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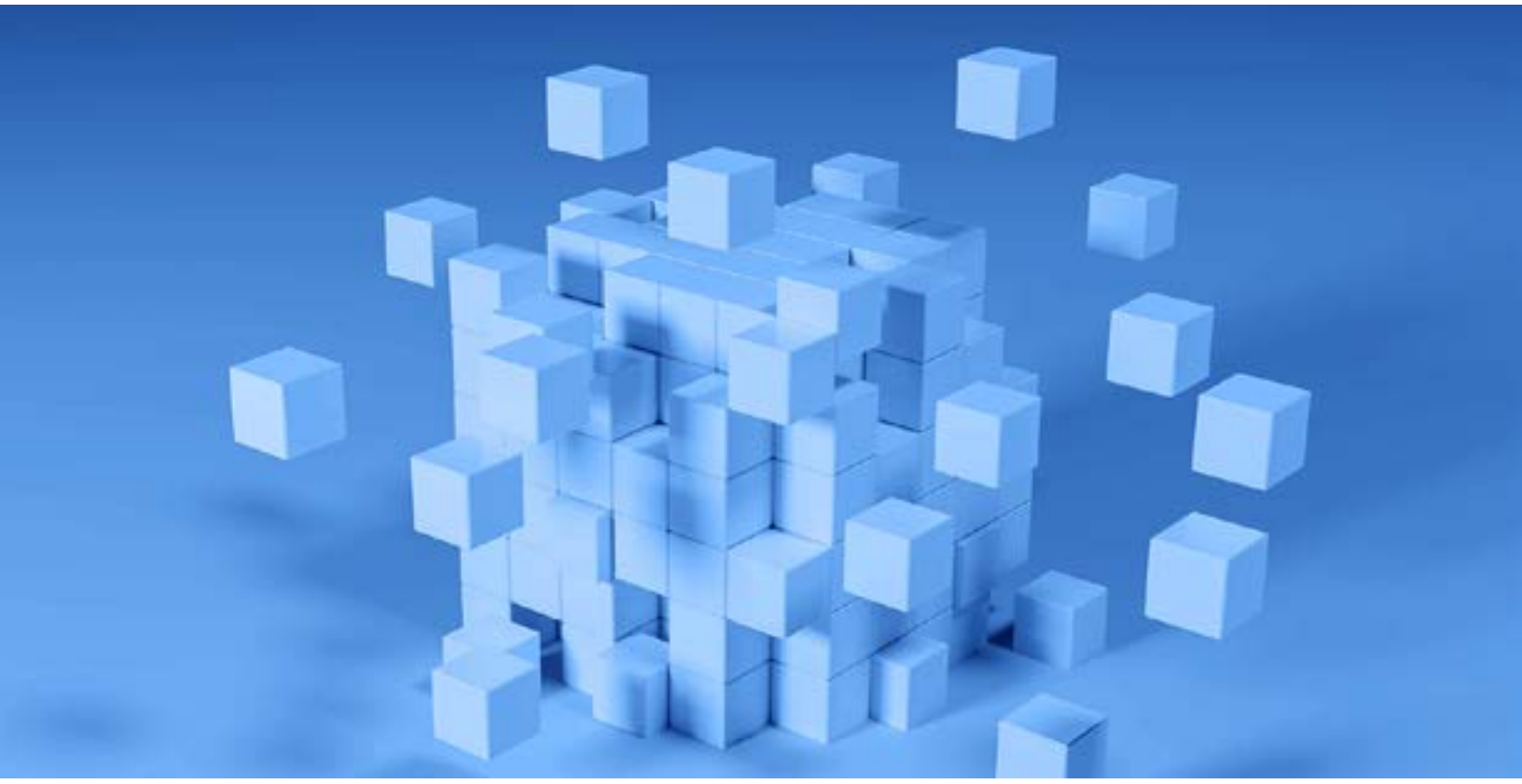
Automotive & Assembly Practice

European automotive industry: What it takes to regain competitiveness

Europe's automotive industry has been a cornerstone of the region's economy, but disruptions have challenged its leadership. How can the European industry restore its competitive edge?

This article is a collaborative effort by Harald Deubener, Lukas Michor, Niels Patschke, and Ruth Heuss, with Franziska Wiebke, Greta Brockmeier, Nicholas Schwarz, and Patrick Wetzel, representing views from McKinsey's Automotive & Assembly Practice.



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The automotive industry—including OEMs of passenger cars and trucks, suppliers, and downstream players such as aftermarket or financing providers—is a major part of Europe's economy. These players collectively account for 7 percent of Europe's GDP, providing about 13.8 million direct and indirect jobs.[1] In 2019, the European Union dominated the global automotive market, hosting ten of the top 20 suppliers and four of the top ten OEMs by revenue. Yet this leadership position has been challenged by disruptive changes in powertrain technology, consumer demands for specialized features within vehicles, and the shift from hardware- to software-defined vehicles.[2]

Enhancing the industry's competitiveness requires substantial additional investments to facilitate the transition to electrified powertrains and ensure a reliable supply of critical components. And achieving these objectives will require a collaborative effort from all stakeholders across the automotive industry, adjacent sectors, and the public sector.

This article expands upon other McKinsey research on European automotive suppliers and OEMs. It seeks to discover how these companies are affected by changing industry dynamics, the methods they have found to persevere, and the gaps where further action is essential to regain competitiveness.

A core pillar of the European economy at risk

Historically, the relevance of Europe's automotive industry expands far beyond its core in terms of spillover effects: every euro invested in the automotive industry results in 2.6 times the value added for the wider economy. The industry contributes more than ten million jobs indirectly to downstream and adjacent industries.[3] Projects for the automotive industry make up 10 percent of the gross value added for both manufacturers of basic metals, rubber, and plastic products and manufacturers of fabricated metal products.[4] European automotive OEMs also make up 40 percent of European semiconductor demand across EMEA,[5] and the automotive industry accounts for 75 percent of European battery sales.[6] Moreover, in 2023, the European automotive industry contributed around €1.7 trillion in gross value added to the European economy, with technology and car exports generating about €570 billion.[7] And by 2030, 30 percent of Europe's green steel demand is projected to be attributable to the automotive industry.[8]

Compared to historic heights, the competitiveness of the European automotive industry has decreased. Since 2017, European automakers have lost more than 13 percentage points in market share,[9] while the average profitability of European automotive suppliers has dropped from 7.4 percent in 2017 to 5.1 percent in 2023.[10] In a recent survey with 119 automotive suppliers, 66 percent expect that the state of low profitability will continue at least until 2025.[11] This decreased profitability also feeds a further challenge: companies may struggle to gather the funds needed to advance the automotive transformation—especially smaller companies with limited access to external means such as debt financing. Further, recent McKinsey analysis estimates that about €370 billion in gross value added (nearly 21 percent of total automotive value added in Europe) is at risk amid the shift toward electric vehicles (EVs) (see sidebar "About the methodology").[12]

[1] "Automotive industry," European Commission, accessed December 13, 2024.
[2] "How European consumers perceive electric vehicles," McKinsey, August 5, 2024.
[3] "Automotive industry," European Commission, accessed December 13, 2024.
[4] *2023 EU industrial R&D investment scoreboard*, European Commission, 2023.
[5] Based on McKinsey analysis of Omdia data from the second quarter of 2024.
[6] S&P Global data; McKinsey Battery Insights; McKinsey Center for Future Mobility data.
[7] "Europe's economic potential in the shift to electric vehicles," McKinsey, October 3, 2024.
[8] McKinsey MineSpans.
[9] S&P Global data for EV sales volumes; McKinsey analysis from Andreas Cornet, Ruth Heuss, Patrick Schaufuss, and Andreas Tschiesner, "A road map for Europe's automotive industry," McKinsey, August 31, 2023.
[10] Automotive suppliers are based on a proprietary McKinsey database, and regional allocation is based on headquarters in EMEA due to the differing reporting practices across companies and overall data availability.
[11] McKinsey and CLEPA Pulse Check Survey, October 2024.
[12] "Europe's economic potential in the shift to electric vehicles," McKinsey, October 3, 2024.

Five disruptions cause unparalleled need for change

The European automotive industry is increasingly under pressure. Five disruptions require the industry to significantly adapt to regain competitiveness.

Geoeconomics. Currently, 64 percent of all motor vehicles produced by the European automotive industry are exported to countries outside the European Union, and 43 percent of Europe's value added originates from vehicle sales to non-European countries.[13] Yet recent disruptive events have put significant pressure on local supply chains and have strained customer access.

While Chinese OEMs challenge US and European OEMs in their home markets, the United States has increased tariffs for Chinese EVs to 100 percent.[14] The European Union followed by increasing tariffs by up to 45 percent.[15] The United States has further expanded tariffs to parts of the automotive supply chain, including semiconductors and batteries. Additional geoeconomic actions between the United States and China, such as export restrictions for chipmaking tools,[16] could lead to a stronger fragmentation of trade flows, increasing product and production costs. These developments could encourage some parts of EV manufacturing and production to move to Europe and help European OEMs close the competitive gap with other countries. For example, several new Chinese OEMs have announced a search for a European production location.[17]

Rising uncertainty in powertrain technology. Despite the recent slowdown in EV adoption rates, global EV sales continue to grow. The McKinsey Center for Future Mobility (MCFM) projects that by 2030, 30 to 42 percent of new passenger vehicles sold globally will be battery electric vehicles (BEVs). BEV powertrains are less complex to manufacture than internal combustion engine (ICE) vehicles, which has implications for value added in Europe. According to a recent McKinsey study, 85 to 90 percent of the value added from ICE vehicles produced in Europe remains in Europe, whereas only 50 to 60 percent of BEVs' value added remains in Europe.[18] There is additional value that can be found in investing in new components. For example, batteries in BEVs account for more than a third of the vehicles' total value added, and they are currently predominantly manufactured outside of Europe.[19] Tapping into these sources of value would require players to rapidly build up capabilities and supply chains for EVs, actively manage manufacturing setups, address workforce challenges, and reskill employees.

For the trucking segment, multiple low-emission technologies are expected to coexist, requiring the automotive industry to account for diverging charging and refueling needs across applications and regions.

[13] *2023 EU industrial R&D investment scoreboard*, European Commission, 2023.
[14] "President Biden takes action to protect American workers and businesses from China's unfair trade practices," White House, May 14, 2024.
[15] "EU greenlights tariffs for Chinese electric vehicles," Deutsche Welle, October 4, 2024.
[16] "China to restrict exports of chipmaking materials as US mulls new curbs," Reuters, July 3, 2023.
[17] "Xpeng: We are coming to Europe to bring technology," Reuters, October 2, 2024; Nick Carey, "China's BYD will consider second Europe plant in 2025, executive says," Reuters, May 9, 2024.
[18] "Europe's economic potential in the shift to electric vehicles," McKinsey, October 3, 2024.
[19] MCFM data.

About the methodology

In June and July of 2024, McKinsey conducted a study about the automotive industry in Europe. For this analysis, we interviewed 50 leading industry experts and surveyed about 50 automotive OEMs and suppliers that are members of the European Automobile Manufacturers' Association (ACEA) and the European Association of Automotive Suppliers (CLEPA). Additional insights were derived from the 2024 Mobility Consumer Survey from the McKinsey Center for Future Mobility (MCFM) and the Supplier Pulse Check Survey conducted in October 2024 by McKinsey and CLEPA among 119 suppliers.

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The MCFM projects that annual sales of heavy-duty vehicles in 2035 can be broken down into the following categories: BEVs, used mainly for short-and midrange distances (approximately 45 percent); fuel-cell electric vehicles (FCEV), used mainly for long-haul routes (approximately 16 percent); hydrogen ICEs (H2ICE) (approximately 9 percent); and diesel vehicles (approximately 30 percent).

Customers and infotainment demand. A smooth digital customer experience has become a nonnegotiable feature for many customers. According to the 2024 MCFM Mobility Consumer Survey, 59 percent of EV buyers and 48 percent of traditional-car buyers believe that their usage of in-car connectivity solutions will increase in the future, and more than 50 percent of both EV and traditional-car buyers will only purchase a car if it comes with automatic smartphone integration, either for free or configurable for a fee. Premium-car buyers increasingly look for a seamless interaction with their vehicle, coupled with a personalized, intuitive user experience and design. To keep up with these customer demands, incumbent players need to rapidly increase the speed of in-house innovations in new technologies, such as voice and hand gesture recognition technologies, or acquire the necessary technology from third parties and effectively integrate those features into their vehicles.

Software and advanced driver assistance system (ADAS). The global market for automotive software and ADAS features is expected to be worth approximately €165 billion by 2035.[20] Across regions, OEMs have incorporated ADAS features into their vehicles, including high-definition mapping, positioning systems, and sign identification. Autonomous-driving features will likely become must-haves for consumers everywhere—but particularly in the Chinese market.[21] The MCFM Mobility Consumer Survey 2024 found that 53 percent of Chinese customers would be willing to switch car brands for better ADAS features.[22]

Chinese growth challenge. Passenger vehicle demand in Europe and the United States has declined by 2.5 percent from 2023 to 2024.[23] Purchasing power is largely expected to remain flat in these regions until 2030. In contrast, China is expected to see the income groups that would buy a passenger vehicle grow by 104 percent between 2023 and 2035,[24] and vehicle demand is projected to grow by approximately 2 percent annually.[25] While European OEMs have historically made large profits in the Chinese market, they are facing increasing competition from domestic Chinese brands. At the same time, the number of OEMs globally is increasing: there are 18 more OEMs and 50 more automotive brands today than there were in 2018.[26] While the market share of European OEMs has

[20] MCFM data.
[21] MCFM Mobility Consumer Survey 2024.
[22] MCFM Mobility Consumer Survey 2024.
[23] Based on McKinsey and Oxford Economics analysis.
[24] Households in the more than €32,000 annual income bracket are considered relevant for light vehicle demand.
[25] "Light vehicle production forecasts," S&P Global, accessed December 13, 2024.
[26] McKinsey analysis of S&P Global data.

decreased by five percentage points from 2020 to 2023, Chinese OEMs could gain an 18-percentage-point market share in their home market in the same period.[27] At the same time, Chinese OEMs are entering the European market with ambitious market share targets.[28]

To regain competitiveness, selected European OEMs have entered partnerships to obtain access to advanced software and hardware capabilities. For example, in 2023, a premium European OEM announced a partnership with a Chinese OEM to help boost its BEV offerings.[29] However, results from the recent McKinsey and CLEPA Pulse Check Survey also show that European suppliers have become more hesitant to invest in China, with only 11 percent of survey respondents considering China a key priority region for future growth.[30]

How the industry can move forward

In light of these disruptive challenges, how can the European automotive industry reclaim its competitive position? McKinsey sought to discover how the automotive landscape and adjacent markets will evolve through 2035, using its database, surveys from relevant industry groups, and information pulled from interviews with leading industry experts, OEMs, and suppliers (see sidebar "Key insights from McKinsey survey with ACEA and CLEPA member companies"). This research provides seven recommendations for stakeholders across the European automotive industry to regain a competitive edge.

OEM-specific recommendations

Three recommendations are most relevant for OEMs in the European automotive industry.

Embed customer centricity into the core of the business. The MCFM Mobility Consumer Survey 2024 found significant differences in customer preferences across regional markets, particularly in terms of customer experience, connectivity offerings, and autonomous-driving features.[31] European OEMs must account for this heterogeneity by localizing product and service offerings to address regional market nuances, rather than relying solely on a global one-size-fits-all approach. OEMs can also revise previous global platform strategies to allow for a higher degree of regional customization.[32] Recent research by McKinsey's Industrials & Electronics Practice has also shown how integrating customer centricity into internal processes can spur growth.[33]

Establish robust regional operating models. Geopolitical constraints and variations in macroeconomic trajectories and regional volume demand necessitate tailored approaches for regional markets. OEMs can assign dedicated leadership to, and create resources for, key markets—such as China, the United States, and the European Union—to better align with local consumer demands and regulatory requirements. In contrast, operating models based on centralized control can result in delayed decision-making and inflexible approaches that fail to resonate with local markets.

Develop a competitive strategy for lithium iron phosphate batteries. It is imperative for European OEMs to secure regional capabilities in battery technology and close the supply gap in Europe. Forty-five percent of respondents to the CLEPA and ACEA member survey consider battery performance (referring to range and charging speed, for example) as an important source of strategic differentiation in 2035. A competitive battery strategy will help reduce dependence on foreign partners, contributing to a higher degree of strategic autonomy and preserving export opportunities (to the US market, for instance). Europe has launched actions to increase battery production capacity through the industrial development program of the European Battery

[27] McKinsey analysis of S&P Global data.
[28] For example, see Luca Ciferri and Burkard Riering, "BYD executive outlines ambitious plans for Europe," Automotive News China, March 12, 2024.
[29] Linda Lew, "Audi, SAIC EV tie-up a 'coming of age' for Chinese automaking," July 21, 2023.
[30] McKinsey and CLEPA Pulse Check Survey, October 2024.
[31] MCFM Mobility Consumer Survey 2024.
[32] "Audi, partner SAIC to develop China-specific EV platform," Reuters, May 20, 2024; "Ready for next EV push: Volkswagen enters into agreement with XPENG for fast joint development of two smart e-cars," Volkswagen Group, February 29, 2024.
[33] Ali Sankur, Ewan Duncan, Gianmarco Cilento, and Steffen Fuchs, "True customer-centricity: An operating model for competitive advantage," McKinsey, December 10, 2024.

Key insights from McKinsey survey with ACEA and CLEPA member companies

The 2024 survey questions among 46 ACEA and CLEPA member companies addressed the status quo of the industry, current trends and challenges, and future opportunities for the European automotive industry. Five key insights emerged:

1. Fifty-nine percent of respondents identified a centralized electrical/electronic (E/E) architecture as a key source of strategic differentiation for cost savings by 2035.

2. For the future competitiveness of the European automotive industry, survey respondents identified a set of non-funding-related requirements, including the setup of a European automotive hub for scaling university research to industrialization (16 percent), a joint open-source software ecosystem (16 percent), and a European semiconductor ecosystem (15 percent) (exhibit).

3. In response to current skill gaps, OEMs and suppliers consider on-the-job training (29 percent) and qualification programs with educational partners such as universities (24 percent) as the most promising solutions.

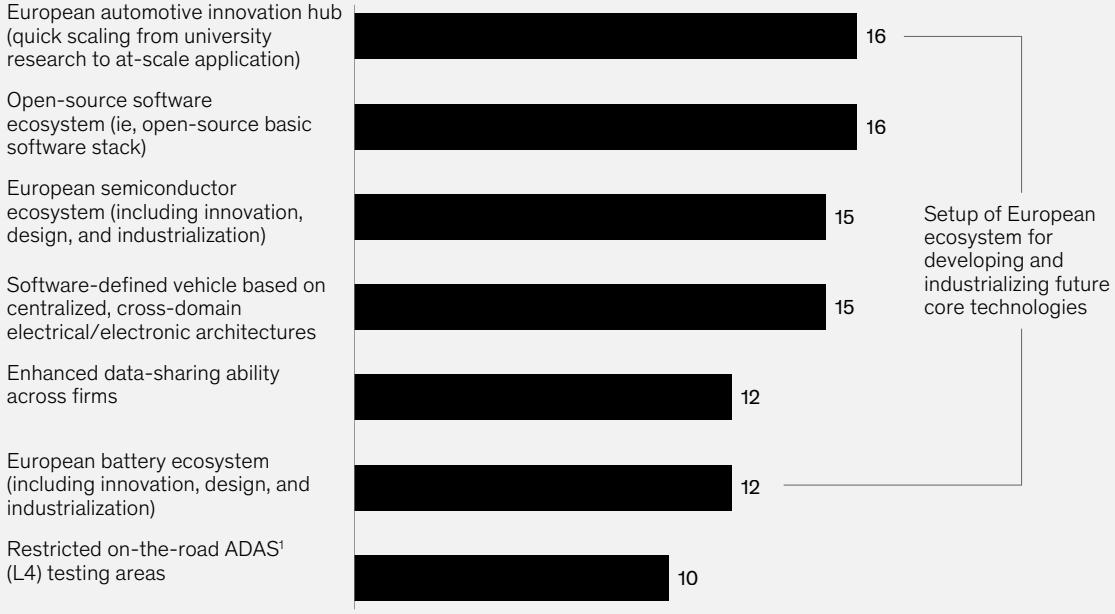
4. Eighty-one percent of survey respondents believe that the development of energy-efficient components to save energy and increase electric-vehicle range could potentially be a unique selling proposition for the European industry.

5. While 57 percent of respondents consider circularity capabilities as a potential source of profit pools, green materials are considered a cost driver (up to 68 percent of respondents).

Exhibit

Setting up a technology ecosystem will be required to ensure the future competitiveness of the European automotive industry.

Which non-funding-related elements are needed to enable the European auto industry to remain competitive?, % of respondents ranking area as top-3 answer



[1]Advanced driver assistance system.
Source: McKinsey ACEA and CLEPA Member Survey, June–July 2024, n = 46

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Alliance (EBA250),[34] but delays and cancellations of builds for European battery gigafactories have slowed progress and suggest a need for individual action by OEMs.

Supplier-specific recommendations

Results from the most recent McKinsey and CLEPA Pulse Check Survey of 119 European automotive suppliers reveal a rather pessimistic volume outlook for the near future—60 percent of survey respondents expect the market to shrink by the end of 2025.[35] Considering declining production volumes, European suppliers must find ways to lower their break-even point and mitigate volume volatility by optimizing the ratios of fixed and variable cost. This will require them to adopt a lean operating model with a flexible cost structure, variability in product offerings, and a resilient supply chain. While suppliers should address this challenge holistically, exemplary actions might include optimizing products technically (such as simplifying vehicle architecture or using lean specifications), increasing the use of efficiency-enhancing technologies such as generative AI, or making the structural cost base more flexible.

Overall recommendations for both OEMs and suppliers

OEMs and suppliers in the European automotive industry can work together in three ways.

Accelerate product development cycles. Improving the speed of product development is required to meet rapidly changing customer demands. McKinsey analysis shows that European incumbents lag behind their global counterparts in time to market.[36] For example, while concept-to-pilot phases last up to four years for European OEMs, benchmark OEMs in China can achieve this milestone in just 21 months,[37] giving them a first-mover advantage in addressing emerging customer demands. European incumbents should aim for a 30 to 50 percent reduction in time to market by increasing the use of standardized and simplified vehicle architectures, adopting continuous development practices, and leveraging AI-driven engineering. Additionally, streamlining program management and governance structures can enhance agility, minimize bottlenecks, and reduce time-consuming decision-making processes.

[34] For more, see the website of the European Battery Alliance.
[35] "Grim outlook for European automotive suppliers, as lower volumes suppress profitability," CLEPA, November 27, 2024.
[36] Andreas Cornet, Ruth Heuss, Patrick Schaufuss, and Andreas Tschiesner, "A road map for Europe's automotive industry," McKinsey, August 31, 2023.
[37] Andreas Cornet, Ruth Heuss, Patrick Schaufuss, and Andreas Tschiesner, "A road map for Europe's automotive industry," McKinsey, August 31, 2023.

Streamlining program management and governance structures can enhance agility, minimize bottlenecks, and reduce time-consuming decision-making processes.

Relentlessly reduce product cost. Affordable pricing is a driver for EV adoption rates in Europe, especially in an economic environment in which the cost of living is a concern for many. European incumbents face stiff competition from global companies that are gaining popularity and market share because of their competitive pricing.[38] To offer competitive products in European markets without compromising profit margins, the industry needs a relentless focus on reducing product costs, targeting up to 20 percent savings compared with the current state. Implementing design-to-cost strategies can help address the existing cost gap, and new technologies, such as generative AI and advanced manufacturing, can help boost productivity. Furthermore, European OEMs should scrutinize cost drivers across the value chain, from raw materials to final assembly.

Embrace a new era of collaboration. Given the speed and severity of disruptive forces, individual companies can aim to enhance the efficiency of their operating models, but no company can do it alone. To realize new sources of competitive advantage, close collaboration among European OEMs, suppliers, adjacent industries (such as energy and infrastructure providers), and policymakers is essential. Collaboration should span from current core competencies (including manufacturing flexibility to manage demand variability and shocks) to opportunities for additional value creation (such as innovative vehicle architecture and ADAS offerings) to enabling factors (such as charging infrastructure and the availability of skilled labor).

A new era of collaboration: Eight opportunities for OEMs, suppliers, adjacent industries, and policymakers

Reclaiming a competitive position requires more than just individual efforts. While automotive OEMs and suppliers have several opportunities to capture value on their own, collaboration is essential to successfully reinvigorate the European automotive industry. The interconnectedness of the automotive ecosystem necessitates close cooperation among all stakeholders, including adjacent industries and policymakers. Our research reveals eight opportunities where collaboration promises the greatest benefits for OEMs, suppliers, and adjacent industries (Exhibit 1). These collaborations can drive growth and innovation and can serve as a source of competitiveness for the European automotive industry. By working together, stakeholders can address current challenges and unlock new sources of value, ultimately paving the way for a resilient and thriving automotive sector.

1. Allow for manufacturing transparency and flexibility

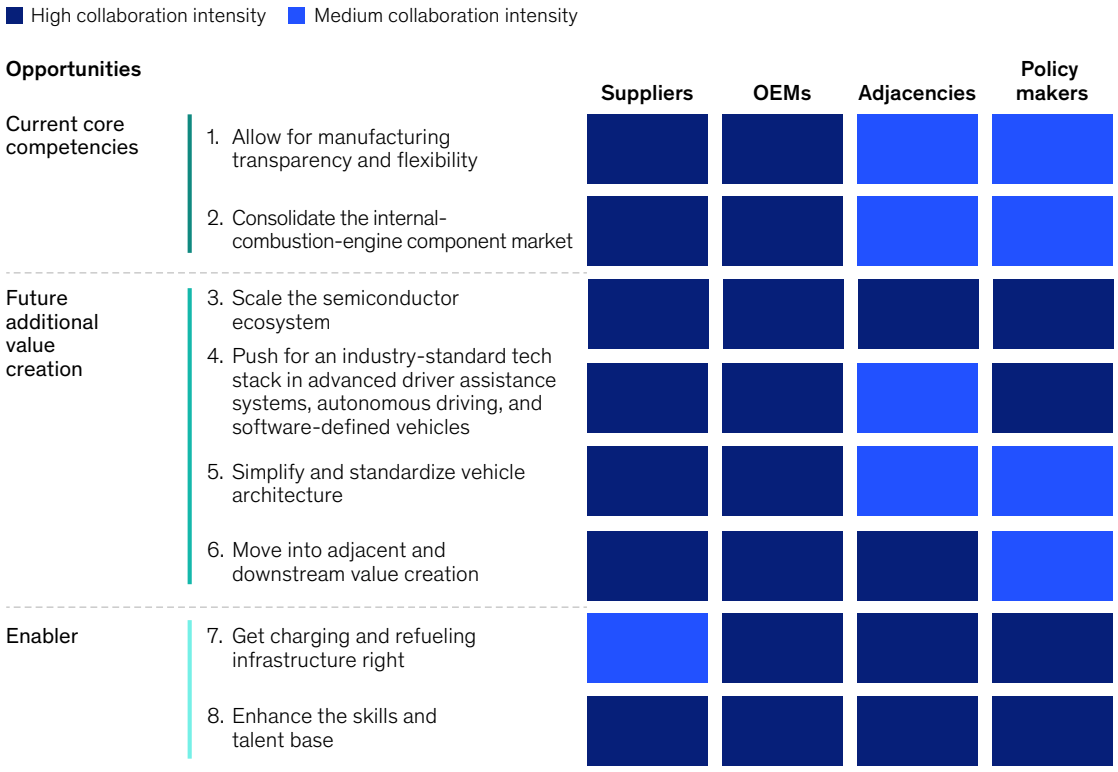
According to the 2024 ACEA and CLEPA members' survey, 31 percent of respondents consider increased flexibility across product lines to be crucial for responding to demand uncertainties. OEMs and suppliers can operate more efficiently by improving manufacturing flexibility to help manage demand variability and market shocks. Simplified programmable automation can also improve flexibility between different technologies at scale. To manage drops in ICE volumes while building up BEV production, for example, certain OEMs have updated manufacturing capabilities to produce ICE and BEV powertrain equipment on the same production line or platform.

Several joint actions can improve flexibility. OEMs and their suppliers can enhance automation and connectivity (through simplified broadcasting, for example) to improve the transparency and stability of volume forecasts while reducing response times. Further, OEMs and suppliers can define standardized component requirements and increase modularity to enable production lines and platforms to be shared across OEMs. For example, OEMs can consider dropping exclusivity requirements to increase suppliers' manufacturing flexibility and reduce the cost of R&D or operational investments. Similarly, suppliers can offer more modularized components, such as modularized steering motors, so that they can follow similar manufacturing processes and have a larger share of common parts.

[38] Indrabati Lahiri, "Chinese car makers turn to hybrids to avoid EV tariffs from the EU," Euronews, December 6, 2024.

Exhibit 1

Eight opportunities exist for European automotive OEMs, suppliers, and policy makers, as well as across adjacent industries.



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2. Consolidate the ICE component market

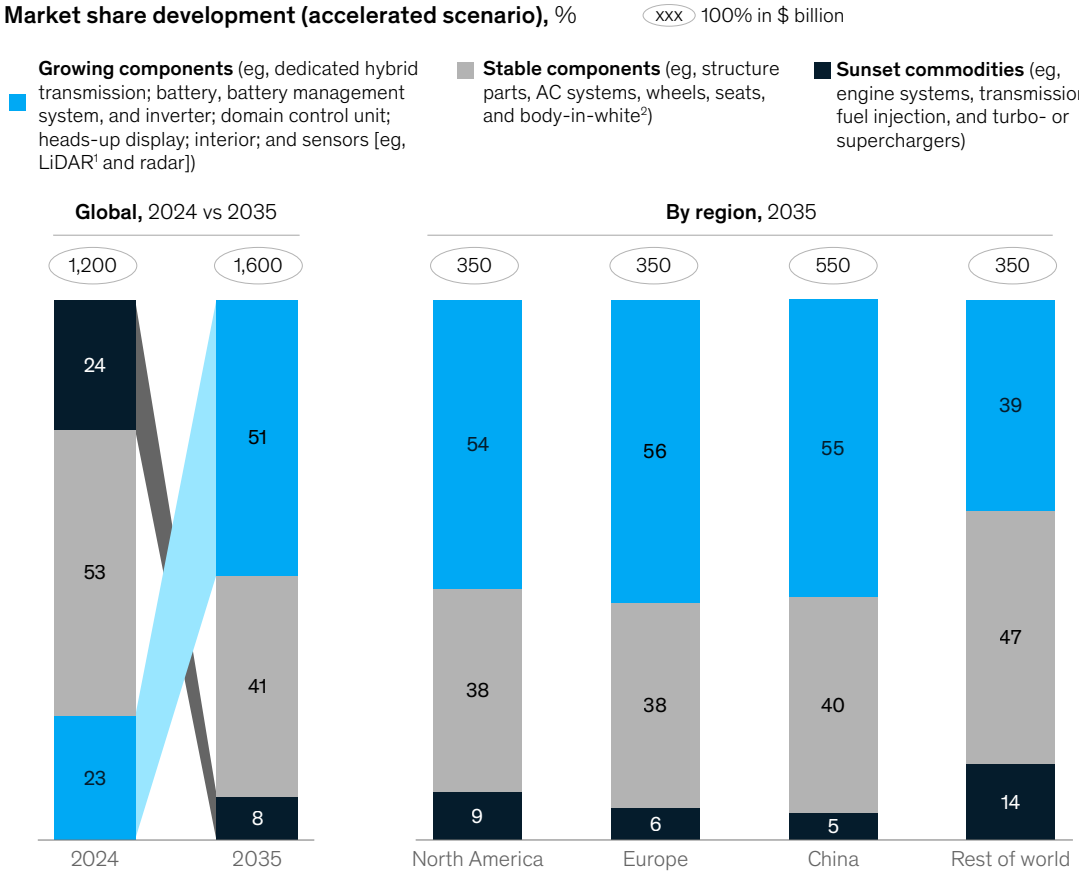
Overall volumes of ICE vehicle sales are under pressure because 40 to 50 percent of EV components are nontraditional car components such as batteries and semiconductors.[39] Based on McKinsey analysis, components prevalently manufactured in Europe—such as engine parts, fuel systems, and exhaust systems—worth about €230 billion in global yearly revenue are not needed in BEV manufacturing, and ICE component markets are expected to reach their peak in 2025, with an accelerating decline after 2030. Even though some OEMs have considered prolonging their ICE vehicle programs—a European volume OEM, for example, redirected a third of its R&D budget into ICE vehicles[40]—the decline in the ICE component market will result in a substantial shift in component values globally, with the share of pure ICE components expected to fall from 24 percent to 8 percent in the total component market between 2024 and 2035 (Exhibit 2).

This scenario may materialize in a tight-knit collaboration among OEMs and suppliers that could result in a competitive advantage for ICE components. There is a need for reliable partnerships that can fulfill demand of ICE components at competitive costs. This reliability would help OEMs and suppliers to successfully manage the overall declining ICE vehicle sales volumes from a cost and delivery perspective—for example, by limiting or removing price increases as economies of scale decline—and provide financial stability to suppliers so they can deliver the required volumes.

[39] "Europe's economic potential in the shift to electric vehicles," McKinsey, October 3, 2024.
[40] Lois Hoyal, "EVs are the future, but combustion era 'is not over,' VW CFO says," Automotive News Europe, June 5, 2024.

Exhibit 2

The decline in the ICE component market will result in a shift in component volume outlook globally, with more severity in specific market segments.



Note: Figures may not sum to 100%, because of rounding.
[1]Light detection and ranging.
[2]"Body-in-white" refers to the car body frame before painting.
Source: McKinsey Center for Future Mobility

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OEMs, suppliers, and policy makers could consider different forms of cooperation. First, instead of optimizing costs solely for individual gains, they could consider longer term contracts and volume agreements across the value chain. For example, they could aim for global optimization when awarding contracts while considering secondary costs for necessary plant build-ups. These contracts would also help to avoid short-term EDI cancellations[41] that drive complexity and cost in the entire value chain.

Second, joint commitments can help bring down costs by reducing complexity drivers such as change requests and respective R&D capacities. They can also allow for more flexibility and speed up approvals for future relocations of volumes of ICE components within production networks to allow for an effective consolidation during the market ramp-down.

[41] EDIs (electronic data interchanges) are used by OEMs to notify suppliers about the call-off orders they can expect in the future. Call-offs are not binding orders, however, so OEMs can create many with one supplier and order them on short notice at lower volumes, or they can cancel their call-off orders days before the schedule delivery, which can encumber suppliers.

The European automotive industry needs resilient and sustainable access to core technologies that could offer a competitive advantage, such as semiconductors.

3. Scale the semiconductor ecosystem

The European automotive industry needs resilient and sustainable access to core technologies that could offer a competitive advantage, such as semiconductors.

As of Q1 2024, Europe was able to fulfill approximately 70 percent of its total semiconductor demand with local front-end supply.[42] Full autonomy for semiconductor manufacturing is neither realistic nor necessary. However, a certain market share in the different stages of the value chain is relevant to build and maintain independence. In the case of front-end manufacturing, for example, if Europe wants to prevent losing ground, an investment of $205 billion is required by 2028.[43] Moreover, Europe must increase its backend manufacturing capacity if it wants to sustain its current market position. These efforts will necessitate investing further and addressing factors such as labor costs to ensure the financial viability of backend manufacturing in Europe. Additionally, Europe's attractiveness as a semiconductor ecosystem requires strengthening resilience beyond chip manufacturing, extending to wafer manufacturing, equipment, materials, and energy supply. Looking at demand from the automotive industry only, demand is tripling through 2030.[44] Semiconductor manufacturing capacity is increasing rapidly, though mainly outside of Europe: through 2028, 52 percent of semiconductor front-end capacity buildout is planned to take place in China, 10 percent in the United States, and only 8 percent in Europe. Furthermore, significant investments are taking place in other regions, such as South Korea (including a planned €430 billion investment to set up a world-leading semiconductor cluster by 2050[45]) or Taiwan.

China is expected to be responsible for 60 percent of the capacity build-up of automotive-relevant mature nodes (22 nanometers or greater), whereas Europe is not building a relevant footprint. Despite a strong competitive position in early-stage R&D for new materials, process technology, and leading-edge equipment, Europe is also lagging behind in its semiconductor start-up investments—China and the United States have both seen almost twice as many investments into semiconductor companies since 2010, driven by the US CHIPS and Science Act and the Chinese National Integrated Circuit Industry Investment Fund.[46] However, if Europe wants to sustain this stronghold, it needs to double down on early-stage R&D and strengthen capabilities for leading-edge semiconductor design.

OEMs and suppliers should collaboratively seek strategic partnerships and supply agreements with major semiconductor producers to reduce supply chain vulnerability (in case of potential issues with local sourcing requirements, for example) and to build up further semiconductor capacity in Europe. At the same time, the regulatory environment will need to support an accelerated build-out of European supply.

[42] McKinsey analysis of Omdia data.
[43] *Halbleiterkrise: Voraussetzungen für künftige Relevanz, Kompetenz und Resilienz für Europa (Semiconductor crisis: Prerequisites for future relevance, competence and resilience for Europe)*, VDA, May 2023.
[44] *Halbleiterkrise: Voraussetzungen für künftige Relevanz, Kompetenz und Resilienz für Europa (Semiconductor crisis: Prerequisites for future relevance, competence and resilience for Europe)*, VDA, May 2023.
[45] Martin Fritz, "South Korea invests big in becoming a global chip leader," Deutsche Welle, January 24, 2024.
[46] McKinsey Start-up Investment Landscape Analysis (SILA); Antonia Hmaidi, "China's long-term struggle to become integral in semiconductor supply chains," Mercator Institute, March 4, 2024.

4. Push for an industry-standard tech stack in ADAS, autonomous driving, and software defined vehicles

The European automotive industry is currently falling behind Chinese OEMs and US tech players in developing distinctive and price-competitive solutions for ADAS and autonomous-driving features. European automotive companies are generally subscale compared to global tech companies and automotive market challengers, particularly in software, AI expertise, and chip technology. For instance, 43 percent of R&D employees at entrant OEMs outside Europe specialize in software, compared to just 16 percent of incumbent OEMs. Moreover, analyses on start-up deal sizes show that, since 2010, total investment into ADAS features (such as autonomous vehicle [AV] integration, ADAS components, AV software, and SLAM[47]) in the United States was more than 3.5 times that in Europe.[48] At the same time, 30 percent of respondents of the 2024 CLEPA and ACEA members' survey consider ADAS system performance an important differentiator for the European automotive industry by 2035 at the latest.

To counterbalance this deficiency and increase the chance of becoming competitive in ADAS, three industry-wide collaborative efforts could prove beneficial:

First, companies can align on and develop standards and open-source code for nondifferentiating elements of the ADAS tech stack within the boundaries of competition law, including, for example, abstraction layers between operating system and hardware, operating system and middleware interfaces, communication and transportation middleware, and the security layer. This standardization could lead to fewer integration efforts for suppliers and OEMs and, as such, allow for shorter time-to-market timeframes.

Second, companies can foster industry collaboration for data collection, AI models, and a software development toolchain to reduce the high costs of data collection and increase ADAS safety based on more learning opportunities through edge cases.

Last, policy makers could play a vital role in facilitating the definition of common standards for data sharing, system interoperability, and data handling and help develop a regulatory framework for testing driver assistance and automated systems on the road.[49]

5. Simplify and standardize vehicle architecture

Investing in vehicle architecture innovation can enhance cost-effectiveness and increase the sustainability of the manufacturing processes. For instance, adopting a zonal-based electrical/electronic (E/E) vehicle architecture (consolidating electric control units into fewer domain controllers responsible for different zones in the vehicle, for example) can save 10 to 20 percent of material costs through optimized specifications, reduce engineering expenses, accelerate the time from concept to mass production by 20 to 30 percent driven by lower number of central processors with higher performance, and improve vehicle performance throughout its lifecycle. By 2035, a McKinsey analysis projects that 35 percent of all produced vehicles will feature zonal E/E architecture, which may enable secure over-the-air updates, benefiting both OEMs and end-users.[50] This trend is supported by the 2024 CLEPA and ACEA members' survey, where 59 percent of respondents identified centralized E/E architecture as a key source of strategic differentiation for cost savings by 2035.

Exemplary methods to achieve cost competitiveness in manufacturing through innovative vehicle architecture include gigacasting (casting large aluminum body-in-white parts in a single piece and replacing multiple smaller parts) and unboxing (building vehicles from the inside out) - these opportunities can be captured particularly well in greenfield situations. Further cost savings can be achieved by AI-supported end-to-end supply chains, design-to-cost optimization, the integration of die-cast components into mechanical assemblies (such

[46] McKinsey Start-up Investment Landscape Analysis (SILA); Antonia Hmaidi, "China's long-term struggle to become integral in semiconductor supply chains," Mercator Institute, March 4, 2024.
[47] McKinsey SILA.
[48] McKinsey SILA.
[49] *The future of European competitiveness – In-depth analysis and recommendations*, European Commission, September 9, 2024.
[50] "Advanced semiconductors for the era of centralized E/E architectures," McKinsey, June 29, 2024.

as using one die-cast for the rear or front wagon), and the implementation of more-functional integration, such as omitting the floor structure and mounting seats directly on top of battery housing.

Rethinking vehicle architecture principles requires close collaboration between OEMs and suppliers. The development of an entirely new architecture not only implies a high degree of technological change but also requires a rapid execution to capitalize on cost savings against global competition. In this context, OEMs and suppliers should align on a shared vision to jointly move toward a zonal E/E architecture to achieve cost reductions and efficiency gains. Once this alignment has taken place, OEMs and suppliers need to define the required industry-wide standards for component commonality, recycling, and material reuse to allow technical optimization in the new architecture systems. For example, they could standardize aluminum wiring and connectors or chemical cell structures for high-voltage batteries.

6. Move into adjacent and downstream value creation

European suppliers and OEMs can seize attractive growth opportunities from new and adjacent value pools that are opened by advancements in technology, evolving customer behaviors, and macroeconomic shifts (see sidebar "Adjacent value pools with big potential").

In a recent publication on Europe's economic fortunes in the shift to EVs,[51] the MCFM showed that additional opportunities from downstream value creation could generate a further €220 billion to €270 billion by 2035. For example, the global adjacent value pool for passenger cars is estimated by the MCFM to exceed €370 billion in 2035 for energy (including power, charging services, and infrastructure), about €900 billion for shared mobility services, and about €180 billion for digital services. Companies need to rethink their partnering approaches when considering moves into adjacent value-creation areas. Forging strategic alliances might help share the financial burden of investing into new business ideas or aid in gaining required skills.

OEMs and suppliers could profit from sharing and jointly leveraging vehicle data to develop and market features throughout the vehicle life cycle, such as in-car entertainment or predictive maintenance. Further, standardizing selected market features—such as entirely consistent and common charging standards across brands (for example, beyond common plugs only)—can enable further value creation and accelerate growth by reducing market entry barriers and can increase the scale of innovation offering.

7. Get charging and refueling infrastructure right

To meet the energy demand of mobility in Europe, continued and accelerated public and private investments in infrastructure for EV charging and hydrogen refueling will be necessary. The need for these investments in Europe is large: according to McKinsey analysis, investments into EV chargers of about €130 billion are required to meet demand (increasing the number of public charging points from about 1.0 million currently to about 2.5 million in 2030).[52] Meeting hydrogen demand for prospective FCEVs on the road in 2030 requires investments into hydrogen generation of €14 billion, as well as another €6 billion to €7 billion to set up the necessary 1,500 hydrogen refueling stations.[53]

Collaboration across the industry is required to get infrastructure right. Charge point operators can improve pricing transparency and offer customers attractive pricing across networks. Charge point owners could offer such pricing to MSP players, who could pass this on to their customers. The industry should align on common standards to ensure efficient capital deployment and investment in complementary infrastructure. Policy makers can help to speed up permitting processes, facilitate the buildout of energy grids and smart meters, and create a supportive environment for the rollout of vehicle-to-grid services.

8. Enhance the skills and talent base

As the European automotive industry adapts to evolving product requirements and demographic changes, building a skilled workforce is paramount.

[51] "Europe's economic potential in the shift to electric vehicles," McKinsey, October 3, 2024.
[52] *European EV charging infrastructure masterplan*, ACEA, March 2022.
[53] McKinsey Hydrogen Insights.

Adjacent value pools with big potential

Given the potential opportunities available from leveraging vehicle data, policy makers can capture these growth opportunities by defining common standards for sharing, using, and protecting data within the boundaries of EU data protection laws while still offering a high degree of convenience for customers. OEMs, suppliers, and adjacent industries can take advantage of five adjacent value pools:

Auto financing. New financing and leasing offerings, such as shifting more to "usership" (rather than ownership) models, can open new value pools for companies offering auto financing services and can open the door for further downstream access, especially for aftermarket and other services. Tailored offerings can also create opportunities for usership mobility models for passenger cars and trucks.

Automotive aftermarket. The automotive aftermarket sector could also see substantial growth, potentially contributing up to €75 billion in value added for European companies in 2035.[1] As the internal-combustion-engine fleet ages, additional maintenance will be required, which will increase the demand for automotive aftermarket companies to bridge the gap to the battery-electric-vehicle transition. Aftermarket companies can develop a competitive edge by focusing on exceptional customer centricity and deploying AI-based pricing. Additionally, OEMs will need to define a clear electric-vehicle (EV) strategy, especially for end-of-life batteries, to continuously reap value from these vehicles.

Digital and connected services. Across the entire life cycle, digital and connected services represent another lucrative value pool for suppliers and OEMs. By sharing and leveraging vehicle data, features such as advanced infotainment, autonomous driving, in-car entertainment, and predictive maintenance can be developed and contribute between €27 billion and €60 billion in value added for European companies in 2035.[2]

Charging infrastructure. Europe needs to install, operate, and maintain an additional 410,000 charging stations each year through 2030, which could increase value added in Europe by €60 billion to €90 billion.[3]

Battery circularity. The automotive industry in Europe could tap into additional opportunities available from battery reuse in EVs or other means of transportation, including micromobility, by repurposing used batteries in second-life applications such as energy storage systems and recycling. Battery recycling services alone could contribute about €13.5 billion in value by 2035.[4] Over the next 20 years, this sector could enable battery manufacturers to source more than half of the raw materials needed for new batteries from discarded, recycled batteries.[5] While the short- to midterm value of such an opportunity depends heavily on the future development of local EV battery production, battery recycling could emerge as a fundamental long-term value driver with significant value-added potential after 2035, safeguarding the industrial backbone for future electric mobility. To realize these opportunities, players from the automotive industry need to establish sufficient access to battery volumes large enough to reach a meaningful level of scale. Potential strategies include partnership agreements with OEMs and cell producers, as well as models that give incentives to EV drivers for providing access to end-of-life vehicles, thereby closing the loop.[6]

[1] "Europe's economic potential in the shift to electric vehicles," McKinsey, October 3, 2024.
[2] "Europe's economic potential in the shift to electric vehicles," McKinsey, October 3, 2024.
[3] "Electric cars: EU needs 8 times more charging points per year by 2030 to meet CO2 targets," ACEA, April 29, 2024; "Europe's economic potential in the shift to electric vehicles," McKinsey, October 3, 2024.
[4] McKinsey Center for Future Mobility data.
[5] Franziska Maisel et al., "A forecast on future raw material demand and recycling potential of lithium-ion batteries in electric vehicles," *Resources, Conservation and Recycling*, May 2023, Volume 192.

Currently, Europe trails behind North America in critical skill areas, such as engineering, digital and analytics, and manufacturing. For example, according to McKinsey analysis, 51 percent of North American employees possess the required skill levels in R&D, as compared with only 42 percent in European companies. Further, new entrant OEMs outside Europe have a significantly higher share of software-focused R&D talent (about 43 percent) compared with incumbent OEMs (about 16 percent), which focus most of their R&D on hardware.

OEMs and suppliers can consider two moves to advance their skill sets. First, partnerships with universities and the public sector can help build academic curriculums or develop reskilling courses that align with industry needs, which can ensure a steady pipeline of skilled professionals. These collaborations are critical to ensure skills programs are specific and cost-effective, especially for small or midsize suppliers that cannot afford such programs on their own. Two relevant initiatives are the Alliance for Batteries Technology, Training and Skills (ALBATTS), which develops curriculums and learning materials to train future skills relevant along the entire battery life cycle[54]; and the Automotive Skills Alliance, a European partnership that aims to reskill 5 percent of the European automotive workforce.[55]

Second, collaborations between suppliers and OEMs that can jointly reskill existing employees are paramount to keepcrucial to keeping up with industry demands. Some organizations have made strides to do this. For example, the European Battery Alliance already reskilled more than 100,000 workers to meet the demands of the battery value chain.[56]

The path to regaining the historical success of Europe's automotive industry is long. While many challenges exist, European leaders in the auto industry, adjacent sectors, and the public sector can work together to reinvigorate the competitiveness of the European automotive industry. In turn, these efforts will also ensure the continuation of positive secondary effects to the wider European economy. Automotive players can focus on transforming their companies by implementing cost-effective strategies, continuing their investments in new technologies, and accelerating research and development. Adjacent industries can invest in enabling infrastructure, including battery technologies, energy, and semiconductors, to support the transformation and participate in adding value. And policy makers can define effective policies and regulatory environments that are attractive for these investments, therefore ensuring competitiveness with other regions. By focusing on these actions collectively, the European automotive industry can regain its competitiveness.

[54] "About albatts," Project ALBATTS, accessed December 10, 2024.
[55] "A skills partnership for the automotive ecosystem," Automotive Skills Alliance, accessed December 10, 2024
[56] "InnoEnergy Skills Institute trains 100,000 workers for Europe's battery sector," InnoEnergy, December 5, 2024.

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