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Strategic Cooperation

UK–EU Automotive Value Chains Amid Global Challenges

Final Report

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Abbreviations

ACEA	European Automobile Manufacturers' Association
BEIS	Department for Business, Energy and Industrial Strategy
BEV	Battery electric vehicle
BG	Business group
CBAM	Carbon border adjustment mechanism
CEE	Central and Eastern Europe
CPTPP	Comprehensive and Progressive Agreement for Trans-Pacific Partnership
CRM(s)	Critical raw material(s)
CVD	Countervailing duty
EFTA	European Free Trade Association
EPO	European Patent Office
EPRS	European Parliamentary Research Service
ERC	European Research Council
ETS	Emissions trading scheme
EU	European Union
EUR	Euro
EV	Electric vehicle
FDI	Foreign direct investment
FTA	Free trade agreement
FVA	Foreign value-added
GBP	Pound sterling
GUO	Global ultimate owner
GVA	Gross value-added
GVC	Global value chain
HQ	Headquarters
ICE	Internal combustion engine
ICIO	Inter-country input-output (tables)
IEA	International Energy Agency
IFR	International Federation of Robotics
ILO	International Labour Organization
IMF	International Monetary Fund
IP	Industrial policy
IPA	Investment promotion agency
IPC	International Patent Classification

IPR	Intellectual property rights
IRA	(US) Inflation Reduction Act
ITRE	European Parliament Committee on Industry, Research and Energy
JP + KR	Japan and South Korea
LFP	Lithium iron phosphate
LLM	Large language model
MFN	Most-favoured nation
NACE	EU statistical classification of economic activities
NAFTA	North American Free Trade Agreement
OECD	Organisation for Economic Co-operation and Development
OEM	Original equipment manufacturer
ONS	(UK) Office for National Statistics
PATSTAT	European Patent Office statistical database
PEM Convention	Regional Convention on pan-Euro-Mediterranean preferential rules of origin
PHEV	Plug-in hybrid electric vehicle
R&D	Research and development
RoO	Rules of origin
SME	Small and medium-sized enterprise
SMMT	Society of Motor Manufacturers and Traders
TCA	Trade and Cooperation Agreement
TiVA	Trade in Value Added
TLS	Taxes-less-subsidies
UK	United Kingdom
UN	United Nations
US	United States
USD	US dollar
VER	Voluntary export restraint
WIPO	World Intellectual Property Organization
WITS	World Integrated Trade Solution
WTO	World Trade Organization
ZEV	Zero-emission vehicle

Executive summary

Two external forces are reshaping the automotive sector in the European Union (EU) and the United Kingdom (UK). The first is technological: the shift to electric vehicles (EVs) changes what a vehicle is made of, who makes it and where value is captured. The second is geopolitical, as subsidies, tariffs and competition for critical raw materials (CRMs) alter the terms on which producers compete, principally between China and the United States (US). Although neither force originates in Europe, it is where a substantial share of the consequences is felt. The trade and industrial policies of the EU and the UK are better understood as the means through which the two partners decide how to respond, and that response remains largely within their own control. This report suggests that the EU and the UK face a common external challenge and that their relationship is the most directly malleable lever.

The competitiveness problem predates electrification. As noted by the Draghi report (2024a), the costs of energy and labour, the absence of scale, the speed of permitting and the cost of capital were already constraining European manufacturing and the transition to EVs has compounded those pressures. This report examines the extent to which the two partners can meet that combined pressure and how much of the sector's remaining strength in premium engineering, safety, brand value and high-quality manufacturing depends on their willingness to act jointly.

Methodology

The report was prepared for the European Automobile Manufacturers' Association (ACEA) and the Society of Motor Manufacturers and Traders (SMMT).

It draws on three strands of evidence. The quantitative analysis follows 62 automotive business groups (BGs), accounting for at least 95% of vehicle registrations in the EU, the European Free Trade Association (EFTA) and the UK over the period 2014 to 2024. Using the whole corporate group as the unit of analysis, rather than the individual plant or the national aggregate, allows the report to examine how investment, employment and innovation are organised within corporate structures and exposes dependencies that sectoral statistics conceal. Four analytical pillars are constructed from firm-level accounts and ownership records: position in the global value chain (GVC), structure of corporate ownership, geography and composition of foreign direct investment (FDI), and the distribution of inventive activity. The results are presented as 10 facts, each ending with a takeaway for the EU–UK relationship.

Firm-level evidence comes from 28 responses to an online survey across the EU and UK automotive value chain in spring 2026 and from six in-depth interviews with senior executives from manufacturers of premium and volume passenger cars, luxury vehicles and heavy commercial vehicles. A parallel set of interviews was held with officials in the relevant EU and UK institutions. The survey records the distribution of views among participating firms; the firm interviews explain why it is held and what firms are doing in response; and the policymaker interviews indicate the extent to which the resulting agenda is actionable. The survey corroborates the interview evidence rather than providing a statistically representative base, with closely ranked items treated as indicative.

Summary of key findings

- Rules of origin (RoO) are a shared capability test. The transitional rules for electric accumulators and EVs apply until the end of 2026, with the full product-specific rules of the Trade and Cooperation Agreement (TCA) scheduled to take effect on 1 January 2027. Both UK and EU producers face origin requirements for tariff-free EV trade. Industry estimates supplied by ACEA and SMMT suggest that, among the battery electric vehicle (BEV) and plug-in hybrid electric vehicle (PHEV) exports covered by their 2027 forecasts, 23.9% and 1.7%, respectively, would comply with the rules scheduled to apply in 2027. These are forward-looking industry estimates that cannot be independently validated from the aggregate data provided, with more detailed production and sourcing evidence needed to establish where compliance constraints arise. Under the bilateral framework, exposure is shared, although the industrial starting points and potential compliance costs differ, as the UK starts from a thinner domestic battery base and the EU starts from a larger ecosystem that remains incomplete and substantially foreign-owned (Facts 5 and 10).

- Batteries and CRMs are the deepest shared weakness and installed capacity should not be confused with realised, origin-compliant supply. Companies have invested an estimated EUR 72 billion in European battery and EV manufacturing facilities since 2017, with European facilities holding around 250 GWh of cell capacity by 2025, close to two-thirds of domestic demand. Separately, the EU import-dependence indicator shows that extra-EU imports still account for roughly two-thirds of its apparent use of lithium-ion accumulators. These measures have different geographical and product coverage: the import share alone does not measure factory utilisation or RoO compliance. The pace at which European capacity becomes reliable production, together with upstream material dependencies, is therefore central to the 2027 adjustment. The UK is earlier in its build-out and depends on a small number of critical projects (Fact 5).

- The EU and the UK remain each other's most important automotive partner, although the value chain between them has thinned. Eurostat reports that vehicles were the largest EU goods export to the UK in 2025, worth EUR 55.8 billion or 16.2% of all EU goods exports to that market, and the World Bank's WITS database and United Nations (UN) Comtrade data identify the UK as the EU's largest destination for vehicles, parts and accessories that same year. SMMT places the EU's share of UK car exports at 56.7% in 2025 and ACEA reports that 60.4% of UK vehicle exports went to the EU, the difference reflecting the narrower definition of cars against all vehicles. Decomposition of value added qualifies this picture: the 27 EU Member States' (EU-27) share of value embedded in UK automotive exports fell from about 20% in 2016 to about 13% in 2022, while the UK share in EU-27 exports remained flat, at roughly 1.5%. The relationship has become thinner and more conditional, with both partners now more reliant on imported and increasingly Chinese inputs (Fact 4).

- Ownership ties were reorganised rather than severed. Within the BGs studied, UK and EU firms are more often connected through shorter chains of ownership than in 2015, particularly when weighted by employment, although some longer-distance connections remain. This is consistent with a reorganisation of cross-Channel corporate structures in a period of changing economic conditions (Fact 6).

- The centre of gravity has moved east and both partners are losing ground together. Between 2015–2016 and 2023–2024, employment in the vehicle-manufacturing operations of the groups examined fell by 17% in the rest of Europe and by 30% in the UK, while growing by more than 40% in China. Europe and the UK together lost more than 300,000 jobs within these groups over the period and China gained roughly 350,000 (Fact 1).

- The transition will take place inside the incumbent groups and its burden will fall unevenly. Established manufacturers still account for almost all EU and UK activity and EV-native entrants remain small, so policy has to work through the incumbents and their suppliers (Fact 2). The UK workforce is more exposed to the internal combustion engine (ICE), EU incumbents are more dependent on mixed-powertrain models and both rely on geographically concentrated plants and supplier clusters (Fact 3).

- Inward investment has retreated and its sources are diverging. Automotive FDI has fallen in both the EU and the UK since 2021–2022 and has shifted away from vehicle assembly towards a different mix of production and non-production functions. The green-FDI component remains substantial in the EU's later observations, whereas the UK's green investment is more episodic, falling back in 2023–2024. The EU's investment base remains overwhelmingly intra-European, whereas the UK has a more geographically diversified recorded source mix, including Chinese, Indian, Japanese and US investors. Investment promotion agencies (IPAs) on both sides are pivoting towards green automotive projects, sharply so in the UK (Facts 7 and 8).

- Inventive activity is shifting towards China in volume, while the European knowledge base retains influence. China now leads the growth in automotive patenting across batteries, power electronics and software, and the EU and UK prior-art base remains important, particularly in batteries, against the wider competitive challenge created by China's growing technological prominence. Battery technology is more central to the EU's inventive portfolio, as batteries and fuel cells rank fourth among the EU's leading patent classes and do not appear among the UK's leading six (Facts 9 and 10).

Stakeholder evidence corroborates the quantitative findings and adds the firms' own assessment of urgency.

- Firms identify US trade policy and tariffs as the most immediate threat, with an average rank of 2.3 and first place for 11 of 24 respondents, followed closely by Chinese competition and de-risking at 2.5. In interviews, the EU's local content proposals were described as the overriding risk for UK-based producers, as definitions excluding UK content would put a substantial share of EU sales in question.

- The 2027 RoO thresholds are the clearest near-term signal of strain, with firms citing duty exposure of the order of one billion pounds sterling (GBP) without mitigation and production already migrating to lower-burden sites. Applying the thresholds as planned was the least-favoured option in the survey, ranked last by 8 of 15 respondents.

- Batteries and CRMs are the deepest structural exposure, with lithium ranked most critical at an average of 2.4, followed by cobalt at 2.7 and nickel at 3.7. Processing rather than extraction is described as the hardest dependency to mitigate.

- The prevailing response is to hold and watch. The modal assessment of the impact of current conditions was moderate adjustment, expressed through delayed projects, deferred capital and suppliers consolidating or leaving the sector, rather than exit or relocation.

- Energy costs, weak consumer demand and regulatory divergence between the EU and the UK weigh on investment decisions as heavily as trade rules, with existing frameworks for joint research and development (R&D) assessed as inadequate.

- Firms converge on a single request: a coordinated EU–UK partnership covering trade, critical minerals and batteries, supported by predictable multi-year frameworks. This was the strongest policy preference in the survey and was repeated in every firm interview.

Recommendations

The recommendations are set out in full in Section 9, by time horizon, together with the underpinning evidence. Near-term measures address the pressures firms identify as most acute and are actionable within the current policy cycle. Structural measures rebuild the foundations of a competitive sector and will require sustained investment and political capital.

1. Address the 2027 RoO thresholds now and treat them as a shared problem (Facts 5 and 10; firm voice). Any accommodation on the thresholds should be paired with a joint battery roadmap covering private investment, public capital and operating support where projects are viable but not yet bankable, together with coordinated action on active materials, recycling, permitting and grid access, so that an extension functions as a bridge to compliant capacity. This should be supported by a shared EU–UK evidence base on vehicle production, battery and component sourcing and RoO compliance, allowing industry and authorities to monitor where constraints arise and how they change as investment and sourcing patterns evolve. UK accession to the Regional Convention on pan-Euro-Mediterranean preferential rules of origin (PEM Convention) could also be assessed for its implications for automotive supply chains, including wider cumulation possibilities. That assessment would need to examine how the revised PEM Convention rules would interact with or replace relevant TCA rules and whether parallel arrangements could be agreed.

2. Count UK content as European content in local content and "Made in Europe" definitions, as a measure in the EU's own interest (Facts 4, 6 and 10; firm voice). Excluding UK content is, in the view of firms interviewed, more likely to shift future assembly to third countries than to repatriate it to EU producers, which face many of the same structural pressures. With more than GBP 6.9 billion of EU-made parts entering the UK in 2025 (Fact 4; SMMT's "typical parts" measure), the EU has a substantial commercial stake in UK automotive production. Assessing local content proposals therefore requires attention to their effects on suppliers and assembly operations on both sides of the Channel.

3. Secure the conditions under which firms invest, namely policy stability, infrastructure, demand and competitive costs (Facts 2 and 3; firm voice). Decarbonisation should remain the settled destination, with related regulations adjusted transparently and

predictably, and EU and UK timelines kept as close as possible. Charging roll-out should be treated as critical infrastructure on both sides, demand support should be simple and durable and energy costs, permitting speed and grid connections should be addressed within the same package.

4. Pursue regulatory alignment through existing structures (Fact 4; firm voice). Priority should go to areas where divergence imposes cost without conferring strategic advantage, beginning with battery standards, charging specifications, zero-emission vehicle (ZEV) mandates, software, cybersecurity, driver-assistance systems and type approval, and working through the bilateral automotive working group rather than new institutions. Linking the two emissions trading schemes (ETS) is better treated as a later objective.

5. Close the investment gap and build a joint approach to CRMs (Facts 5, 7 and 8). Public funds should catalyse rather than substitute private capital through co-investment frameworks that de-risk manufacturing at scale, combined with volume commitments, processing capacity in Europe and partner economies, recycling targets and joint procurement and stockpiling arrangements.

6. Sustain and pool the shared innovation base and coordinate on investment (Facts 3, 8 and 9). Reciprocity in research funding, where firms hold substantial value chain content on both sides, was among the measures firms requested most consistently. The growing technological prominence of China in batteries and other EV technologies strengthens the case for treating EU and UK capabilities as complementary parts of a wider European innovation and industrial base. Coordination on investment screening is better pursued through information-sharing than full harmonisation and investment incentives should be conditioned on local supply-chain development and paired with spatially targeted skills funding.

7. Approach Chinese competition through a sequenced response (Facts 1 and 9; firm voice). Where trade-distorting subsidies are documented and injury established, calibrated and World Trade Organization (WTO)-consistent measures are appropriate if only to buy time and work alongside negotiated subsidy reductions and market access conditioned on technology transfer. The same logic of integrated value chains argues against escalation in response to US tariffs. None of this succeeds if economic security, industrial policy (IP) and climate policy are pursued in separate silos; treating them as a single package aligns the trade, investment and decarbonisation levers on which a competitive sector depends.

1. Introduction

1.1 Aims and objectives

The global automotive industry is being reshaped by three interacting forces: technological change, geopolitics and the trade and industrial policies of the European Union (EU) and the United Kingdom (UK).

The transition to electric vehicles (EVs) is also fundamentally altering value chains and regulation. In this report, EV means a battery electric vehicle (BEV) unless stated otherwise, a plug-in hybrid (PHEV) pairs a battery that can be charged from the grid with a combustion engine, and a conventional hybrid cannot be plugged in. Geopolitics, expressed through subsidies, tariffs and competition for critical raw materials (CRMs), is changing the rules under which the sector operates. The trade and industrial policies of the EU and the UK are not a global force in the same sense; rather, they are where Europe's response to the first two is decided and shape the arena in which the continent's manufacturers compete.

The first two external forces are moving the centre of gravity of the industry away from the rest of Europe and the UK and towards China. This realignment presents the EU and the UK with a common challenge, framed here as the risk of losing the frontier, or, framed more positively, the opportunity to preserve and build on Europe's strengths in premium engineering, safety, brand value and high-quality manufacturing. The most pressing competitive pressures originate externally, in the dynamics between China and the United States (US). The lever most directly available to European and British policymakers is the relationship between the EU and the UK. How the two manage their shared value chains, their investment environment and their common innovation base will do much to determine whether the European automotive sector holds its position at the technological frontier or slides into structural dependence.

Much existing research continues to study the sector as conventionally defined, focusing on the narrow industry classification or the individual plant. As supply chains have grown more complex and value generation has spread from research and development (R&D) and design through end use, this lens has become insufficient. Production decisions are now typically taken within corporate structures that span sectors, functions and borders. At the level of the narrow sector or individual plant, emerging vulnerabilities remain invisible, including dependence on materials once unconnected to the sector and producers in countries once considered outside the value chain.

This report adopts the business group (BG) as its unit of analysis. Drawing on firm-level ownership data, it reconstructs 62 automotive BGs and traces their activities across production, employment, investment, ownership and innovation. The evidence is organised around 10 empirical facts: the first part documents the global reallocation of the industry and its composition, while the second examines the structural and policy response, paying particular attention to the evolving relationship between the EU and the UK. The quantitative analysis establishes how employment, trade, ownership, investment and innovation are changing across the EU–UK automotive system. An original firm survey and in-depth interviews identify the pressures firms consider most important and how these affect their investment and production decisions. Interviews with policymakers examine where policy priorities converge or differ between the EU and the UK. These sources connect the changes observed in the data with the commercial constraints facing firms and the policy choices

available to both sides, without treating the interviews as representative of the industry or causal explanations of the quantitative findings.

This report seeks to:

- Document how the automotive industry has shifted and assess what its magnitude and direction mean for the EU and the UK.
- Use BG-level evidence to establish how this reallocation is composed across employment, value chains, investment, ownership and innovation.
- Identify the threats facing the EU and the UK, from the concentration of risk in incumbent rather than EV-native producers to dependence on imported batteries and CRMs.
- Examine how corporate ownership and investment ties between the EU and the UK have restructured since the UK left the EU and where the two regions' interests converge and diverge.
- Capture the perspective of firms across the value chain on geoeconomic concerns and the policy measures they consider most effective.
- Draw out the implications for EU and UK strategic cooperation on trade, CRMs, batteries and the shared innovation base.

By combining original firm-level analysis with the direct testimony of industry, the report offers an evidence base for the choices facing the EU and the UK as they respond to a fragmenting global economy and seek to preserve a competitive automotive sector.

1.2 Structure of the report

The report is organised as follows.

- **Section 2** sets out the methodology, including the BG approach, the firm-level data on which the analysis rests and the survey and interview programmes.
- **Section 3** reviews the academic and policy literature on the three forces reshaping the sector globally and establishes the mechanisms through which they operate.
- **Section 4** introduces the analytical and data pillars and the ownership networks that underpin the empirical analysis, which is presented as 10 facts in two parts.
- **Section 5** covers Facts 1–5 and documents the global reallocation of the industry and its composition.
- **Section 6** covers Facts 6–10 and sets out the structural and policy response, from the restructuring of corporate ownership and the changing geography of foreign direct investment (FDI) to the shift of innovation towards China and the policy exposure created by rules of origin (RoO) and battery capacity constraints. Each fact closes with a take-home message for the relationship between the EU and the UK.
- **Section 7** draws policy implications from the empirical analysis.
- **Section 8** presents the firm voice from the survey and interviews and sets it against the policy response.
- **Section 9** sets out the implications for EU and UK strategic cooperation.
- The appendices document the data sources and construction of every series, the reconstruction of the ownership networks and the employment data, the IPC code labels and the BGs in the sample.

2. Methodology

2.1 Overview

This study adopts a mixed-methods design, combining original firm-level quantitative analysis with three strands of primary engagement. The quantitative analysis takes the BG as its unit of analysis and is organised into four pillars: global value chains (GVCs), corporate ownership, FDI and innovation. It is complemented by a structured firm-level survey, a programme of semi-structured firm interviews and a parallel programme of policymaker interviews. The quantitative evidence establishes the scale, direction and composition of the changes reshaping the sector. The survey and interviews provide the voice of industry and policymakers in the context of live strategy and policy. The qualitative evidence is triangulated with the quantitative facts rather than treated as a standalone or statistically representative dataset. The construction of every quantitative series is documented in the technical appendices. The survey and interview programmes are described in Section 8, together with their results.

3. The automotive industry: An evidence review

This review traces the evolution of the automotive industry through key academic papers that form the backdrop to recent developments. It argues that technological change, geopolitics and policy in the EU and UK are the three pillars altering the face of the automotive sector: the transition to EVs requires different inputs and production steps, driving change in the supply chain and location of value creation; technology fundamentally alters what a car is; and geopolitics interacts directly with the rising need to source inputs globally. Subsidies and tariffs present a significant challenge for the sector, as the evolving geopolitical landscape alters the rules under which the sector operates. Finally, trade and industrial policy (IP) in the EU and UK seek to promote and manage the technological transition while also addressing rising geopolitical tensions. For the continent's car industry, EU–UK policy alters the arena in which it operates. Accordingly, the analysis is structured along these three pillars, each with a distinct locus of agency.

Two further methodological choices are important. First, the three pillars – technological change, geopolitics and policy in the EU and UK – are studied by drawing on both academic and grey literature, including policy documents and work by think tanks. This literature speaks to the more novel questions yet to be explored by academic work and provides real-time policy tracking, foresight scenarios with industry data and sectoral analysis that incorporates the very recent past. Valuable insights from existing academic work are usefully complemented by a younger and faster-moving literature.

Second, the BG is the lens of the study. Academic papers have tended to study the narrowly defined automotive sector or individual factories. In the past, production organisation within factories or within the automotive sector alone may have been the key determinant of a manufacturer's productivity and contribution to the wider economy. However, a narrow sectoral definition is no longer useful as supply chains become more complex. The generation and distribution of value added along the value chain from R&D and design to end use and beyond has dramatically evolved to include activities outside the automotive sector per se.

New supply linkages are being developed with the evolution of products and processes. For example, export restrictions on minerals not previously used in the sector and applied in countries not previously thought to partake in the value chain can critically affect the sector.

The economic and political forces shaping the sector have moved well beyond the individual factory and the narrowly defined sector. This has important implications for how production organisation, GVCs, FDI and patents operate. The BG is now the appropriate lens to understand how technology, geopolitics and policy affect this industry, given the constraint of data availability on supply chains. As the industry's value chain and products are changing, the study of BGs allows systematic capture of the activities that enter automotive production and consideration of emerging global vulnerabilities and policy dependencies.

This evidence review begins with a chronology of the automotive industry's development, specifically EU–UK linkages. It then looks at the drivers of change in the industry: technology, geopolitics and the EU–UK relationship. These sections move towards the current period and will serve to inform policy decisions.

3.1 The automotive sector – a chronology

This chronology of the automotive sector focuses on the EU–UK relationship, against the global backdrop of the evolution of the industry. Bailey et al. (2010) provide an overview of the broader developments in the organisation of automotive production. The authors describe three phases up to 2010: Fordism, which is essentially volume assembly; post-Fordism, which focused on lean production; and the rise of flexible platform-sharing. EU–UK relations followed the same global trend of generalised economic integration in the first phase. With the single market, the EU and UK went further than the rest of the world, which proceeded with most-favoured nation (MFN) rules. With the UK's departure from the EU, disintegration associated with uncertainty and trade risks appeared earlier in EU–UK relations than in global affairs, with an asymmetry taking hold as the 27 EU Member States (EU-27) continued on a path of economic integration, in increasingly stark contrast to the rest of the world. This section structures the literature by this periodisation and adds a growing literature studying Brexit, wider geopolitical fragmentation, EVs and IP.

3.1.1 Production, trade policy and GVCs (from Fordism to the 2010s)

An extensive literature shows that automotive firms optimise the organisation of production as a source of competitive advantage. As the sector has moved beyond volume assembly, profitability increasingly relies on varieties, production locations and supply chains. MacDuffie et al. (1996) show that product variety raises production costs per vehicle. However, lean production plants neutralise this penalty, which is high only in plants organised around mass production. Van Biesebroeck (2007) argues that variety, flexible technology and vertical integration function as strategic complements: the productivity gains from adopting any one depend on whether the other elements are also introduced.

The automotive sector is, arguably, more affected by trade barriers than other sectors. Goldberg (1995) studied the economics of quantity restrictions in automobile imports. During the 1980s, the US and Japan agreed a so-called voluntary export restraint (VER). Goldberg (1995) shows that VERs led to a drop in car imports of about 300,000 units per year. In response, Japanese car makers doubled down on the dimension of import value not targeted by the VER: the value of a given imported vehicle. The paper documents the striking quality

upgrading carried out by producers limited in their export volumes to the US. It calculates a 62–65% equivalent tariff rate that would have generated the same reduction in import volumes, which is high (yet not unheard-of given EU and US tariff rates on Chinese vehicles). Berry et al. (1999) estimate that the VER cost US consumers USD 13 billion and increased car makers' profits by USD 10 billion. They calculate that an equivalent tariff would have yielded a US welfare gain.

A whole strand of the literature studies the location decisions of car manufacturers. McCalman and Spearot (2013) look at offshoring decisions after the North American Free Trade Agreement (NAFTA). Their analysis reveals that offshoring decisions varied in meaningful ways by variety: older platforms and simpler, lower-volume models were assigned to Mexican plants, with more complex, newer and higher-volume varieties assigned to US plants. This finding shows that differences in overall labour costs matter, as does vertical differentiation. Bailey et al. (2010) point to the strong regional characteristics of globalisation in the automotive sector. Multinational enterprises locate final assembly plants near major markets, while moving intermediate input plants to regions within the same trading bloc (Central and Eastern Europe (CEE) economies and Mexico for Western Europe and the US, respectively). Ambroziak (2016) illustrates how European car makers' FDI allowed CEE automotive manufacturers to integrate into European supply chains. This shows up as rapidly rising intra-industry trade in intermediate inputs, such as parts and components. Pavlínek et al. (2017) are more critical, noting that despite rising employment in automotive manufacturing in CEE countries, profits were repatriated to home markets. This limited reinvestment and technology transfer, relegating CEE economies to the ranks of an integrated periphery. A tentative generalisation from their study is that automotive firms benefit from regionalisation and globalisation, but not all production locations benefit symmetrically, as the skill-intensity and profitability of production steps vary.

The position of countries' automotive sectors along the supply chain has key implications for supply chain resilience and IP. Bailey and De Propris (2014) show that 50% of intermediate goods in the UK car industry are imported, compared to 30% in Germany. Davies et al. (2014) calculate that Tier-1 suppliers in the UK automotive industry sourced only 34% of inputs domestically, compared to 60% in comparable European countries. This provides a GBP 2 billion potential gain from increasing domestic input usage. Bailey and De Propris (2014) consider this a GBP 3 billion reshoring opportunity and call for an active IP. The main constraints cited by UK firms in moving the production of automotive intermediates onshore are access to finance, skills shortages and increased costs along the supply chain. An appropriate IP would need to improve small and medium-sized enterprises (SMEs)' access to financial markets, foster skill development and incentivise capital investments. The authors conclude that market forces alone are insufficient to bring about increased reshoring, which would likely lead to greater supply chain resilience.

In a global study, Head and Mayer (2019) show that straightforward cost-minimising offshoring accounts for 8% of cars sold in a brand's home market. If offshoring mainly reflected producers' decision to flock to low-cost environments, this share should be substantially higher. However, this low value depends crucially on an environment with low tariffs. According to their estimations, production decisions are highly sensitive to tariffs. For the EU–UK context, the implication is that tariff increases are more of a threat to automobile production in the UK than a modest divergence in production costs. Their findings underscore this report's argument that BGs are the right lens of analysis: production decisions are not simply cost minimising across independent firms.

3.1.2 UK withdrawal from the EU (2016 onwards)

The UK's withdrawal from the EU is considered to consist of two events: the referendum in 2016 generally increased uncertainty rather than risk, as a wide range of future outcomes on economic integration between the EU and UK were imaginable at the time. When the withdrawal materialised in early 2020, it increased trade barriers within Europe, leaving economists to draw on a long-standing literature. Bailey and De Propris (2017) name four adverse channels through which the UK's departure operates: the depreciation of pound sterling (GBP) raises input costs; FDI uncertainty disrupts investment decisions; tariffs risk cross-border operations; with a resulting, and partly existing, underperformance of supply chains. The referendum-induced uncertainty shock of 2016 operated mainly through the first two channels, as GBP depreciated and uncertainty affected FDI decisions. The latter two channels rose to prominence with the actual withdrawal from the EU in early 2020.

Moradlou et al. (2021) analyse conversations with 30 senior executives in the automobile sector. Some 88% of multinational corporations report having offshored or planning to offshore production to the EU as a result of the UK's departure. Most of the costs of Brexit arise from indirect effects through GVCs, with motor vehicles the hardest-hit sector, given the sector's sensitivity to regional trade barriers and complexity of production (Vandenbussche et al. 2022). According to the frequently cited Novy et al. (2024), UK trade was negatively affected, albeit to a lesser degree than expected by economists. Freeman et al. (2024) find that the effects are largest for smaller firms. This is in line with trade theory, suggesting that increased costs of operating in a foreign market affect the smallest and lowest-productivity firms most.

3.1.3 EV transition and IP (late 2010s to present)

The transition to EVs brings large-scale technological change to the automotive industry. Celasun et al. (2023) present statistical evidence that the growth in EV production in Europe already displaced jobs in internal combustion engine (ICE) sectors in the late 2010s. The Organisation for Economic Co-operation and Development (OECD) (2024) estimates that EVs will need 30% less labour input than ICE vehicles, implying that 501,000 ICE jobs in the EU may disappear. Wingender et al. (2024) model mandatory decarbonisation and EV competition from China. While the overall economic effects are small, they are disproportionately large for Hungary, Czechia and Slovakia, which are exposed to lower demand for ICE components as final assembly plants in Western Europe transition to electric models. These asymmetric labour risks are analysed in Fact 3. However, Central European economies can offset economic losses by attracting Chinese FDI (Wingender et al. 2024).

A second major feature of the automotive sector's current chronological stage is the rising significance of industrial and trade policies. Through their interaction with the transition to EVs, the incidence of industrial and trade policies goes well beyond EU–UK relations. Rotunno and Ruta (2024) show that China's subsidies divert trade. Unilateral tariffs are inferior to multilateral subsidy discipline enforced through the World Trade Organization (WTO). Aldaz-Carroll et al. (2024) also note the asymmetric nature of policies in the sector. While EU climate policies such as the carbon border adjustment mechanism (CBAM) adversely affect emissions-intensive exporters from outside the EU, rising demand for CRMs generates new winners and potential for economic integration and development in some resource-rich economies. However, the latter may induce a strategic dependence of Western car makers. Henry (2024) argues that the UK's dependence on foreign firms leaves it exposed to supply chain decisions made abroad.

The following sections address this interplay between technological change and industrial and trade policies.

3.2 Technological change

The transition to EVs is reshaping the operation of the automotive sector. The structure of automotive groups and their corresponding exposure to industrial and trade policy must evolve as value generation shifts and supply chains reconfigure.

3.2.1 Global EVs

In 2024, 20% of global car sales were EVs, with China at 50% (International Energy Agency (IEA), 2025a). In China, scale economies led to a 30% reduction in battery prices, leading to car prices (without subsidies) converging between EVs and ICE cars. In Europe and the US, the price and cost gap between EVs and ICE cars remains significant. Notwithstanding China's rise as an auto manufacturer, the IEA Global EV Outlook projects that EV manufacturing capacity will quadruple in the EU and the US under currently committed projects.

To date, there have been considerable effects on Europe's car makers. Celasun et al. (2023) and OECD (2024) show evidence of the EV transition's adverse employment effects. Fact 1 documents the geographical reallocation of employment within the automotive BGs studied, but does not separately identify the contribution of electrification to those changes. Juge et al. (2025), in an analysis for the Bruegel Institute, paint a positive picture for the EU: since 2017, EUR 72 billion has been invested in battery and EV manufacturing. EU battery capacity amounts to two-thirds of domestic need and EV capacity is twice domestic demand, suggesting a continued role for successful exporting. Nonetheless, these result from foreign investments, initially from South Korea's battery giants and increasingly from China. Northvolt's bankruptcy highlights the ongoing difficulties in scaling battery production independently in the EU (Facts 2 and 5).

Despite some EU measures to increase trade barriers, Yao and Zymek (2024) argue that increased Chinese FDI in Europe (Fact 7), improved productivity and a more complete single market are preferable to tariffs. McKinsey & Company (2024) find that Europe's USD 1.9 trillion automotive industry could lose USD 400 billion in a disruptive EV scenario; in an alternative successful scenario, the industry could add USD 300 billion in downstream value added. Similarly, the European Parliamentary Research Service (EPRS) foresight study (EPRS, 2024a) compares scenarios ranging from a "cutting-edge Europe" to a collapse under a "sanctions spiral". A similar finding is provided by CBI Economics (2024) for the UK: in a positive scenario, both automotive industries benefit from the transition to EVs. However, the downside risk is calculated to be larger than the potential upside.

3.2.2 (Re-)Organisation of production

Productivity in the automotive industry is shaped by the interactions between variety, flexibility and vertical integration (MacDuffie et al., 1996; Van Biesebroeck, 2007). In the age of EVs, similar, albeit modified, principles should apply. New investments are required in battery management systems, electronics integration and software, affecting what is vertically integrated and the very definition of a variety.

The industry's shift to EVs relates to the sensitivity of offshoring decisions to trade costs (McCalman and Spearot, 2013; Head and Mayer, 2019). Trade policy shifts will lead to selective production relocations. Ambroziak (2016) and Pavlínek et al. (2017) show that FDI alone without R&D creates employment in intermediates. As technological dependence on Asian, especially Chinese, manufacturers grows, this is an important insight. Wingender et al. (2024) show that EV-related employment losses will be concentrated in the very countries that Ambroziak (2016) and Pavlínek et al. (2017) studied as FDI-led growth cases. The broader insight here is that IP will need to foster a genuinely innovative and productive automotive industry, not overly dependent on foreign CRMs and technology that would leave the sector exposed to employment losses beyond the CEE economies. Fact 9 highlights that the EU retains an important automotive knowledge base, while China's share of patenting has increased substantially. The 2020–2024 evidence documents continuing European knowledge linkages but cannot establish whether they have strengthened or weakened over time.

Adjustments will become evident in Europe's car industry. McKinsey's action plan (McKinsey & Company 2025) argues that European manufacturers need to cut costs by 20–50%, reduce time-to-market by 50%, invest EUR 200–300 billion in batteries by 2035 and bring about a sixfold expansion of charging infrastructure.

Takeaway. Globally, EV costs are falling rapidly, disproportionately so for Chinese manufacturers, leaving both EU and UK producers facing a widening cost and technology gap. Battery dependencies are real and growing (Fact 5): the industry faces difficulties in scaling European-owned battery production despite substantial investment in new facilities and relies on concentrated Chinese processing capacity and resource-rich economies for critical inputs (Fact 5). The required investment and productivity gains are substantial, but must be delivered at a time when automotive sales volumes and profit margins are falling.

3.3 Geopolitics: Trade and IP in an increasingly polarised world

Over the last five years, the automotive industry has witnessed a China shock of EV growth and Chinese subsidies (Rotunno and Ruta, 2024). On the European side, Draghi (2024b) describes an EU lack of competitiveness: Chinese manufacturers are a technological generation ahead and operate at 30% lower unit cost, worsened by higher energy prices and lower scale economies in the EU. The literature shows that the automotive industry's China shock is a result of both Chinese policy and an EU crisis of competitiveness. This section discusses how trade and industrial policies in the EU and UK are and should be deployed to help the industry to navigate geopolitical change.

3.3.1 Trade policy as a response

The EU has implemented several trade policy responses to shield its automotive sector. Trade policy has previously been used to address growing car imports (Goldberg, 1995; Berry et al., 1999), with unfavourable evidence. In the EU, the 2023 countervailing duty (CVD) investigation into Chinese EV subsidies generated debate. While legally appropriate, Sapir et al. (2023) call for an accompanying green IP, as trade barriers alone cannot replace advances in competitiveness. The EPRS (2024a) considers that CVDs need to be combined with IP, FDI rules requiring technology transfers and a push to diversify supply chains. Dadush (2024a) instead argues that CVDs are counterproductive as they raise consumer prices and reduce competitive pressures for EU car manufacturers.

The literature discusses the risk of Chinese retaliation. Aldaz-Carroll et al. (2024) point to rising protectionism in EU, US and Chinese climate policies, which may trigger retaliation. European countries are sensitive to retaliation given the continued importance of sales in China. Garcia-Herrero (2024) notes that Germany switched from abstention to opposition when voting on CVDs on Chinese EVs, which may serve to protect its China-based EV production. It also underscores governance issues and highlights that the EU does not currently speak with a unified voice on trade, one of its core competencies.

Dadush and McCaffrey (2024) critique the European Commission's subsidies calculation as overstated. Oxford Economics (2024) calculates that a 25% US tariff would severely harm European manufacturers.

In the UK, the Trade Strategy (UK Department for Business and Trade, 2025a) calls for pragmatic sectoral approaches. While maintaining strong relations with the EU, the US and China, policymakers hope to pursue differentiated engagement, reform the WTO (including joining the Multi-Party Interim Appeal Arbitration Arrangement) and expand Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) membership. This new strategy reflects a fragmenting world and a commitment to multilateral mechanisms. However, vehicle manufacturers continue to face an increasingly complicated net of tariffs, regulations and RoO regimes across these trading relationships.

3.3.2 IP as a response

China has emerged as a major provider of FDI in the industry (Fact 7). Tagliapietra et al. (2025) report that EUR 5 billion of greenfield investments were made in 2024, creating technological and climate opportunities while fostering a different kind of dependence on China. A suitable IP may take the form of conditional engagement. Under such a framework, access to the single market would be conditional on technology transfer and supply chain localisation. Investment screening would need to be coordinated and harmonised at EU level to avoid arbitraging. The proposed approach is reminiscent of Chinese investment policies for Western car makers in the 1980s and 1990s. Fact 7 uses Orbis data to document how FDI sources in the EU and UK have diverged to date.

Juge et al. (2025) point to the cost of regulatory instability and suggest that the USD 6 billion of project cancellations in the US battery sector since the election of President Trump has caused irreversible damage. Patella et al. (2018) consider policy consistency a critical success factor for EV deployment. The election pledge of the UK Labour Party (2024) argues that the 2023 ICE phase-out reversal created policy uncertainty that deterred investment.

3.3.3 Economic security and CRMs

The European Commission's 2023 Economic Security Strategy proposed a "de-risk rather than decouple" approach. Key elements are supply chain resilience, technology sovereignty and investment screening. In 2025, the EU committed to improving its monitoring of strategic dependencies, together with a willingness to incur economic costs to reduce such dependencies (European Commission, 2025a). In the private sector, BusinessEurope (2024) calls for economic security concerns to reinforce openness and competitiveness. The Royal United Services Institute (2025) criticises current EU thinking on economic security for a lack of precision, pragmatism and partnership.

Local content rules are the newest instrument in this toolkit and the one with the most direct bearing on EU–UK relations. The Commission's proposed Industrial Accelerator Act (European Commission, 2026) would attach "Made in Europe" conditions to strategic products, including EVs and batteries, through public procurement, terms of public support and conditions on some inward investment. The stated aim is to secure European manufacturing capacity where dependence on third countries is judged a risk. For the automotive sector, the critical detail is the definition of "European". UK-built vehicles and UK-made components sit inside integrated European supply chains and whether they count as domestic content will shape sourcing decisions on both sides of the Channel. This report does not examine the proposed Industrial Accelerator Act in detail. The question it raises for the analysis is one of capability, developed in Fact 10: whether the EU and the UK can build the battery and component base that any local content rule presupposes. Section 8 shows how heavily that question already weighs on firms' investment decisions.

Critical minerals form a new pivotal dimension of economic security. According to the Global Critical Minerals Outlook (IEA, 2025b), prices for battery metals have collapsed, with supply surging beyond demand. However, supply chains for such materials are increasingly concentrated: China dominates the processing of lithium, cathode active materials, graphite, phosphoric acid (used in lithium iron phosphate (LFP) batteries) and manganese sulphate. By 2035, copper will face substantial supply shortages. Beyond price stabilisation measures – price fluctuations discourage investments – commitments to volumes and partnership frameworks are considered. Moreira and Pannetier (2022) show that truly green EVs require a high portion of sustainable energy across the lithium supply chain. Decarbonising lithium's supply chain through fuel switching in processing can reduce emissions by 50%. This is a key insight for green supply chain standards.

These dependencies are invisible under a standard automotive sector classification but become central in BG-level assessments.

Takeaway. China's cost advantage in EVs goes beyond subsidies and cannot be addressed through trade barriers alone; domestic IP must accompany defensive measures. CRM supply chains are concentrating further, creating strategic dependencies (Fact 4) that neither trade policy nor domestic IP can resolve without active supply chain diversification and international partnerships. A common, harmonised policy stance that avoids regulatory instability and coordinates investment screening (Fact 7 shows rising divergence in FDI sources between the EU and UK) is a prerequisite for an effective EU–UK response.

3.4 EU–UK relations and the evolving policy landscape

Relationships between the EU and UK have undergone significant change over the past decade. In addition, policymakers in the EU and UK increasingly use industrial and trade policies to address the challenges faced by the automotive sector. This section explores each party's individual policies and bilateral developments.

3.4.1 UK: Adaptation and strategy

The first section presented a chronology of the automotive industry focused on the EU–UK relationship. This section extends this approach by discussing how UK automotive policy has moved through three phases: pre-withdrawal alignment with the single market, post-withdrawal damage limitation, and, most recently, an active IP. In the first phase, the UK's competitive position rested on regulatory alignment and single market access. The 2013

automotive strategy (HM Government and Automotive Council, 2013) treated these as foundational advantages and committed an initial GBP 1 billion to the Advanced Propulsion Centre, establishing the principle of government-industry co-investment.

The UK's departure from the EU removed these foundations. The House of Commons Business, Energy and Industrial Strategy (BEIS) Select Committee (2018) concluded that any post-Brexit arrangement could only limit damage, confirming that WTO tariffs would eliminate the sector's profit margins (Bailey and De Propris, 2017). The reshoring opportunity identified earlier (Bailey and De Propris, 2014; Davies et al., 2014) gave way to a more pressing concern: supply chains' inability to absorb increased border frictions. By 2023, the sector had suffered six consecutive years of declining production volumes (House of Lords Library, 2023).

The third phase reflects a recognition that the EV transition and post-Brexit adjustment cannot be managed passively. The stakes are asymmetric: CBI Economics (2024) simulates that a successful BEV scale-up would add GBP 16.1 billion in gross value-added (GVA) and 167,000 jobs by 2035, whereas failure would cost GBP 34.1 billion and 404,000 jobs. The policy response has escalated accordingly. In response to the House of Commons Business and Trade Committee (2024), the UK government committed GBP 2 billion by 2030. The Labour Party (2024) pledged to reinstate the 2030 ICE ban and co-invest in gigafactories targeting 200 GWh of battery capacity. RoO relief through improved ties with the EU was part of this plan. However, delivery still lags behind ambition. Zero-emission cars accounted for 21.8% of new car registrations in the first quarter of 2026. However, zero-emission vehicles (ZEVs) – battery-electric and fuel-cell vehicles – still accounted for 5.1% of the total stock of licensed vehicles in the UK at the end of March 2026, up 1.1 percentage points (pp) on the year. The difference reflects the much slower turnover of the existing vehicle fleet. Charging infrastructure gaps also mean that uptake remains unevenly distributed across regions (UK Department for Transport, 2026; House of Commons Library, 2025). Parliamentary assessments find the transition proceeding too slowly (House of Lords Library, 2024) and the House of Commons Business and Trade Committee (2026) has called for a new economic security doctrine.

The most comprehensive response is the Modern Industrial Strategy (UK Department for Business and Trade, 2025b), which commits GBP 86 billion to R&D, pledges to cut regulatory costs by 25% and caps corporate taxes at 25%. Its Advanced Manufacturing Sector Plan (UK Department for Business and Trade, 2025b) forms an active IP across four pillars: reducing energy costs (British Industrial Competitiveness Scheme and Critical Minerals Strategy); directing R&D and capital investment into batteries (Battery Innovation Programme) and autonomous vehicles (Automotive Technology Strategy in 2026 and Automated Vehicles Act by 2027); supporting manufacturing clusters (GBP 160 million per investment zone); and strengthening public-private partnerships. This strategy deploys more investment and marks a decisive turn towards industrial activism.

3.4.2 EU: Regulation and IP

EU automotive policy has undergone a parallel shift, moving from a regulation-led framework focused on emissions targets towards an active IP. Brown et al. (2021), commissioned by the European Parliament Committee on Industry, Research and Energy (ITRE), identified a paradox: European manufacturers lead globally in volume and R&D intensity, yet face structural deficits in battery supply, semiconductors, software capabilities and digital platform

development. Their eight policy recommendations span CRMs, green supply chains, charging infrastructure, skills, data sovereignty and autonomous vehicle regulation, and anticipate many elements of the subsequent policy response. The Draghi report (Draghi, 2024a) provides the most comprehensive framing, attributing Europe's competitiveness gap to regulatory instability, high energy costs and insufficient scale economies. It also proposes 10 sectoral measures centring on industrial action planning, technology neutrality, affordable EVs, software-defined vehicles and supply chain diversification. An important constraint on any IP is that BEV production costs per unit currently exceed consumers' willingness to pay, compressing margins and limiting manufacturers' capacity to self-finance the transition (Dietz et al., 2025).

The policy response has accelerated since 2025 across three dimensions. First, on the contested question of the 2035 ICE phase-out: where the European People's Party Group (2024) called for reversal in favour of technology neutrality, the Commission's Industrial Action Plan (European Commission, 2025b) opted for conditional flexibility, effectively easing the phase-out timeline for manufacturers. The same package includes measures on innovation and digitalisation, competitiveness and supply chain resilience, reskilling and state aid. Second, the Clean Industrial Deal (European Commission, 2025c) represents the broader shift from regulation to IP. Nonetheless, more traditional EU measures such as electricity market reform to reduce industrial energy costs and simplified state aid rules sit at its heart. The accompanying Automotive Package adds a Battery Booster Strategy, more flexible yet forward-looking emission standards and decarbonisation rules for corporate vehicles (European Commission, 2025d). Third, the Industrial Accelerator Act (European Commission, 2026) is widely interpreted as the EU's answer to the US Inflation Reduction Act (IRA).

EU policy has moved from setting emissions targets to deploying direct investment, state aid and trade instruments. A tension remains between the ambition of the 2035 phase-out as a policy anchor and the political pressure to soften it, given compressed margins and concentrated employment risks. Future policy will need to navigate this tension.

3.4.3 EU–UK relations: RoO, economic security and strategic cooperation

The Trade and Cooperation Agreement (TCA)'s RoO interact with the EV transition to create an acute pressure point. EVs must contain a rising share of EU/UK-origin inputs to qualify for zero tariffs, with thresholds reaching their highest level by 2027. This requirement presupposes battery manufacturing capacity and origin-compliant supply across the wider EU–UK value chain, against a smaller UK capacity base and an incomplete EU ecosystem. The EPRS (2024b) documents this shortfall. The cost of non-compliance is high: extending the 2024 thresholds to 2026 (Council of the European Union, 2023) avoided up to GBP 4.3 billion in tariffs on the UK automotive sector (Prime Minister's Office, 2023; UK in a Changing Europe, 2023). The 2027 deadline remains in place, as does the capacity gap. Fact 10 brings battery capacity and import-dependence evidence together with patent data on technological specialisation. The latter are a complementary indicator of capabilities, not a measure of manufacturing output or RoO compliance.

The RoO challenge is compounded by a structural problem. Automotive production has globalised beyond the regional networks that the TCA's origin rules were designed to govern. Supply chains now stretch to CRM-rich economies and Asian battery manufacturers, making it increasingly difficult for origin-based rules to capture where value is created. This is where the BG lens becomes analytically useful: the activities that determine whether an EV qualifies

under RoO (mining, refining, cell and module assembly) span sectors that a narrow automotive classification misses.

The geopolitical context has shifted the calculus for cooperation. Both the EU and UK face increasing competition from China, rising trade barriers from the US and novel resource dependencies. The EU's Joint Communication on economic security (European Commission, 2025a) explicitly frames supply chain resilience as a policy priority, creating new pressures as well as new common ground. Where the TCA was drafted primarily as a trade management instrument, the automotive sector is now embedded in an economic security debate in which the UK and EU share interests.

The 2025 diplomatic reset has begun to build institutional channels for addressing these shared concerns. The UK–EU Summit Outcome Document (UK Government and European Council, 2025) signals an intent to promote regulatory dialogue. Bilateral treaties reinforce this trajectory: the UK–Germany Treaty on Friendship and Cooperation (UK Government and German Government, 2025) is particularly relevant given the two countries' automotive integration; the UK–France Industrial Partnership Joint Statement (UK Government and French Government, 2025) covers clean energy and advanced manufacturing cooperation. These multilateral and bilateral channels represent a departure from piecemeal TCA management. Whether they produce durable cooperation on RoO, charging infrastructure interoperability, joint CRM procurement and coordinated investment screening remains to be seen.

Takeaway. Both the UK and EU have shifted from regulation-led models to active IP in response to converging pressures: the EV transition, Chinese competition, US trade disruptions and structural cost disadvantages. The most acute bilateral question is the tightening of RoO thresholds under the TCA in 2027. Industry on both sides reports a substantial expected compliance challenge under the rules scheduled for 2027, although the aggregate industry estimates cannot be independently validated or used to identify where the constraints arise. . The question is whether sany accommodation is paired with a credible plan to build the capacity required for compliance. Improving diplomatic ties opens a window for strategic cooperation, which may close if regulatory divergence widens.

4. Understanding the automotive ecosystem through data

4.1 Four analytical and data pillars

The unit of analysis is the BG, defined as a set of at least two legally autonomous firms that function as a single economic entity through hierarchical control, with a global ultimate owner (GUO) holding, directly or indirectly, a majority stake in at least one independent subsidiary (Altomonte et al., 2026). The rationale is that investment, R&D and employment decisions are taken within corporate groups rather than at the level of the country or the plant. Ownership structures determine the entities through which profits, intellectual property rights (IPR) and restructuring are routed. For groups spanning the UK and the EU, they are also the

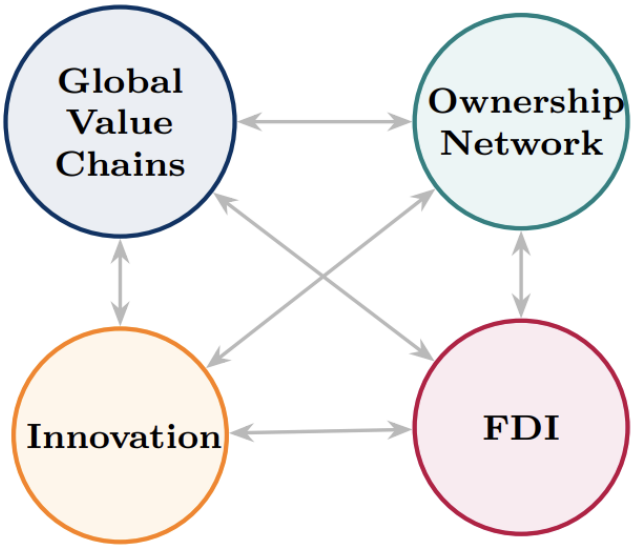
channel through which trade and IP ultimately take effect. This lens reveals strategic dependencies and emerging vulnerabilities that country-level statistics cannot capture.

The empirical analysis is organised around four pillars, each capturing a margin along which manufacturing BGs act and evolve over time in response to macro-trends (or stressors). BGs operate within complex GVCs that are (in part) controlled via equity modes through their ownership network operating across countries and sectors. BGs make key decisions on the location of innovation activities, their strategic direction and how innovation supports and is integrated into other activities of the group and the wider value chain. Through FDI, acquisitions and joint ventures, BGs govern and reshape value chains, with important implications for innovation and value creation in host countries and regions.

The analysis is organised around four data pillars, each capturing a margin along which BGs act (see Figure 1).

- **GVCs:** Foreign value-added (FVA) shares of exports and bilateral source decompositions, built from the OECD Trade in Value Added (TiVA) and inter-country input-output (ICIO) tables, with Comtrade.
- **Ownership network:** Network topology, including bilateral ownership distance between UK and EU firm pairs, read directly from the reconstructed network mapped from Orbis Historical.
- **FDI:** Completed cross-border projects from Orbis Crossborder, valued in USD and smoothed as two-year moving averages, split by activity, climate-relevant green flag and source country.
- **Innovation:** Patent measures using simple patent families from Orbis IP and the European Patent Office (EPO) statistical database (PATSTAT), assigned to technology classes from their main International Patent Classification (IPC) code and located by inventor country.

Figure 1. Conceptual framework



Source: *Authors' elaboration.*

GVCs are the main macro-level lens connected to the underpinning micro-level of the BG. BGs are identified through the ownership network controlled by the major global players in the European automotive industry. The combination of the BG ownership network and the economic activities orchestrated and controlled by the network via the value chain (including non-equity linkages, e.g. supply-chain buyer-supplier linkages) constitutes the automotive ecosystem considered here. Innovation activities are controlled by and connected to the automotive ecosystem and shape its evolution, technological trajectory and, ultimately, its location and job footprint. New FDI captures the evolution of the automotive ecosystem over time, across countries and along business functions (from R&D to production, sales and logistics). FDI can also incorporate "green" content in terms of products (final and intermediate components), processes and use of inputs (e.g. energy or recycled materials) that contribute to lower emissions and/or other environmental objectives.

Table 1 shows how each pillar is linked to a set of data sources with global coverage that are analysed in the following sections.

Table 1. Data sources and headline metrics

Pillar	Data source	Headline metric	Unit
GVCs	OECD TiVA, OECD ICIO, UN Comtrade	FVA share of exports	Country–year
Ownership network	Orbis Historical	Pair-distance distribution, assortativity	Firm–firm pair
FDI	Orbis Crossborder	Completed FDI value, source-country mix	Project–year
Skill mix and technology	International Labour Organization (ILO), International Federation of Robotics (IFR)	Industrial skill composition, automation intensity	Country–year
Innovation	Orbis IP/PATSTAT	Patent counts, backward citations	Patent family

Notes: *Coverage: 62 automotive BGs, ≥ 95% of EU/European Free Trade Association (EFTA)/UK registrations 2014–2024; Appendix A details the construction of every series; Appendices B and C set out the ownership-network and employment procedures.*

4.2 Ownership networks

Investment, R&D and employment decisions are made within corporate groups that span multiple countries and regions. This report focuses primarily on BGs, a set of at least two legally autonomous firms that function as a single economic entity through hierarchical control, with a GUO owning, directly or indirectly, a majority stake in at least one legally independent subsidiary (Altomonte et al., 2026). The ownership structure determines the entities through which profits, IPR and restructuring processes are routed. Networks

therefore reveal strategic dependencies that country statistics miss, as well as focusing on the BGs spanning the UK and the EU where industrial and trade policy bite.

This study focuses on 62 groups, accounting for at least 95% of EU/EFTA/UK registrations over the period 2014–2024. Each group is mapped to its GUO and reconstructed from Orbis Historical ownership data, with public and semi-public upper layers severed so that the network represents the private economic group. These groups are classified in "Light-duty vehicles – established OEMs [original equipment manufacturers]", "Light-duty vehicles – Chinese, EV-native and emerging", "Small-volume manufacturers" and "Heavy-duty vehicles" (see list in Appendix E).

Figure 2 illustrates the reconstructed ownership network of BMW in 2024 as an example of the structure of one of the 62 BGs in the sample. The main holding company, represented by the larger circle in the figure, controls 266 subsidiaries (smaller circles, with size proportional to firm size) through direct majority stakes, indirect control by transitivity and indirect control through the consolidation of voting rights (see Appendix B for details). The figure should be read as a map of corporate control rather than a conventional supply chain map: it identifies the entities through which strategic decisions, ownership rights, financial flows and restructuring options are organised within the group. The exposure of the UK and the EU to automotive transformation is mediated both by trade in vehicles and components and by the internal architecture of multinational groups that control trade and investment flows and technologies.

Figure 2, panel (a) shows that BMW's ownership structure is strongly geographically clustered. A large EU-based sub-tree (blue circles) is visible on the right-hand side of the chart, alongside a smaller UK-based cluster at the bottom right and a distinct North American cluster at the top left. This pattern illustrates how BGs connect territories through common ownership while preserving a highly differentiated internal geography. EU, UK and non-European operations are not simply independent national units, but are positioned within an integrated hierarchy of control. The BMW example provides an initial idea of how BG data can uncover the underlying structure of EU–UK relationships: intra-EU links, intra-UK links and cross-border ownership bridges coexist within the same corporate system. These bridges matter because they are the channels through which changes in regulation, trade costs, IP or market conditions may trigger internal reallocation across subsidiaries, functions and jurisdictions.

Figure 2, panel (b) shows a more complex pattern by looking at the industrial classification of the subsidiaries. Some ownership chains are dominated by automotive manufacturing activities, while others combine core automotive manufacturing, downstream activities and other related operations. A further group of entities specialised in financial activities is concentrated relatively close to the holding company, suggesting that financial, treasury and ownership-management functions are part of its core organisational architecture. This functional heterogeneity reinforces the value of analysing BGs rather than sectors alone: the same automotive group simultaneously coordinates production, sales, finance, holding structures and other support activities across different jurisdictions. Country-level automotive statistics capture only part of the economic relationship, while ownership networks reveal the corporate channels through which value, control and strategic dependency are organised.

Figure 2. Reconstructed ownership network of a single BG (BMW Group)

(a) Subsidiaries by macro-region

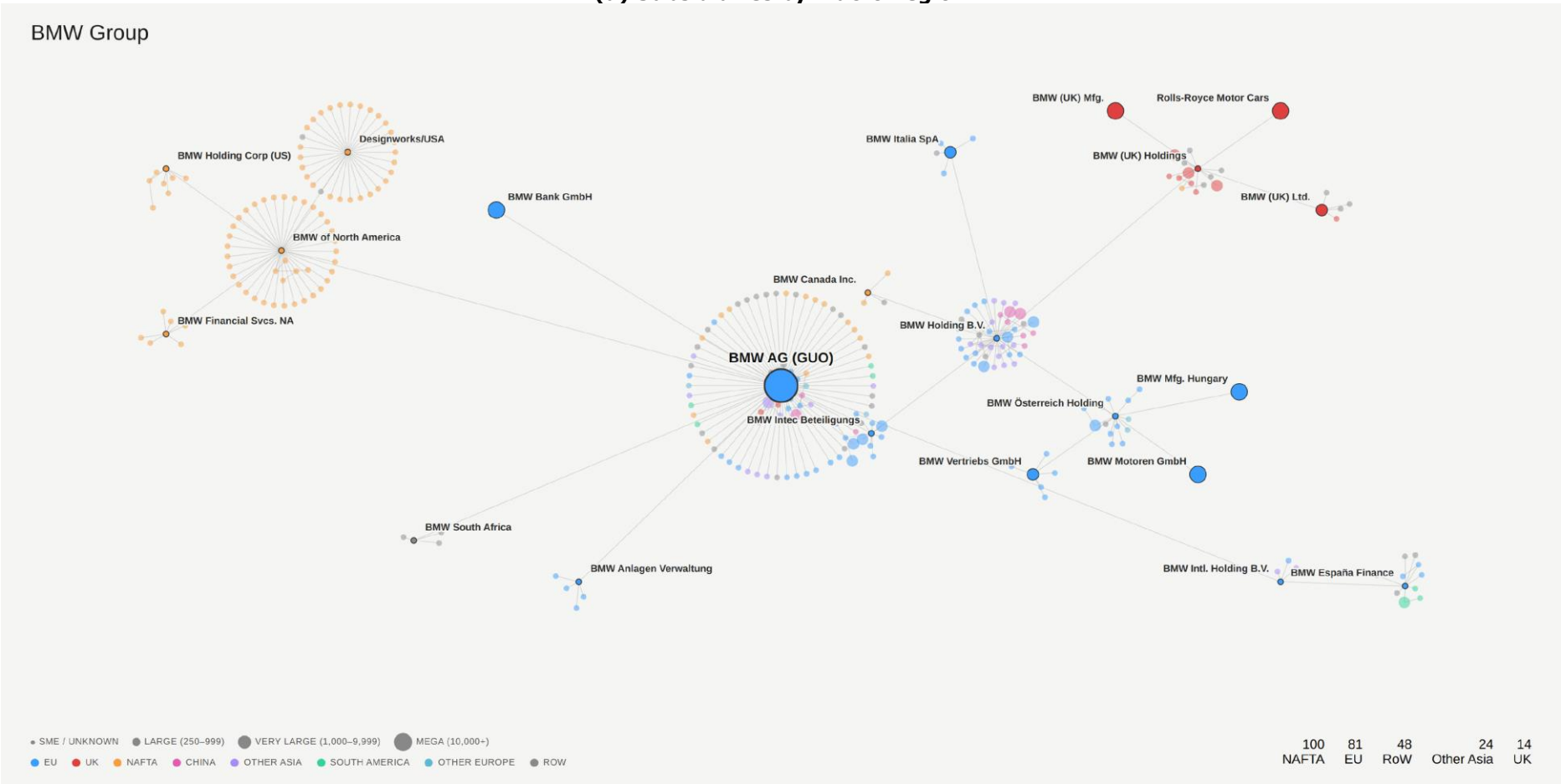
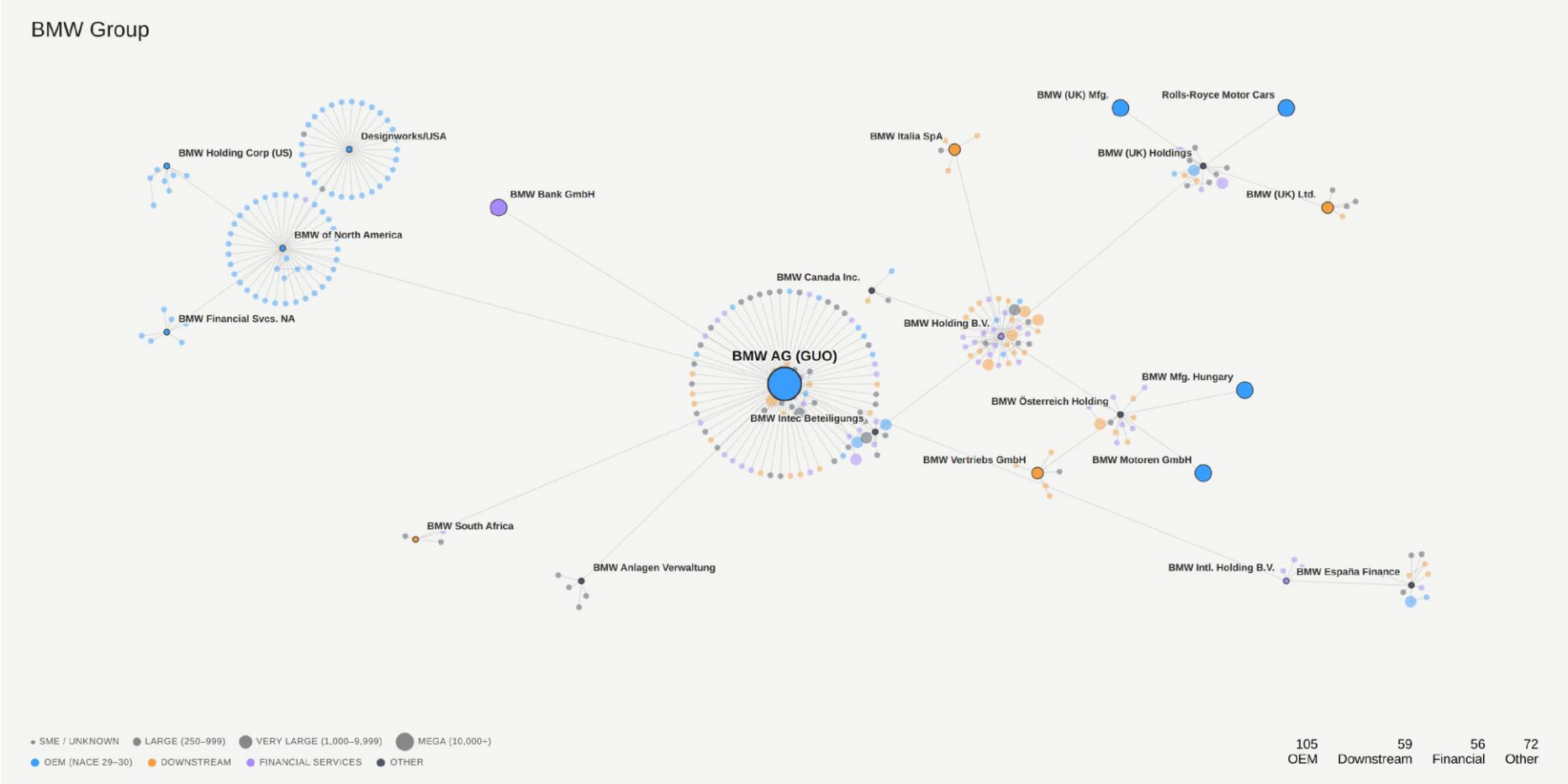


Figure 2 (continued)

(b) Subsidiaries by industrial classification



Source: *Authors' elaboration of Orbis Historical data.*

Notes: *Each node is a subsidiary and each edge a direct ownership link; the tree is rooted at the GUO. Node size reflects firm size (employment); colour identifies the macro-region of incorporation in panel (a) and the industrial classification in panel (b), as shown in each legend. Public and semi-public upper layers are severed so that the network represents the private economic group (see Appendix B).*

5. Part I: Global reallocation and composition

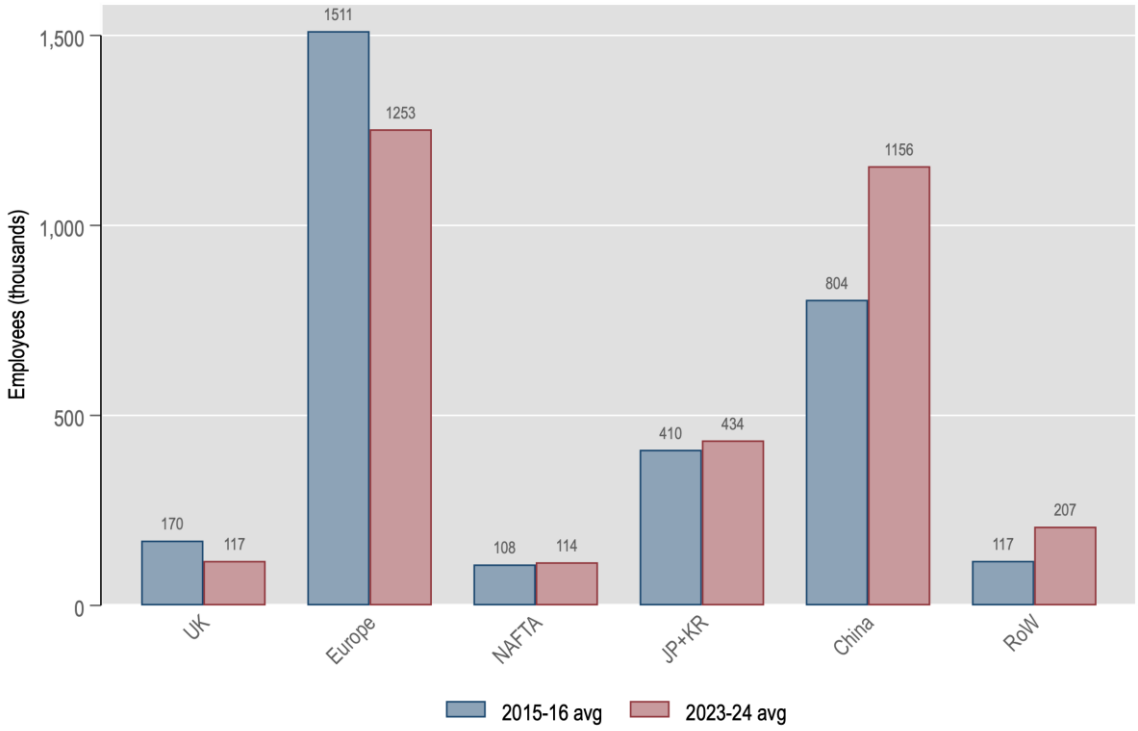
5.1 Fact 1. The global reallocation of OEM employment creates a shared EU–UK challenge

This study's focus on BGs can trace broad movements in OEM employment by aggregating the employment of the main 62 BGs by geography and following its evolution over time. This provides a more nuanced picture than standard sectoral data from national accounts. Here, it is mainly used to interpret EU–UK automotive interdependence: employment is allocated to the operating entities within each group, while strategic control remains organised through cross-border corporate structures.

Figure 3 shows the geographical evolution of employment within these groups. Between 2015–2016 and 2023–2024, the centre of gravity shifted decisively away from Europe and the UK. Europe remained the largest employment base, but OEM employment fell by 17%, while the UK contracted by 30%. Together, Europe and the UK lost more than 300,000 OEM manufacturing jobs within the BGs. China moved in the opposite direction, growing by more than 40% to become the only large macro-region to record substantial employment growth (approx. 350,000 jobs). Employment in the rest of the world also increased, while NAFTA countries and Japan + South Korea (JP + KR) remained broadly stable.

This is not a simple decline story. The reallocation is consistent with two potentially complementary processes, which the aggregate employment comparison does not quantify separately. The first is within-BG reconfiguration: established BGs, particularly those with their headquarters (HQ) in Europe, may reallocate employment across their international operations. The second is the emergence of new players, most visibly in China, whose rapid expansion can enlarge the global employment base of the sector and pull its centre of gravity eastwards. The economic substance of the shift is therefore not only that "automotive" employment has moved, but that the location of production capacity, supplier demand, learning-by-doing and future investment mandates is changing. Fact 2 provides complementary evidence on the growing global employment share of younger BGs. The relative decline of Europe thus owes as much to the internal restructuring of incumbents as to the entry and growth of BGs that were marginal or absent at the start of the period. Even if the aggregate employment comparison does not establish their relative contributions, this regionally uneven pattern is consistent with the literature's expectations (OECD, 2024; Wingender et al., 2024).

Figure 3. OEM employment, by macro-region, 2015–2016 vs 2023–2024



Source: *Authors' elaboration of Orbis Historical data.*

Notes: *Employment in vehicle manufacturing (EU statistical classification of economic activities (NACE) 291) within the 62 BGs, allocated bottom-up through each group's reconstructed ownership tree to the country of the operating entity, aggregated to macro-regions and reported as two-year averages (2015–2016 and 2023–2024). "Europe" covers all European countries except the UK; see Appendix C for allocation algorithm and coverage-ratio rules.*

Figure 3 shows that the UK and Europe face a shared structural challenge: both remain deeply embedded in the legacy automotive production system, but both are losing relative weight as global employment and manufacturing scale move eastwards. In this context, the relevant policy question is how the UK and EU can preserve and upgrade their joint position within the value chain. That means looking beyond sectoral employment totals to the specific functions, capabilities and linkages that still anchor value locally: advanced manufacturing, engineering, R&D, battery and EV components, software, testing, standards, finance and after-sales services.

Takeaway. The centre of gravity of the industry has moved. Its magnitude and direction matter for both regional IP and supply chain risk. The EU and the UK face a common strategic problem: their automotive ecosystems remain strongly connected, but both are exposed to the same global reallocation of scale, employment and supplier demand.

5.2 Fact 2. Historical OEM groups still anchor EU–UK automotive integration

This section analyses BGs by founding era, broadly pre-1950, 1950–1989, 1990–2009 and 2010 onwards.

Figure 4 shows the changing distribution of employment across these classes in the EU and the UK and compares them to the global shift. Employment (Fact 1) is split by the founding-vintage class of each group[1], based on the main manufacturer[2] (see Appendix A). The purpose is to identify the types of corporate actors holding automotive employment on each side of the Channel and through which EU–UK adjustment is likely to occur.

In the EU and the UK, the oldest class carries almost all employment: in both cases employment remains overwhelmingly concentrated in well-established pre-1950 groups. The contrast with the global picture is sharp. Globally, the share of employment held by pre-1950 groups falls substantially, while younger groups, especially those founded between 1990 and 2009, gain weight. The post-2010 "EV-native" class is almost entirely absent, accounting for a negligible share of employment in the EU or the UK and visible at the global level only through Chinese and US entrants.

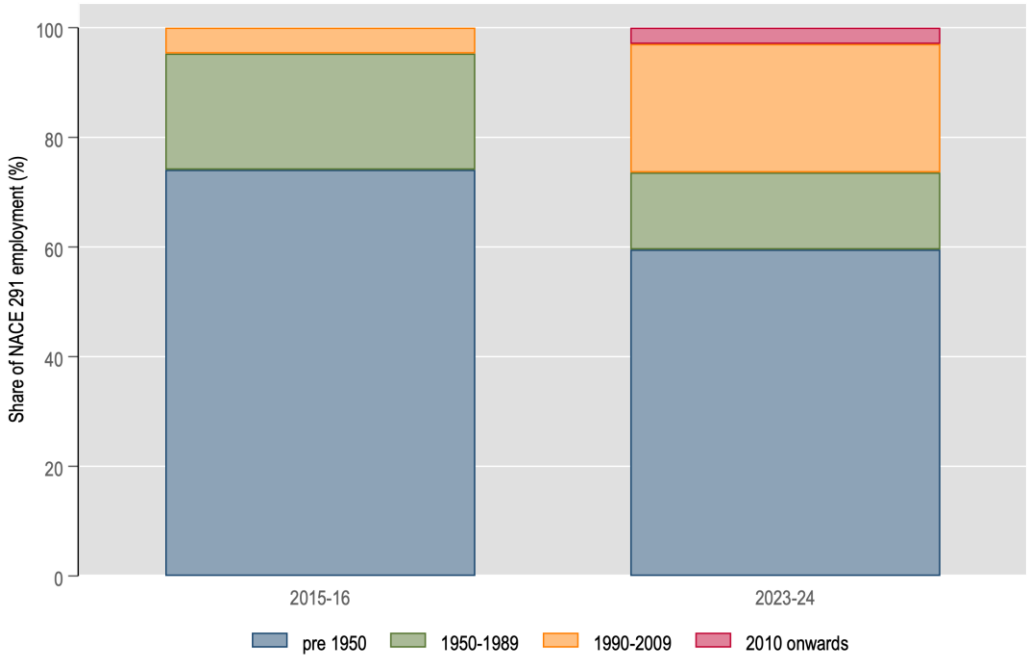
The European EV transition is therefore a transformation of incumbents and policy levers must work through, rather than around, legacy groups. This sharpens the labour risk concern: as adjustment cannot be outsourced to a new cohort of firms, the burden of retooling falls on those incumbents whose current employment is ICE-weighted (Fact 3). Additional EV capacity in Europe must be built from within incumbents through retooling and new model lines, not absorbed by a domestic challenger that does not exist at scale.

This is the first implication for the post-Brexit EU–UK value chain. Figure 4 shows that Brexit has not been accompanied by a marked divergence in the founding-vintage composition of the UK and EU automotive employment in these BGs. On both sides, employment remains anchored in the same historical OEM groups, whose decisions about platforms, model allocation, component sourcing and retooling continue to structure cross-border integration. What may have changed since Brexit is the margins on which these incumbent groups make allocation decisions: trade frictions, RoO, battery localisation, regulatory alignment, investment incentives and access to the wider European market (Facts 6 and 7). The point here is narrower: EU–UK integration remains incumbent-led, but the competitiveness of that integration is now being tested under more difficult global and regulatory conditions.

[1] As vintage is assigned at BG level, a BG's entire workforce inherits its founding-era label and the figure reflects the kinds of firms holding European employment, rather than the age of individual plants.
[2] For example, Stellantis is recorded in the pre-1950 group, although it was founded only in 2021.

Figure 4. OEM employment, by BG founding vintage, 2015–2016 vs 2023–2024

(a) Global



(b) EU

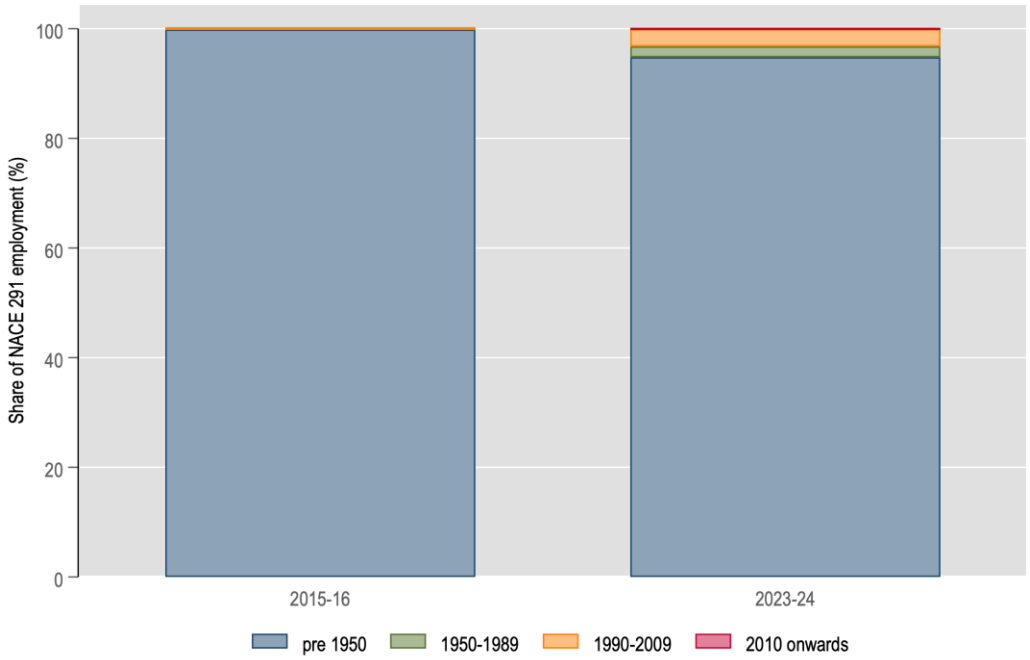
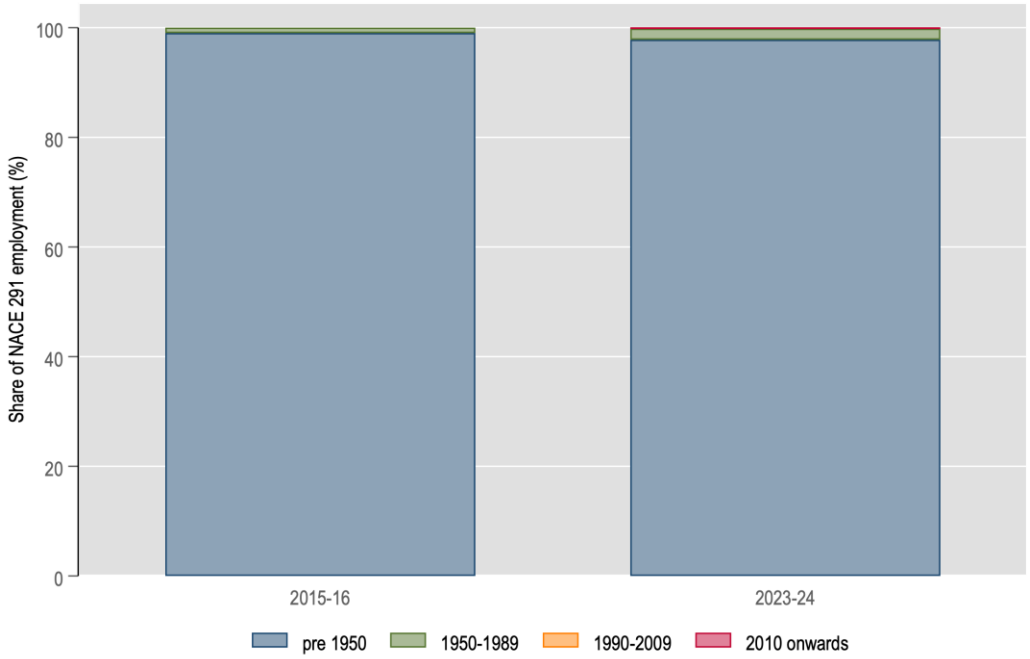


Figure 4 (continued)

(c) UK



Source: *Authors' elaboration of Orbis Historical data.*

Notes: *Same allocated employment as Figure 3 (Orbis Historical, NACE 291, two-year averages), split by founding-vintage class of each BG's main manufacturer (pre-1950, 1950–1989, 1990–2009, 2010 onwards); founding vintage assigned at BG level and entire workforce inherits its founding-era label; see Appendices A and C.*

Takeaway. There is no shadow EV sector waiting in the wings: EU–UK competitiveness depends on how historical OEM groups retool and reallocate activity within their existing cross-border value chains.

5.3 Fact 3. The EU and UK share EV transition risk, but face uneven adjustment burdens

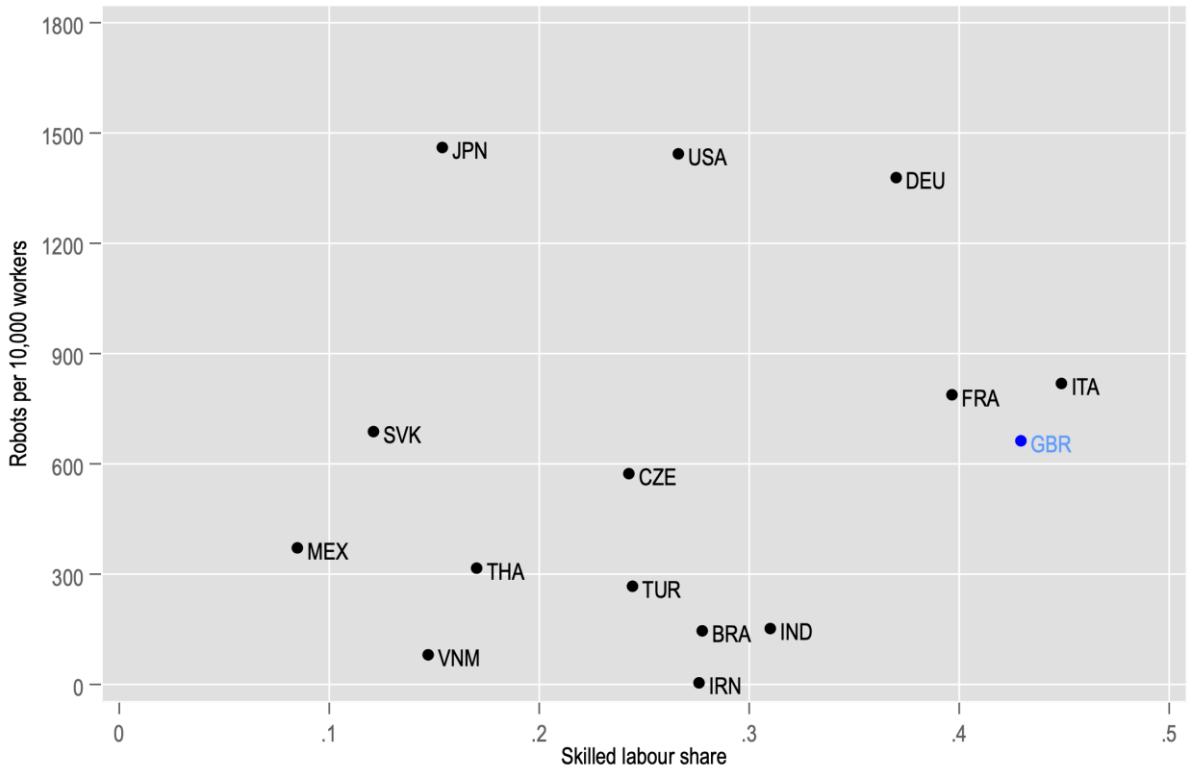
This section combines three perspectives on transition exposure. The first is a skill–automation positioning of the major producer economies; the second is the powertrain orientation of their employment; the third is the geography of production sites across the EU and the UK. Together, these measures show the extent to which automotive employment is exposed to electrification, where this exposure is likely to materialise and through which labour market and value chain channels. The skill–automation positioning (see Figure 5) combines an industry-level high-skill intensity measure (ILO data) with an automation-intensity indicator measured as robots per 10,000 workers (IFR data), by country for 2022. Powertrain employment shares (see Figure 6) reuse the BG-level employment allocation of Fact 1, with each group split by its powertrain orientation.

In Figure 5, each country sits in a plane whose horizontal axis captures workforce skill intensity, measured as the share of high-skilled workers in the automotive sector, while the vertical axis captures automation intensity, measured as the number of robots per 10,000 workers. A country's position summarises the two margins along which it can absorb an EV transition: the specificity and cost of the skills at risk, and the extent to which production systems are already organised around automation. Figure 6 reports, for each region, the

share of employment attached to ICE versus electrified powertrains, indicating how much of the existing workforce sits on the side of the displaced technology.

Three country groups stand out: CEE, emerging Asia and Mexico combine low-to-intermediate skill with relatively low automation; Japan and the US combine intermediate skill with very high automation; and Western Europe, including the UK, combines high skill with intermediate automation. Germany is the main European exception, with automation intensity closer to Japan and the US. The UK sits within the high-skill European cluster, but below Germany, France and Italy in automation intensity. This gives the UK a distinctive exposure profile: a skilled automotive workforce, but a weaker automation buffer than the most robot-intensive producer economies.

Figure 5. Skill and automation intensity, by country, 2022



Source: Authors' elaboration of ILO and IFR data.

Notes: *Horizontal axis: industry-level share of high-skilled workers in the automotive sector (share, 0–1), from ILO 2022 data; vertical axis: automation intensity measured as robots per 10,000 workers, from IFR 2022 data; JPN=Japan; USA=US; DEU=Germany; ITA=Italy; FRA=France; SVK=Slovakia; CZE=Czechia; MEX=Mexico; THA=Thailand; TUR=Türkiye; IND=India; BRA=Brazil; VNM=Vietnam; IRN=Iran.*

Powertrain exposure compounds this effect differently across the EU and the UK. Figure 6 shows that both remain overwhelmingly incumbent- and mixed-powertrain systems, with very limited EV-pure employment. The EU employment base is still dominated by mixed-powertrain groups, while the UK appears more directly ICE-exposed, with a visibly larger share of employment attached to ICE-oriented groups. The risk is that much of the exposure of automotive employment sits inside historical BGs whose existing skills, plants and supplier relationships were built around ICE technologies. The combination of high skill and ICE

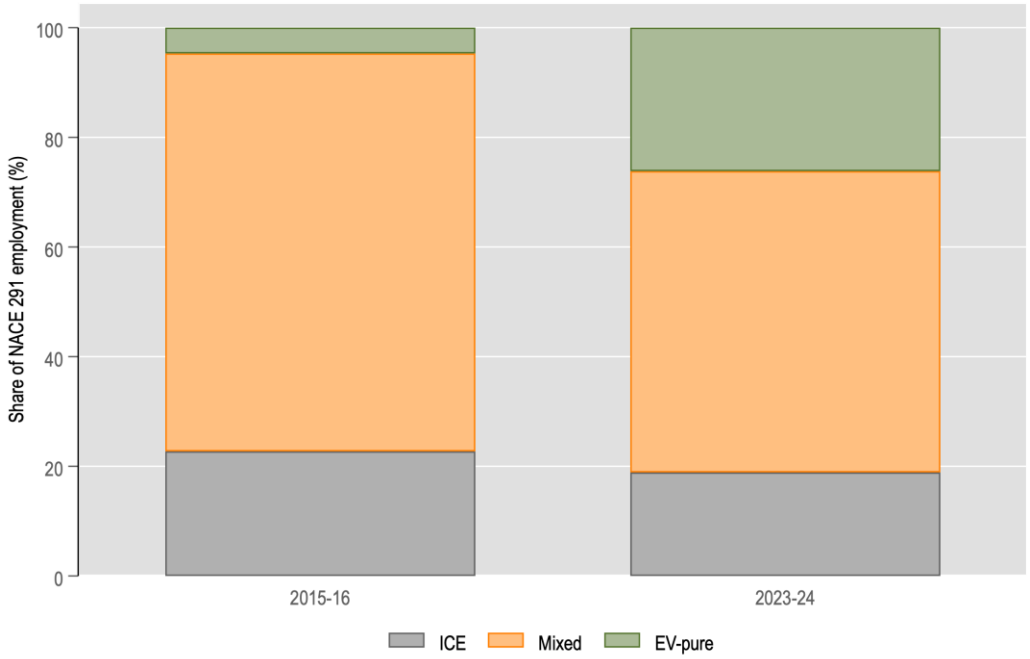
concentration is precisely the profile the transition literature suggests is most exposed (OECD, 2024).

Both the EU and UK economies are exposed through the same transition, albeit with different adjustment profiles. The EU has a broader mixed-powertrain employment base and a denser continental production system, while the UK combines high skills with a more ICE-intensive employment profile and lower automation intensity than the leading automated producers. Cooperation is about preserving trade flows, as well as coordinating the retooling, supplier upgrading, skills formation and investment conditions needed to keep both sides of the value chain competitive as production shifts towards battery electric, digital and lower-carbon mobility.

The same EV shock translates into different adjustment costs across producer economies: highly automated systems may absorb part of the transition through capital-intensive reconfiguration; lower-cost production hubs face a different challenge linked to capability upgrading; and the EU and UK face a higher cost adjustment because the transition risk is embedded in skilled, incumbent workforces and established supplier ecosystems.

Figure 6. OEM employment, by powertrain orientation, 2015–2016 vs 2023–2024

(a) Global



(b) EU

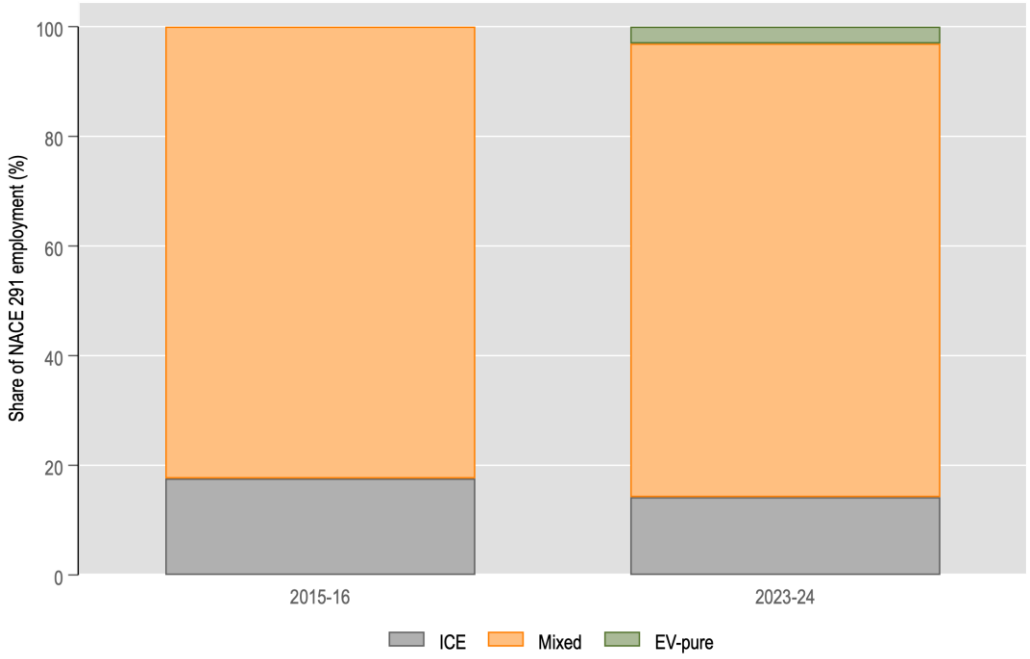
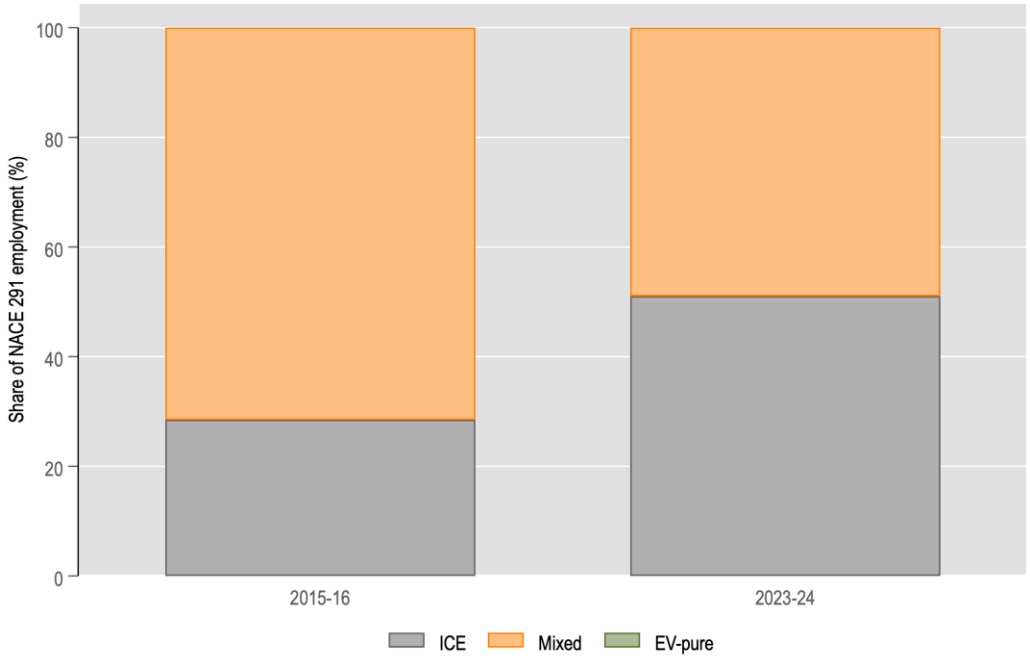


Figure 6 (continued)

(c) UK



Source: *Authors' elaboration of Orbis Historical data.*

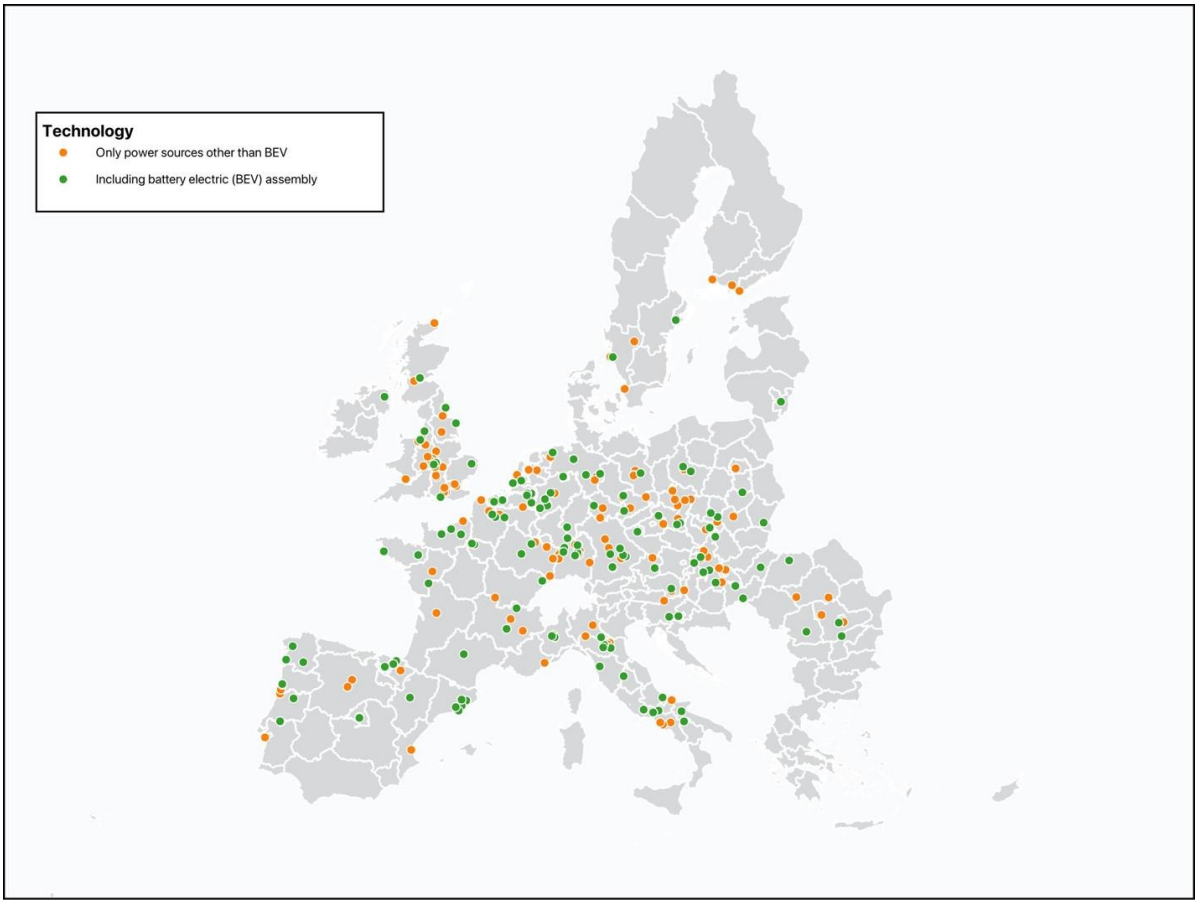
Notes: *BG-level employment allocation of Figure 3 (Orbis Historical, NACE 291, two-year averages), split by each group's powertrain orientation (ICE, mixed, EV-pure) and reported as regional share of employment; powertrain orientation recorded at BG level; see Appendix A.*

The final step is to locate this exposure geographically. Figure 7 maps automobile assembly and production plants across the EU and the UK, distinguishing facilities that include BEV assembly from those relying on other power sources. The map shows that transition exposure is not distributed evenly across national economies; rather, it is concentrated in specific automotive regions and production corridors, where plant-level retooling decisions may have concentrated effects on local labour markets and supplier ecosystems.

The map confirms that EU–UK transition risk is highly territorial. BEV and non-BEV facilities are interwoven across the wider European production space, including dense clusters in the UK, Germany, France, Spain, Italy and Central Europe. This concentration sharpens the asymmetry in two ways. First, it makes the high-skill, ICE-weighted profile a regional rather than national condition: the specific skills at risk are embedded in the supplier networks and labour pools surrounding individual sites, where reabsorption depends on local rather than national labour market conditions. Second, it identifies the facilities through which conversion, retooling or closure decisions may affect host regions. The magnitude of the shock is set by the technology transition, but its incidence is shaped by the geography of production[3].

[3] Plant locations drawn from ACEA's inventory of automobile assembly and production plants in Europe, covering sites active in 2026.

Figure 7. Automobile assembly and production plants, EU and UK, 2026



Source: *European Automobile Manufacturers' Association (ACEA) interactive map of automobile assembly and production plants in Europe.*

Notes: *Sites active in 2026; markers distinguish plants that include BEV assembly from plants relying on other power sources.*

Takeaway. The EU and UK face a shared EV transition risk, but uneven adjustment burdens: the UK is more ICE-exposed and the EU is more dependent on mixed-powertrain incumbents. Both depend on geographically concentrated plants and supplier ecosystems whose competitiveness will require coordinated retooling, skills and investment strategies.

5.4 Fact 4. Imported-input reliance and persistent EU–UK automotive interdependence

This section examines the EU and UK position within the automotive GVC, measured through the FVA content of their gross exports[4]. The FVA share captures how much of what a region exports originates, in value terms, outside its own borders and thus how far it sits towards the downstream, final-assembly end of the chain rather than the upstream, input-supplying end.

Figure 8 plots this share over time, with the horizontal axis showing the year and the vertical axis the FVA share of automotive gross exports, separately for the EU-27 and for the wider

[4] Measures drawn from OECD TiVA tables, which provide the Borin–Mancini (2019) decomposition of gross exports, and from the OECD ICIO tables, 2025 edition, for the bilateral source-country decomposition; see Appendix A.

EU-27+UK automotive space. A rising line means that a growing fraction of the value of the exported good is imported: exports increasingly lean on externally sourced intermediates rather than on domestically generated content.

The share rises for both regions after Brexit, indicating that imported content accounts for a growing proportion of automotive gross exports. This is compatible with a possible downstream shift along the chain. The EU-27+UK line remains below the EU-27 line, which is informative: part of what appears as foreign dependence for the EU-27 alone is internal to the wider European automotive space when the UK is included. This evidence supports the core argument of this report. The UK is outside the EU single market, but remains economically embedded in the wider European automotive value chain. This supports the argument on the weakness of UK value chain integration before Brexit (Bailey and De Propris, 2014) and extends the result to the EU after 2016.

This value-added evidence should be read alongside bilateral gross trade evidence. Official trade data confirm the scale of the relationship: Eurostat reports that, in 2025, the EU exported EUR 345.3 billion of goods to the UK and imported EUR 158.7 billion, generating a EUR 186.6 billion surplus; vehicles were the largest EU export product group to the UK, worth EUR 55.8 billion (16.2%) of all EU goods exports to the UK[5]. For HS87 (vehicles, parts and accessories) as a whole, the World Bank's WITS database and United Nations (UN) Comtrade report that the UK was the EU's largest export destination in 2025, with EU exports to the UK worth USD 63.2 billion, ahead of the US, Türkiye and China[6]. Combining WITS export and import flows also supports the view that the UK was the EU's largest automotive goods trading partner in 2025 under the HS87 definition: EU exports to the UK were USD 63.2 billion and EU imports from the UK were USD 17.1 billion.

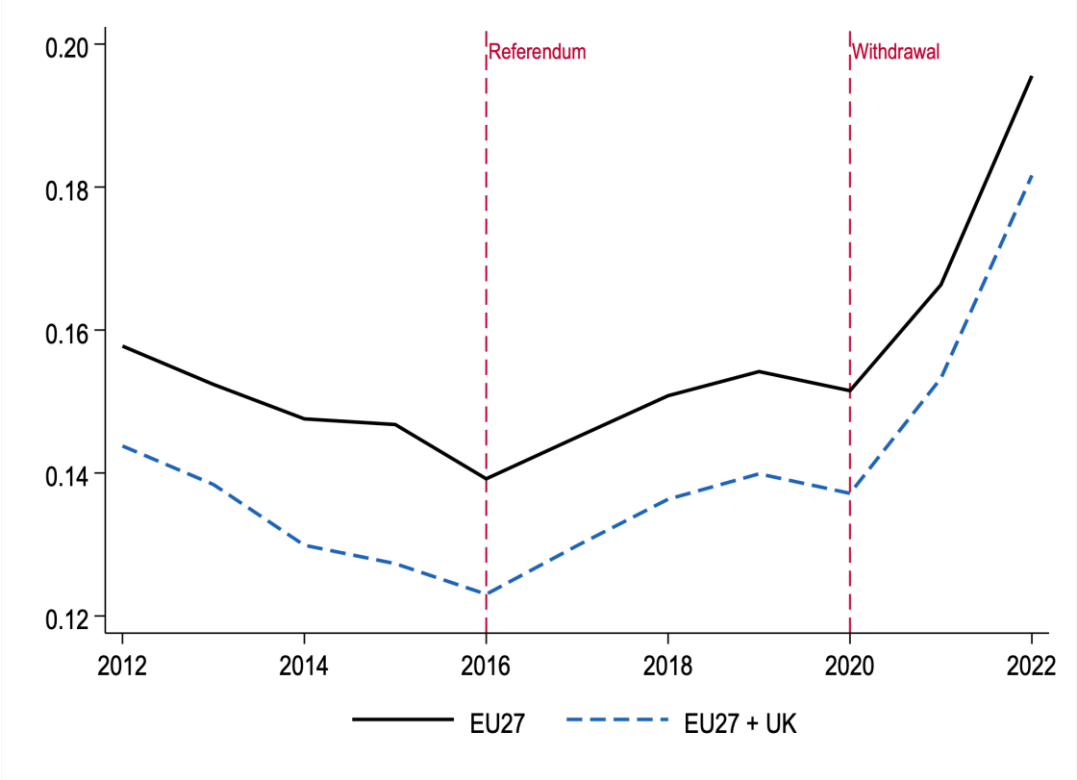
Industry evidence points in the same direction. In written evidence to the House of Commons Business and Trade Committee, the Society of Motor Manufacturers and Traders (SMMT) describes the UK and EU automotive sectors as "deeply interdependent and mutually beneficial". The same submission states that the EU was by far the UK's largest export market for cars in 2025, accounting for 56.7% of UK car exports, and that the UK was the EU's number one automotive trading partner and largest export market for EU-built vehicles. ACEA similarly identifies the UK as the EU's biggest market for new vehicle exports and the biggest export market for EU-made BEVs. It reports that almost 30% of the EU's 5 million vehicle exports went to the UK in 2025, worth EUR 42 billion, and that 60.4% of UK vehicle exports went to the EU[7]. SMMT also states that the UK is the EU's largest importer of automotive components globally, with imports of EU-made typical parts into the UK worth over GBP 6.9 billion in 2025 and UK typical-parts exports to the EU worth more than GBP 2.4 billion. This is consistent with WITS/UN Comtrade data for 2024, where the UK was the leading destination for EU HS8708 motor vehicle parts exports, narrowly ahead of China and the US[8].

The value-added data qualify the bilateral trade story. Gross trade shows that the EU and UK remain central automotive partners. Value-added decomposition shows that, since Brexit, the structure of this integration has become thinner and more asymmetric.

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[5] Eurostat. 2026. EU trade in goods with the United Kingdom in 2015–2025.
[6] WITS. 2025. European Union Vehicles; other than railway or tramway rolling stock, and parts and accessories thereof exports by country.
[7] ACEA. 2026. Fact sheet: EU–UK vehicle trade.
[8] WITS. 2024. European Union Motor vehicles; parts and accessories, of heading no. 8701 to 8705 exports by country.

Figure 8. FVA share of automotive exports, 2012–2022



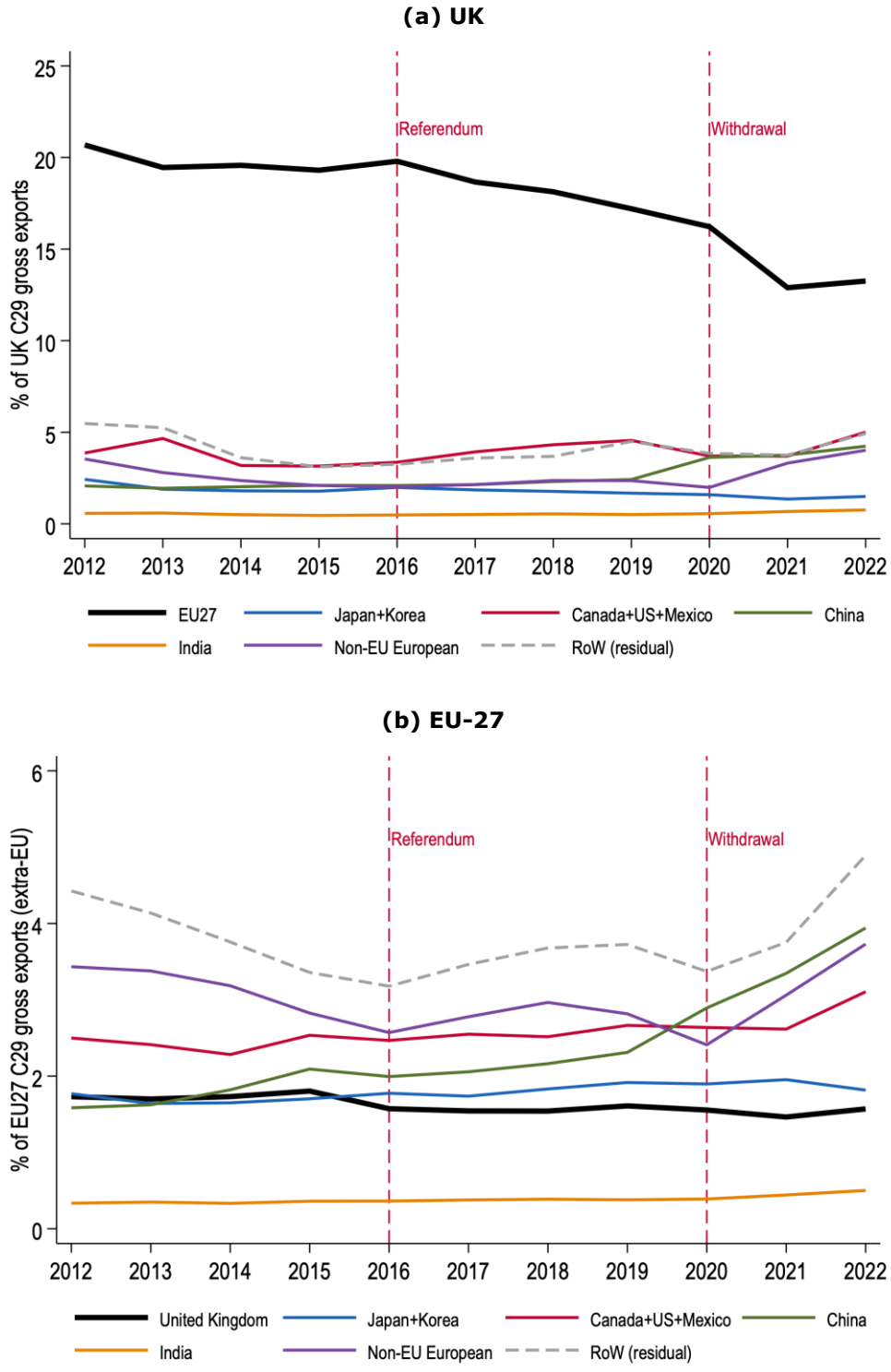
Source: *Authors' elaboration of OECD TiVA data.*

Notes: *FVA share of gross automotive exports by year, i.e. the share of foreign content in the value of exports. The solid line is the EU-27; the dashed line is the wider EU-27+UK automotive space. Vertical lines mark the 2016 referendum and the 2020 withdrawal.*

The aggregate share conceals where the imported value originates. Figure 9 decomposes the FVA in UK and EU-27 automotive (C29) exports by source economy over time, comparing two endpoints, 2016 and 2022. Each panel reports source country shares of gross exports: the horizontal axis shows the year, the vertical axis shows the source economy's share of the value embodied in exports, and each line represents a source economy. The discussion below focuses on changes between 2016 and 2022.

The two panels are not mirror images. On the UK side, the EU-27 FVA share falls sharply, from about 20% in 2016 to about 13% in 2022, a substantial change in the period spanning the Brexit referendum and subsequent withdrawal. The UK's automotive exports remain Europeanised, but less so than before. On the EU-27 side, the UK share is flat, at roughly 1.5–1.6% throughout. This asymmetry partly reflects scale: the UK is far more dependent on EU value added than the EU-27 is on UK value added. This does not mean that the UK is irrelevant to the EU automotive sector: in gross trade terms, the UK remains a major destination for EU vehicles and components; in FVA terms, it is one of several external input sources for a much larger continental production system.

Figure 9. Source-country value added in automotive gross exports, 2012–2022



Source: *Authors' elaboration of OECD ICIO data.*

Notes: *Bilateral source decomposition of FVA in automotive (C29) gross exports, from OECD ICIO tables, 2025 edition. Each line is a source economy's share of value embedded in the region's C29 exports. The value-added coefficient vector includes taxes-less-subsidies (TLS) on intermediate products, following the OECD TiVA Guide 2025; vertical lines mark the 2016 Brexit referendum and the 2020 withdrawal.*

The movement common to both panels is a rising Chinese share: China's share of UK FVA nearly doubles during the period, from around 2.1% to 4.2%, and rises comparably for the

EU-27, from around 2.0% to 3.9%, in each case accompanied by a lengthening tail of smaller source economies. This does not displace the EU as the dominant source of FVA in UK automotive exports, but shows that the EU–UK value chain is increasingly exposed to a wider restructuring of upstream inputs. Brexit coincided with two movements: a weakening of EU–UK value-added integration and a growing role for Chinese and other non-European inputs in both UK and EU exports.

Gross trade and value-added measures capture different dimensions of integration. Gross trade identifies the market destination and customs value of vehicles and components crossing borders. Value-added decomposition identifies where the value embodied in exports originates. The UK can thus be the EU's largest automotive export market in gross terms, while accounting for a much smaller share of EU-27 automotive export value added.

Takeaway. The EU–UK automotive value chain remains substantial in gross trade, but the value-added evidence shows a thinner and more asymmetric pattern of integration over the period spanning Brexit. Preserving competitiveness (especially vis-à-vis China) now requires rebuilding upstream capabilities while keeping cross-Channel trade, components and RoO arrangements workable.

5.5 Fact 5. Battery capacity is expanding, but EU–UK EV supply chains remain exposed

This section asks how far the EU–UK automotive value chain is exposed to battery dependence during the EV transition. Batteries are now the central upstream input in EV production: their availability, location, ownership and RoO status shape whether vehicle production can remain competitive on both sides of the Channel.

The first part of the evidence focuses on the EU, where consistent production and extra-EU trade data make it possible to construct an import-dependence ratio. This ratio asks a simple question: For a given product category, what proportion of estimated EU battery use is accounted for by imports from outside the Union? It is calculated by approximating EU battery use as domestic EU production plus extra-EU imports, minus extra-EU exports. Extra-EU imports are then divided by this measure of apparent EU use[9]. A value close to zero would mean that EU demand is mostly covered by domestic production; a value close to one would mean that EU demand is almost entirely covered by imports.

A directly comparable measure could not be constructed for the UK with the same degree of consistency because the available UK production and trade classifications could not be reconciled sufficiently consistently[10]. The UK side is instead assessed through confirmed gigafactory projects, expected capacity, project maturity and projected domestic battery demand. Together, the EU import-dependence ratio and the UK capacity-gap evidence show why batteries remain a shared upstream constraint on the EU–UK EV value chain.

[9] Formally, the import share for product p in year t is $\text{imports}_{p,t}$ / ($\text{production}_{p,t}$ + $\text{imports}_{p,t}$ − $\text{exports}_{p,t}$). Subtracting exports in the denominator captures batteries genuinely used within the EU rather than those merely passing through it for re-export; imports are measured on an extra-EU basis, so shipments between Member States are not counted as foreign dependence.

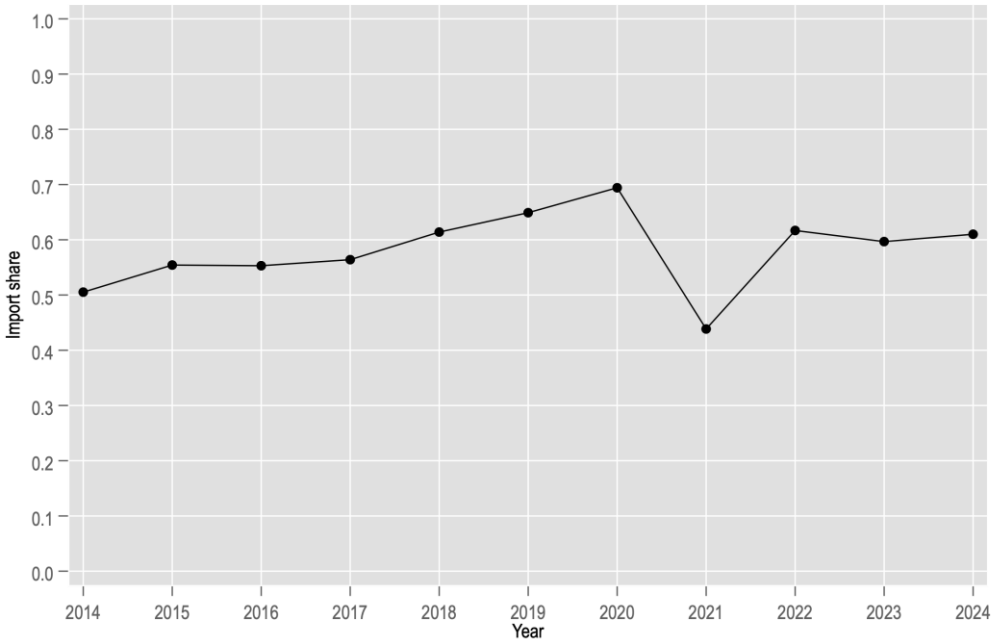
[10] A consistent measure could not be constructed for the UK because the available UK production and trade classifications could not be reconciled sufficiently consistently at product level..

Figure 10 plots this import share over time in two panels, with the vertical axis giving the share of EU battery use met by imports. Panel (a) covers all rechargeable accumulators, a broad and long-running category that serves as a historical benchmark. Panel (b) isolates lithium-ion accumulators, a category relevant to EVs but also covering non-automotive applications, for which comparable data only begin in 2019.

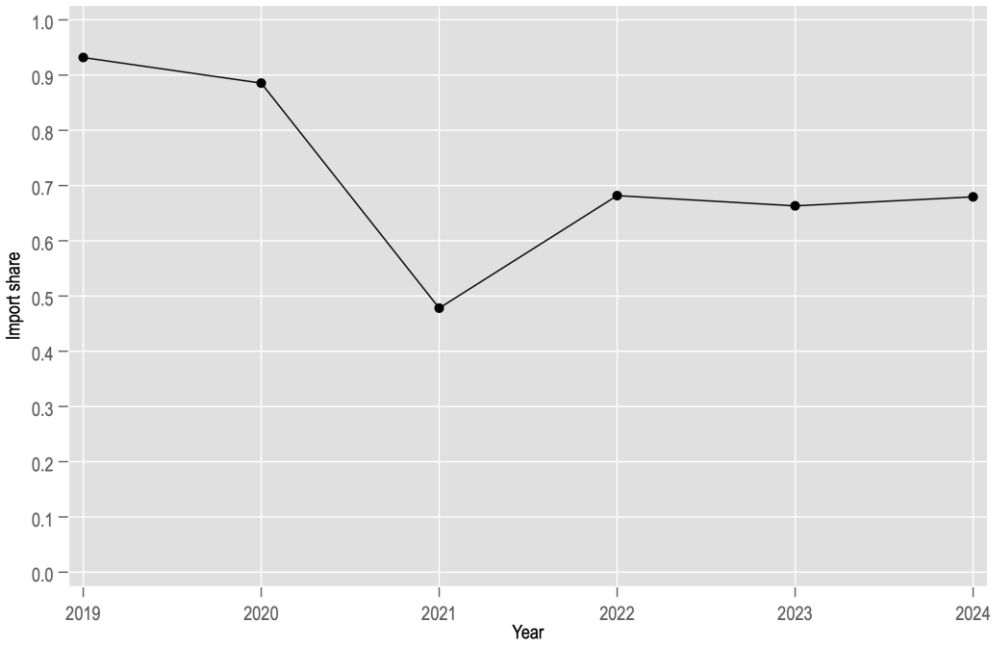
The benchmark series shows that EU import dependence in batteries was already high well before the EV acceleration, as the Union has long sourced the bulk of its accumulators from abroad. The lithium-ion series falls sharply in 2021 and should be interpreted cautiously, given the short series and the disruption around this period. However, the post-2021 pattern is clear, stabilising at roughly two-thirds of domestic use thereafter. Domestic production is rising, but is far from covering European demand, leaving the EV supply chain structurally exposed at its most strategically sensitive input. UK-based EV production depends on battery supply that is physically available, cost-competitive and compliant with EU–UK RoO requirements. A battery deficit on either side therefore weakens the commercial viability of the wider cross-Channel EV value chain.

Figure 10. EU-27 import share of apparent battery consumption, 2014–2024

(a) All rechargeable accumulators (historical benchmark)



(b) Lithium-ion accumulators (EV-relevant, not EV-exclusive)



Source: *Authors' elaboration of Eurostat PRODCOM (production) and Eurostat Comext (extra-EU trade) data.*

Notes: *Import share = extra-EU imports divided by apparent EU use, where apparent use equals EU production plus extra-EU imports minus extra-EU exports, all measured in monetary values (the unit cancels in the ratio); a higher value indicates greater reliance on foreign supply; panel (a) covers all rechargeable accumulators (PRODCOM DS-059358; the 2014–2018 and 2019–2024 codes are bridged around the PRODCOM discontinuity); panel (b) covers lithium-ion accumulators (PRODCOM 27202350), which cannot isolate batteries used in EVs and for which data begin in 2019.*

This dependence should not be read as evidence of inaction. European manufacturers and policymakers have made substantial efforts to build battery and EV capacity in Europe. Bruegel's European Clean Tech Tracker estimates that since January 2017, companies have invested EUR 38 billion in European battery manufacturing facilities and a further EUR 34 billion in EV facilities across 293 individual investments in 214 facilities. By 2025, European facilities had around 250 GWh of battery-cell manufacturing capacity, close to two-thirds of domestic demand[11]. Existing evidence therefore suggests that Europe has tried to build a battery value chain. The key question is whether the EU and the UK can convert investment announcements, installed capacity and early-stage projects into reliable, locally embedded and strategically controlled supply.

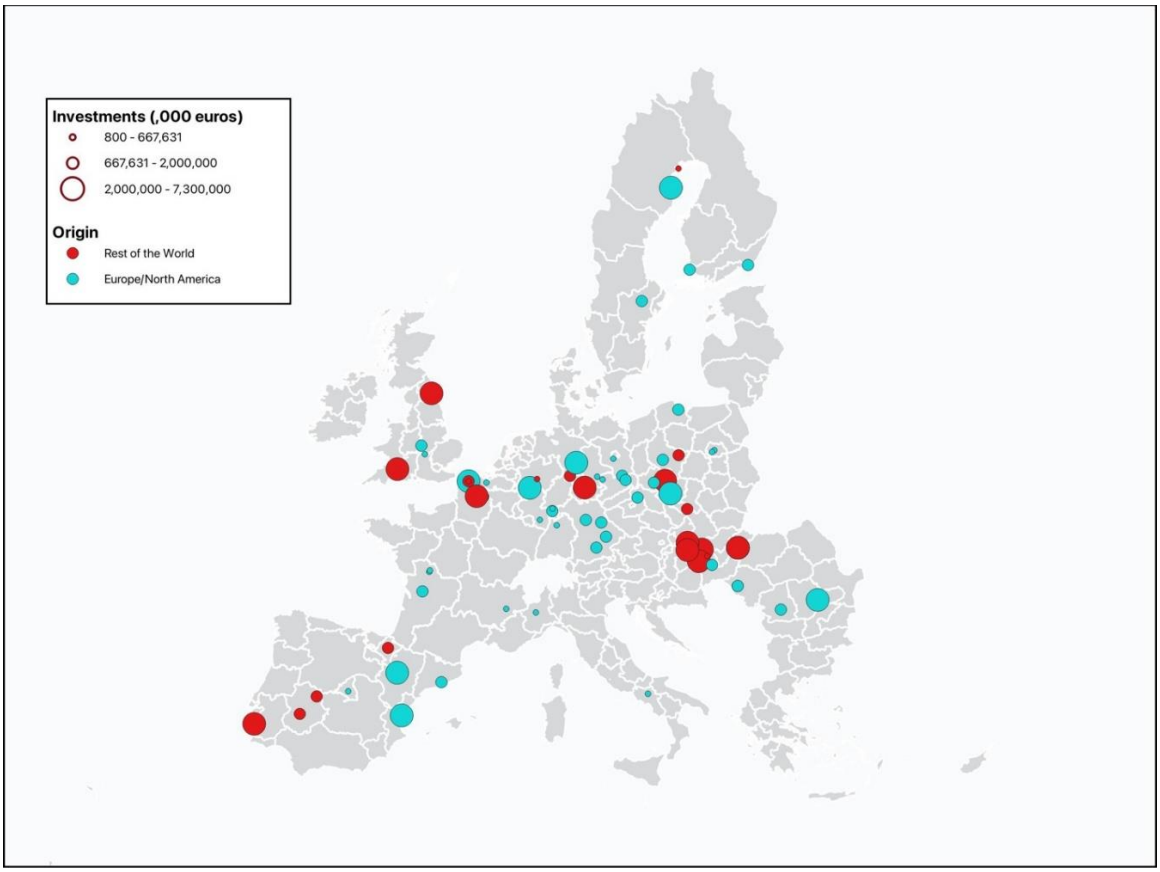
European-owned cell production has made significant progress. ACC, the joint venture formed by Stellantis and TotalEnergies' Saft subsidiary and later joined by Mercedes-Benz, inaugurated its Billy-Berclau/Douvrin gigafactory in May 2023. The first production unit was expected to be operational before the end of 2023, with an initial production line of more than 13 GWh, rising to 40 GWh by 2030[12]. PowerCo, Volkswagen's in-house cell company, commissioned Salzgitter in December 2025, with annual production capacity of up to 20 GWh in the first step and possible expansion to 40 GWh[13]. Verkor inaugurated its Bourbourg/Dunkirk gigafactory in December 2025; the site has 16 GWh of annual capacity, is in industrial ramp-up and production is scheduled to start in autumn 2026, with possible expansion to 50 GWh after 2030[14]. These projects show that European incumbents are trying to internalise part of the battery chain rather than relying solely on imported cells or foreign-owned onshore capacity. However, many projects remain recent, ramping or vulnerable. Northvolt, once one of the most prominent European battery champions, filed for bankruptcy in Sweden in March 2025[15]. ACC's wider European expansion has also narrowed: in February 2026, Reuters reported that the planned Kaiserslautern and Termoli gigafactories had been dropped or definitively shelved, according to unions, while ACC stated that the prerequisites for restarting them were unlikely to be met[16]. The result is a European battery value chain that is materially stronger than five years ago, but still dependent on a combination of ramping European-owned capacity, foreign-owned onshore production and imported upstream inputs[17].

Figure 11 shows the spatial distribution of these investments across EU and UK territory. Battery investment is now visible across the wider European production space, including the UK, France, Germany, Spain, the Nordic countries and CEE. This reinforces the EU–UK framing of the report: battery localisation is not a peripheral clean-tech issue, but an upstream condition for future competitiveness of automotive production on both sides of the Channel. The map points to an asymmetric position: the EU has a larger and more diversified

[11] Intereconomics. 2026. Tracking the EU Clean Industrialisation Process: A Focus on Batteries and Electric Vehicles.
[12] ACC. 2023. ACC inaugurates its first Gigafactory in Billy-Berclau/Douvrin.
[13] Volkswagen Group. 2025. Start of European battery cell production: PowerCo commissions Salzgitter gigafactory.
[14] Verkor. 2025. Verkor reaches a decisive milestone and opens its first gigafactory.
[15] Northvolt. 2025. Northvolt files for bankruptcy in Sweden.
[16] Reuters. 2026. Stellantis-backed ACC drops plans for Italian, German gigafactories, union says.
[17] Sandström, C. 2026. 'Explaining Northvolt's Bankruptcy and the Dilemma of Green Deals'. In: Henrekson, M., Sandström, C., Stenkula, M. (eds.). 'A Green Entrepreneurial State?' *International Studies in Entrepreneurship*, Vol. 49. Springer, Cham.

project pipeline, while the UK depends on a smaller number of large projects whose delivery is critical for keeping UK vehicle production embedded in European EV value chains.

Figure 11. Investment in EV battery production facilities in Europe, 2010–2024



Source: *Authors' elaboration of Bruegel European Clean Tech Tracker and Orbis Crossborder data.*

Notes: *Battery manufacturing projects announced, under construction, paused or operational, 2010–2024, located in the EU, the UK, Norway and Switzerland; marker size represents reported investment value (EUR, three size classes as in the legend); marker colour identifies the origin of the investing BG (European vs non-European); see Appendix A for selection criteria, treatment of domestic investments and reconciliation of unmatched projects.*

A further qualification concerns ownership and scale rather than effort. These European ventures are recent and still ramping, whereas much operating capacity remains foreign-owned. Bruegel reports that existing European battery facilities are largely owned by South Korean companies, while new Chinese investment is increasingly important, including CATL's potential EUR 7.3 billion investment in a 100 GWh facility in Debrecen, Hungary[18]. A large part of Europe's progress towards domestic supply has taken the form of attracting foreign cell producers onshore, the same mechanism documented in Fact 7. This reduces some import exposure, but does not automatically create European control over technology, IPR, supplier relationships or future allocation decisions.

The UK is at an earlier point on the same curve, with fewer confirmed projects and a larger gap between announced capacity and projected demand. AESC's second Sunderland plant is the more advanced confirmed project: UK Export Finance describes it as a 15.8 GWh/year

[18] Bruegel. 2025. Europe has a solid basis for battery and electric vehicle manufacturing growth.

battery manufacturing facility adjacent to AESC's existing battery plant[19]. Agratas's Bridgwater project is larger, with announced capacity of 40 GWh, but its timing should be treated carefully. Original announcements pointed to production from 2026, while current public material indicates operations scheduled to start in 2027[20]. This remains well below projected UK need: the Faraday Institution estimates UK battery manufacturing demand at around 110 GWh per year by 2030, equivalent to six 20 GWh gigafactories[21]. From an EU–UK integration perspective, access to batteries produced in the UK or wider region will be crucial to maintain the competitiveness of UK EV assembly and retain model allocation decisions within global OEM networks.

This dependence is the supply-chain counterpart of the imported input reliance documented in Fact 4. In the battery case, imported inputs include one of the EV's highest-value components. For the UK, the same issue is sharper because domestic cell capacity is more limited and future EV production depends heavily on whether confirmed gigafactory projects reach scale. For the EU, the ability to convert announced and installed capacity into reliable, European-controlled supply is crucial. In both cases, battery dependence turns the EU–UK relationship from a trade question into a value chain resilience question. This is in line with the current debate on the EU's strategic dependence in clean-technology inputs (Draghi, 2024b; EPRS, 2025).

Takeaway. Battery dependence remains a key upstream constraint on EU–UK EV integration. The EU has built significant capacity but still imports roughly two-thirds of the lithium-ion accumulators in its measured apparent use and remains exposed to foreign ownership. The UK is earlier in its build-out and more dependent on a small number of projects whose delivery is critical for remaining embedded in European EV value chains.

[19] UK Government. 2025. Category B project supported: AESC EDG, UK.
[20] Engage Environment Agency. n.d., Gravity – Agratas, Battery Gigacentre, Bridgwater.
[21] Faraday Institution. 2024. Faraday Institution publishes 2024 update to its study "UK Electric Vehicle and Battery Production Potential to 2040".

6. Part II: Structural and policy response to changing EU–UK relationships

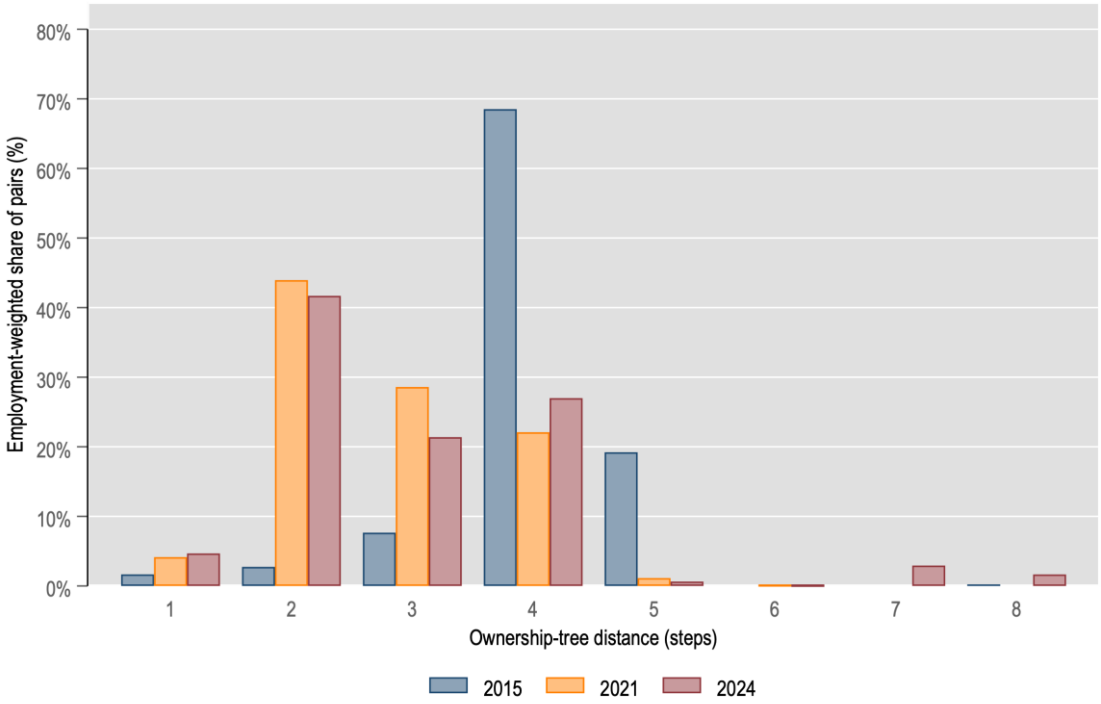
6.1 Fact 6. EU–UK ownership ties have shortened, not unravelled

This section examines how the corporate ownership ties linking UK and EU firms have been reconfigured over the past decade and how the wider ownership network has reorganised. The focus is on how BGs reorganised those links over a period of changing trade and regulatory conditions. The analysis has two levels: bilateral ties between UK and EU firms belonging to the same BG; and the structure of the network as a whole.

The bilateral analysis measures the ownership distance between every EU–UK firm pair within a common group, i.e. the number of steps along the shortest path connecting the two firms through the group's ownership tree. A short distance indicates that the two firms sit close together in the corporate hierarchy (e.g. one directly owning the other), whereas a long distance indicates that they are connected only through a chain of intermediate holdings and are organisationally remote, even while formally part of the same group. Weighting each pair by employment allows characterisation of how the workforce is distributed across close and distant ownership ties and how that distribution has shifted over time. In substantive terms, this measure captures whether employment sits in EU–UK links that are organisationally close and potentially easier to coordinate, or in links that remain formally connected but are more remote inside the corporate structure.

Figure 12 reports this distribution. In 2015, EU–UK firm pairs were tightly concentrated at ownership distance 4–5. By 2024 this concentration had dispersed. Short paths, especially distance 2, account for a much larger share of employment-weighted pairs than in 2015, indicating a greater concentration of observed EU–UK pairs at shorter ownership distances. The chart suggests that distance 2 accounts for just over 40% of employment-weighted pairs in 2024, while distance 3 accounts for around 21%. Long paths, especially distance 7–8, also emerge, but remain much smaller in employment-weighted terms.

Figure 12. EU–UK ownership pair-distance distribution, 2015, 2021, 2024



Source: *Authors' elaboration of Orbis Historical data.*

Notes: *Built from the reconstructed BG ownership networks (Orbis ownership data; Appendix B). For every EU–UK firm pair within a common BG, ownership distance is the number of steps along the shortest path through the lowest common ancestor; the distribution is weighted by firm employment and compared across 2015, 2021 and 2024.*

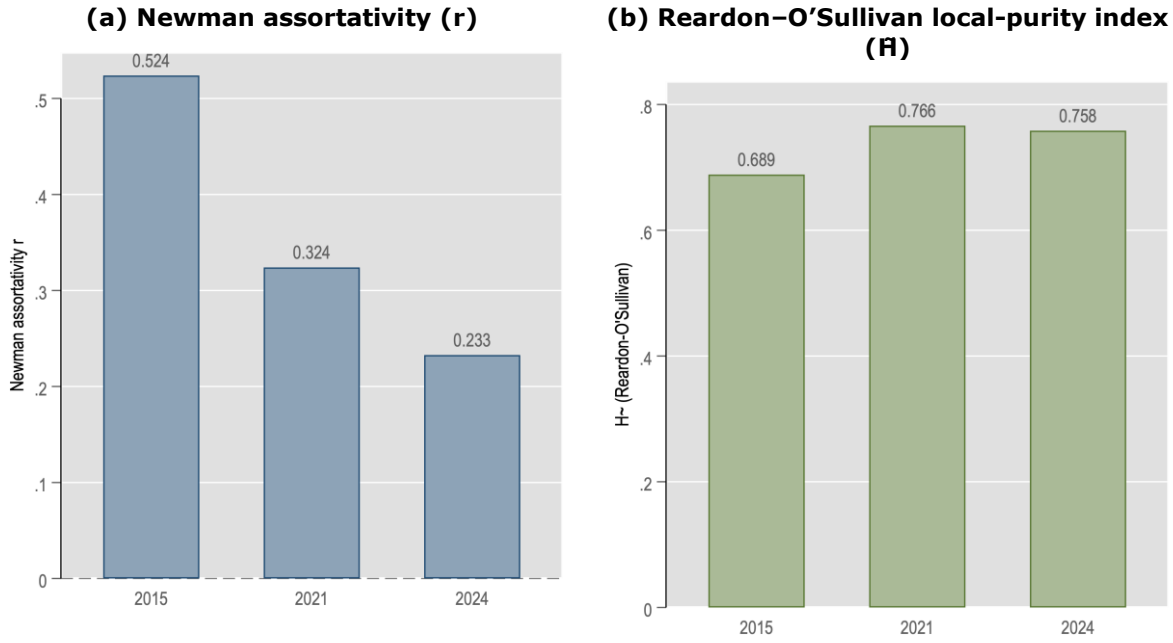
The resulting polarisation of retained links is the central finding. The 2024 distribution carries mass at both short and long ownership distances, rather than exhibiting a uniform loosening of EU–UK links. The dominant movement occurs between 2015 and 2021, when employment-weighted EU–UK links shift sharply towards shorter ownership distances. Where links are retained, they are held more tightly than before (short-path mass), as groups absorb affiliates more directly to economise on the higher cost of coordinating across the border. Between 2021 and 2024, by contrast, the distribution becomes less concentrated: distance 4 regains some weight, while a smaller set of pairs drifts apart through the insertion or removal of intermediate holdings. The important point is that Brexit did not simply break EU–UK ownership links, but induced selective reorganisation, with some links pulled closer into the corporate hierarchy and a smaller set becoming more organisationally distant. However, the distributions describe the pairs observed in each year: they do not establish whether the same pairs moved closer or further apart, how many links disappeared, or what caused the changes.

Moving from individual EU–UK pairs to the structure of the network as a whole, two complementary indices characterise how the overall ownership architecture has evolved (see Figure 13). The first is "assortativity", which measures "like-with-like" connection, i.e. whether firms tend to be connected to other firms with the same attribute. Here, the relevant attribute is macro-region: higher macro-regional assortativity means that ownership ties are more concentrated within the same region, while lower assortativity means that the network is less organised around same-region ownership ties. Newman assortativity is a global measure of regional homophily and summarises, across the entire network, the degree to

which ownership ties connect firms located in the same region, with higher values indicating that linkages are concentrated within rather than between regions (see Figure 13, panel (a)). The Reardon–O'Sullivan local-purity index (H^*) is its local counterpart, capturing the regional homogeneity of each firm's immediate ownership neighbourhood, with higher values indicating that a firm's closest connections are predominantly co-regional (see Figure 13, panel (b)).

The two indices point in the same direction. Assortativity declines markedly over the period, from 0.524 in 2015 to 0.324 in 2021 and 0.233 in 2024, reflecting a weakening of the old macro-regional ownership structure at the level of the network as a whole. The Reardon–O'Sullivan local-purity index rises from 0.689 in 2015 to 0.766 in 2021, remaining high at 0.758 in 2024, indicating that firms' immediate ownership neighbourhoods have become more regionally uniform. Jointly, these movements describe a structural transition from a Eurocentric to a multi-polar ownership architecture: the global network is less organised around one dominant regional core, while local ownership neighbourhoods are more internally cohesive. This reinforces the EU–UK evidence in Figure 12. BGs have not simply disintegrated across borders, but have reorganised ownership to retain cross-border links alongside more cohesive regional and local clusters.

Figure 13. Network summary indices, 2015, 2021, 2024



Source: *Authors' elaboration of Orbis Historical data.*

Notes: *Both indices are computed on the reconstructed BG ownership network underlying Figure 12 (Orbis ownership data; Appendix B). Newman assortativity r measures global regional homophily, the degree to which ownership ties connect firms in the same macro-region; the Reardon–O'Sullivan index H* measures the regional purity of each firm's local ownership neighbourhood; higher values indicate stronger same-region concentration. Formal definitions are given in Appendix B.*

Takeaway. Brexit did not loosen EU–UK ownership uniformly. The dominant response of heterogeneous firms to a shock raising the cost of cross-border integration (Helpman et al., 2004; Antras and Helpman, 2004; Alfaro et al., 2019) has been to hold retained links more tightly, absorbing affiliates more directly through internal rationalisation (Breinlich et al.,

2020), with only a small minority of pairs drifting apart. This is important for EU–UK relationships: the post-Brexit corporate response is not simple separation, but selective restructuring within still-connected BGs. EU–UK integration persists, but is being reorganised through ownership hierarchies that concentrate some links more tightly while allowing others to become more distant. At network level, this sorting coincides with a broader structural transition from a Eurocentric to a multi-polar ownership architecture, characterised by fewer dominant cross-regional ties but internally more cohesive regional clusters.

6.2 Fact 7. Automotive FDI has retreated in both the UK and EU, but green investment and source geographies diverge

This section examines inward greenfield FDI into the automotive sector of the EU and the UK along two dimensions: the changing composition of that investment over time, and the source countries from which FDI originates[22]. The purpose is to connect the report's earlier evidence on trade, batteries and ownership to the investment decisions reshaping the EU–UK automotive value chain. If Fact 4 showed thinner value-added integration, Fact 5 identified batteries as the key upstream constraint, and Fact 6 showed selective ownership restructuring, this section asks whether new inward investment is reinforcing or weakening the productive base on each side of the Channel.

Each project is classified both by business function (vehicle manufacturing (NACE 29), other production, knowledge functions and HQ-and-sales) and whether it is flagged as climate-relevant ("green"). The evolution of level, functional mix, green content and source geography of investment is then tracked.

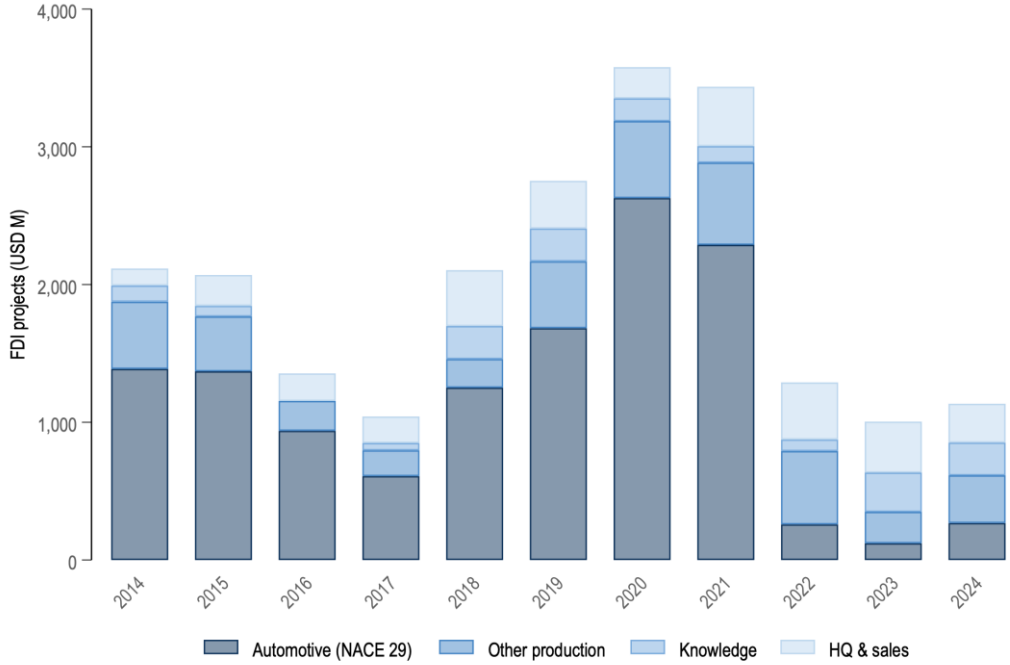
"Green FDI" here does not mean only renewable energy or only investment by firms in conventionally green sectors. Rather, it is defined at project level, using the actual content of the investment (Alvarez-Vilanova et al., 2026). The method asks whether the project description indicates an activity that contributes to the green transition, for example EV production, batteries and accumulators, charging infrastructure, recycling, energy efficiency, cleaner production processes or other environmentally relevant activities. It uses a taxonomy-guided large language model (LLM) classification: a structured green taxonomy is translated into prompts and the model reads project descriptions to identify climate-relevant activity across all sectors. This matters because green investment can be hidden inside ordinary manufacturing, logistics, services or HQ functions, and would be missed by classifications based only on sector codes or narrow keyword searches. The resulting "green" flag should be read as a project-content classification, not as a measured environmental impact outcome.

As the series counts completed rather than announced projects, it lags investment decisions and understates the most recent commitments; the timing of any turning point should be read with that lag in mind.

[22] Completed FDI projects are taken from Orbis Crossborder, valued in USD million and reported as two-year moving averages.

Figure 14. Completed inward automotive FDI, by composition, 2014–2024

(a) EU – all automotive FDI



(b) UK – all automotive FDI

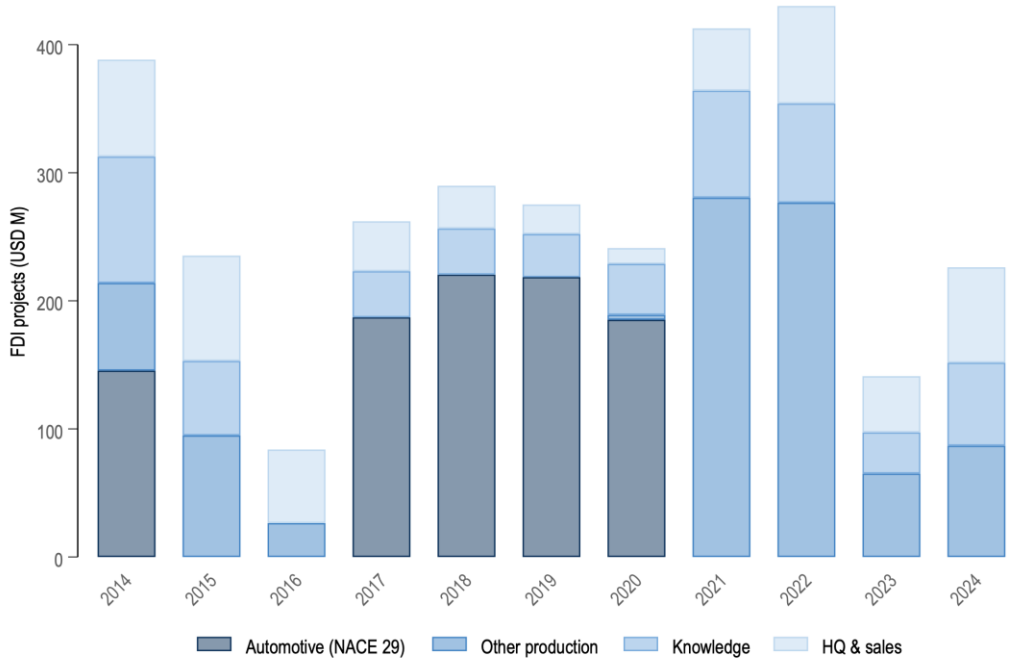
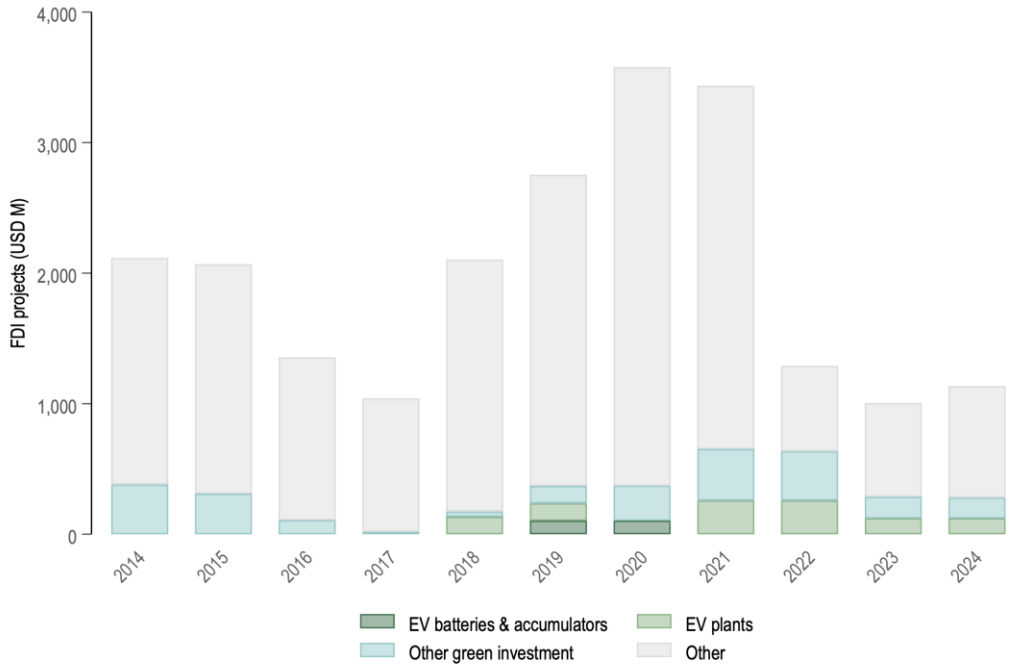
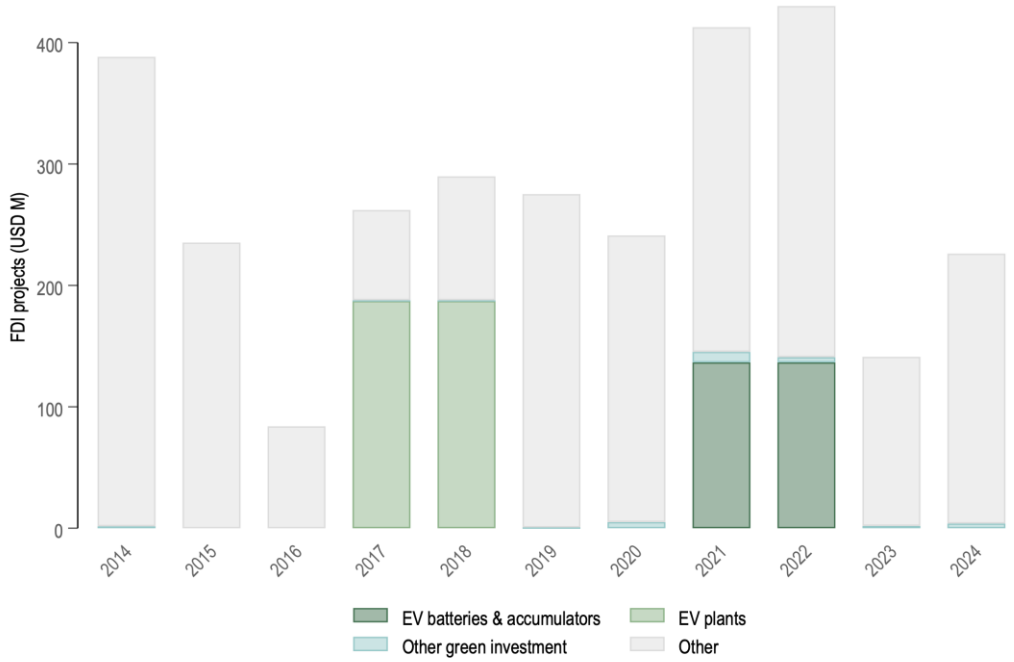


Figure 14 (continued)

(c) EU – green vs other



(d) UK – green vs other



Source: *Authors' elaboration of Orbis Crossborder data.*

Notes: *Completed (not merely announced) cross-border projects from BvD Orbis Crossborder, 2014–2024, valued in USD million and smoothed as two-year moving averages; panels (a) and (b) split projects by business function: vehicle manufacturing (NACE 29), other production, knowledge functions and HQ-and-sales; panels (c) and (d) split the same projects by a climate-relevant "green" flag, distinguishing EV batteries and accumulators, EV plants and other green investment from other automotive FDI.*

Figure 14 reports the composition of completed FDI. Panels (a) and (b) show the functional composition of all automotive FDI, while panels (c) and (d) separate climate-relevant green projects from other investments. Vehicle manufacturing dominates FDI value in the EU up to

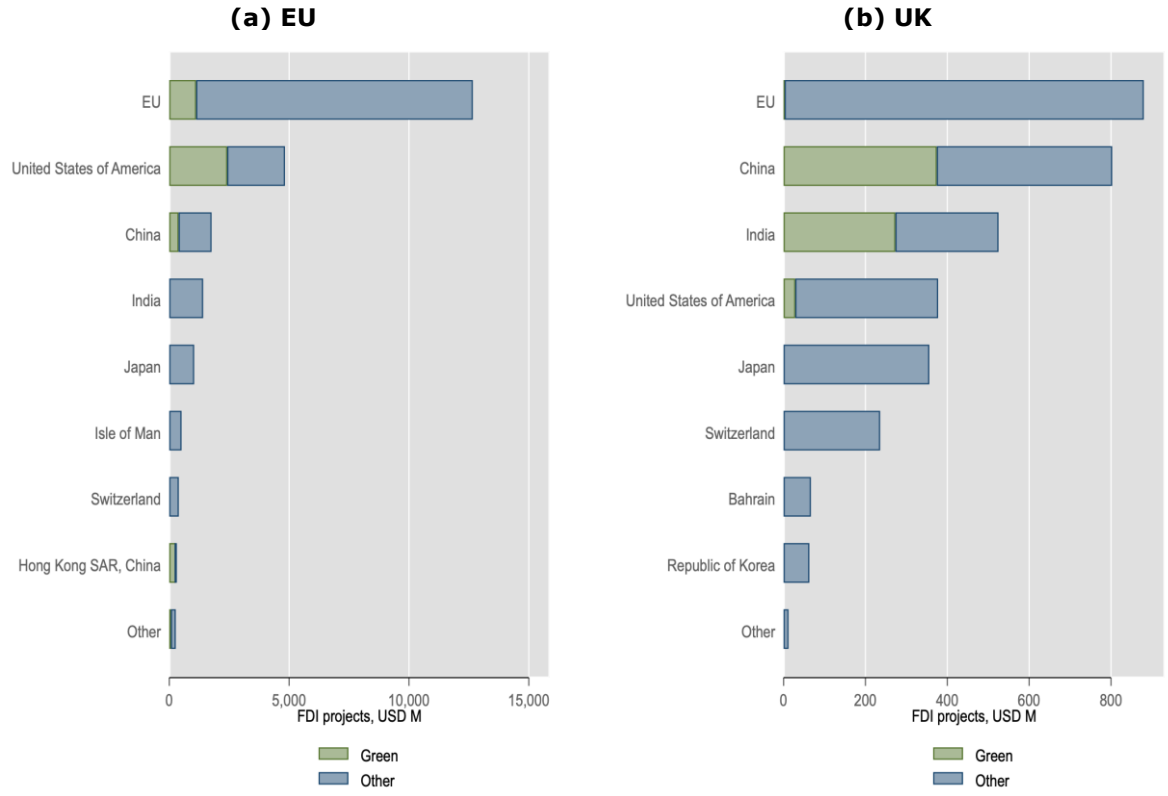
the 2020–2021 peak, while the UK series is smaller and more volatile, with vehicle manufacturing more visible before the later 2021–2022 peak. EU automotive FDI rises strongly up to 2020–2021 and then falls sharply, while UK automotive FDI peaks later, around 2021–2022, falls in 2023 and partly recovers in 2024. After 2021 there is a sharp reversal, especially in the EU. The post-peak decline is concentrated in vehicle manufacturing, while the residual activity shifts towards other production, knowledge and HQ-and-sales functions. In the UK, the post-2020 investment mix is less centred on NACE 29 vehicle manufacturing and more dependent on other production, knowledge and HQ-and-sales activities.

The green panels add a second layer of understanding. In the EU, green automotive FDI becomes more visible after 2018 and remains a meaningful part of completed investment in the later years, even as total automotive FDI declines from its peak in 2020–2021. In the UK, green FDI is more episodic: it is concentrated in specific periods, especially 2017–2018 and 2021–2022, and falls back markedly in 2023–2024. The level of automotive FDI falls after 2021 in both regions, while the mix shifts away from vehicle manufacturing towards other production and HQ-and-sales functions. EV and battery plants account for only part of the green investment, with a substantial share sitting in other green activities, including supporting facilities, infrastructure, services and cleaner-production investments. The shift is therefore compositional as well as cyclical: capital is moving out of vehicle manufacturing and into adjacent and non-production functions. The EV transition is not producing a simple one-for-one replacement of conventional vehicle manufacturing FDI by new EV manufacturing capacity.

This finding is central to the EU–UK story. The EU retains a substantial green component despite falling from peak automotive FDI, while the UK's green investment remains concentrated in particular years and projects. Both regions face the question of whether new investment can sustain vehicle production and associated supplier capabilities. For the EU, this means whether green investment is sufficiently anchored in production functions rather than concentrated in adjacent activities. For the UK, the issue is sharper because the investment series is smaller, more volatile and more dependent on a limited number of large projects. In both cases, the EV transition is not automatically replacing lost conventional automotive investment with equivalent new production capacity.

The two regions differ sharply in the origins of their inward investment (see Figure 15). The EU's inward automotive FDI is overwhelmingly intra-European, at roughly USD 13 billion, compared to USD 5 billion from the US, the only major non-European source. The UK is far more diversified in origin: the EU (USD 880 million), China (USD 800 million), India (USD 525 million), US (USD 380 million) and Japan (USD 350 million). The contrast between the EU's intra-European investment base and the UK's more geographically diversified source structure is a key difference.

Figure 15. Completed inward automotive FDI, by source region or country, 2014–2024



Source: *Authors' elaboration of Orbis Crossborder data.*

Notes: *Completed automotive FDI as in Figure 14 (Orbis Crossborder, USD million), summed over 2014–2024 and disaggregated by source region or country of the investing entity; bars distinguish climate-relevant green projects from other automotive FDI, following the classification of Alvarez-Vilanova et al. (2026).*

The source geography of green FDI also differs. In the EU, total inward automotive FDI remains dominated by European investors, while green investment also includes important non-European sources. In the UK, a large part of green automotive FDI is associated with non-EU origins, especially China and India. This makes the UK's green automotive transition more directly exposed to third-country investment decisions. EU policy changes also affect the UK, through both trade rules and the investment decisions of European BGs that remain major investors in the UK.

This asymmetry has implications for policy. A common decline in vehicle manufacturing FDI points to a shared competitiveness problem, but divergent source geographies mean that policy instruments will be felt differently. EU IP, battery regulation and RoO will matter for both sides, but the UK will also be more sensitive to decisions by Chinese, Indian, Japanese and US investors. The EU–UK relationship is not simply a bilateral trade relationship, but is embedded in the wider geopolitical reallocation of automotive investment.

Takeaway. Automotive FDI has weakened in both the EU and the UK since their peaks (2020–2021 in the EU; 2021–2022 in the UK), with the functional mix becoming less centred on vehicle manufacturing. The green component remains substantial in the EU's later observations, whereas UK green investment is more episodic and falls back in 2023–2024. This creates a shared, but not identical, EU–UK competitiveness problem: the EU remains anchored mainly in intra-European investment, while the UK is more exposed to a diversified

set of Chinese, Indian, Japanese, US and European investors. EU–UK cooperation therefore matters not only for trade, but for aligning battery rules, green IP and investment conditions in a value chain increasingly shaped by third-country capital.

6.3 Fact 8. The strategies of investment promotion agencies (IPAs) are shifting towards green automotive FDI, especially in the UK

This section turns towards public agencies. IPAs are the institutional interface between a country, a region and mobile capital, and the share of automotive FDI activity that falls within their remit, and the extent to which that remit is green, reveals where the sector's public-facing institutions are most focused. In the EU–UK context, this is also a question of connection-building. IPAs operate at national and sub-national level, where they help to translate broad industrial priorities into concrete links between investors, sites, suppliers, skills, infrastructure and regional production systems. They are one of the policy instruments through which post-Brexit EU–UK automotive relationships can be rebuilt below the level of formal trade policy.

The evidence is based on the RIPE Survey of IPAs, 2025 edition, conducted periodically by LSE. The survey covers national and regional IPAs across Europe and records their sectoral priorities, green FDI strategies (in automotive and all other sectors of the economy), institutional characteristics and operating practices. Figure 16 counts how many IPAs exist and asks whether the region–sector cells that actually receive automotive FDI are covered by an IPA and if that IPA reports a green automotive FDI strategy.

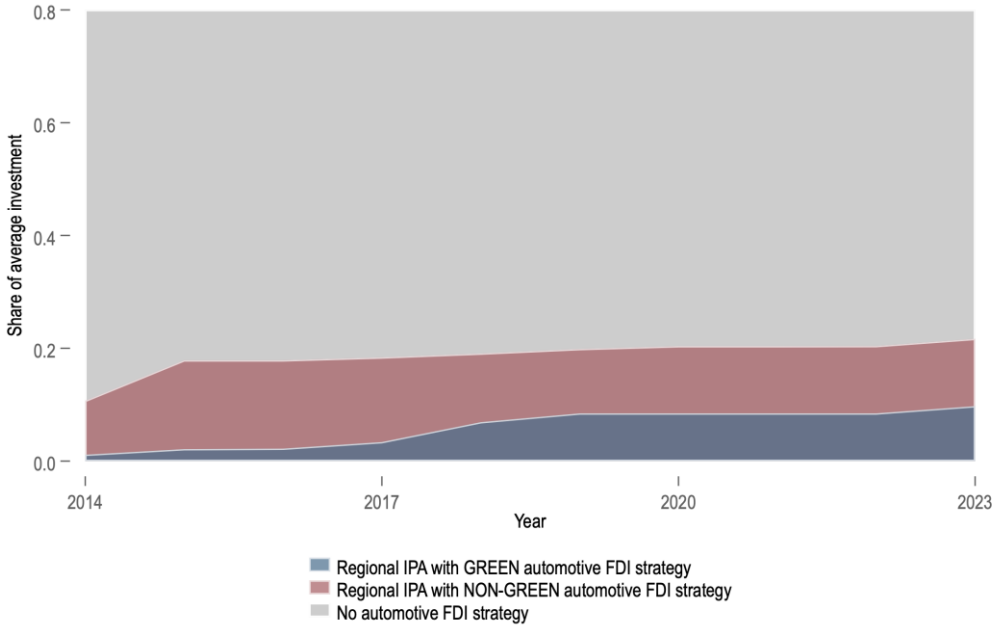
The interpretation is consistent with the evidence on investment promotion in Crescenzi et al. (2021), which shows that sub-national IPAs with sectorally targeted strategies can increase FDI inflows. This is especially relevant for the automotive industry because green investment is highly place-specific: EV assembly, batteries, components, charging infrastructure, recycling and cleaner production depend on local land, energy, skills, permitting, suppliers and logistics. IPAs thus matter as both marketing bodies and as connective institutions between mobile capital and regional capabilities.

In the UK, the Harrington Review argued for a more strategic and better organised approach to attracting internationally mobile investment, with a stronger role for the Office for Investment and for commercially credible propositions across the UK's nations and regions. The implication is that automotive investment promotion must be national in strategic direction but sub-national in delivery: green automotive FDI lands in specific regional ecosystems, not in abstract national economies.

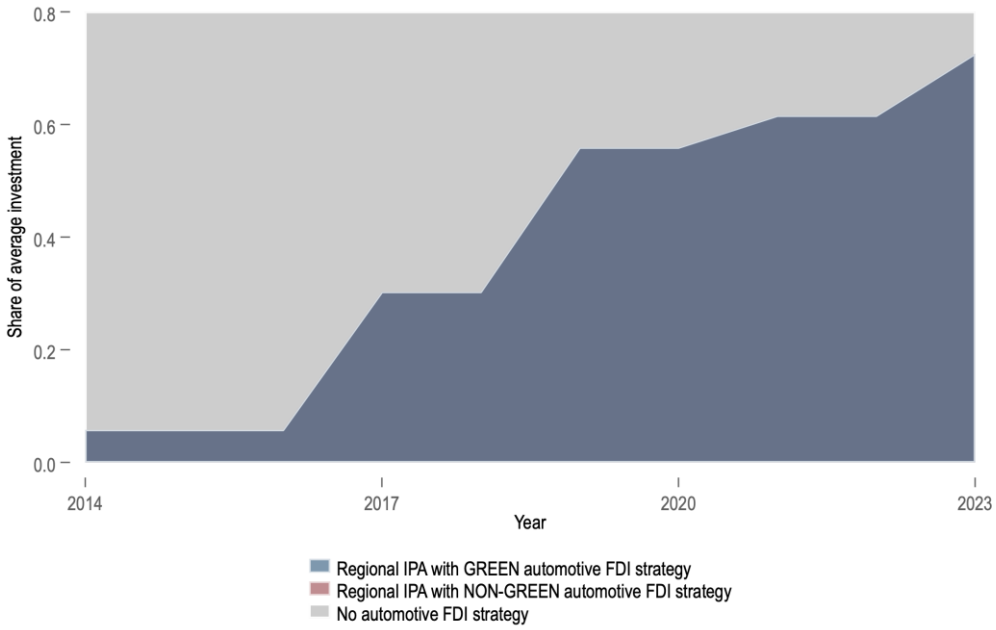
The green dimension should also be read from a green value chain perspective. Green automotive FDI is not limited to renewable energy generation. It includes climate-relevant investment within and around automotive value chains: EV production, batteries and accumulators, charging infrastructure, recycling, cleaner production processes, energy efficiency and related services. According to Crescenzi and Harman (2023; 2026), the development question is whether these investments remain isolated projects or become channels for wider greening of host economies through suppliers, skills, standards and local technological capabilities.

Figure 16. Automotive FDI covered by a local IPA and/or IPA strategy, 2014–2023

(a) EU



(b) UK



Source: *Authors' elaboration of Orbis Crossborder data and LSE RIPE Survey of IPAs (2025).*

Notes: *Region–sector cells flagged by presence of local IPA, weighted by average completed FDI flow into each cell over 2014–2023, such that vertical axis measures share of average investment covered by an IPA with a green automotive FDI strategy, by an IPA without a strategy or by no automotive FDI strategy; FDI flows from Orbis Crossborder; IPA coverage and characteristics from RIPE Survey of IPAs, 2025 edition, covering national and regional IPAs across Europe and recording each IPA's history, sectoral strategy, green automotive FDI priorities, public/private status and modus operandi. A "green automotive FDI strategy" indicates that IPA reports an explicit strategy to attract climate-relevant automotive investment, including EVs, batteries, charging, recycling, cleaner production and related green value chain activities.*

Figure 16 shows, for each region–sector, whether a local IPA is active and weights that flag by the cell's average completed FDI flow over 2014–2023. Accordingly, the series measures the share of FDI-relevant activity that falls within an IPA's remit rather than a simple count of agencies; a higher value means that promotion effort reaches a larger slice of where investment actually lands. Both regions move in the same direction at very different intensities: in the EU, IPA-covered region–sectors roughly double from around 10% to over 20% of FDI-weighted activity, with the green-focused subset rising from a negligible 1–2% to roughly 10%; in the UK the shift is far steeper, from about 5% to over 70%, and essentially all of that coverage is green. By the end of the period, most FDI-weighted UK region–sector coverage is associated with IPAs reporting a green automotive FDI strategy. The indicator suggests a gradual expansion of green strategy coverage in the EU and a much sharper increase in the UK. It does not measure promotion expenditure or establish that IPA strategies caused the observed investment flows.

The shared signal is a reorientation of the sector's public-facing institutions towards climate-relevant activity: broad-based but modest in the EU, and near-total in the UK. The contrast in intensity is informative, with the EU spreading a growing but still partial promotion effort across a wider set of activities and the UK showing a particularly pronounced expansion in FDI-weighted coverage by IPAs reporting green automotive strategies.

This asymmetry mirrors the wider pattern in the report. The EU has a larger and more diversified automotive and battery ecosystem, meaning that investment promotion can operate across multiple regional clusters and functions. The UK has a smaller and more exposed automotive base, so the strategic role of investment promotion is sharper: to secure the projects, suppliers and regional capabilities needed to keep UK production embedded in European EV value chains.

The policy implication is that IPAs are not peripheral to EU–UK automotive cooperation. They are part of the institutional infrastructure through which cooperation becomes operational at sub-national level. National agreements on RoO, batteries, standards and IP create the framework, but regional IPAs help to translate that framework into investable propositions such as sites, skills packages, supplier development programmes, infrastructure coordination and aftercare. Investment promotion can thus help to reconnect the UK and EU automotive systems below the level of formal trade policy, especially where green automotive projects require cross-border supply chain complementarities.

The green orientation of IPA strategies matters for the quality of development. If green automotive FDI is embedded in local suppliers, skills and innovation systems, it can support wider environmental upgrading in host economies rather than simply adding isolated clean-tech facilities. This is the green GVC logic applied to EU–UK automotive relations: green FDI can become a mechanism for greening production systems beyond energy generation, but only if investment promotion is linked to supplier upgrading, skills formation, technology diffusion and local institutional capacity.

Takeaway. Investment promotion is an increasingly important policy lever in the EU–UK automotive transition. Both the EU and the UK show a shift towards IPA coverage of green automotive FDI, but the UK shift is much sharper and more concentrated. This creates both an opportunity and a risk. Green-focused promotion can help secure the battery, EV and supplier investments needed to keep UK production connected to European value chains, but it also means that the UK is more dependent on the effectiveness of a small number of strategic investment promotion efforts. For the EU, the challenge is different, requiring a broader regional IPA infrastructure to embed green automotive investment across multiple

production clusters. In both cases, IPAs can help to translate green industrial strategy into place-based connections between investors, suppliers, skills and regional capabilities.

6.4 Fact 9. China leads the patent shift, but EU–UK prior art links remain important

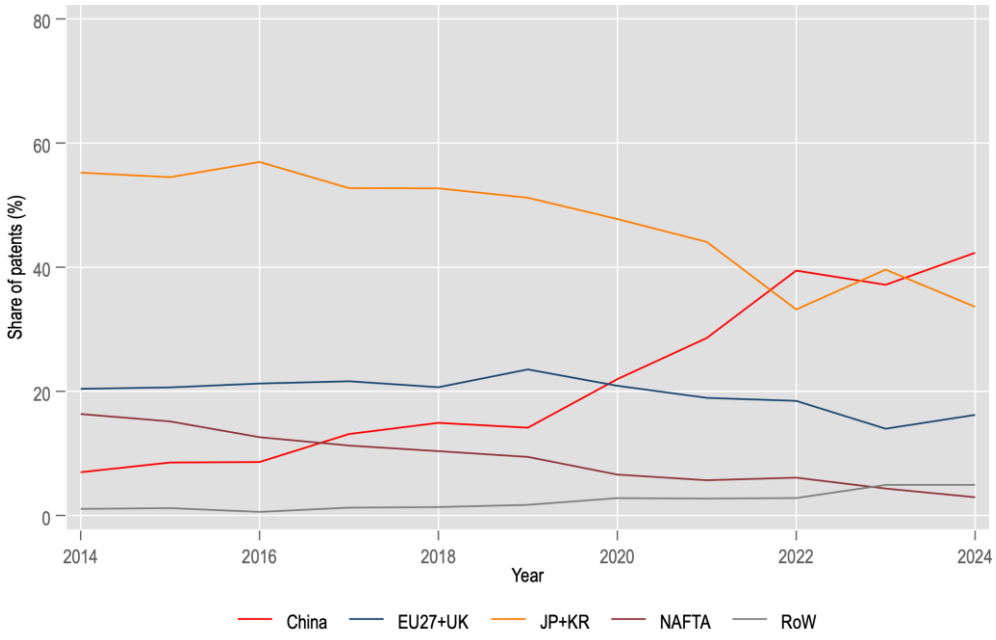
This section examines how the geography of automotive innovation has shifted along two dimensions: the volume of patenting across regions and technology classes, and the cross-region citation flows that reveal the prior art inventors underpinning each region[23]. This is the innovation counterpart to the trade, battery, ownership and investment evidence developed in Facts 4–8. If production, batteries and FDI are reorganised geographically, the question is whether the knowledge base underpinning the automotive transition is shifting in the same direction.

Figure 17 plots, for each of four technology classes, every region's share of patent families by year, i.e. a rising line means a growing share of the world's inventive output in that class. As a patent family groups related patent filings for the same invention, the measure is closer to a count of inventive activity than a count of individual patent applications. On volume, China's patent family share rises rapidly across the four technology classes and exceeds the combined JP + KR share by the end of the plotted period, while the EU-27+UK share is broadly stable or modestly declining, depending on the technology class, and does not match China's rapid increase in batteries, power electronics and software/autonomy. This shows that the EV transition is changing both where vehicles are assembled and where the underlying technological frontier is expanding.

[23] Patents are simple families from Orbis IP, assigned to a technology class from the main IPC code and located by inventor country, which captures where knowledge is created; backward citations are aggregated into regional citing-to-cited flows. One caveat dominates the recent years: forward citations accrue over time, so the latest cohorts are mechanically under-cited (right-truncation), and the citation-weighted variants therefore use cohort-normalised weights so that recent and older patents are compared like-for-like; see Appendix A.

Figure 17. Patent family shares, by inventor region and technology class, 2014–2024

(a) ICE



(b) Batteries and cells

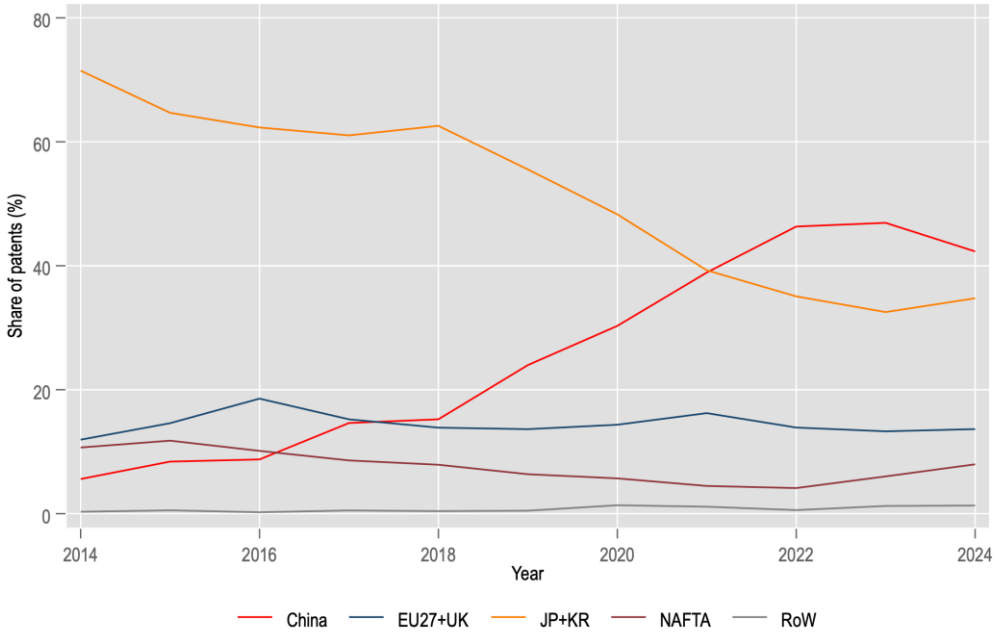
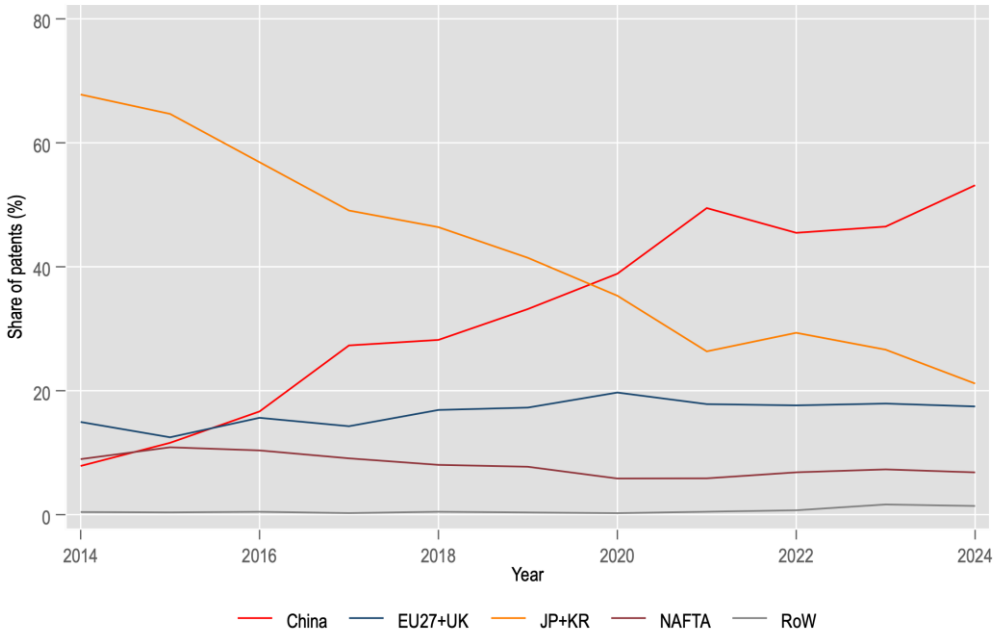
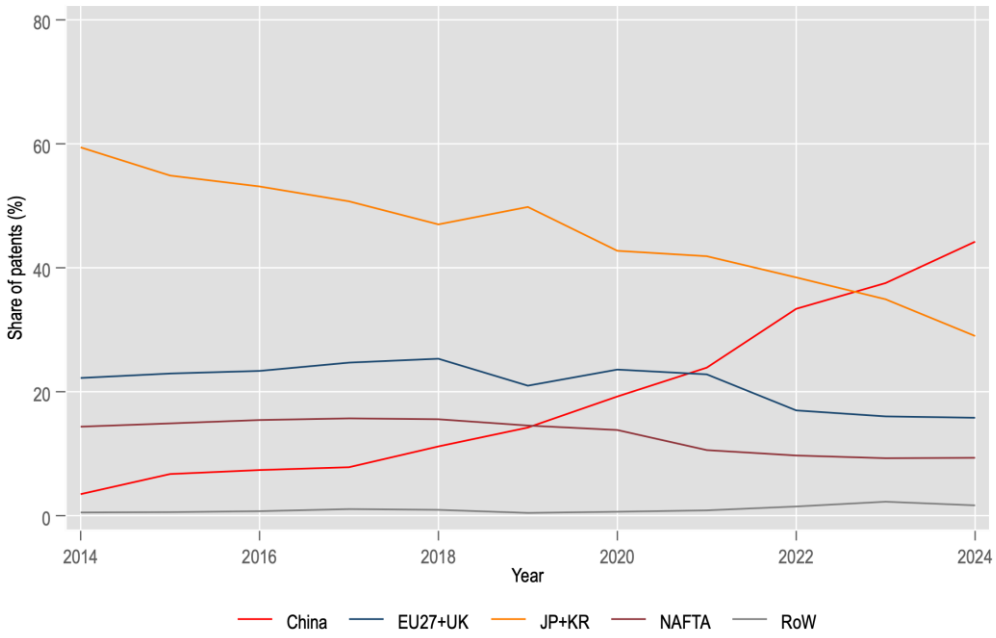


Figure 17 (continued)

(c) Power electronics



(d) Software and autonomy



Source: *Authors' elaboration of Orbis IP and PATSTAT data.*

Notes: *Simple patent families from Orbis IP, assigned to a technology class from the main IPC code (ICE: F02, F01N; batteries and cells: H01M; power electronics: H02M, H02P, B60L; software and autonomy: G06N, G05D, B60W) and located by inventor country, capturing where knowledge is created. Regions: China, EU-27+UK, Japan and South Korea (JP + KR), NAFTA and rest of world (RoW).*

Figure 18 looks at cross-region knowledge linkages, aggregating backward-citation links between regional buckets for batteries and cells, with the citing region on the left and the cited region on the right; a thicker flow indicates that the citing region draws more heavily on the cited region's prior art. The citation patterns add nuance to the volume picture: EU-

27 battery patents draw heavily on EU-27+UK prior art, indicating a strongly regionalised knowledge base. Chinese patents account for a rapidly rising share of patent families, but the all-region citation map suggests that Chinese prior art is still less central to cross-region citation flows than its patent volume rise alone would imply. The UK panel shows that UK battery patents draw on several external knowledge bases, including EU-27+UK, JP + KR, NAFTA and China; the UK is therefore better described as a user or importer of cross-region prior art than as a "recipient" of citations.

Figure 18. Cross-region backward-citation flows, batteries and cells, 2020–2024

(a) All regions (citing region on the left, cited region on the right)

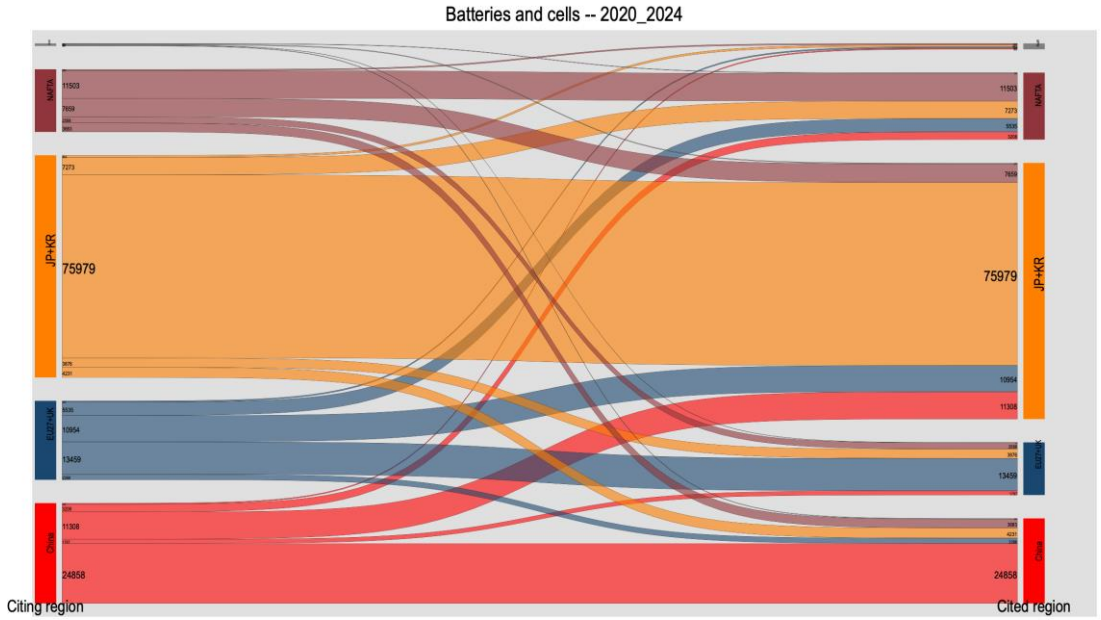
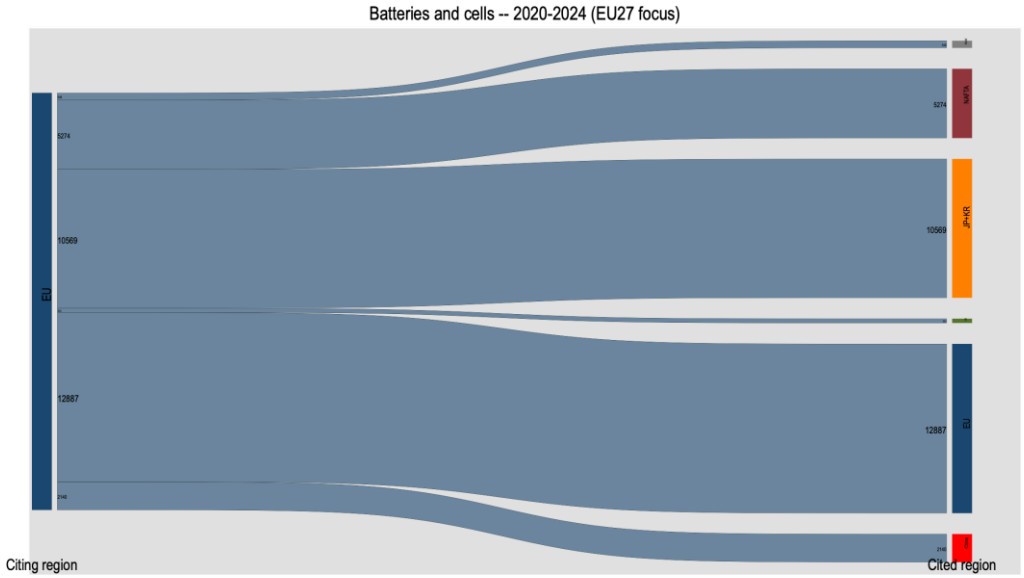
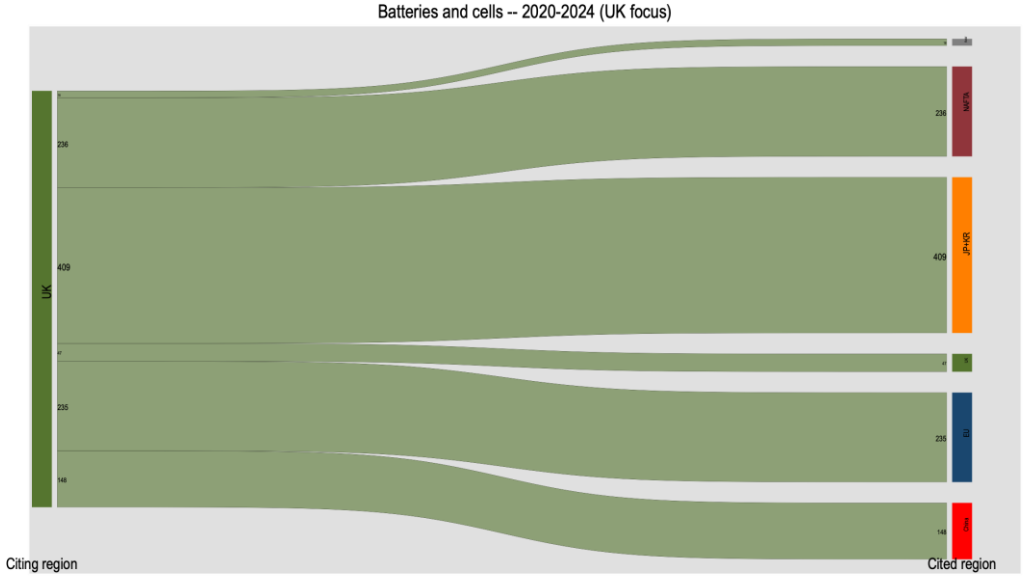


Figure 18 (continued)

(b) EU-27 as citing region



(c) UK as citing region



Source: *Authors' elaboration of Orbis IP and PATSTAT data.*

Notes: *Shows backward citations across macro-regions (citing region on the left, cited region on the right) for batteries and cells (H01M) over 2020–2024; flow width is proportional to the number of citations; citation-weighted variants use cohort-normalised weights to offset the right truncation of the most recent cohorts. As backward citations, the flows should be read as knowledge inputs used by inventors in the citing region.*

China's rising share of patent families has not been matched one-for-one by the centrality of Chinese prior art in cross-region citation flows, i.e. its output has not yet become internationally mobilised knowledge to the extent its volume growth might suggest. Conversely, the EU retains citation weight even as its volume share slips, but increasingly cites itself. For the UK, the 2020–2024 battery citation map shows an inventive base that remains connected to European prior art but also draws substantially on other major innovation blocs, especially JP + KR and NAFTA. This is the innovation counterpart of the

value chain evidence documented earlier: UK automotive capabilities remain embedded in wider European systems, but are also exposed to technological shifts occurring outside Europe.

Facts 4 and 5 show that the UK and EU remain commercially and materially connected through value added and batteries. Fact 6 shows that ownership links have been reorganised rather than simply dissolved. Fact 7 shows that investment sources are diverging. Fact 9 adds the knowledge dimension: the EU–UK automotive system remains an important innovation space, but the centre of gravity of patenting is moving towards China, especially in the technologies that define the EV transition. Strategic cooperation therefore cannot be limited to trade frictions or battery capacity. It also has to support shared innovation capabilities, research collaboration, technology diffusion, standards and the co-location of production and knowledge functions.

Takeaway. Automotive innovation is shifting towards China in patent volume across ICE, batteries, power electronics and software/autonomy, but the battery citation evidence suggests that prior art influence remains more regionally embedded than patent counts alone imply. The EU-27+UK knowledge base remains important, especially through EU-27 self-referencing and UK links to European prior art, but is no longer sufficient to anchor the technological frontier on its own. This mirrors the wider report: EU–UK automotive integration persists, but its competitiveness now depends on whether trade, ownership, investment and innovation links can be reinforced in the face of rising Chinese scale and continuing Asian strength in battery technologies.

6.5 Fact 10. Battery capabilities remain uneven across the EU–UK EV value chain

This section brings together the preceding evidence on battery production, import dependence and investment with a complementary indicator of technological specialisation. It asks whether the capability constraints identified in the EU–UK battery value chain are also reflected in the established patent portfolios of the two economies and why that distinction matters for RoO and local content policy. It also introduces new industry estimates from ACEA and SMMT on expected compliance with the RoO scheduled to apply from 2027. These estimates provide a useful indication of the compliance challenge anticipated by manufacturers, but are based on internal industry data that cannot be independently reproduced or validated with the publicly available sources used elsewhere in this report.

The two forms of evidence answer different questions. The preceding facts provide evidence on production sites, employment, battery import dependence, investment and ownership, but do not constitute a complete plant-level dataset of realised battery output, active material sourcing or vehicle-level compliance. The patent evidence is used more narrowly to examine whether battery technologies are central to the established inventive base of the UK and EU. It therefore adds a longer-term perspective on technological specialisation rather than a measure of current manufacturing capacity or RoO compliance.

This additional evidence is highly relevant to support policy options discussed in Section 7. RoO are not only customs provisions for EVs, but are designed to encourage battery and EV production capacity within the EU–UK area. The current transitional rules for electric accumulators and EVs apply until the end of 2026, with the full product-specific rules scheduled to apply from 1 January 2027. This creates exposure on both sides of the Channel. UK producers need local or regionally sourced battery content to export EVs tariff-free to the

EU, but EU producers also have a stake in the same issue because EU automotive exports to the UK must satisfy the same RoO framework. The policy question is whether the wider EU–UK battery and EV ecosystem can generate enough local content, scale and technological capability to keep cross-border EV trade commercially viable. The compliance exposure is symmetric in principle, if asymmetric in capacity: both UK and EU producers face product-specific origin requirements for tariff-free EV trade, while the compliance position of individual vehicles depends on their actual sourcing and the applicable rules. However, the UK starts from a thinner domestic battery base, while the EU starts from a larger but still incomplete and partly foreign-owned ecosystem. The industry estimates reported in Table 2 provide a direct indication of how manufacturers expect these constraints to translate into RoO compliance in 2027. They should be interpreted as forward-looking industry assessments rather than independently verified compliance forecasts.

Table 2. ACEA/SMMT industry estimates of RoO compliance among EV exports for 2027

	BEV	PHEV
Combined compliance rate	23.9%	1.7%

Source: *Authors' calculations using aggregate estimates supplied by ACEA and SMMT.*

Notes: *Figures report the estimated share of vehicles forecast to be traded between the EU and UK in 2027 that manufacturers expect to comply with RoO scheduled to apply in 2027, by powertrain; percentages combine ACEA estimates for EU-to-UK exports with SMMT estimates for UK-to-EU exports. For each powertrain, the combined compliance rate is calculated as the total expected compliant units reported by ACEA and SMMT, divided by the total forecast export units reported by the two associations; it is weighted by forecast export volumes covered in the respective surveys rather than calculated as a simple average of the two directional percentages; ACEA estimates are based on manufacturers' own submissions, with participating manufacturers accounting for 75% of all BEVs produced in Europe, according to ACEA. UK-to-EU estimates were provided by SMMT and are based on four manufacturers' responses to a March 2026 survey and covering "almost the entirety of UK BEV/PHEV exports to the EU", according to SMMT; SMMT confirmed that "compliant" refers to vehicle-level compliance with the RoO scheduled to apply in 2027, including the requirement to incorporate a battery meeting its applicable origin requirements. Figures refer to forecast exports covered by the participating manufacturers and should not be interpreted as independently verified estimates for all EU–UK vehicle trade; only aggregate estimates were supplied to the research team; underlying export forecasts, sourcing information and compliance calculations could not be independently validated against publicly available official sources; underlying unit counts and separate directional estimates are not disclosed.*

The estimates point to a potentially significant compliance challenge, particularly for PHEVs, and highlight an important evidence gap. The aggregate submissions do not identify which components, suppliers or sourcing decisions account for expected non-compliance and the publicly available official data do not allow these forecasts to be independently reproduced at vehicle level. A more rigorous assessment would require linking vehicle production to battery and component sourcing, production locations, input values and the precise origin criteria applied. Developing this evidence base would require closer cooperation between manufacturers, industry associations and UK and EU authorities, both to monitor compliance and to assess how changes in sourcing, investment or policy could alter that compliance.

The following patent analysis addresses a different, longer-term question. It cannot validate the industry estimates or substitute for the detailed production and sourcing data needed to assess RoO compliance. Instead, it examines whether battery technologies have become an important part of the inventive capabilities accumulated in the UK and EU between 2017 and

2025. Read alongside the capacity, investment and import dependence evidence in Fact 5, this provides a longer-term perspective on the capabilities available to support battery industrialisation.

Figure 19 ranks each region's four-digit IPC subclasses by cumulative patent family count over 2017–2025. A code's rank indicates how central that technology is to the region's overall inventive output[24]. Among the UK's top six patenting IPC codes, there is no H01M (batteries and fuel cells); in the EU's top six, H01M ranks fourth. This does not prove that the EU has solved the battery capacity problem, nor that the UK cannot develop such capability. Rather, it shows that battery-related inventive activity is more central to the EU's automotive technology portfolio. Read alongside Fact 5, this suggests that the EU has greater battery capacity and that battery technologies are more prominent within its automotive patent portfolio but still remains import- and foreign-ownership exposed; the UK has a thinner confirmed capacity pipeline and batteries do not yet appear among its leading automotive patent fields. Both sides therefore face battery industrialisation gaps, albeit from different starting points. These differences are not an explanation of the compliance rates in Table 2, which depend on the sourcing and production structure of particular vehicles, while the patent rankings capture accumulated inventive activity over a much longer period.

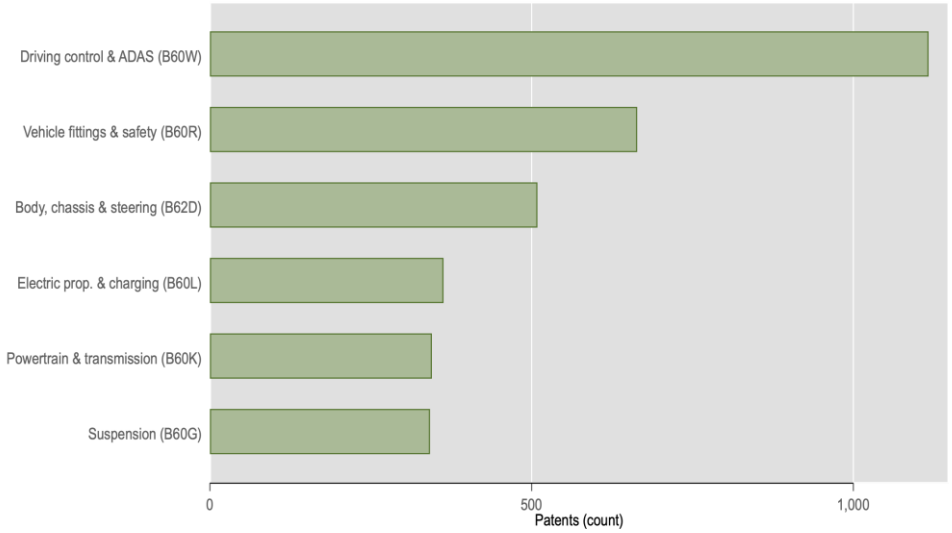
Read against Fact 7, the absence of batteries and fuel cells (H01M) from the UK's six largest technology fields provides a complementary perspective on the investment and capacity patterns documented in Facts 5 and 7. The UK is seeking to build battery and EV capacity, while relying on a small number of strategic projects and a more geographically diversified set of investors. The EU has a larger and more diversified battery ecosystem and H01M appears among its leading patent fields, but Fact 5 shows that EU battery use still relies heavily on imports and much onshore capacity is foreign-owned. In the EU, the same field ranks fourth, above both powertrain and transmission (B60K) and electric propulsion and charging (B60L); in the UK the sixth position is held by suspension (B60G), a mature mechanical domain. These cumulative patent rankings cannot identify the effects of the Battery Innovation Programme. Assessing the programme would require evidence of its supported projects, timing and subsequent innovation or production outcomes. Together with the industry estimates in Table 2, the policy relevance is bilateral: a UK-only reading would be too narrow, as EU producers also depend on a RoO-compliant EU–UK battery ecosystem if EV exports to the UK are to remain tariff-free and competitive. An EU-only "Made in Europe" or local content response would be incomplete if it treats the UK as external to the production system that still links vehicle assembly, components, ownership, investment and innovation across the Channel.

The relevant policy questions are whether RoO or local content requirements should be tightened or extended and whether the underlying production system can adjust sufficiently to meet them. That depends on battery capacity, active materials supply, supplier upgrading, skills, recycling, permitting and innovation on both sides of the EU–UK value chain. In practical terms, local content or "Made in Europe" objectives will only be credible if they are matched by investable projects and regional delivery capacity. Otherwise, they risk raising compliance costs without solving the underlying battery bottleneck.

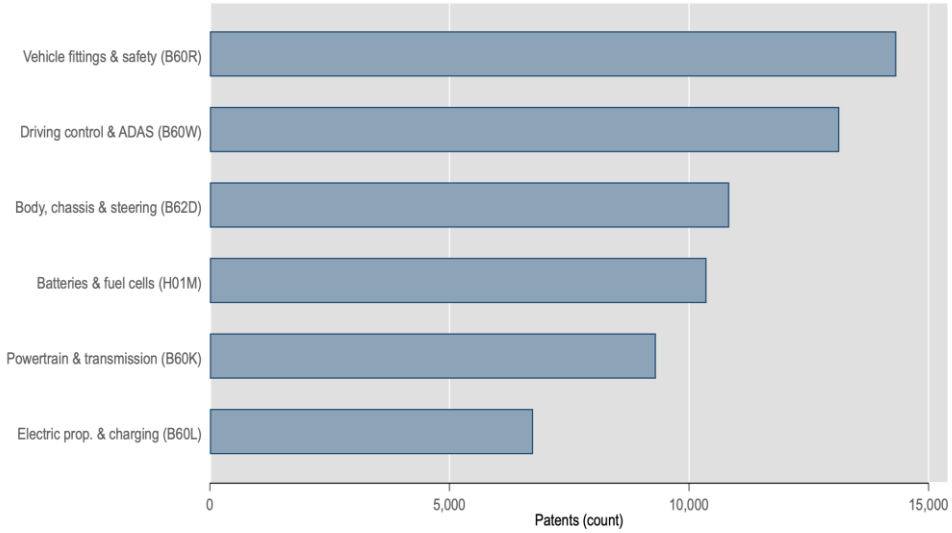
[24] For each region, the four-digit IPC subclasses are ranked by patent family count over 2017–2025, using the same Orbis IP simple families as Fact 9; the rankings are cumulative counts and describe the established centre of gravity of each region's inventive activity rather than a single year; IPC labels are listed in Appendix D.

Figure 19. Top six four-digit IPC subclasses, by patent family count, 2017–2025

(a) UK



(b) EU



Source: *Authors' elaboration of Orbis IP and PATSTAT data.*

Notes: *Cumulative counts of the same Orbis IP simple families as Figure 17, ranking four-digit IPC subclasses by family count over 2017–2025; labels are short descriptions of IPC subclass, with the four-digit symbol in brackets (see Appendix D for full labels); figure captures technological specialisation in patenting, rather than production capacity, realised output or RoO compliance.*

This places Fact 10 within the report as a whole. Fact 3 shows that automotive production sites and employment exposure are geographically uneven. Fact 4 shows that EU–UK automotive integration remains commercially important but thinner in value-added terms. Fact 5 identifies batteries as a major upstream constraint. Fact 7 documents changes in the composition and geography of automotive FDI, while Fact 8 shows the growing role of investment promotion in green automotive strategies. The ACEA and SMMT estimates add manufacturers' expectations of the immediate RoO compliance challenge, while exposing the limits of the currently available production and sourcing data. Fact 10 adds that RoO exposure is also a capability and information problem: local content must be produced, but

policymakers also need sufficiently detailed evidence to understand where compliance constraints arise and the investments or sourcing changes that could address them.

Takeaway. RoO expose a shared EU–UK battery capability challenge. The combined ACEA/SMMT estimates suggest that only 23.9% of BEVs and 1.7% of PHEVs covered by their 2027 forecasts would comply with the new rules. Battery technologies are more prominently represented in the EU's automotive patent portfolio, together with a larger battery ecosystem, while the UK has a smaller, more project-dependent capacity pipeline. Both nevertheless face the wider competitive challenge created by China's growing technological and industrial prominence in batteries and EV technologies. For policymakers, this strengthens the case for a joint EU–UK battery industrialisation strategy, combining investment in cells and active materials with recycling, skills, supplier upgrading, innovation and regional production capabilities. RoO and "Made in Europe" requirements can support that process, but their effectiveness will depend on whether the required production and technological capabilities are developed on both sides of the Channel.

7. Policy reflections

The preceding sections have established the forces reshaping the automotive sector, shown that the literature converges on a set of actionable responses, and employed a range of empirical indicators. This section distils these into prescriptive recommendations, organised by the same three pillars: technological change, geopolitics and EU–UK relations. The policy message that follows is deliberately integrated: technology, trade, investment, ownership and regional capabilities are not separate margins of adjustment, but mutually reinforcing parts of the same EU–UK automotive transition.

7.1 Technological change

As the EU and the UK each remain anchored in historical automotive BGs rather than large EV-native challengers, technological change requires the transition of existing incumbents and their supplier ecosystems (Fact 2). Three conditions for a successful EV transition emerge from the literature: regulatory stability, sufficient charging infrastructure and consumer incentives. These are necessary but not sufficient. The evidence in Facts 1, 3 and 5 also points to broader competitiveness conditions: energy costs, labour costs, bureaucracy, permitting speed, grid connections and the ability to retool existing plants and suppliers at scale. Project cancellations in the US battery sector following policy reversals illustrate the cost of regulatory uncertainty (Juge et al., 2025; Patella et al., 2018). For the UK, a stable phase-out timeline, aligned with the EU to the extent possible, is necessary to attract the long-horizon investment demanded by the sector.

The UK government expects a need of at least 300,000 chargepoints by 2030; however, the figure of 76,507 available in 2025 remains far from the target (House of Commons Library, 2025). Grid upgrades for chargepoints should be designated as nationally critical infrastructure to address connection delays (House of Lords Library, 2024). This is a binding constraint: spatial variation in BEV adoption reflects charging availability. The same issue applies on the EU side, albeit through a different policy framework. The Alternative Fuels Infrastructure Regulation (European Parliament and Council, 2023) sets mandatory national deployment targets for publicly accessible charging infrastructure, including along the trans-

European transport network. Delivery still depends on Member States' implementation and practical enabling conditions such as grid connection, land acquisition, permitting and local coordination. Looking at consumer incentives, the persistent EV cost gap justifies targeted purchase support for lower-income households where the gap is most prohibitive (Dietz et al., 2025). However, incentives need to be simple, durable and aligned with the wider regulatory framework. Complex schemes, punitive measures applied to EV use or policies that shift excessive compliance costs onto manufacturers can weaken the demand signal that incentives are meant to create. In the UK, the Vehicle Emissions Trading Scheme operates separately from the EU framework, adding administrative and compliance costs for firms selling into both markets.

Labour market policy must be early and spatially targeted. ICE workers' skills are broadly compatible with green sector occupations, but retraining is required (Celasun et al., 2023). Given the spatial concentration of employment losses (Facts 1 and 3; Wingender et al., 2024), dedicated regional transition funds should be established. For the new skills needed in the sector (e.g. battery management, electronics integration, software), FDI incentives should be conditioned on local supply chain development and technology transfer to ensure that employment gains are not confined to low-value assembly (Facts 7 and 8). This is also where green automotive FDI can support wider host-economy upgrading. From a green GVC perspective, investment matters both because it reduces emissions within a single project and because it can diffuse cleaner technologies, standards, supplier capabilities and skills through the regional production system (Crescenzi and Harman, 2026). For batteries, both the EU and UK remain exposed to imports of lithium-ion accumulators, limited locally available cell production and foreign-controlled capacity and upstream input dependencies (Fact 5), although the EU retains a stronger automotive innovation base (Fact 9). Fact 9 also suggests that EU–UK cooperation should extend to innovation policy: joint battery research, power electronics, software, autonomy, standards and demonstration projects are needed to ensure that local content and manufacturing objectives are supported by a shared technological base, rather than assembly capacity alone.

Economic security, IP and climate policy should be governed as an integrated package rather than in separate silos (Royal United Services Institute, 2025; BusinessEurope, 2024; European Commission, 2025a). For automotive policy, this means that decarbonisation targets must be matched by energy infrastructure, battery capacity, investment promotion, permitting reform and regional skills policies.

7.2 Geopolitics: Trade and IP in an increasingly polarised world

The investment gap is the central challenge. Fact 7 documents the shifting composition and origins of automotive FDI. European manufacturers require more than EUR 150 billion annually, while a separate estimate identifies EUR 200–300 billion in battery investment need through 2035 (McKinsey & Company, 2025) and the Draghi report calls for EUR 750–800 billion annually across the wider European economy (Draghi, 2024a). Against this, the European Commission's 2025 commitment of EUR 3 billion for batteries underscores that public investment must catalyse rather than substitute private capital. Both the EU and the UK should structure public-private co-investment frameworks that de-risk battery and EV manufacturing at scale. In practical terms, coordinating investment policy means aligning public capital, operating support, permitting, grid access, skills packages, investment promotion and supplier development programmes so that private investors can consider bankable projects rather than fragmented national or regional offers. Fact 8 shows why IPAs

matter, as the institutions that can translate strategic priorities into investable regional propositions.

The literature supports a sequenced response to trade policy. First, where trade-distorting subsidies are identified and material injury documented, WTO-calibrated CVDs are appropriate (Sapir et al., 2023). However, CVDs alone stall without closing the structural competitiveness gap and risk reducing the pressure that may itself drive innovation (Dadush, 2024a, 2024b). The evidence confirms that import restrictions do not address underlying cost structures (Goldberg, 1995; Berry et al., 1999). Second, affected economies should negotiate subsidy reductions. Third, EU market access for Chinese manufacturers should be conditioned on technology transfer and supply chain localisation, combined with harmonised investment screening across the EU (Tagliapietra et al., 2025). Fourth, facing US tariffs, EU and UK policymakers should avoid escalation given the GVC-mediated ripple effects on European exporters (Dadush, 2024b; Oxford Economics, 2024). Multilateral approaches remain preferable to unilateral tariffs; the UK's multi-pronged trade strategy, notably the US quota, the India Free Trade Agreement (FTA) and increasing linkages with the EU's ETS, represent attempts to navigate this middle ground.

CRM dependencies are a major strategic risk (Fact 5 battery evidence; IEA, 2025b; OECD, 2024; firm interviews in Section 8). Neither domestic IP nor trade policy can resolve these alone. Recommended measures include: volume commitments and price stabilisation mechanisms to de-risk CRM investment; processing capacity investments in Europe and partner economies; battery recycling targets; and joint EU–UK CRM partnerships. On CBAM, compliance costs for exporters of critical materials (Aldaz-Carroll et al., 2024) necessitate accompanying support for low-income trading partners.

7.3 EU–UK relations: Achieving a strategic partnership

EU–UK relations in the automotive sector are currently managed through the TCA, including temporary RoO accommodations for EVs and batteries. This is inadequate given the persistence of EU–UK value chain integration (Fact 4), reorganisation rather than dissolution of ownership links (Fact 6) and the shared exposure to Chinese competition and US trade disruption. UK in a Changing Europe (2023) notes that a failure to move forward risks benefitting only China. The structural costs of the current framework are high for both sides (Vandenbussche et al., 2022; Novy et al., 2024). Facts 4–10 point to the same conclusion, showing that EU–UK automotive integration has not disappeared, but has become thinner, more conditional and more exposed to battery, investment and innovation bottlenecks. Fact 6 shows that EU–UK ownership links have been reorganised rather than dissolved, suggesting that policy should focus on both attracting new investors and aftercare for existing BGs through retaining mandates, supporting reinvestment, reducing coordination costs and preventing the gradual downgrading of UK and EU sites within global corporate hierarchies.

Three policy priorities follow. First, the 2027 RoO threshold increase must be addressed. This should not be framed as a UK-only compliance problem. The compliance exposure is symmetric in principle, even if asymmetric in capacity: both UK and EU producers need origin-compliant batteries and components for tariff-free cross-border EV trade, but the UK starts from a thinner domestic battery base while the EU starts from a larger but still incomplete and partly foreign-owned ecosystem. A further extension without a credible capacity-building plan risks entrenching dependence. Policymakers should pair any threshold accommodation with a joint EU–UK battery roadmap focused on commercially viable

investment, public capital and operating support where needed, active materials, recycling, permitting, grid access and supplier upgrading. Fact 5 shows that battery capacity is expanding, but Fact 10 shows that local content compliance remains a shared capability problem.

Second, regulatory convergence should be pursued in areas where divergence imposes costs without conferring strategic advantages. Mutual recognition of battery supply chain standards and interoperable charging infrastructure specifications would reduce compliance costs. Linking the two ETSs belongs in a later tier of the agenda, with the interview evidence indicating that policymakers regard deeper linkage as technically and politically complex. The same logic applies to software, cybersecurity, advanced driver-assistance systems and connected and autonomous vehicles. Mutual recognition should also be considered where duplicate UK and EU approval processes raise costs without improving safety or competitiveness. Particular care is needed because regulatory divergence does not always affect Northern Ireland and Great Britain in the same way, creating additional complexity for firms operating across the UK internal market and EU value chains.

Third, a structured trade and cooperation framework should be established, encompassing RoO, joint CRM procurement and stockpiling, coordinated investment screening and regulatory dialogue on autonomous and connected vehicles. The framework could also include a dedicated investment promotion channel linking national agencies, regional IPAs and automotive clusters on both sides of the Channel. Fact 8 shows that FDI-weighted coverage by IPAs reporting green automotive strategies has expanded, particularly in the UK. Such cooperation could help to translate national agreements into investable regional projects in batteries, components, recycling, charging infrastructure and supplier upgrading.

UK accession to the Regional Convention on pan-Euro-Mediterranean preferential rules of origin (PEM Convention) should be assessed as an additional compliance route alongside the TCA's EV-specific rules. This is in line with the finding that EU–UK automotive integration persists but has become more conditional (Fact 4), that battery capacity and local content compliance remain shared constraints (Facts 5 and 10) and that the UK relies on a more diversified set of non-EU investment and supply-chain links than the EU (Fact 7). Accession to the PEM Convention could widen cumulation possibilities and help firms to manage origin requirements across European and neighbouring supply chains. It would not remove the need for coordinated EU–UK investment in batteries, active materials, recycling and supplier upgrading. The window for cooperation is open.

8. Firm voice and policy response

8.1 Survey and interview evidence

The quantitative analysis establishes how employment, ownership, trade, investment and innovation are changing across the EU–UK automotive system. The survey and interviews add the firms' perspective: which pressures matter most to their decisions, how those pressures affect investment and production plans and where the existing policy framework falls short. They provide complementary evidence on the mechanisms and commercial constraints behind the patterns observed, rather than a causal explanation of the quantitative results. The firm voice comes from three sources. First, an online survey of 28 firms from across the EU and UK automotive value chain in spring 2026. Second, six in-depth interviews in March 2026 with senior executives from government affairs, procurement, finance and industrial strategy at major manufacturers spanning premium and volume passenger cars, luxury vehicles and heavy commercial vehicles. Third, a parallel set of interviews with officials from key domestic and multilateral government bodies. The survey records the distribution of views among participating firms, the interviews explain why firms hold that view and their related actions, and the policymaker interviews show the extent to which the resulting agenda is actionable.

The survey had four parts: geoeconomic environment and supply-chain strategy; EU and UK trade and regulatory divergence; green transition and electrification; and investment and location decisions. It mixed single-choice, ranking and open-text questions. Ranking questions are reported as the average rank given by respondents (i.e. a lower number means a higher priority) and open-text answers are grouped by theme. Twenty-eight valid responses were received. Sixteen firms completed the whole questionnaire and the rest dropped out after the opening sections. Respondents were senior and weighted towards vehicle manufacturers: nine vehicle manufacturers, seven Tier-1 suppliers and seven Tier-2 or Tier-3 suppliers reported a single primary role, and the remaining five spanned more than one role or came from adjacent industries such as steel. Sixteen firms employ more than 1,000 people, nine employ more than 10,000 and 12 are SMEs. Manufacturing footprints are concentrated in the UK and Germany, with several firms also producing in North America, China, Japan and South Korea.

Both interview programmes used the same semi-structured, virtual format, combining a common set of questions with room to follow individual issues in depth. Interview material was analysed by theme and read alongside the survey and the 10 quantitative facts. Given its size and composition, the survey is treated as corroborating evidence rather than a statistically representative sample: differences between closely ranked items are indicative, not precise, and several ranking questions mix battery and non-battery firms. The policymaker interviews are intended to frame, not measure, the policy debate. Accordingly, this evidence provides a view of the gap between the threats firms perceive and the adjustments they feel able to make.

8.2 Firms' responses

Across the survey and the interviews, the most consistent pattern is a gap between the threats firms identify and the actions they feel able to take. Faced with policy uncertainty, most have adopted a cautious, wait-and-see position. The main findings are set out below, cross-referencing the relevant quantitative fact where appropriate.

- **External shocks matter more than internal risks.** Asked to rank today's geoeconomic pressures, respondents put US trade policy and tariffs first (average rank 2.3; top concern for 11 of 24 respondents), with China-related de-risking and EV competition a close second (2.5); EU–UK trade friction sat mid-table (3.0). Looking ahead, China moves to the top (2.1), ahead of US policy (2.6). The interviews add a frequently cited third concern: the EU's "Made in Europe" and Industrial Accelerator Act local content proposals, which firms in the UK describe as the single overriding threat (Fact 10).
- **Firms see the threats but are not acting on them.** In the survey, the dominant stance on future investment is to wait and see. The interviews reveal substantial hesitation among manufacturers, with projects delayed, capital deferred and suppliers consolidating or leaving the sector altogether. Interviewees are clear that it is geoeconomic pressure, not the green transition, that is prompting them to review their global footprint. These accounts provide a forward-looking perspective on investment intentions that complements the completed-FDI evidence in Fact 7.
- **Batteries and CRMs are the deepest structural exposure.** Lithium is ranked the most critical input (2.4), ahead of cobalt (2.7) and nickel (3.7), and China's dominance of processing is seen as very hard to mitigate. The Nexperia semiconductor disruption of late 2025 is cited as the moment this exposure became tangible, with even "localised" battery chains remaining China-dependent upstream, where most cell costs originate. The economics of localisation are punishing: origin-compliant cells and cathode material add anything from hundreds to several thousands of euros per vehicle and Western producers cannot match China's speed of industrialisation. This reinforces the dependence documented in Fact 5.
- **RoO are the clearest signal of strain.** Today's rules are manageable, but several firms believe that the battery thresholds due in 2027 will be impossible to meet. Applying them as planned was the least-favoured option in the survey (ranked last by 8 of 15 respondents), with a postponement of around three years scoring best and a two-year delay close behind. One manufacturer faces duty exposure of more than GBP 1 billion if it does nothing, with origin-compliant cells adding several thousand pounds per vehicle. Another is already moving production to EU sites where the burden is lower, and with some nine months to go, official guidance on both sides was still not agreed (Fact 10).
- **Regulatory divergence is a persistent cost.** Firms judge both EU and UK frameworks to be fragmented or inadequate for supply chain resilience, the green transition and cross-border R&D. Exposure is uneven: one group of firms scores divergence as a meaningful cost driver (60–90 out of 100), while road freight and niche producers report little impact. Misaligned ZEV mandates, mismatched carbon-border timing, a UK vehicle ETS that sits apart from the EU ETS and regulatory reversals all erode confidence to invest. The green transition itself is seen as challenging but achievable, provided policy remains stable.
- **Demand and costs weigh as heavily as trade rules.** Manufacturers report that the UK's ZEV mandate has run ahead of consumer demand, with the gap closed through billions of pounds of discounting, and that new taxes on EVs send a mixed message that undercuts IP. In the survey, labour cost and skills are the dominant location factor (average rank 2.5; the first choice of 6 of 16), with the cost of doing business, proximity to markets, regulatory stability, energy costs and proximity to supply chains in a tight

cluster behind. Subsidies and IP incentives rank near the bottom (5.6). In interviews, energy costs are sometimes described as the highest in Europe. Firms want consumer incentives and IP to point the same way, together with regulatory stability that leaves room to adjust to the market.

- **The policy ask is a shared commitment.** Firms call for a coordinated EU–UK strategic partnership on trade, critical minerals and batteries. More specifically, they ask for UK content to count in EU origin and local content definitions, predictable multi-year frameworks, support linked to production rather than capital alone, relief on energy costs and reciprocity on funding where firms hold substantial value chain content on both sides. A late signal that the UK might be included in the EU's draft Union origin definition was welcomed as a positive, concrete development.

8.3 Firm and policymaker perspectives in dialogue

The policymaker interviews allow the firm voice to be set against the policy response. They encompass officials across EU and UK institutions, including the European Commission, the European Parliament and the UK Department for Business and Trade. On most points, the two readings converge. Where they diverge, the gap is instructive, showing where the case for cooperation has yet to be made.

One difference runs throughout the exchanges: urgency. The relationship is vital to both sides. The trade data in Fact 4 show that the UK is the EU's largest export market for vehicles and its largest buyer of automotive components, with the EU taking well over half of UK car exports; a weaker UK industry means a smaller market and a thinner supply base for EU producers. But the risks land sooner and harder on the UK side, as reflected in the policymaker interviews. UK officials engaged with the industry's arguments in detail, while EU officials tended to frame the UK as a third country within the current trade arrangements. This asymmetry of urgency shapes how a cooperative agenda must be argued. The exchanges below pair the main industry contentions with opportunities and policy responses.

- **Local content exclusion.** Firms place the EU's "Made in Europe" and Industrial Accelerator Act proposals at the top of the risk map. UK-assembling manufacturers are gravely concerned about exclusion from local content definitions. The UK side endorses firms' substitution fallacy argument directly, noting that around EUR 12 billion of EU components flow into UK-built vehicles, many re-exported to the EU, meaning that excluding UK content would likely shift assembly to third countries such as Japan or China. The EUR 12 billion figure is officials' own general estimate and is not directly comparable with the SMMT figure of more than GBP 6.9 billion of EU-made typical parts imported into the UK in 2025 used elsewhere in this report (Fact 4). The EU side frames the relationship as that of a third country bounded by current trade arrangements. The opening this creates is to advance UK inclusion as a measure in the EU's own interest rather than a bilateral favour. Fact 10 explains the rationale: local content rules only work if the capability to comply exists and that capability is a shared EU–UK problem.
- **RoO.** Firms treat the 2027 thresholds as the clearest single signal, citing duty exposure in the order of GBP 1 billion and production already moving to lower-burden EU sites. The EU side corroborates the diagnosis of decline but downgrades RoO as an industrial priority, pointing instead to input dependency as its leading concern. Both sides see scope to work through structures that already exist, particularly the bilateral automotive working group, rather than new institutions. Any accommodation on the

thresholds is best pursued through those channels and paired with credible commitments on capacity.

- **Batteries and CRMs.** Firms identify battery and CRM dependence as their deepest structural exposure, with localisation economics that Western producers cannot yet match. Here, industry and policymakers are closest. The EU side names input dependence in battery materials, semiconductors and sensors as its leading concern. The opening is to frame a joint battery and minerals commitment as a contribution to reducing EU strategic dependence and to broaden the diagnosis beyond batteries to semiconductors, rather than presenting it as a concession to the UK.
- **Regulatory divergence.** Firms describe divergence as a persistent cost driver, singling out misaligned ZEV mandates and mismatched carbon-border timing. Policymakers show an appetite for coordination through existing channels, viewing deeper linkages, including ETS, as technically and politically complex. The practical reading is to sequence the agenda: begin with the concrete divergences firms identify and leave broader linkage as a longer-term objective.
- **Investment case.** For manufacturers, RoO, local content definitions, energy costs, regulatory divergence and the strength of consumer demand are not separate issues. Together, they determine whether a future model, battery supply contract or electrification programme can be justified in the UK or the EU. Policymakers on both sides tend to handle these questions in separate files. The opening is to treat them as one investment proposition, similar to the recommendations in Section 9.
- **Asymmetry of urgency.** As the risks firms identify land on the UK side first, the most effective case to make in Brussels is to emphasise that allowing the UK value chain to contract would not bring activity back to the EU but likely displace it outside Europe altogether. Framed that way, cooperation is a matter of European competitiveness rather than a bilateral concession.

The thread running through these findings is the report's central thesis. The EU and the UK face a common external challenge and their relationship is the lever most directly within their control.

9. Conclusions and recommendations

This report shows that the centre of gravity of the automotive industry is shifting away from the rest of Europe and the UK and that the relationship between the EU and the UK is the response lever most directly within their control. The conclusions here draw on both the quantitative analysis, organised around 10 empirical facts at the level of the BG, and the qualitative evidence from the firm survey, firm interviews and policymaker interviews.

9.1 Summary of key findings

Key findings:

- **The centre of gravity of the industry has moved towards China.** Across the BGs studied, manufacturing employment has fallen by 17% in the rest of Europe and by 30% in the UK since 2015–2016, while employment in China has risen by more than 40%. The EU and the UK are losing ground together (Fact 1).
- **Exposure is concentrated in established incumbents rather than EV-native entrants.** The groups most exposed to the transition are the traditional OEMs, not the EV-native and emerging manufacturers now setting the pace, and labour risk is unevenly distributed across producer regions (Facts 2 and 3).
- **Imported inputs account for a growing share of European automotive exports.** The FVA share of EU automotive exports has risen over the past decade and dependence on imported batteries and components has deepened (Facts 4 and 5).
- **Battery and CRM dependence is the deepest structural exposure.** Despite some EUR 72 billion invested in European battery and EV plants since 2017, the EU still imports around two-thirds of the lithium-ion accumulators in its measured apparent use, much of its capacity is foreign-owned and the UK's pipeline depends on several critical projects (Fact 5).
- **Ownership and investment ties between the EU and the UK have been reorganised, not dissolved.** Most BGs retained their EU–UK ownership links after the UK's withdrawal from the EU and pulled them closer, with only a minority drifting apart. Inward automotive investment has fallen in both regions since 2021–2022 and shifted towards greener, non-assembly activities, with the UK far more dependent than the EU on non-European investors. IPAs on both sides are pivoting to green automotive projects, particularly in the UK (Facts 6–8).
- **Innovation is shifting towards China in volume, but Europe's knowledge base still counts.** China now leads the growth in automotive patents across the main technology classes. EU and UK prior art remains influential, especially in batteries, albeit no longer sufficient to anchor the frontier alone (Fact 9).
- **RoO and battery capacity are the most urgent near-term policy exposure.** The 2027 RoO thresholds, set against battery capability gaps on both sides of the Channel, are the greatest pressure point identified by firms, and one that local content rules alone cannot resolve (Fact 10).
- **The firm voice points to a gap between perceived threats and feasible action.** Firms identify external shocks clearly but adopt a cautious, wait-and-see posture and converge on a shared, specific policy ask centred on coordinated EU–UK cooperation.

9.2 Caveats and areas for further research

Several caveats and areas for further research should be considered.

- The quantitative findings describe associations rather than causal effects and should be read as evidence of direction and magnitude rather than mechanism.
- Given its size and composition, the survey is treated as corroborating the firm voice rather than a statistically representative base; closely ranked items are read as indicative.
- The small number of policymaker interviews frame, rather than measure, the policy debate. The absence of comment on a given measure reflects an interviewee's remit, rather than their opposition.
- The BG reconstruction depends on the coverage and accuracy of commercial ownership data, documented and validated in the appendices.
- Future research could examine the dynamics of UK investment as post-withdrawal data mature, the regional incidence of the transition's employment effects as they are felt and the extent to which spillovers from high-end R&D, including motorsport, reach the mainstream sector. Regional and cluster-level analysis of EU–UK connections, as requested by SMMT, is outside the scope of this report because the ownership, employment and investment series are built at firm level and allocated to countries; mapping them to regions would require plant-level geocoding and validation against regional statistics that were not available within the study. The plant and battery investment maps in Facts 3 and 5 are a first step towards that picture and a full regional cluster analysis is the natural follow-on project.

9.3 Recommendations

The recommendations are drawn from the empirical findings and stakeholder engagement, organised by time horizon. Each is tied to the facts and supporting evidence. The near-term priorities address the pressures firms identify as most acute and are actionable within the current policy cycle, while the longer-term priorities rebuild the structural foundations of a competitive sector and will require sustained investment and political capital.

Near-term priorities

- **Address the 2027 RoO thresholds as the immediate priority and treat them as a shared problem** (Facts 5 and 10; firm voice). RoO, set against the battery capability gaps on both sides of the Channel, are the greatest pressure point in the evidence, with firms describing the thresholds due in 2027 as the clearest signal of strain. Both UK and EU producers need origin-compliant batteries for tariff-free trade and the combined ACEA/SMMT estimates point to a substantial compliance challenge among the exports covered by their 2027 forecasts (Facts 5 and 10). Any accommodation on the thresholds should be paired with a joint EU–UK battery roadmap: commercially viable private investment, public capital and operating support where projects are viable but not yet bankable, and coordinated action on active materials, recycling, permitting, grid access and supplier upgrading, so that an extension becomes a bridge to that capacity. UK accession to the PEM Convention should be assessed as an additional compliance route alongside the TCA's EV-specific rules.

- **Pursue UK inclusion in EU origin and local content definitions as a measure in the EU's own interest (Facts 4, 6 and 10; firm voice).** Firms place the EU's local content proposals at the top of the risk map and the evidence on the substitution fallacy explains why the concern reaches beyond the UK: excluding UK content would not repatriate assembly to EU producers, which face the same structural pressures, but would likely displace it to third countries such as Japan or China. With more than GBP 6.9 billion of EU-made parts entering the UK in 2025 (SMMT's "typical parts" measure; Fact 4), and more than half of UK car exports going to the EU, treating UK content as foreign weakens the European value chain as a whole.
- **Secure the conditions for the transition: Policy stability, infrastructure, demand and competitive costs** (Facts 2 and 3; firm voice). As the transition must happen inside incumbent groups and their suppliers, the conditions under which they invest matter more than any single instrument. Policy stability comes first: decarbonisation should remain the settled destination, but the regulations that deliver it (notably the EU's carbon dioxide (CO_2) standards for cars and vans, now under revision, and the UK's own timeline) should be adjusted transparently and predictably, rather than treated as immovable, and the two timelines kept as close as possible. As charging infrastructure falls considerably short of targets on both sides, grid connections for chargepoints should be treated as critical national infrastructure, with the EU's Alternative Fuels Infrastructure Regulation and the UK's chargepoint programme delivered in step. Demand-side support should be simple, durable and consistent with IP, i.e. targeted purchase support where the cost gap is most prohibitive and no measures that penalise EVs while mandating their sale. Energy costs, permitting speed and labour costs should be addressed as part of the same package, as firms name them alongside trade rules as decisive for investment.
- **Pursue regulatory alignment through existing structures (Fact 4; firm voice).** Firms identify divergence as a persistent cost driver. Both sides express a clear preference for working through existing channels, particularly the bilateral automotive working group, rather than new institutions. Firms can lower compliance costs by starting where divergence imposes costs without conferring strategic advantage. For example, through mutual recognition of battery supply chain standards, interoperable charging specifications, closer coordination of ZEV mandates and alignment on software, cybersecurity, driver-assistance rules and type approval, where duplicated UK and EU processes add cost without improving safety. The deeper question of emissions-trading linkage, which policy discussions judge technically and politically complex, is better left to a later stage.

Longer-term, structural priorities

- **Close the investment gap and build a joint approach to CRMs.** Battery and CRM dependence is the deepest structural exposure (Fact 5), with European battery capacity largely the product of foreign investment and processing of related minerals concentrated in China. As the financing required runs well beyond current public commitments, public funds should catalyse rather than substitute private capital through co-investment frameworks that de-risk manufacturing at scale. As neither domestic innovation nor trade policy can resolve materials dependence alone, this is most credibly combined with volume commitments and price stabilisation, processing capacity in Europe and partner economies, recycling targets and joint EU–UK procurement and stockpiling. Price stabilisation measures would need to be designed with partners, including the US, rather than set out as unilateral European instruments.

- **Sustain and pool the shared innovation base.** The EU's share of automotive patents has declined across the principal technology classes, while China's has risen (Fact 9). The citation evidence shows that European and other established knowledge bases remain important, strengthening the case for protecting and building on EU and UK research capabilities. Reciprocity on funding, where firms hold substantial value chain content on both sides, is among the measures firms most consistently request to slow that shift.
- **Coordinate investment screening and condition support on high-value capability.** The geography and composition of FDI have shifted, with a growing Chinese presence (Facts 6–8). This makes closer coordination on screening valuable, albeit better pursued through information-sharing than full harmonisation, enabling each side to retain its autonomy. The employment effects of the transition fall unevenly across regions (Fact 3), thus investment promotion should be **c**oordinated with local supply chain development and technology transfer and paired with spatially targeted skills funding, so that gains are not confined to low-value assembly. IPAs on both sides are already pivoting towards green automotive projects (Fact 8); linking national and regional agencies across the Channel would turn cooperation into projects in specific places.
- **Approach Chinese competition through a sequenced response (Facts 1 and 9; firm voice).** China and the US are considered benchmarks here, rather than subjects in their own right, but the response to them shapes everything else. China is the leading forward-looking risk firms identify, but the evidence is equally clear that import restrictions do not address underlying cost structures. Where trade-distorting subsidies are documented and injury established, calibrated and WTO-consistent measures are appropriate to buy time. However, they do not close the competitiveness gap and only work alongside negotiated subsidy reductions and market access conditioned on technology transfer and localisation. The same logic of integrated value chains argues against escalation in response to US tariffs. None of this succeeds if economic security, IP and climate policy are pursued in separate silos. Treating them as a single package aligns the trade, investment and decarbonisation levers on which a competitive sector depends.

These recommendations aim to support evidence-based policymaking and to help the EU and the UK to preserve a competitive automotive sector at the technological frontier.

Appendix A. Data sources and construction

This appendix consolidates the origin of every chart. Construction of the two firm-level building blocks – the ownership network and the employment series – is set out in full in Appendices B and C; the remaining series are described here.

A.1 BGs and the sample

The unit of analysis is the BG: 62 groups accounting for at least 95% of EU/EFTA/UK registrations over 2014–2024, each mapped to its GUO and reconstructed from Orbis Historical with public and semi-public upper layers severed. Appendix B gives the full reconstruction algorithm.

A.2 Employment allocation

Group employment is allocated bottom-up through the ownership tree, attributed to the country of the operating entity, restricted to vehicle manufacturing (NACE 291), and reported as two-year averages (2015–2016 vs 2023–2024). Appendix C details the cleaning, deduplication, interpolation and allocation procedure.

A.3 Vintage, powertrain and skill–automation

Founding-vintage and powertrain-orientation classes are recorded at BG level and merged onto the employment panel; Facts 2 and 3 split the same allocated employment by these fields. The skill–automation positioning in Fact 3 draws on industry-level high-skill intensity from the ILO and automation intensity (robots per 10,000 workers) from the IFR, by country, for 2022.

A.4 GVC position (Fact 4)

GVC measures are built from the OECD TiVA tables, which follow the Borin–Mancini (2019) decomposition of gross exports since the 2021 release. The FVA share is foreign content as a percentage of gross exports. The bilateral source decomposition in Fact 4 uses the OECD ICIO tables, 2025 edition, for C29.

A.5 Battery dependence (Fact 5)

Dependence is the import share of apparent consumption, imports / (production + imports – exports), computed at product level, with production from Eurostat PRODCOM and trade flows from Eurostat Comext on an extra-EU basis. Two product scopes are reported: all rechargeable accumulators (historical benchmark) and lithium-ion accumulators (EV-relevant but not EV-exclusive category, for which data begin in 2019).

A.6 Ownership-network metrics (Fact 6)

Network topology is read directly from the ownership network mapped using the algorithm described in Appendix B. For each EU–UK firm pair within a BG, the bilateral ownership

distance is the length of the shortest path through the lowest common ancestor. The distribution is weighted by employment and compared across 2015, 2021 and 2024. Newman assortativity (r) measures macro-regional homophily across the ownership network (the tendency of like to link with like); the Reardon–O'Sullivan index ($\tilde{H}$) measures the regional purity of each firm's local neighbourhood.

A.7 FDI (Fact 7)

Completed cross-border investment projects are drawn from Orbis Crossborder, valued in USD million and smoothed as two-year moving averages. Projects are split by activity (vehicle manufacturing NACE 29, other production, knowledge functions and HQ-and-sales), by a climate-relevant "green" flag and by source country.

A.8 IPAs (Fact 8)

IPA coverage is taken from the RIPE Survey of Investment Promotion Agencies, 2025 edition, conducted periodically by LSE and recording national and regional agencies' sectoral strategies, green-FDI priorities, institutional characteristics and operating practices. Each region–sector cell is flagged for the activity of a local IPA and weighted by its average completed FDI flow over 2014–2023 (Orbis Crossborder). The indicator measures strategy coverage; it does not measure IPA expenditure or identify the causal effect of promotion on realised FDI.

A.9 Patents (Facts 9 and 10)

Patents are simple families from Orbis IP. Each family is assigned to a technology class from its main IPC code – ICE (F02, F01N), batteries and cells (H01M), power electronics (H02M, H02P, B60L) and software and autonomy (G06N, G05D, B60W) – and located by inventor country. Fact 9 reports within-class regional shares and aggregates backward citations into regional citing-to-cited flows; Fact 10 ranks four-digit IPC subclasses by family count for 2017–2025.

Appendix B. Reconstructing BG ownership networks

B.1 Overview of the algorithm

Mapping corporate ownership networks from Orbis requires a bespoke procedure, as the database records raw shareholder–subsidiary dyads rather than pre-assembled hierarchical trees.

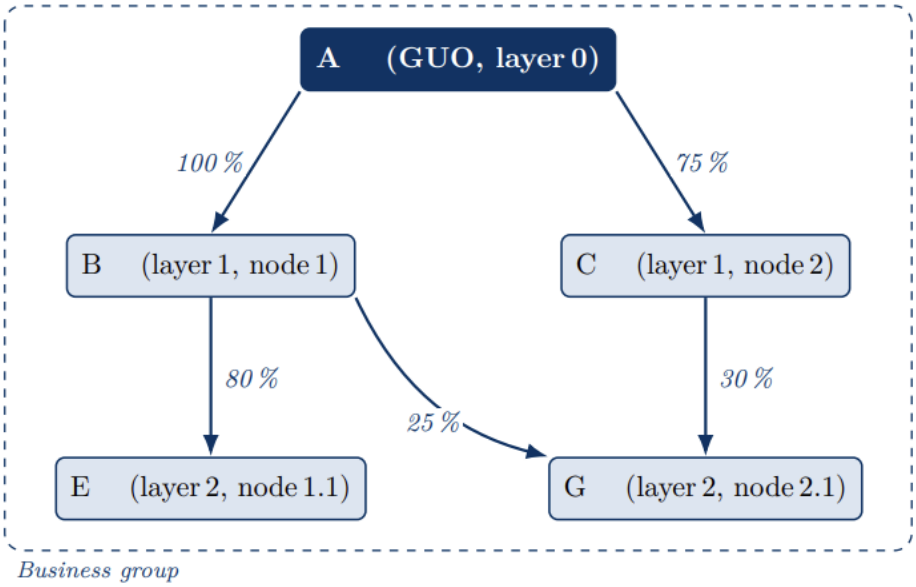
Starting from the GUO, the algorithm iteratively adds any entity that an in-group shareholder controls, until no new members are found. Control can arise in three ways: direct majority control, where a single in-group entity holds a direct or total equity stake of at least 50.01%; transitivity, where if A controls B and B controls C, then A controls C, so C enters the group even though A holds no direct stake in it; and consolidation of voting rights, where if A controls both B and C, and B's and C's direct stakes in D sum to at least 50.01%, then A

effectively controls D through its two subsidiaries acting in concert. D is then recorded as directly controlled by whichever of B or C holds the larger individual stake.

Each entity in the group is assigned a unique primary parent through three ordered passes: direct majority control (highest direct stake ≥ 50.01%), consolidated control (combined stakes of shareholders with the same ultimate controller) and a total-stake fallback for any remaining unassigned entities.

The parent map is converted into a hierarchical address string using breadth-first search. Where an entity appears through multiple ownership routes, only the shallowest occurrence is retained, suppressing the double-counting that would otherwise arise from within-group crossholdings.

Figure 20. Corporate ownership tree: control and consolidation of voting rights



Source: *Authors' elaboration.*

Notes: *A is the GUO; B and C are direct majority subsidiaries (layer 1); E is controlled directly by B (layer 2); G is not controlled by any single shareholder: C holds 30% and B holds 25%, but as A controls both B and C, their combined stakes (30% + 25% = 55% ≥ 50.01%) suffice for A to control G via the consolidation rule.*

B.2 Severing public and semi-public upper layers

A critical methodological challenge arises for BGs whose formal GUO in Orbis is a government body, sovereign wealth fund or public holding institution rather than a commercially active corporation. Applying the algorithm as described would aggregate all subsidiaries of the public parent (potentially spanning banking, energy, aerospace and consumer goods) into a single "group", swamping the automotive signal in any aggregate statistic[25].

[25] Affected cases include the government of Bahrain (ultimate shareholder of McLaren Automotive via the sovereign wealth fund Mumtalakat); the State-owned Assets Supervision and Administration Commission of the State Council of China (SASAC, the ultimate controller of FAW Group, Dongfeng Motor and SAIC Motor through layered state-holding intermediaries); the Beijing and Shanghai municipal governments (controlling BAIC Group and the Shanghai Automobile Industry Group respectively); the government of Vietnam (via Vingroup); and similar public entities in Malaysia and the Gulf region.

The solution adopted is to identify, for each such case, the first commercially autonomous node beneath the public layer, defined as the highest-ranking subsidiary that (i) is principally engaged in automotive or closely related manufacturing activities, (ii) has a distinct corporate identity and independent management structure, and (iii) does not also control entities in unrelated sectors primarily as a result of the public parent's diversified portfolio. This node becomes the effective GUO and the public layers above it are removed.

Appendix C. Employment data: Cleaning and allocation

C.1 Overview

Firm-level employment data are drawn from Orbis Historical, supplemented for a subset of key firms by a direct Orbis online query retrieving the latest available financial statements. The allocation procedure converts raw firm-level headcount observations into a consistent series of employment by BG, country and year for 2015–2024. It addresses three challenges specific to Orbis: the coexistence of consolidated and unconsolidated accounts for the same entity; missing observations for individual firm-years; and the risk of double-counting when consolidated accounts are stacked on top of entity-level accounts.

C.2 Input data construction

The employment data are merged with the ownership trees from Appendix B. For each year 2015–2024, the ownership-tree panel is loaded and the corresponding financial records joined. Consolidation codes C2 (consolidated accompanied by an unconsolidated companion filing) and C* (unspecified consolidated) are reclassified to C1. Zero employment values are treated as missing to avoid converting legitimate gaps into spurious zero observations.

C.3 Deduplication of firm-year records

Multiple financial statements may exist for the same firm-year in Orbis because: (i) the same entity may file both unconsolidated and consolidated accounts; (ii) slight differences in closing dates generate duplicate rows across data vintages; or (iii) the same filing may be imported from multiple information providers. Deduplication proceeds as follows. Across consolidation codes within the same ID × year, the preferred account is selected using an ordered priority rule: unconsolidated entity-level accounts (U1, U2, *U**) are preferred first, followed by limited financials (LF) and no-financials records (NF), followed by consolidated-with-companion (C2), and finally consolidated-only (C1, C*). Within each code, rows with non-missing employment are ranked above rows without. The algorithm keeps the single best-ranked row per firm-year and a post-deduplication assertion verifies that no duplicates remain.

C.4 Interpolation of missing employment values

After deduplication, time-series gaps in employment within each ID × consolidation code panel are filled by linear interpolation between the nearest non-missing values, without

extrapolating beyond the observed range. For firms where employment is entirely absent but gross output (GO) is available, a supplementary imputation is applied: the firm's mean employment-to-output ratio (estimated over all years for which both variables are observed) is multiplied by available output figures to recover an implied headcount. This ratio-based imputation is conservative and affects only a small share of observations, predominantly small entities at the periphery of corporate groups.

C.5 Bottom-up allocation algorithm

The core methodological challenge is that consolidated accounts for a parent company mechanically aggregate the employment of all its subsidiaries. Directly summing employment across all entities (i.e. both the parent's C1 figure and the subsidiaries' individual figures) would therefore double-count workers. The algorithm resolves this by processing entities from the deepest layer of the hierarchy upwards, applying decision rules at each consolidation node to determine whether the node's own C1 figure or the disaggregated sub-tree sum is more informative.

For each C1 entity that has at least one child node in the ownership tree, the algorithm constructs: (i) the sum of allocated employment from all descendants within the sub-tree (those nodes already designated as usable in earlier, deeper passes of the loop); and (ii) the coverage ratio, defined as this sub-tree sum divided by the C1 node's own reported employment.

C.5.1 Same-country case

Where all entities in the sub-tree are incorporated in the same country as the C1 node, the sub-tree provides no additional geographical disaggregation. If the coverage ratio is below 0.75, the sub-tree is too sparse to be trusted as a complete local representation and the C1 figure is preferred (sub-tree nodes are deactivated). At or above 0.75, the sub-tree is considered sufficiently representative and is used instead of the C1 node.

C.5.2 Mixed-country case

Where the sub-tree contains entities in multiple countries, geographical disaggregation is the primary objective. If the coverage ratio exceeds 0.80, the sub-tree provides both good coverage and useful geographical detail and is preferred. If the coverage ratio falls below 0.50, the sub-tree is too sparse and the C1 figure is retained, sacrificing geographical detail. For intermediate coverage ratios (0.50–0.80), the geographical benefit is judged to outweigh the incomplete coverage and the sub-tree is preferred.

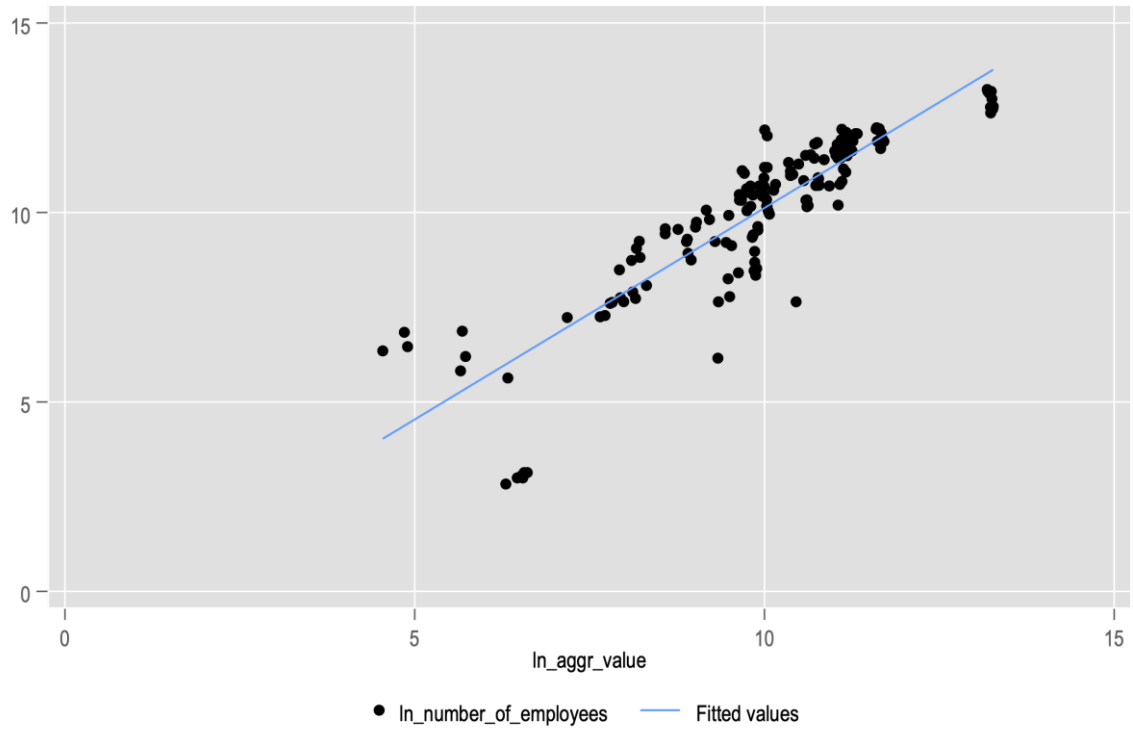
C.5.3 Residual imputation

When the sub-tree is preferred but does not fully account for the C1 employment (coverage ratio below 1), a residual is computed as the difference between the C1 reported employment and the sub-tree sum, and assigned to the C1 node's own country of incorporation. This preserves group-level totals while distributing as much employment as possible to specific countries via the sub-tree.

C.6 Validation against Eurostat/ONS aggregates

This procedure performs reasonably well at reconstructing country-level employment in motor vehicle manufacturing, tracking the levels obtained from Eurostat and the UK Office for National Statistics (ONS) for OEMs (see Figure 21). Coverage is also adequate for the other broad-automotive groups, notably bodies and trailers (NACE 292) and parts and accessories (NACE 293).

Figure 21. Reconstructed vs official country-level employment, NACE 291



Source: *Authors' elaboration of Orbis Historical, Eurostat and ONS data.*

Notes: *Comparison of bottom-up employment allocation described in Appendix C with official country-level employment in NACE 291 from Eurostat (Structural Business Statistics) and ONS.*

Appendix D. IPC code labels

Vehicle structure & body	
B62D	Motor vehicles; trailers – chassis, steering, superstructure
B60G	Vehicle suspension arrangements
B60R	Vehicle fittings or parts not otherwise provided for
B60K	Arrangement of propulsion units and transmissions; auxiliary drives; dashboards; cooling, air intake, exhaust and fuel supply
B60W	Conjoint control of vehicle sub-units; control systems for hybrid vehicles

B60L	Propulsion of electrically propelled vehicles; electric power for auxiliary equipment; electrodynamic braking; safety devices for EVs
H01M	Processes or means (e.g. batteries) for the direct conversion of chemical energy into electrical energy

Source: *World Intellectual Property Organization (WIPO) IPC, four-digit (subclass) level.*

Note: *Definitions condensed.*

Appendix E. BGs in the sample

E.1 Light-duty vehicles – established OEMs

Name manufacturer	Main brands	Name group
Volkswagen Aktiengesellschaft	Volkswagen, VW Commercial Vehicles, Škoda, SEAT, CUPRA, Audi, Porsche, Bentley, Lamborghini	Volkswagen Aktiengesellschaft
Stellantis N.V.	Abarth, Alfa Romeo, Chrysler, Citroën, Dodge, DS, Fiat, Jeep, Lancia, Maserati, Opel, Peugeot, Ram, Vauxhall	Stellantis N.V.
Renault	Renault, Dacia, Alpine	Renault
BMW	BMW, MINI, Rolls-Royce	BMW
Mercedes-Benz Group AG	Mercedes-Benz, Mercedes-AMG, Mercedes-Maybach	Mercedes-Benz Group AG
Ford Motor Company	Ford, Lincoln, Ford Pro	Ford Motor Company
Toyota Motor Corporation	Toyota, Lexus, Daihatsu, Hino	Toyota Motor Corporation
Hyundai Motor Company	Hyundai, Genesis, Kia	Hyundai Motor Company
Nissan Motor Co., Ltd.	Nissan, Infiniti, NISMO	Nissan Motor Co., Ltd.
Honda Motor Co., Ltd.	Honda, Acura	Honda Motor Co., Ltd.
Mazda Motor Corporation	Mazda	Mazda Motor Corporation
Mitsubishi Motors Corporation	Mitsubishi	Mitsubishi Motors Corporation
Suzuki Motor Corporation	Suzuki	Suzuki Motor Corporation
Subaru Corporation	Subaru	Subaru Corporation
General Motors Company	Chevrolet, Buick, GMC, Cadillac	General Motors Company

Jaguar Land Rover Limited	Jaguar, Range Rover, Defender, Discovery	Tata Motors Passenger Vehicles Limited
Tata Motors Passenger Vehicles Limited	Tata, Tata.ev	Tata Motors Passenger Vehicles Limited
Bentley Motors Limited	Bentley	Volkswagen Aktiengesellschaft
INEOS Automotive Limited	Grenadier	INEOS Automotive Limited

E.2 Light-duty vehicles – Chinese, EV-native and emerging

Name manufacturer	Main brands	Name group
Zhejiang Geely Holding Group Co., Ltd	Geely Auto, Volvo Cars, Lynk & Co, Polestar, Proton, Zeekr, London EV Co.	Zhejiang Geely Holding Group Co., Ltd
Tesla, Inc.	Tesla	Tesla, Inc.
BYD Company Limited	BYD, Denza, Fangchengbao, Yangwang	BYD Company Limited
SAIC Motor Corporation Limited	MG, Roewe, Maxus, IM, Wuling, Baojun	Shanghai Automobile Industry (Group) Co., Ltd.
Chongqing Changan Automobile Company Limited	Changan, Deepal, Avatr, Kaicene	Chongqing Changan Automobile Company Limited
Dongfeng Motor Group Company Limited	Dongfeng, Aeolus, Voyah, M-Hero, Nammi, Forthing	Dongfeng Motor Corporation
Chery Automobile Co., Ltd.	Chery, Exeed, Omoda, Jaecoo	Chery Holding Group Co., Ltd.
Great Wall Motor Company Limited	Haval, Wey, ORA, Tank	Baoding Innovation Great Wall Asset Management Co.
Guangzhou Automobile Group Co., Ltd.	GAC Motor, Aion, Trumpchi	Guangzhou Automobile Group Co., Ltd.
Beijing Automotive Group Co., Ltd.	BAIC, Beijing, BJEV/BluePark, Arcfox	Beijing Automotive Group Co., Ltd.
NIO Inc.	NIO	NIO Inc.
Li Auto Inc.	Li Auto (Li Xiang)	AMP Lee Ltd.
XPeng Inc.	XPeng	Private owner
Zhejiang Leapmotor Technology Co., Ltd.	Leapmotor	Zhejiang Leapmotor Technology Co., Ltd.
Rivian Automotive, Inc.	Rivian	Rivian Automotive, Inc.
VinFast Auto Ltd.	VinFast	VinFast Auto Ltd.

Mahindra & Mahindra Limited	Mahindra	Mahindra & Mahindra Limited
Togg (Turkiye Otomobil Fabrikasi A.S.)	Togg	Tofas Turk Otomobil Fabrikasi Anonim Sirketi

E.3 Small-volume manufacturers

Name manufacturer	Main brands	Name group
Ferrari N.V.	Ferrari	Ferrari N.V.
Lotus Cars Limited	Lotus	Zhejiang Geely Holding Group Co., Ltd
Aston Martin Lagonda Global Holdings PLC	Aston Martin	Aston Martin Lagonda Global Holdings PLC
McLaren Automotive Limited	McLaren	Abu Dhabi Advanced Motors – Sole Proprietorship LLC
Morgan Motor Company Limited	Morgan	Sports Cars (England) Combined S.C.A.
Caterham Cars Ltd.	Caterham	VT Holdings Co Ltd
Bugatti Automobiles S.A.S.	Bugatti	Rimac Group d.o.o.
Bovensiepen	Bovensiepen	Burkard Bovensiepen GmbH + Co. KG
Bertone	Bertone	–
Brabus GmbH	Brabus	TSC Holding GmbH
Donkervoort Automobielen B.V.	Donkervoort	Stichting Administratiekantoor D.A. Donkervoort Beheer
Gordon Murray Automotive Limited	Gordon Murray Automotive	Gordon Murray Automotive
Goupil Industrie S.A.	Goupil	Polaris Inc.
HWA AG	HWA	HWA AG
Hispano Suiza Cars, S.L.	Hispano Suiza	Inverama SL
Koenigsegg Automotive AB	Koenigsegg	Spirit of Performance AB
KTM Sportcar GmbH	KTM X-Bow	Stellenbosch
Pagani Automobili S.p.A.	Pagani	Pagani
Praga Cars s.r.o.	Praga	Praga a.s.
Rimac Automobili d.o.o.	Rimac	Rimac Group d.o.o.
RUF Automobile GmbH	RUF	RUF Automobile GmbH
Zenvo Automotive A/S	Zenvo	Zenvo Group A.S.

E.4 Heavy-duty vehicles

Name manufacturer	Main brands	Name group
Daimler Truck AG	Mercedes-Benz Trucks, Freightliner, Western Star, FUSO, BharatBenz, RIZON	Daimler Truck Holding AG
TRATON SE	Scania, MAN, International, VW Truck & Bus	Volkswagen Aktiengesellschaft
AB Volvo	Volvo Trucks, Renault Trucks, Mack, UD Trucks, Nova Bus, Prevost	AB Volvo
DAF Trucks N.V.	DAF	PACCAR Inc
CNH Industrial Oesterreich GmbH	Case IH, New Holland Agriculture	CNH Industrial N.V.
Iveco Group NV	IVECO, IVECO BUS, HEULIEZ, ASTRA, MAGIRUS	Iveco Group NV
Isuzu Motors Limited	Isuzu, UD Trucks	Isuzu Motors Limited
FAW Jiefang Group Co., Ltd.	Jiefang	China FAW Group Co., Ltd.
Sinotruk Jinan Truck Company Limited	HOWO, SITRAK	Sinotruk (Hong Kong) Limited

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