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ELECTRIC MOBILITY IN EUROPE: RECONCILING THE ECOLOGICAL TRANSITION WITH INDUSTRIAL SURVIVAL

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ABSTRACT

Electric vehicles (EVs) in the EU face growing turbulence as shrinking consumer subsidies coincide with intensified competition from lower-cost Chinese manufacturers. Recent EU measures – higher tariffs on Chinese EVs and a strategy to reinforce the full industrial value chain – aim to safeguard Europe's automotive capabilities. Yet the easing of CO_2 rules for combustion engines and the possible 2026 review of the 2035 phase-out date illustrate the challenge of balancing ecological transition, industrial resilience, and household purchasing power. This paper argues for an "electrification shock" to accelerate scale and reduce costs rather than slowing the transition. Demand-side priorities include adapting subsidies to national energy-price conditions, requiring public and corporate fleets to integrate a minimum share of EVs, and ensuring the availability of affordable entry-level models. On the supply side, large-scale support for European battery production and sustained tariff protection are essential to narrow the cost gap with China, while partnerships with Chinese firms must secure genuine technology transfers and protect employment. Such measures must be anchored in a stable and predictable regulatory trajectory, as policy reversals risk deterring investment and slowing the decarbonisation of road transport.

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ELECTRIC MOBILITY IN EUROPE: RECONCILING THE ECOLOGICAL TRANSITION WITH INDUSTRIAL SURVIVAL[1]

Sandrine Levasseur

Summary

Electric vehicles (EVs), which are essential to the decarbonisation of road transport, are currently experiencing a period of turbulence within the European Union (EU). Their uptake still depends largely on public subsidies paid to households, even though these subsidies are drying up due to budgetary constraints. At the same time, the European automotive industry is facing increased competition from Chinese manufacturers, who offer electric models that are 20% cheaper than their European equivalents.

In response to these competitive pressures, the European Commission adopted two measures in 2024 and 2025 aimed at strengthening the European automotive sector: it raised customs duties on EVs produced in China and presented an action plan to consolidate the entire value chain, from access to critical raw materials to battery manufacturing. At the same time, the relaxation of CO_2 emission standards for combustion engine vehicles in spring 2025, as well as the possible review in 2026 of the 2035 deadline for ending the sale of new non-zero-emission vehicles, highlight the difficulty of reconciling three objectives simultaneously: ensuring the ecological transition, preserving the industrial survival of the automotive sector and supporting household purchasing power.

This paper argues that instead of opting for a strategy of "industrial procrastination", the EU should create an "electrification shock" in order to generate the volumes needed for economies of scale, which are crucial for making European vehicles more affordable and competitive. This shock would require a set of coordinated actions targeting both demand and supply. On the consumer side, this would involve adapting purchase and use subsidies to national realities, particularly where the cost of electricity is a barrier. For businesses and public authorities, introducing a requirement to include a minimum proportion of EVs in their fleets would enable the market to expand rapidly. European manufacturers should also be encouraged, or even compelled, to offer truly affordable entry-level models.

On the industrial front, it is essential to provide massive support for battery production in Europe in order to reduce the cost gap with China, while maintaining sufficient customs duties to protect the automotive ecosystem and encourage relocation. However, this strengthening of "Made in Europe" cannot be achieved without partnerships with Chinese manufacturers, who are also world leaders in electric technologies. Nevertheless, steps must be taken to ensure that these partnerships facilitate genuine technology transfers and help to maintain employment levels in Europe.

Finally, all of these measures must form part of a clear trajectory, without calling into question previously defined objectives, so as to avoid regulatory uncertainty, which is detrimental to investment and encourages a wait-and-see attitude. This, in turn, hampers progress in the decarbonisation of road transport.

[1] This text is a translated and slightly revised version of the *Policy Brief* entitled "Mobilité électrique en Europe: Réconcilier transition écologique et survie industrielle", published in *OFCE Series*, No. 152 on 10 December 2025.

1 The European political agenda faced with the electric car trilemma

For several years, European authorities have been confronted with a trilemma in the field of clean mobility, which has become even more acute in recent years. First, given the current state of available technology, the electrification of the European vehicle fleet appears essential in order to reduce greenhouse gas emissions (GHG) and achieve the goal of carbon neutrality by 2050. Second, the European automotive sector is facing strong competitive pressure from Chinese manufacturers, who are now able to offer electric vehicles (EVs) at prices 20% lower than those of European manufacturers for equivalent models (Wingender et al., 2024). This price advantage is compounded by a significant move upmarket and growing technological mastery across the entire EV value chain, notably in battery production (Jato, 2024). In the medium term, the very survival of the European automotive industry is therefore at stake, as it faces competition from China on both price and non-price fronts. Finally, the third component of this trilemma relates to the purchasing power of European motorists: maintaining social acceptability of the transition requires the availability of affordable EVs, particularly for lower-income households.

Overall, while the solution that would reconcile these three objectives may appear obvious – namely, the production of affordable EVs within Europe – its implementation remains highly challenging, if not outright unattainable. The EU's recent political agenda on EVs reflects these difficult trade-offs: for each objective, there have been advances, but also setbacks, or at least the risk thereof.

1.1 The 2035 deadline in sight

At the heart of this political agenda is the question of whether or not to maintain the 2035 deadline for achieving 100% carbon-free vehicles in new registrations. This means deciding whether or not to ban the sale of new vehicles with combustion engines from 2035 onwards while allowing the existing fleet to remain on the roads. Although European Commission President U. von der Leyen announced in mid-December 2025 her will to soften 2035 combustion car deadline, we do not know yet to date if the softening option will finally apply or not. Yet, in early October, German Chancellor Merz called for *"2035 not to be seen as a cut-off date"* and for flexible solutions such as plug-in hybrid cars or alternative fuels (synthetic and hydrogen) to be considered. It should be noted that the clause reviewing the 2035 deadline, which is provided for in the 2023 European legislation, is currently following a trilogue legislative process that has began in December 2025 (with the presentation of the report and the European Commission's proposal) and should be concluded by June 2026 at the latest (with a vote by the European Parliament and adoption by the European Council)[2]. During this legislative process, the balance of power suggests that discussions will be particularly heated. In the European Parliament, the European People's Party Group (EPP) continues to wield considerable influence and has already proposed revising the applicable regulatory framework, particularly by

[2] More specifically, Regulation (EU) 2023/631 stipulates that in December 2025, the Commission will present a report assessing "the effectiveness and impact of the Regulation on tightening CO_2 emission standards for new cars in line with the EU's climate ambition". This report will examine "progress made towards reducing emissions, technological developments – including plug-in hybrids – and the need to ensure an economically viable and socially equitable transition to zero-emission mobility". On the basis of this report, the Commission will decide on the need to review the targets set in the regulation, namely the ban on the sale of new CO_2 emitting vehicles from 2035. In turn, the European Parliament and the Council will decide by June 2026 at the latest on whether to maintain the deadline.

reintroducing technological neutrality as a fundamental guiding principle[3]. Meanwhile, most MEPs from Green and left-wing parties continue to defend the strict ban of non-zero-emission vehicles. In the European Council, where heads of state and government decide by qualified majority, maintaining the 2035 deadline is by no means certain. This is evident in the stance taken by German Chancellor F. Merz, which echoes the position already expressed by Italy, Poland, Hungary and Slovakia.

1.2 Other items on the political agenda for winter 2025

Recognising the challenges faced by the automotive sector and its suppliers, the European authorities initiated a strategic dialogue with manufacturers in early 2025. This resulted in the publication of the European Commission's Action Plan for the Automotive Industry (EC, 2025a) in April of that year. This plan demonstrates a strong commitment to supporting the automotive sector, particularly EVs, and outlines the key principles for safeguarding the European automotive ecosystem. However, certain provisions will need to be clarified by the European authorities in the coming months, particularly with regard to new regulations or financial support for technologies and infrastructure. Among the elements related to EVs, are:

- **The definition of local (i.e. European) content in vehicles**, which will be the subject of forthcoming regulations and will concern EVs but more broadly all types of propulsion. In general terms, the aim is to support European automotive equipment manufacturers, who are facing increasing competition from their Chinese counterparts (Pardi et al., 2025). With regard to EVs more specifically, the aim is to develop the production of batteries – and their components – within the EU so that European manufacturers can acquire the technology and, *ultimately*, reduce car manufacturers' dependence on Chinese battery manufacturers.
- **The revision of EU policy on foreign direct investment** (FDI), particularly from China, is another key element. Beyond requiring a minimum level of local content, the new regulations will ensure that FDI from Chinese and, more broadly, Asian companies is accompanied by technology transfers that benefit European companies. Joint venture agreements between Chinese and European partners should thus enable the latter to close the technology gap, in a similar way to how Chinese companies benefited from technology transfers through their partnerships with European manufacturers in China some twenty years ago – a form of reverse technology transfer.
- **The details regarding the Battery Booster Package**, announced in April 2025 and bringing together a range of measures to support innovation and the production of high-energy-density batteries within the EU. While the European Commission has announced the amount of subsidies earmarked for production, the terms and conditions for allocating these funds to battery manufacturers have yet to be specified. It will also be necessary to determine whether and how state aid can be used to support battery production at a national level. Indeed, some Member States have competed with each other to attract gigafactories by offering substantial subsidies to battery manufacturers in an opaque manner.

[3] In other words, the EPP (European People's Party) group, which represents 26% of MEPs, believes that the GHG reduction targets should be maintained, but the choice of technologies to achieve them should be left to car manufacturers (EPP, 2024).

1.3 Two recent decisions in support of the European automotive sector: between pragmatism and indecision

Recently, European authorities have adopted two important decisions that can be seen as pragmatic short-term measures to support the EU automotive sector, while also revealing persistent indecision in the face of conflicting policy objectives.

One of these decisions concerns the relaxation of CO_2 emission standards for combustion engine vehicles in April 2025. It should be noted that the Corporate Average Fuel Economy (CAFE) standard aims to reduce the fuel consumption and associated CO_2 emissions of new vehicles. Calculated across the entire range of vehicles sold, the standard requires each manufacturer to comply with an average CO_2 emissions threshold. This threshold has gradually been tightened since its introduction in the EU, from 140 g CO_2/km in 2008 to 95 g in 2021, then 81 g in 2025 and 50 g in 2030. It is accompanied by significant financial penalties of €95 per gram of excess CO_2, multiplied by the number of vehicles sold. The CAFE standard therefore seeks to compel car manufacturers to modify their vehicle portfolios by offering vehicles with increasingly lower CO_2 emissions, with the ultimate goal of achieving a 100% carbon-free portfolio.

Following intensive lobbying, the standard was relaxed in April 2025 to allow manufacturers to calculate their emissions over a three-year cycle (2025–2027) rather than for 2025 alone without incurring penalties[4].

Another important decision, adopted in July 2024 and confirmed in October 2024, was the introduction of additional customs duties on vehicles imported from China. This measure is the result of an investigation launched in autumn 2023 into *"unfair subsidies from the Chinese government that threaten to cause economic harm to EV producers in the EU"* (EC, 2024a). Since October 2024, customs duties have been raised to 35.3%, in addition to the existing 10%, depending on the level of subsidies received by Chinese manufacturers and their degree of cooperation with European authorities. These duties will be applicable for five years. It should be noted that these additional tariffs on EVs have not been accompanied by additional tariffs on their components, particularly batteries, despite evidence of 'unfair subsidies' being readily available.

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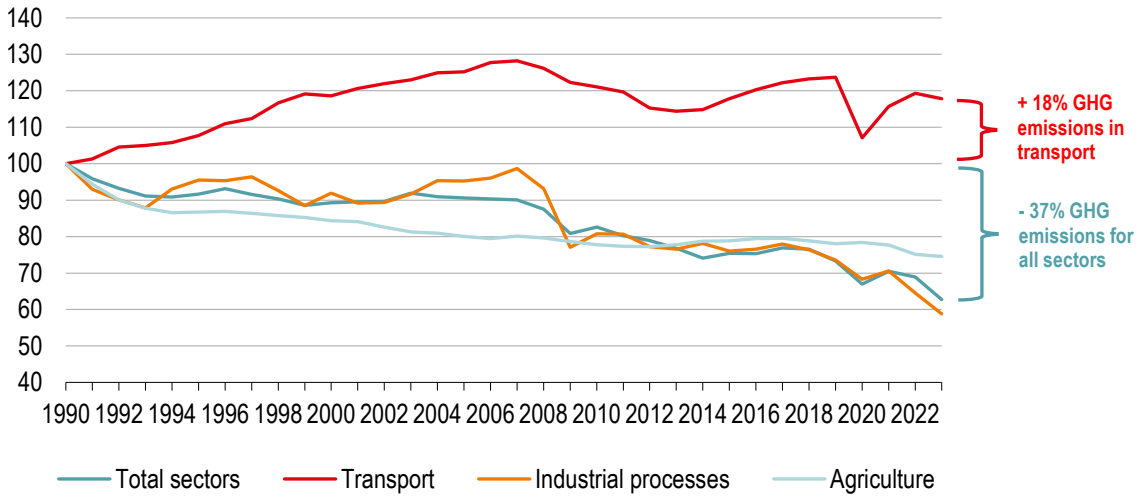
The remaining of the paper is organised as follows: First, it reviews the EU's climate targets and, on the basis of life cycle studies, concludes that large-scale electrification of the European car fleet is necessary to achieve them (Section 2). It then presents two assessments of the current situation. The first provides information on the extent to which European households in the EU have adopted EVs (section 3), while the second focuses on European car production and the employment it generates (section 4). Section 5 focusses specifically on the details of questioning the 2035 deadline. Finally, the Study concludes with the most effective solution for reconciling the EU's environmental preservation, job creation in the automotive sector and motorist purchasing power objectives (section 6).

[4] Regulation (EU) 2019/631, amended by Regulation (EU) 2023/851, then amended by Regulation (EU) 2025/1214 adopted by European Parliament and Council on 17 June 2025.

2 EU environmental objectives and insights from life cycle assessments

As part of the Green Deal adopted in 2019, the EU set itself the goal of achieving carbon neutrality by 2050. The transport sector was responsible for 27.3% of GHG in 2023, with passenger vehicles accounting for over 57%. Therefore, the sector must reduce its emissions by 90% by 2050 compared to 1990 (EC, 2023b). An interim target of a 40% reduction by 2030 has been set, which could be increased to 45% if the European Emissions Trading System II (ETS II), which also covers the transport sector, comes into effect in 2028. Given the observed developments, the required effort in the transport sector remains significant, as its GHG emissions have increased since 1990, unlike other sectors (Figure 1).

Figure 1: Greenhouse gas emissions in the EU (1990=100)



Source: Eurostat; author's calculations.

Existing technologies that have reached industrial maturity suggest that EVs are essential for achieving carbon neutrality by 2050. Life cycle analyses, which take into account CO_2 emissions from vehicle production and use, show that EVs remain highly advantageous in terms of climate impact. Admittedly, battery production is energy-intensive and weighs on their "carbon footprint", but this "surplus" of emissions compared to a combustion engine vehicle is offset within one to three years of use, or after travelling between 17,000 and 40,000 kilometres travelled (Amant et al., 2020; Negri and Bieker, 2025). Over their entire life cycle, EVs emit 45-80% fewer GHG than a combustion engine vehicles, and this gap widens as the electricity mix becomes more decarbonised (EC, 2020; Bieker, 2021; Amant et al., 2020; Negri and Bieker, 2025). In comparison, hybrid vehicles, often touted as a compromise, only reduce emissions by 20-30% compared to combustion engine vehicles (Amant et al., 2020; Negri and Bieker, 2025). Finally, while hydrogen cars have a similar manufacturing carbon footprint to EVs, their energy inefficiency during use makes them two to three times more energy-intensive (De Wolf and Smeers, 2023). Moreover, hydrogen produced from natural gas, accounting for nearly all of the currently available hydrogen, reduces emissions by only 26% over the entire life cycle compared to cars with combustion engines (Negri and Bieker, 2025).

In the absence of significant reductions in GHG emissions from the transport sector, other sectors of the economy, notably industry and heating, will have to contribute more

and bear the burden of decarbonisation. According to Zeyen et al.'s (2025) estimates, the electrification of road transport is particularly cost-effective. For instance, implementing the "100% decarbonised" target by 2030 (rather than 2035) for passenger vehicles would prevent the carbon tax from doubling by that date. This would encourage other sectors to further reduce their emissions[5].

3 Electrification of the European car fleet in international comparison

With EVs accounting for between 18% and 22% of new registrations since 2021, the EU is a leader in the adoption of decarbonised mobility among major developed economies. By comparison, this share has only just reached 10% in the United States, and has not exceeded 3% in Japan (IEA, 2024). Currently, there are over 6 million EVs on the road in the EU, compared to 4.7 million in the United States and just 340,000 in Japan.

Admittedly, the EU figures pale in comparison to China's, where EVs accounted for 28% of new registrations in 2024. With a total of 23 million EVs on the road, China has by far the largest number of zero-carbon vehicles of any country.

However, the Chinese car market differs from those of the other major developed economies. In China, the relatively recent rise in living standards has created a market dominated by first-time buyers. In contrast, Western markets mainly rely on renewing the existing fleet, where the average car lifespan is 12 to 15 years. This distinction is crucial as it enables car manufacturers operating in China to benefit from economies of scale in EV production – a significant advantage that only Chinese manufacturers have truly exploited thus far[6]. In comparison, the niche nature of the EV market in developed economies is holding back R&D investment by established manufacturers, thus limiting their EV portfolio.

The rollout of public charging infrastructure is a key indicator of the effectiveness of vehicle electrification. While most charging needs can be met at home, publicly accessible charging stations are essential for long-distance travel. By the end of 2024, the EU had approximately 775,000 public charging stations, equating to one station for every 7.7 EVs on the road. This ratio is similar to that in China (one station for every 7 EVs), but much better than in the United States, where there is one station for every 23 EVs. However, a notable weakness of the European network is the low proportion of fast-charging stations: only 13.5% of the total in the EU compared to 45% in China and 25% in the United States[7]. Furthermore, the current infrastructure falls well short of the targets set by the European Commission, which estimates that 3.5 million public charging points will be needed by 2030 to support the growth of the EV fleet and ensure the achievement of ecological transition targets (IEA, 2024).

It should also be noted that the electrification of the vehicle fleet is uneven across the EU: Western European countries, where households are generally more affluent, have higher EV adoption rates than Central and Eastern European countries, which are often

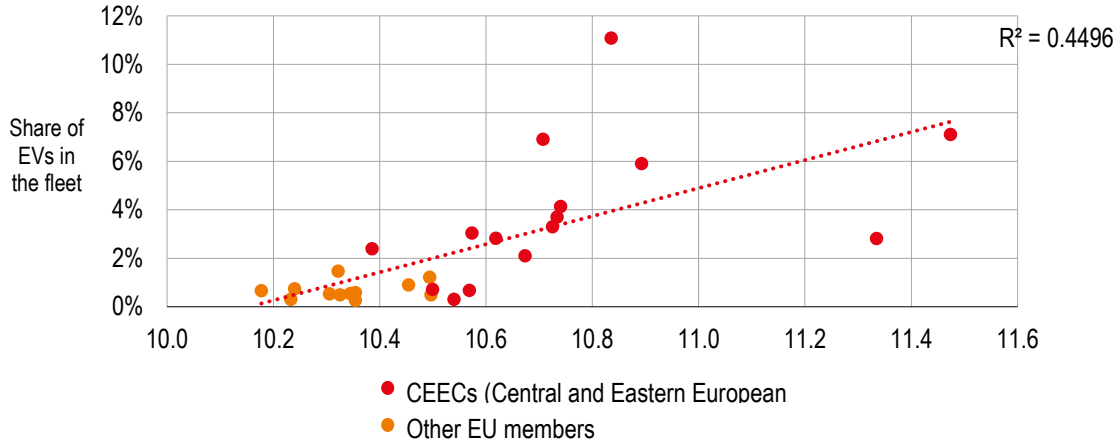
[5] The price of CO_2 should therefore be raised to €290/t_{CO_2} in 2030 rather than €137/t_{CO_2} according to Zeyen et al. (2025).

[6] Chinese manufacturer BYD, which became the world's third-largest vehicle producer in 2024 with 4.27 million units produced, generates more than 90% of its sales on the domestic market. Beyond exploiting economies of scale, the "success" of Chinese manufacturers is also based on other factors (see Box 1).

[7] There are generally two or even three types of charging stations, depending on their power and charging speed. A "normal AC" station allows a full recharge in several hours. A "fast DC" station, with a power of around 150 kW, can recharge up to 80% of the battery in 30 minutes. Finally, an "ultra-fast DC" station, with a power output of 350 kW, reduces this time to 15 minutes for the same charge level.

less wealthy (Figure 2). Beyond the purchasing power required to buy an EV, which remains 10% more expensive than a car with an internal combustion engine with equivalent specifications, the cost of using an EV is another factor explaining the differences observed between European countries in EV adoption. This cost is closely linked to the price of electricity relative to petrol (Table 1)[8].

Figure 2: GDP per capita and share of electric cars in the vehicle fleet of EU countries
(at the end of 2024)



Source: Eurostat and IEA; author's calculations.

Table 1 Share of electric cars in the fleet and relative "petrol/electricity" prices in selected EU countries (2024 or 2025)

	Share of EVs in the passenger vehicle fleet (end of 2024)	Electricity price* (€/100km)	Price of petrol 95/E10 (€/100km)	Relative petrol/electricity price (€/100km)	Price observation period
Denmark	11.1%	6.0	13.7	2.3	2024 Q4
Sweden	6.9%	3.2	8.7	2.7	2025 Q2
Netherlands	5.9%	6.7	10.7	1.6	2025 Q1
Germany	3.3%	5.3	10.4	2.0	2025 Q2
France	3.0%	3.9	12.4	3.2**	2024 Q1
Finland	2.8%	2.6	9.5	3.7	2025 Q1
Slovenia	1.2%	5.9	8.9	1.5	2025 Q1
Spain	0.7%	2.6	9.9	3.8	2024 Q4
Estonia	0.6%	3.3	8.4	2.5	2024 Q4
Slovakia	0.5%	4.8	8.6	1.8	2025 Q1
Czech Republic	0.5%	4.9	8.2	1.7	2025 Q4
Cyprus	0.3%	4.9	9.4	1.9	2025 Q1
Poland	0.3%	9.8	9.7	1.0	2024 Q2

* Home charging.
** Updated by www.cartegrise.com

Source: European Alternative Fuels Observatory, IEA; author's calculations.

[8] See also Salutin (2025) on this aspect.

4 Car production in the EU and its implications for employment

Traditional Western car manufacturers have specialised in the production of combustion engine vehicles for over a century (Alochet et al., 2025). However, they are now facing strong competitive pressure from Chinese manufacturers, particularly in the nascent market for low-carbon vehicles, such as electric and hybrid cars. Initially, this competition took the form of aggressive pricing strategies for entry-level models, but the Chinese range of low-carbon vehicles has since expanded considerably to cover the entire spectrum, from affordable to premium, while offering quality comparable to that of Western manufacturers (Wingender et al., 2024; Jato, 2024).

This “price” and “non-price” competition poses major challenges for the EU automotive sector, given its economic importance. The sector accounts for 13.8 million direct and indirect jobs, representing 6.1% of total employment in the EU. It generates 8% of the manufacturing sector’s added value and has produced between 10 and 12 million cars each year since 2021 (Ragonnaud, 2024). Around 250 factories are involved in this ecosystem, covering vehicle assembly and engine and battery manufacturing.

While all EU countries are integrated into this ecosystem, the importance of the automotive sector varies considerably from country to country. It is particularly significant in several Central and Eastern European countries (Slovakia, the Czech Republic, Poland and Romania), as well as in larger countries where traditional manufacturers still operate (Germany, France, Italy and Spain). For instance, Slovakia, which produces half as many vehicles as Spain, allocates 15% of its manufacturing employment to the automotive sector, compared to Spain’s 7% (see Table 2). Within countries, certain regions are heavily dependent on the sector, which can account for up to 30% of jobs in the manufacturing industry or nearly 45%, as in the German region of Braunschweig[9]. A sharp increase, or even a boom, in imports of Chinese EVs would therefore have uneven repercussions for employment depending on the EU country and region.

A study by Wingender et al. (2024) illustrates the issues: an increase in EV imports from China enables EU citizens to purchase cheaper EVs, but this comes at the expense of European car production. Their simulations indicate that if Chinese manufacturers were to capture 15% of the EV market in an “all-electric” EU scenario, employment in the automotive sector would fall by 2.7% in Slovakia, 1.7% in the Czech Republic, 1.3% in Hungary, and 1% in Germany[10]. However, larger EU countries would be less affected by income losses due to a more diversified economy and an increased supply of cheaper EVs. Real GDP would thus fall by 1–1.5% in the Czech Republic and Hungary, but by “only” 0.2% in Germany, France, and the rest of the EU. In this context, the introduction of a 25% tariff on EVs imported from China, fully reflected in selling prices, worsens the situation within the EU on average: although job losses are more moderate, purchasing power is reduced more than in the no-tariff scenario[11].

[9] See the report by Hindrick et al. (2024) on the regional dimension.

[10] The assessments are made in relation to a baseline scenario in which the market share of Chinese manufacturers in EVs sales within the EU would remain at the pre-2023 level of less than 5%. The assumption that Chinese manufacturers will capture 15% of the market is used for illustrative purposes, not as a forecast. On the one hand, the EU has already imposed tariffs on EVs imported from China. However, technological innovations in this sector are very rapid, and can give one (or a few) manufacturers a decisive advantage in a matter of months. Therefore, in the medium term, it is impossible to predict the market shares of the various manufacturers based on their technologies alone.

[11] On customs duties, see also further on in the text and Schularick (2024).

Table 2: Production and employment in the automotive industry in the top 10 car-producing countries in the EU

	Car production (2024)		Direct employment in the automotive industry (2023)		Regions where the automotive sector accounts for the largest share of manufacturing employment**	Direct employment in the automotive industry (2022)	
	Units	In % of total production in the EU	Persons	In % of manufacturing jobs in the country		Persons	In % of manufacturing jobs in the region
Germany	3,942,396	35.0	887,386	11.8	Braunschweig	84,549	44.7
Spain	1,872,988	16.0	150,299	7.0	Aragon	17,525	17.9
Czechia	1,446,855	13.0	172,410	12.8	Central Bohemia	46,993	29.8
Slovakia	993,750	9.0	76,802	15.0	Bratislava Region	18,711	32.8
France	849,437	7.0	214,958	7.7	Franche-Comté	13,713	17.4
Romania	473,110	4.0	159,907	10.8	West	44,404	30.5
Hungary	435,541	4.0	104,652	12.0	Western Transdanubia	31,990	29.1
Italy	309,336	3.0	167,588	4.3	Basilicata	8,569	33.1
Sweden	270,807	2.0	87,283	15.2	Western Sweden	44,126	29.7
Belgium	197,624	2.0	30,173	6.0	East Flanders	12,549	14.6
Subtotal	**10,791,844**	**95.0**	**2,081,631**	**9.4**			
o/w 4 CEECs*	3,349,256	29.0	513,771	12.2			
o/w other EU	616,625	5.0	368,369	4.6			
EU TOTAL	**11,408,469**	**100.0**	**2,450,000**	**8.1**			

*The 4 CEECs (Central and Eastern European Countries) referred to here are the Czech Republic, Slovakia, Hungary and Romania.

**NUTS2 level, NACE rev C29.

Source: ACEA, Eurostat; author's calculations.

5 Considerations regarding the 2035 deadline for the transition to “100% carbon-free” new vehicle registrations

In the face of the EU trilemma of reducing GHG emissions, preserving jobs in the automotive industry, and supporting citizens’ purchasing power, several approaches can be considered. Broadly speaking, two diametrically opposed options have emerged, which are the subject of heated debate within (and between) European institutions[12]:

- **Postponing the transition to “100% zero emissions”** to give European manufacturers sufficient time to invest in R&D, secure their supply chains, and adapt their EV range to meet motorists’ expectations regarding range and price. This additional time could also allow for the development of alternative low-carbon technologies, or for existing ones (e.g. e-fuels or biofuels) to reach industrial maturity, in accordance with the principle of technological neutrality.

However, according to some observers, there is a risk that European manufacturers will not use the additional time to effectively transition to a fully decarbonised car fleet, which would ultimately result in the target being abandoned. In this scenario, combustion engine vehicles, which are likely to emit less CO_2 than current models due to stricter CAFE standards, would coexist alongside hybrid vehicles, while EVs would remain in the minority. The transport sector would then only marginally contribute to reducing GHG emissions, thus jeopardising the goal of carbon neutrality by 2050 (see Section 2 for lessons learned from life cycle analyses).

A second risk related to technological neutrality concerns the dispersion of R&D efforts and investments across several low-carbon technologies. While diversity of new technologies is beneficial from an innovative and technical point of view, it can also hinder industrial maturity and ultimately limit economies of scale. With 12 million new passenger cars registered each year, the European car market is relatively small (see Box 1). In this scenario, the coexistence of many technologies could hinder the reduction of production costs and consequently the selling price of low-carbon vehicles. Added to this is the proliferation of infrastructure needed for different “fuels”, which leads to additional usage costs. Ultimately, motorists’ purchasing power would decrease, and there would be no guarantee of achieving carbon neutrality by 2050.

It should be noted that postponing the transition to “100% carbon-free” beyond 2035 is not purely theoretical, as a clause in the regulation provides for its relevance to be reviewed in 2026 (see Note 1). In December 2025, Ursula von der Leyen, President of the European Commission, proposed amending the legislation to reduce CO_2 emissions from car manufacturers' fleets to 90% instead of 100% for new registrations by 2035. Put differently, this means that plug-in hybrids, range extenders, mild hybrids, and cars with internal combustion engine can continue to be registered in Europe beyond 2035.

- **Maintaining the 2035 deadline for the transition to “100% carbon-free”** and support both car manufacturers and buyers of EVs. Simultaneously supporting the supply and demand for EVs at the EU level would allow economies of scale to be exploited (see Box 1). However, the precise form this support could take is open to debate. The most frequently mentioned options include tariffs on Chinese vehicles to raise their price to the same level as EVs produced in Europe and a minimum European content requirement for vehicles sold in the EU. Examples of support for buyers include purchase subsidies for households and company fleets, and more favourable taxation for EVs than for

[12] See, for example, Todts (2025) on the disagreements within the European Commission concerning the practical implementation of the Action Plan for the European automotive industry. See also the position of the EPP Group in the European Parliament (EPP, 2024).

vehicles with combustion engines[13]. Finally, EVs could be granted a whole range of benefits to make them more attractive than cars with combustion engines (free parking and tolls, reduced electricity prices, etc.).

In this scenario, the transport sector would actively contribute to the target for reducing GHG emissions. This effect would be even more pronounced if the energy mix used for producing and recharging EVs were largely decarbonised (see Section 2). Direct and indirect employment in the European automotive sector would broadly be maintained, except that assembling an EV often takes less time than assembling a combustion engine car[14].

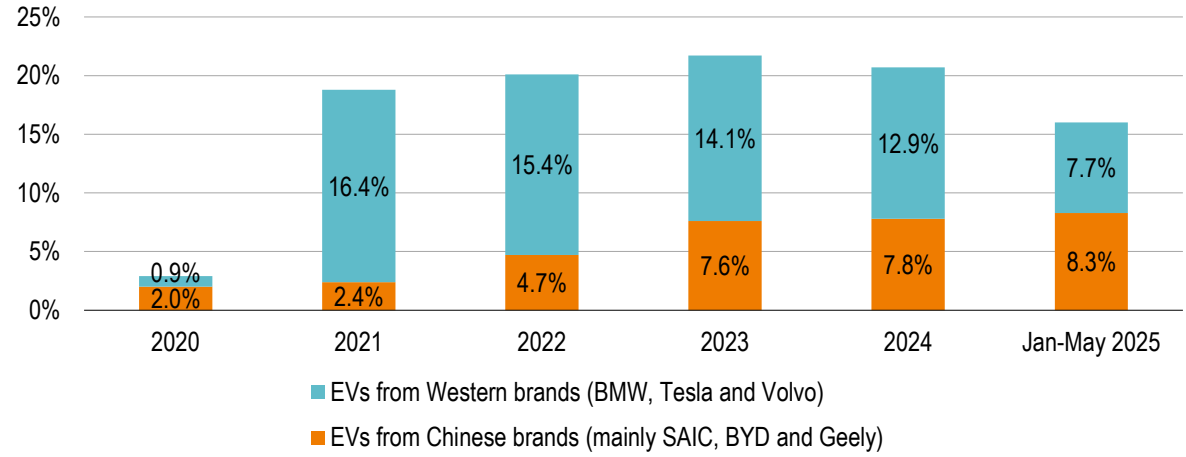
In October 2024, the EU confirmed the introduction of additional customs duties on EVs imported from China after an investigation revealed "unfair" practices by the Chinese authorities, who were heavily subsidising certain car manufacturers operating in China. In 2023, the year the investigation began, the EU imported 438,000 EVs from China, representing 21.7% of new EV registrations in the EU. However, these were not all Chinese brands; 65% were EVs from BMW, Tesla, and Volvo (ACEA, 2024). Therefore, the share of Chinese brands in new EV registrations was modest in 2023. This remained the case in 2024, when the figure stood at 7.8% (Figure 3), equivalent to around 114,000 vehicles registered in the EU. The majority of these were from the SAIC (50,500 EVs), BYD (32,175 EVs) and Geely (20,700 EVs) brands. The first few months of 2025 show that the share of Chinese brands sold in the EU continued to increase, reaching 8.3%. Conversely, the share of EVs manufactured in China but sold under Western brands fell from 12.9% to 7.7% due to two factors. Firstly, Tesla sales declined following the involvement of its CEO, Elon Musk, in the Trump election and administration. This reduced sales of Model 3s manufactured in China by 44% on an annualised basis. Secondly, Volvo announced in May 2025 that it would be relocating production of the EX30 model from China to Belgium. Volvo announced its decision to relocate production of this model on 26 October 2023, shortly after the EC launched its investigation on 4 October 2023. As most EX30 sales are made within the EU, this relocation of production appears to be in line with Volvo's desire to avoid European customs tariffs.

The EU's imposition of additional customs duties is therefore in anticipation of a strong influx of Chinese EV brands, which has yet to materialise, even in the first half of 2025. However, it is uncertain whether customs duties alone will bring the prices of EVs produced in China and Europe into line, given the high profit margins on Chinese models sold in Europe. For instance, BYD's flagship model, the Atto 3, has a widely varying selling price from market to market, reflecting a "pricing to market" strategy. At the end of 2024, the price was €37,990 in the eurozone compared to €21,380 in China. This suggests that an additional 27.4% customs duty on BYD EVs, as decided by European authorities for vehicles sold in the EU, is insufficient to erode the Chinese manufacturer's entire profit margin (see Table 3).

[13]Company fleets, i.e. vehicles purchased by legal entities rather than individuals, account for around 60% of registrations in the EU. In addition to cars, this category includes vans, buses, coaches and lorries. Private individuals, on the other hand, register almost exclusively cars (EC, 2025b).

[14]The generally accepted assembly time for a combustion engine car is around 20–30 hours, compared to 15–20 hours for an EV. This difference is partly explained by the greater complexity of the combustion engine, which comprises several hundred parts, compared to the electric motor, which has only a few dozen parts. Battery production, which is often carried out in a separate but nearby factory (Mayer et al., 2024), remains a lengthy and industrially demanding process. However, it is uncertain whether the skills acquired by individuals in assembling combustion engine vehicles can easily be transferred to manufacturing electric batteries.

Figure 3: Market share of electric vehicles imported from China into the EU



Source: ACEA (2024) for 2020-2023 data; JATO and author's calculations for 2024 and 2025 data.

Table 3: Examples of sales prices for electric models manufactured in China according to the destination market (end of 2024)

					Price difference between the eurozone and China		
Nationality of controlling company	**Models**		**Price in the eurozone**	**Price in China**	**In €**	**In %**	**EU customs duties**
Chinese brands or brands under Chinese control	**Dongfeng Nano/Dacia Spring**	33 kW, 201 or 225 km	€ 17,900	€ 6,636	11,264	170	10% + 20.7%
	MG 4	49 KWh standard 170hp	€ 30,690	€ 18,245	2,445	68	10% + 35.3%
	BYD Atto 3/Yuan Plus	60 kWh Com-fort 204 hp	€ 37,990	€ 21,380	16,610	78	10% + 17.4%
	Polestar 4	100 kWh Long Range, Dual Motor 544 hp	€ 69,300	€ 52,190	17,110	33	10% + 18.8%
Sino-German joint-ventures	**Cupra Tavascan/ Volkswagen ID. UNYX**	82 kWh 4WD 340 hp	€ 54,990	€ 32,615	22,375	69	10% + 18.8%
	Smart #1	49 kWh, 272 hp, 400 or 310 km, LFP battery	€ 34,990	€ 20,170	14,820	73	10% + 18.8%
German brand	**BMW iX3**	210 kW, 540 km CLTC range/ 462 km WLTP	€ 74,600	€ 52,741	21,859	41	10% + 17.4%

Source: JATO, author's calculations.

The introduction of a minimum selling price for EVs manufactured in China is currently under discussion between the European and Chinese authorities. This is intended as an alternative to additional customs duties imposed by the EU and aims to prevent a trade war amid Chinese overproduction of EVs, while ensuring that Chinese EVs are not sold below a "fair" threshold. A similar mechanism was in place in the solar panel sector between 2013 and 2018, setting a precedent in Sino-European trade relations. However, the minimum price was introduced too late to safeguard photovoltaic panel production in the EU, with China already holding more than 80% of the European market share by 2013. In the case of EVs, introducing a minimum price would have a similar effect to introducing customs duties: motorists' purchasing power would decrease, while job losses in the automotive sector would be limited.

6 Conclusion: a pragmatic solution to the EU's trilemma

Only an "intermediate" solution seems most likely to reconcile the objectives of ecological transition, support for the automotive industry and the preservation of motorists' purchasing power within the EU (Wingender et al., 2024). This emerging middle ground reflects the recognition of the need to open up the European EV production ecosystem to foreign players, particularly Chinese ones, while regulating this opening with appropriate tools.

Chinese companies dominate every stage of the battery production process, from extracting and refining raw materials to manufacturing cells and assembling packs (Ericher et al., 2024). Even when the battery supplier is not Chinese, but South Korean or Japanese, the raw materials used to manufacture the cells mainly originate from China[15]. Overall, Chinese companies accounted for 83% of global battery production in 2023 (compared to 75% in 2020), while European companies accounted for just 7%. Furthermore, European battery production (cells, modules, and packs) only covers slightly more than 50% of domestic demand.

In light of this, the EC proposed European regulations on critical raw materials in February 2023, which led to the Critical Raw Materials Act entering into force in May 2024. The Act aims to diversify the EU's sources of supply and improve the circularity and use of resources needed for battery production. More broadly, the regulations are intended to support the ecological and digital transitions (EC, 2024b)[16].

However, the recent bankruptcy of Northvolt[17] – the supposed flagship of the European battery industry – and the technological difficulties encountered by other companies in the sector, have demonstrated the limitations of a strategy that relies solely on European players. In addition to supplying batteries and critical materials, they must also master a technology with which they are not yet fully familiar. This can be attributed to inappropriate initial choices, with European players favouring NMC (nickel-manganese-cobalt) technology, which is certainly more robust in certain environments, albeit more expensive, than the battery technology favoured by Chinese players: LFP (lithium-iron-

[15] The manufacturers CATL, LG Chem and Panasonic, based in China, South Korea and Japan respectively, together account for two-thirds of EV battery production (Ericher et al., 2024).

[16] The regulation establishes three reference levels for the EU's annual consumption of raw materials: 10% must come from local extraction, 40% from processing within the EU and 25% from recycled materials. Additionally, authorisation for extraction projects must be granted within 27 months at most, while approval for recycling and processing projects must be granted within 15 months.

[17] See Zhu (2025).

phosphate) technology[18]. The delay in adopting LFP technology now makes partnerships with global leaders, particularly Chinese ones, inevitable. Currently, LFP technology is best suited to producing affordable EVs, while NMC technology is more suited to premium segments (Šebeňa et al., 2024).

In this context, the EU's openness to FDI from China represents a pragmatic compromise. This allows climate ambitions to be reconciled with maintaining employment in the automotive sector, provided a certain level of "European content" is imposed for components and spare parts used in EV production. In 2026, the Commission will decide on this level, bearing in mind that while a high level is favourable for employment, it is unfavourable for production costs. Pardi et al. (2025) estimate that a threshold of 80% would be necessary to preserve the current ecosystem of European equipment manufacturers. However, the impact on the prices of EVs "made in Europe" remains uncertain: setting up on European soil exposes manufacturers to higher labour and energy costs than in China, as well as generally less favourable taxation. The battery, the key component of an EV, will require substantial public support to be produced in Europe while remaining competitive with Asian offerings (see Box 2).

Several establishments and partnerships are currently in operation or under development between European and Chinese manufacturers of batteries or EVs. Notable examples include BYD, which is set to open an electric vehicle (EV) assembly plant in Hungary in Spring 2026, and CATL, which will manufacture batteries there alongside its gigafactories in Germany and Spain. Other notable companies include Chery, Geely and Leapmotor, which will produce EVs in Spain, Belgium and Poland respectively, in partnership with European manufacturers Ebro, Volvo and Stellantis[19]. It should be noted that the establishment of Chinese companies in the EU is under close scrutiny by European authorities. BYD is currently under investigation for allegedly receiving subsidies from the Chinese government to set up its factory in Hungary. Furthermore, European legislation governing FDI in the EV sector is expected to be strengthened in winter 2025 to include requirements in terms of job creation and technology transfer, with the aim of maximising the positive benefits. Current legislation on the establishment of gigafactories or partnerships between car manufacturers and battery producers has already been criticised (Meunier and Ponsa Sala, 2025; T&E, 2025). Among the grievances is the granting of €900 million in state aid by the Hungarian and Polish governments to the CATL battery factories in Hungary and the LG Energy Solution factory in Poland, without the EC imposing any environmental or social conditions. In the case of two other Sino-European partnerships – between VW-Gotion in Germany and CATL –Stellantis in Spain – the contracts do not provide for any long-term transfer of skills, and these collaborations are entirely focused on meeting short-term demand (Meunier and Ponsa Sala, 2025; T&E, 2025). An effective FDI screening is viewed as a necessary rethink of the EU industrial policy (Dullien and Hackenbroich, 2022).

Ultimately, to make EVs more affordable and encourage widespread adoption, European authorities will need to subsidise households and businesses. As the EC project currently stands, subsidies for the purchase of EVs would be conditional on a minimum level of "made in Europe" content in their manufacture (EC, 2025a). However, given current budgetary constraints, it is unlikely that the average government subsidy of €6,000

[18] For an overview of the differences between LFP and NMC batteries, see here.

[19] However, as part of their capital is under Chinese control, it is more accurate to refer to Ebro and Volvo as Sino-European companies. Additionally, Stellantis – which owns Chrysler, Fiat and Peugeot, among other brands –holds a majority stake in a joint venture with Leapmotor, a Chinese EV manufacturer. This joint venture holds exclusive rights to export, sell and manufacture Leapmotor products outside China (ALJ, 2024).

for the purchase of an EV paid in the EU in recent years will be maintained (see Levasseur, 2025a). In this context, it would be reasonable to require European car manufacturers to offer entry-level models in their EV range while discouraging opportunistic pricing strategies[20]. Despite recent progress, the range of affordable EVs remains limited; only 21 models priced below €30,000 are available on the EU market (Rajon et al., 2025). EC President von der Leyen's September 2025 proposal to create an "E-car" could address the challenges of low-cost, carbon-free mobility within the EU. This car would be *"clean, efficient and lightweight",* as well as *"affordable",* and *"built here in Europe with European supply chains"*[21]. This new category of car, requested by Renault and Stellantis and supported by certain researchers (Alochet et al., 2025), could be inspired by kei cars: small Japanese cars that are strictly limited in size and benefit from specific tax and regulatory advantages. In any case, a new category of vehicle would need to be created that is different from category A "mini city cars". If European regulations were adapted, the E-car could be produced and marketed within the EU at a price of around €15,000, according to Alochet et al. (2025).

The European political agenda for the electrification of the vehicle fleet is set to be busy over the next twelve months. During the first half of 2026, the European Parliament and the European Council will need to decide whether to uphold the 2035 deadline for the transition to "100% carbon-free" new registrations. A series of initiatives are also planned to define the "local content" of EVs, introduce regulations on Chinese FDI, provide details on the Battery Booster Package, and create a new category of EVs.

In any case, the European authorities will have to reaffirm or define new legislation and standards. They must do so firmly and credibly to send a clear and strong signal to the automotive industry. However, they cannot neglect the financial dimension, which is essential to enable manufacturers, equipment suppliers, and battery manufacturers operating in the EU to remain competitive against their Asian competitors, particularly those in China. This regulatory and financial support for the automotive industry should be subject to specific conditions, particularly regarding the composition of EV portfolios, to ensure all EV ranges are represented and not just the most profitable ones. In other words, future decisions should resemble a genuine "contract" between manufacturers and European institutions to prevent subsidies for electric vehicle demand and supply from being passed on to manufacturers' prices and margins.

[20]Against the backdrop of component shortages caused by the Covid-19 crisis, European car manufacturers favoured mid-range and high-end models in the early 2020s as they generated higher profit margins (Dupont-Roc and Hermine, 2025). This resulted in a delay to the release of affordable small EVs, which are only now beginning to appear on the market.

[21]State of the Union address on 10 September 2025 by Ursula von der Leyen, President of the European Commission.

Box 1: Success factors for the Chinese automotive industry

The success of the Chinese automotive industry in the EV sector can be explained by a combination of several factors, which we summarise below.

1. Massive and prolonged subsidies from the Chinese government

Over the past 15 years, Chinese authorities have invested heavily in developing and supporting their automotive industry, particularly the EV sector. This investment has taken the form of direct aid, tax exemptions on production and purchase, investment in charging infrastructure, research and development (R&D) programmes, and government purchases of EVs. Ezell (2024) estimated that the Chinese government allocated around €212 billion to its EV sector between 2009 and 2023.

2. Comparatively lower production costs in China

Car manufacturers benefit from relatively low production costs in China. In addition to subsidies and favourable tax rates, labour and electricity costs are lower than in EU countries. Car manufacturers also tend to produce many components in-house, reducing the number of intermediaries and thus production costs. For instance, BYD manufactures up to 70% of its batteries, chassis and interior components locally and in-house (see ALJ, 2024).

Lower intangible costs, such as greater responsiveness during testing phases and a less restrictive regulatory environment, enable Chinese manufacturers to shorten their production lead times compared to those in Europe and the United States. Nio, for instance, could bring new EV models to market in 120 weeks, compared to 200–216 weeks for European manufacturers such as Volkswagen or Renault. Ultimately, the development costs of a vehicle for a Chinese manufacturer would be equivalent to 27% of those for a German manufacturer.

Additionally, many Chinese manufacturers have a structural advantage in that they have developed a portfolio of EVs without the constraints of converting factories and retraining workers dedicated to producing combustion engine vehicles. Through a “leapfrogging” effect, they invested in electromobility from the outset, following an unhindered development path, which gave them an advantage over traditional Western manufacturers.

3. China’s virtual monopoly throughout the production chain

This virtual monopoly, while rooted in a proactive policy on the part of the Chinese authorities, who sought to develop EV technology at an early stage, is also closely linked to China’s abundant critical mineral resources, which are essential for manufacturing EVs and their components. China dominates both extraction and refining and controls over half of the world’s processing capacity for lithium, cobalt and graphite (Ericher et al., 2024).

4. Significant economies of scale

Since 2022, China has registered around 22 million passenger vehicles each year, while the EU struggles to reach 12 million. This difference in market size, almost a factor of 2, allows Chinese manufacturers to achieve significant economies of scale, giving them an additional competitive advantage.

Source: IEA (data), Technology Company Colab, Bain and Company's Research, Ezell (2024), Ericher et al., 2024, Jean et al. (2025).

Box 2: Putting the European Battery Alliance (EBA) proposals in the context of the planned Battery Booster Package

The European Battery Alliance (EBA), created in 2017 at the instigation of private players to promote the development of a European battery industry, has proposed allocating €9.8 billion as part of the EU's Automotive Action Plan (€1.8 billion between 2025 and 2027, and €8 billion between 2028 and 2030). The aim is to support European battery manufacturers during their first five to six years of production by offering a declining premium per kWh produced. This premium would initially be set at €25/kWh and would then gradually decrease over time.

For comparison, the United States also provides subsidies for battery production under the Inflation Reduction Act (IRA), albeit at a higher rate: $35/kWh for cells and $10/kWh for modules, provided certain local content requirements are met (Levasseur, 2025)[(a)].

The objective of both the EBA proposal and the IRA is the same. On the one hand, the aim is to encourage local battery production in order to reduce dependence on Chinese imports. On the other hand, it aims to make locally produced batteries more price-competitive than those imported from China. Indeed, the price differences for lithium-ion batteries for EVs depend heavily on where they are manufactured: at the end of December 2024, the average price per kWh was $94 in China, whereas it was 31% and 48% higher in the US and Europe respectively (BloombergNEF, 2024). Even with the €25/kWh subsidy proposed by the EBA, the cost of a kWh produced in the EU would be €17.90 ($18.90) higher than a kWh produced in China (exchange rate: $1 = €0.95, INSEE, December 2024). Conversely, the US scheme is a real game changer, reducing the price per kWh to $78 if the subsidy is at its maximum ($45/kWh).

As the EBA does not provide information on the subsidy's degressive trajectory, we are assuming a fixed subsidy of €25/kWh until the expected €9.8 billion has been exhausted by 2030. Under this assumption, approximately 392 million kWh of production would be subsidised. Assuming an average battery capacity of 79 kWh per EV, a total of 4.96 million EVs would receive a subsidy of €1,975 each. This would equate to an average of 827,000 EVs receiving a subsidy for the production of their batteries each year until 2030. However, these volumes remain modest, representing less than 10% of annual passenger vehicle registrations in the EU. In contrast, the IRA offers subsidies for battery production with no volume cap until 2032 (Levasseur, 2025a).

It should be noted that this is only the EBA's proposal concerning the allocation of the €9.8 billion expected under the Battery Booster Package. Over the next few months, the EC will provide further details on how these funds will be allocated. It will also decide on the possible use of state aid to strengthen support for battery production within the EU.

[(a)] To date, these subsidies remain in force, as the Trump administration's desire to abolish them can only be achieved through a decision by Congress.

[(b)] The average battery capacity of EVs purchased by European households in 2023 was 79.2 kWh (source: Alternative Fuels Observatory). This figure forms part of an upward trend that has been observed over the last ten years and which can be attributed, in particular, to the surge in electric SUV sales, the batteries of which often exceed 100 kWh in capacity.

Sources: EBA (2025), IEA (2025); BloombergNEF (2024), Levasseur (2025); author's calculations.

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