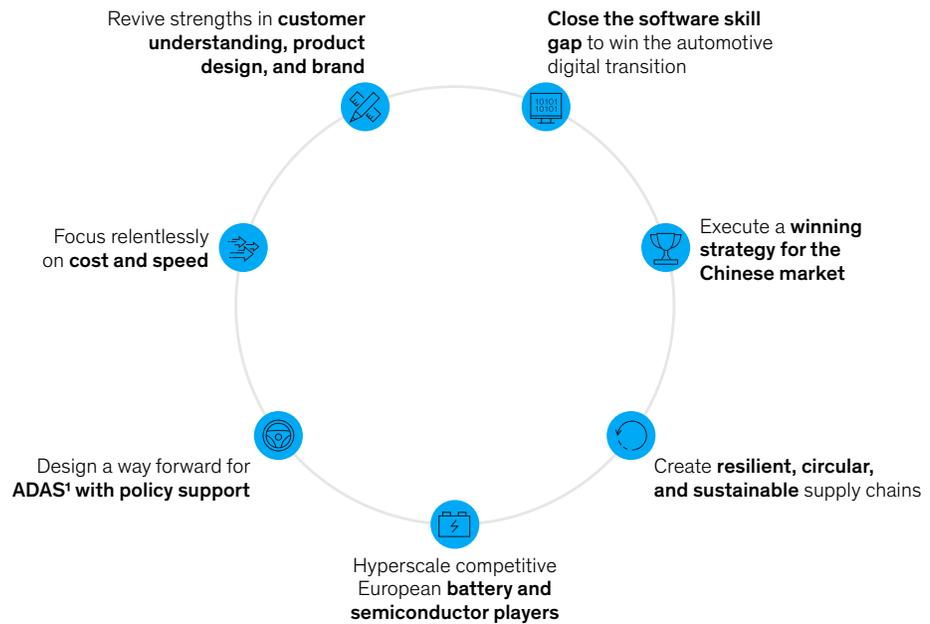
Road map for the European automotive industry

The European auto industry is in the midst of the greatest change in its history. In service of helping the industry remain globally competitive, we outline a road map of seven pillars for stakeholders to act on (Exhibit 4). The time to act is now: according to our analysis, European automotive OEMs and suppliers earn about three times the revenue of their Chinese counterparts and five times the EBIT, which means the European industry can act from a position of strength.

A rapid response from OEMs and suppliers in the European auto industry will be important. But other stakeholders—including adjacent industries such as the energy, research, and public sectors—would also need to act collaboratively to provide an environment that enables success for the European automotive industry (and mobility ecosystem) of the future. In short, the ecosystem approach that made Europe strong in the ICE era has to be translated to serve the era of software-defined, electrified cars.

Exhibit 4

A road map can help the European automotive industry remain competitive.



¹Advanced driver assistance systems.

Revive strengths in customer understanding, product design, and brand

The European automotive industry will need to extend its legacy of cutting-edge product design and superior brand value and transfer it into the new context of software-defined EVs.

Of the 25 global brands with the highest brand value, all but three are European.¹⁵ Our data show that brand remains among the top five purchase criteria for European, American, and Chinese auto consumers. However, in the age of electrification and software-defined cars, purchase criteria will change and brand rankings might get reshuffled.

To maintain superior brand value, European incumbent OEMs would need to analyze and understand customer needs and preferences to build desirable products. Traditional consumer segmentation would need to be adapted for the era of software-defined EVs, with more-detailed consumer profiles and more-granular user profiles. Owning and analyzing consumer data will enable OEMs to offer tailored mobility solutions and seamlessly engage consumers across the life cycle. They can also build their product development organizations to reflect customer journeys and experiences, which would bring operational roles closer to the customer. As consumers' desires change and technology advances, OEMs would need to continuously update their software remotely to bring the most up-to-date functionality to customers and meet their needs.

Focus relentlessly on cost and speed

McKinsey research from 2022 shows that the vehicle purchase price is the most important buying factor for consumers across markets.¹⁶ Particularly in EVs, Chinese OEMs can turn their cost advantage into a competitive edge: our analysis shows that their costs are 20 to 30 percent lower than those of European OEMs.

To catch up, European OEMs could drive down costs strategically. According to our analysis, European OEMs could close up to 20 percentage points of the cost gap by adopting structural product design, vertically integrating battery production, scaling EV production, and improving productivity. For example, battery insourcing could decrease European OEMs' costs by three percentage points, and cost-efficient battery cell chemistry alternatives could save five to six percentage points for some vehicles and segments. As for the remaining five to ten percentage-point cost gap, European OEMs could identify differentiating features that consumers would be willing to pay a premium for, such as brand differentiation; environmental, social, and governance (ESG) leadership; and superior safety performance.

Speed is another consideration. McKinsey analysis shows that European OEMs have a long development cycle compared with competitors from other regions, with concept-to-pilot phases lasting up to four years. By contrast, we've found that the fastest automakers in China need only 21 months to move from concept to pilot, allowing them to respond to market trends much more quickly.

To be clear, it's not necessarily appropriate to make direct comparisons between the Chinese and European automotive sectors or development cycles. However, European OEMs should take on the challenge and redesign their own processes to accelerate innovation, development, and industrialization. For instance, the product design process could be accelerated through iterative styling methods. Subsequent product development could be optimized by decoupling hardware and software development and by applying agile principles to software development. Across all processes, co-locating cross-domain teams and setting up task forces for products that are behind schedule or components with supply bottlenecks can further accelerate development.

¹⁵ "Luxury & premium 2023 ranking," Brandirectory, Brand Finance, accessed August 15, 2023.

¹⁶ Annual MCFM Consumer Survey 2022, McKinsey Center for Future Mobility, global n = 27,869, December 2022.

Execute a winning strategy for the Chinese market

Our research shows China will remain the biggest automotive market in the future, which means winning in China will be important for European OEMs and suppliers that want to play a globally relevant role.

European incumbents have lost five percentage points of market share in China since 2019, a substantial decrease. Meanwhile, our analysis shows that Chinese automakers are outpacing their competitors and have gained more than ten percentage points of market share in China, driven by their hold on more than 80 percent of the EV market.¹⁷

How have they done it? Chinese OEMs offer significantly lower price points, and their products are more appealing and tailored to Chinese consumers' needs and preferences. They also bring targeted innovations to market rapidly; our research shows that more than 70 percent of new vehicles unveiled at the Shanghai auto show in April 2023 came from Chinese OEMs.

Like their OEM counterparts, European automotive suppliers have a hard time gaining traction with Chinese EV players, especially for EV powertrain components and systems. While Western suppliers have held more than half of China's ICE powertrain

market, they hold less than 5 percent of the EV powertrain market.¹⁸

European OEMs and suppliers would need a fundamental strategic overhaul to regain competitiveness in China and meet the preferences of Chinese customers. This starts with developing products specifically tailored for the Chinese market. According to our research, the average customer in China is 34 years old, compared with 58 in Europe. These consumers have significantly different purchasing criteria. For instance, Chinese consumers place higher value on cutting-edge technology, connectivity, ADAS, and on-board multimedia screens than European and American consumers do. Chinese car buyers also favor simplified vehicle choices with preconfigured options.¹⁹

To implement a “local for local” strategy—in which R&D, production, and distribution are in close proximity to where products will be bought and used—European players would need to adjust their operating models for the Chinese market. For example, OEMs could localize research and development capabilities and transfer decision rights to local management. Entering local partnerships across the portfolio and supply chain will also be essential to develop a strong foothold in China and to benefit from the know-how and reputations of local partners.

To implement a ‘local for local’ strategy, European players would need to adjust their operating models for the Chinese market.

¹⁷ McKinsey analysis based on global passenger-car sales data from IHS Markit, 2002–22, accessed May 20, 2023.

¹⁸ McKinsey analysis based on IHS Markit Production Forecast, number of model launches by powertrain for Aion, BMW, BYD, Mercedes-Benz, NIO, Tesla, Volkswagen and Xpeng, data as of 2022, accessed June 10, 2023.

¹⁹ Thomas Fang, Mingyu Guan, Bill Peng, and Tony Zhou, “McKinsey China Auto Consumer Insights 2023,” McKinsey, July 14, 2023.

Create resilient, circular, and sustainable supply chains

To reduce bottlenecks and dependencies, the industry will need resilient, circular, and sustainable supply chains centered on batteries, semiconductors, and green materials. In 2021, the chip crisis led to a loss of ten million vehicles in global production,²⁰ highlighting a need to increase supply chain resilience.

To create resilient supply, localization is vital. We project that the European supply–demand gap for batteries will reach almost 40 percent, or 500 gigawatt-hours (GWh), by 2030. To cover European battery demand locally, an additional 20 gigafactories, a €35 billion investment, would be needed.²¹ The continent would also need 37 new semiconductor fabrication plants to cover local demand, requiring a €190 billion investment.²² As a first step, the European Chips Act will provide €43 billion in subsidies. Next steps could involve expanding the ecosystem along the value chain while safeguarding crucial supplies, with tactics such as increasing safety stock and implementing dual-sourcing strategies.

At least in the midterm, improving the circularity of supply chains will further decrease Europe's dependence on raw materials and components from other regions while increasing sustainability. It could also increase the share of local added value in critical EV components and create additional jobs and economic growth. Our analysis shows that reusing materials from scrapped batteries can also save up to 10 percent of costs and avoid 20 percent of the CO₂ required in production. To implement a circular value chain, industry stakeholders would need to commit to the use of recycled content and material efficiency and establish reverse operations at end of life.

End-to-end transparency on ESG criteria such as digital traceability is an important way to make critical supply chains more sustainable. As sustainability standards in key industries begin to develop—consider the launch of the battery passport, which contains ESG data for batteries²³—the European auto industry should stay at the forefront of ESG performance to gain and maintain a competitive advantage in the future.

Hyperscale competitive European battery and semiconductor players

We've observed that European players are underrepresented in battery manufacturing and high-end compute and semiconductors that power artificial intelligence. According to our analysis, only one European manufacturer is among the top ten in terms of market capitalization for battery manufacturing, while in semiconductors, Europe needs to close the capability gap for the next wave of computing to deliver functionalities such as ADAS.

A path to creating an ecosystem of technology champions consists of three elements. First, Europe should consider developing a pan-European regulatory rule book to scale high-growth firms, aligning tax standards, regulations, labor rules, and bureaucratic processes. Second, to stay at the forefront of technology, the region would need to build specialized knowledge and product innovation capabilities. Suppliers could tap into niche specialties, such as more-sustainable battery refining. Finally, the European industry would need a battery and semiconductor network, similar to the one that serves the aerospace industry. European incumbents could form strategic partnerships with emerging entrants and research institutions.

²⁰ "S&P Global Mobility on short- & long-term impact from chip shortage," *Auto Remarketing*, July 14, 2023.

²¹ McKinsey Battery Insights analysis assumes a 500-GWh supply–demand gap and average capital expenditures of €70 million per gigawatt hour in Europe. This leads to a €35 billion investment need, in addition to the already announced €70 million for planned and existing factories in Europe.

²² *Annual report 2020: The automotive industry in facts and figures*, Verband der Automobilindustrie, 2020.

²³ "Action partnerships: Battery passport," Global Battery Alliance, accessed August 15, 2023.

Design a way forward for ADAS with policy support

Advanced driver assistance systems features are increasingly important. They are becoming a key differentiator for vehicle buyers: According to our research, 51 percent of consumers worldwide would consider switching to some form of ADAS car in the future. Competitive pressures around ADAS are also intensifying. In 2022, Mercedes-Benz was the first automotive player to introduce and certify Level 3 autonomy, the threshold at which drivers can take their hands off the wheel.²⁴ Other participants in the global industry are catching up using a variety of technology approaches.

To remain competitive, the European industry may need to form a cross-industry alliance. Players could collaborate in two main areas. The first area is where differentiation is negligible and where there are opportunities for savings. This would include standardizing sensor communication protocols, which would simplify the integration of new sensors. Standardizing middleware (which sits between front- and back-end technologies) and layers of the operating system are other approaches.

The second area of collaboration is where scale and large databases could enable a faster, more robust development process for efforts including the continuous updates of software layers in maps—updates such as creating high-definition map- and location-based services. A shared pool of data could also be used for AI training and validation.

The right regulatory environment could be critical in enabling this kind of cross-industry collaboration. Public-sector stakeholders could consider adapting existing guidelines to the context of autonomous driving. These updates could encourage collaborative precompetitive research and innovation that advance and accelerate technological progress and drive standardization.

Close the software skill gap to win the automotive digital transition

Software is essential to the future of the automotive industry. But according to our analysis, only 15 to 20 percent of current R&D workers at European incumbents have software skills, compared with almost 45 percent at new entrants.

To shrink the gap, industry stakeholders would need to find holistic solutions. For example, European incumbents could create shared—or at least interoperable—software platforms across OEMs in Europe (and possibly other regions where the industry has strong partnerships) to complement individual participants' capabilities and to avoid costly solo efforts.

Early hiring, reskilling, and foreign talent can also help close the gap. Players can intensify early hiring directly from universities and boost STEM and software talent education through partnerships with universities and schools. Our research shows that reskilling is already in progress: 37 percent of European suppliers have ongoing reskilling efforts, and another 41 percent have plans to implement them. To draw skilled software talent from other regions, European employers would need to accelerate processes around work permits and accommodate foreign talent's requirements on salary, benefits, and working conditions.

Creating an environment that enables accelerated progress

European automotive players are moving in the right direction but should consider scaling and accelerating their efforts. To accomplish this, a wide variety of stakeholders in the region would need to create an environment that breeds progress and future wins for the region's automotive industry. The formula requires a road map, catalysts, and platforms for cooperation.

²⁴ Andrew J. Hawkins, "Mercedes-Benz is the first to bring Level 3 automated driving to the US," Verge, January 27, 2023.

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A clear road map such as the one we outline is needed to help accelerate the European automotive industry's progress. Its seven pillars would need to be converted into actionable measures and quantifiable targets for industry stakeholders—suppliers, OEMs, players from adjacent industries, and regulatory bodies. Associations could take on a coordinating role.

Catalysts play a significant role in implementing the road map. One is a competitive regulatory environment. Clearly defining and communicating common standards and codifying interoperability across all elements of the road map is likely to be critical.

Another critical catalyst of the European industry's transition is EV infrastructure. According to our analysis, the industry will need a cumulative €300 billion worth of infrastructure investments in electricity generation, the electricity grid, EV chargers, and hydrogen refueling systems through 2030.²⁵ European stakeholders have begun to install public chargers at a pace of 2,000 charging points per week.²⁶ But to meet demand, decision makers would need to build out charging infrastructure to the tune of 6,000 to 14,000 charging points per week.²⁷ We found that the wind

and solar assets required to fulfill the corresponding demand for energy with renewable sources would require four times as many workers in Europe by 2030 than are currently available.

Finally, the industry would need platforms for collaboration. As industry boundaries are redefined, three kinds of partnership will become more important: horizontal partnerships between entities in the same parts of the value chain (such as multiple car companies) for efforts such as software development or to gain a solid footing in the Chinese market; vertical partnerships between entities in different parts of the value chain (such as car companies with tech companies) to secure access to technology and talent; and cross-industry partnerships, such as collaborations between automotive players and utilities to facilitate structural goals such as seamless sector coupling.

Our road map shows a way forward for a globally competitive European auto industry. The work will require action from an expansive array of regional stakeholders and a supportive administrative environment. Time is of the essence.

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²⁵ *European EV charging infrastructure masterplan*, ACEA, March 2022.

²⁶ *Ibid.*

²⁷ *Ibid.*