



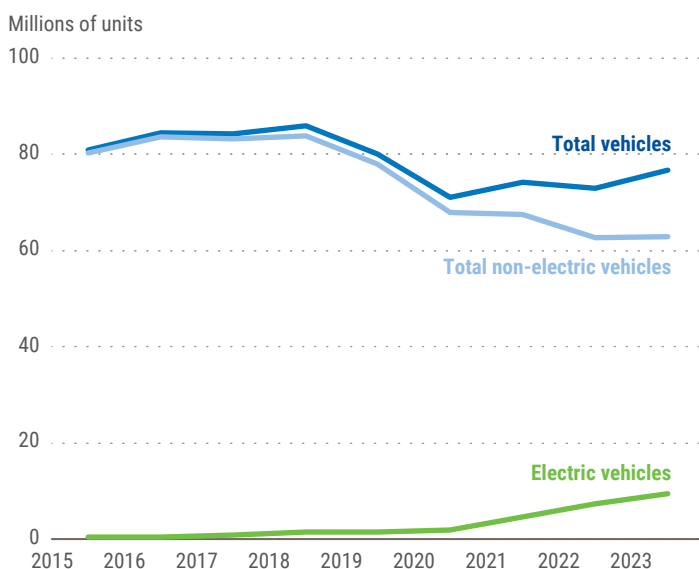
# Electric vehicles and emerging trends in the global automobile market

## Introduction

The automotive industry plays a crucial role in the global economy, accounting for around 3 per cent of the world's GDP.<sup>1</sup> It has been a key driver of innovation, value creation, economic growth, and employment, particularly in developed economies like Germany, Japan, the Republic of Korea, and the United States. In recent years, the sector has faced intense scrutiny due to its contribution to climate change through greenhouse gas (GHG) emissions from transportation, which accounts for approximately 16 per cent of global emissions.<sup>2</sup> Partly in response, electric vehicles (EVs) have become increasingly important although their potential to contribute to emissions reduction could remain unrealized if the electricity used to power them is generated from fossil fuels. Of late, the burgeoning EV market is facing broader trade and geopolitical tensions, characterized by

Figure 1

## Global automobile sales by vehicle type



**Source:** UN DESA, based on data from the International Energy Agency (IEA).

**Note:** EVs include battery electric vehicles and plug-in hybrid vehicles.

<sup>1</sup> Global revenues of the car manufacturing industry in 2023 were estimated between US\$ 3 trillion and 4 trillion ([Spherical Insights](#)), while global GDP stood at US\$105.44 trillion.

<sup>2</sup> Based on [Climate watch data for 2021](#).

## KEY MESSAGES

- » The global automotive market is experiencing transformative shifts, with China emerging as a leading force in electric vehicle (EV) production and exports. In contrast, traditional powerhouses like Germany, Japan, the Republic of Korea, and the United States are facing stiff competitiveness challenges.
- » Although global EV sales have surged in recent years, growth has decelerated in 2024, leading to an unclear outlook. This slowdown reflects ongoing consumer concerns about affordability, insufficient charging infrastructure, and a decrease in government subsidies and price support.
- » The EV sector is increasingly entangled in geopolitical tensions, with rising tariffs and trade restrictions poised to reshape supply chains, impact market strategies for EV manufacturers and potentially slow EV adoption in developed economies.

an escalating rivalry between the world's major economic powers. Concerns over the competitiveness of domestic industries, automotive jobs, and environmental protection have triggered major policy responses, particularly in developed economies. The resulting policy measures have ramifications along the entire EV supply chain, including critical minerals, processing infrastructure, batteries and battery components.

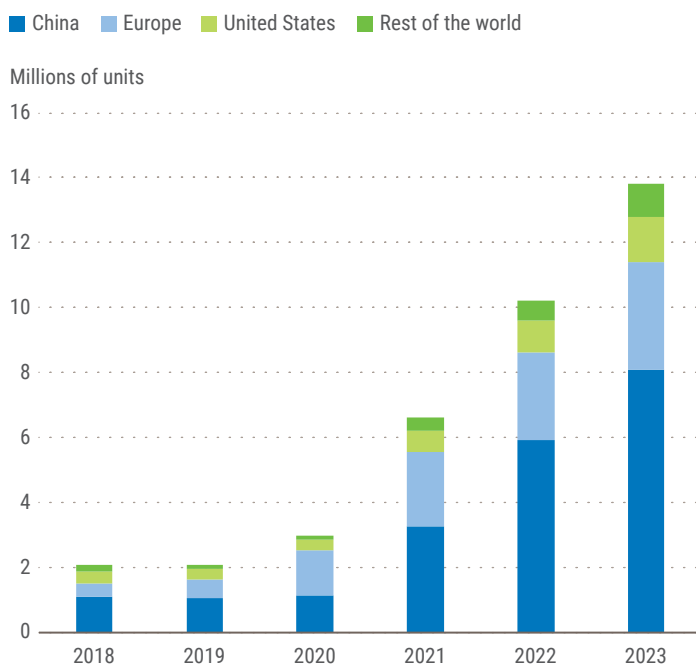
## Recent trends in automotive industry and the EV segment

Global automobile sales peaked in 2018. While the dip in sales in 2020 can be largely attributed to the COVID-19 pandemic, the subsequent rebound primarily benefited EVs. Other vehicle types, notably internal combustion engine (ICE) cars, experienced further declines in sales, followed by a stabilization in sales volume (see figure 1).

Demand for EVs varies across multiple dimensions, notably the propulsion technology and vehicle size. A common classification of electric propulsion technologies includes battery electric vehicles (BEVs), plug-in hybrid electric vehicles (PHEVs), and fuel cell electric vehicles (FCEVs). According to data from the International Energy Agency (IEA), in 2023, BEVs accounted for around 12 per cent of

Figure 2

### Electric passenger vehicle sales by country and region



Source: UN DESA, based on data from the International Energy Agency (IEA).

global new car sales, PHEVs for 6 per cent and FCEV for a minor fraction, while ICE car sales still made up 82 per cent of global car sales. Liu et al (2023) recount findings of several studies indicating that consumer sentiment towards EVs depends on various factors, such as the purchase price and total cost of ownership, the availability of subsidies, vehicle reliability, the density of the charging infrastructure (critical for BEVs), as well as location and desired driving range. In terms of EV size, Chinese consumers tend to favor smaller cars, whereas American customers generally prefer larger vehicles (IEA, 2024), and European consumer preferences fall in between.<sup>3</sup>

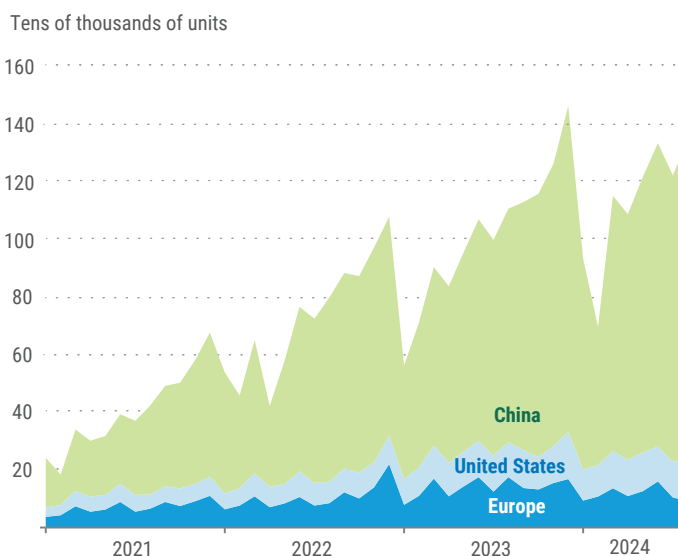
In response to the ongoing efforts to mitigate climate change by reducing emissions, the EV segment of the automotive market has witnessed remarkable growth over the past few years (see figure 2). An important factor for growing EV adoption has been increasing affordability, which varies by region. Car Edge (2024) estimates that the average EV price in the United States has fallen by around 20 per cent between mid-2023 and mid-2024. According to S&P Global Mobility (2024) the average manufacturer's suggested retail price (MSRP) premium for battery electric vehicles (BEVs) compared to non-BEV vehicles is 24 per cent in Western

Europe and 37 per cent in the United States. By contrast, in China the average suggested retail price for BEVs is 7 per cent lower than for non-BEV vehicles. Moreover, technological progress in batteries and other EV components, coupled with supportive government policies like price subsidies, and a growing density of charging infrastructure have driven strong consumer demand and sales growth. The growth momentum has been most dynamic in China, followed by Europe and the United States. According to IEA (2024), this trend is likely to continue and accelerate, given the scope of CO<sub>2</sub> reduction commitments by countries around the world. The "Stated Policies" scenario, which is based on existing policies and measures, projects that the stock of EVs will increase from 45 million in 2023 to 250 million in 2030, with an average annual growth rate of 23 per cent from 2023 to 2035.

However, recent data show that the pace of growth in EV sales has decelerated in 2024 (figure 3) as headwinds in several key markets have intensified. The trend varies across regions and the outlook remains unclear, with analysts indicating that the slowdown could span over the next 12–18 months, or that a rebound may occur in 2025.<sup>4</sup> Several factors are behind the current slowdown. First, according to S&P Global Mobility (2024), affordability remains the top concern among consumers, as expressed by 48 per cent of 7,500 survey respondents. According to

Figure 3

### Monthly sales of electric vehicles in Europe, United States and China



Source: UN DESA, based on data from China Association of Automobile Manufacturers (CAAM), European Automobile Manufacturers' Association (ACEA) and Argonne National Lab.

Note: Europe corresponds to European Union, Norway and Iceland. EVs comprise BEVs for Europe, BEVs and PHEVs for United States, and New Energy Vehicles (NEVs) for China.

<sup>3</sup> According to IEA data for 2023, small and medium-sized EVs constituted 53 per cent of sales in China, whereas the same categories constituted only 39 per cent of sales in Europe. In the United States, large EVs and SUVs accounted for 70 per cent of EV sales that year.

<sup>4</sup> See, for instance, Morgan Stanley (2024) and Motor1 (2024).

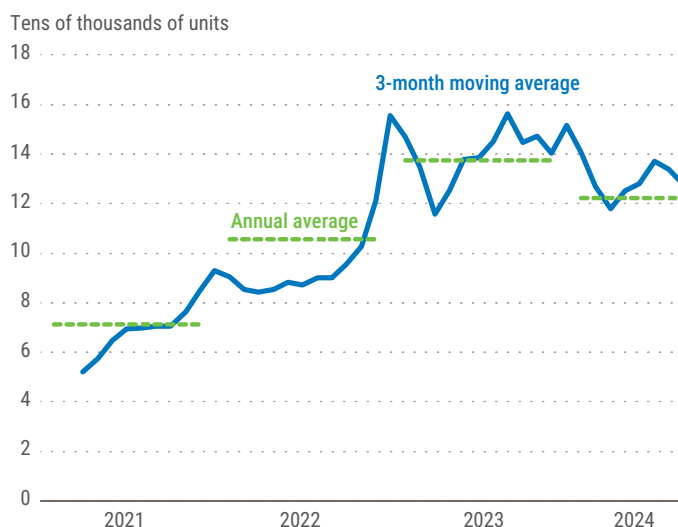
Bank of America (2024), the rate of electric vehicle penetration in the United States premium automobile market is double that of the mass market, with EVs accounting for 14 per cent of premium car sales compared to 7 per cent for the mass market. Secondly, insufficient availability of charging infrastructure in many countries poses a fundamental challenge, discouraging the use of EVs beyond city boundaries and limiting their appeal. Installation of further charging and hydrogen refueling stations was listed by the European Automobile Manufacturers' Association (ACEA) as the number one condition to support continued rollout of EVs in Europe, following the continent's sales slump in recent months (ACEA, 2024). Thirdly, lower-than-expected resale values are impacting EV capital costs (Goldman Sachs, 2024). According to a recent study using a sample of 1.6 million used cars (1–5 years old) sold in August 2023 and 2024, used EV values dropped 25 per cent in the past year compared to a 4 per cent decline for gasoline-powered cars (iseecars.com, 2024). This steeper depreciation undermines EVs' investment appeal and signals their inability to retain value in the used car market comparable to gasoline vehicles (Butts, 2024). Finally, concerns have emerged regarding the performance and reliability of EVs, with 80 per cent more issues being reported in the US compared to gasoline vehicles (Picchi, 2023), while sales in the Republic of Korea have taken a hit following a recent large-scale EV fire.<sup>5</sup>

While globally EV sales are still rising – albeit at a lower rate than in the past few years – the European market has recently experienced a decline (figure 4). In August 2024, registrations of BEVs dropped by 43.9 per cent to 92,627 units (compared to 165,204 the same period last year), while Europe's two biggest markets for BEVs saw sharp declines from a year ago (ACEA (2024)): Germany (–68.8 per cent) and France (–33.1 per cent). Several factors may have triggered the decline. In December 2023, Germany phased out its EV subsidy for consumers, causing EV sales to fall throughout 2024. According to McKinsey (2024), high purchase price, insufficient driving range and concerns about battery lifetime top European consumers' concerns over EVs. In addition, due to the phased structure of the EU's emission reduction schedules for cars, recent analysis suggests that the downturn in 2024 may partly be due to the car manufacturers' decision to frontload sales of high-end, high-margin vehicles, putting off the launch of smaller, more affordable EVs to end-2024 and 2025 (Transport & Environment, 2024). Overall, total passenger vehicle sales have been on a downward trajectory in Europe, signaling broader changes in mobility patterns across the continent, notably through significant continued use of public transport and micro-mobility solutions.

<sup>5</sup> Main issues reported pertain to troubles with battery and charging systems, as well as flaws in how the vehicles' body panels and interior parts fit together.

Figure 4

### Monthly sales of battery electric vehicles in Europe



Source: UN DESA, based on data from Trading Economics and European Alternative Fuels Observatory (EAFO).

Note: Europe corresponds to European Union, Norway and Iceland.

In contrast, the EV market in China continues to grow at a rapid pace. Although the expiration of sales tax exemptions for EVs with a range of less than 200 kilometers weighed on the market in June 2024, sales recovered quickly in July thanks to the government subsidy for trading in an old vehicle to purchase a new EV (Xinhua, 2024). In August 2024, a record-breaking number of more than 1 million EVs were sold in China, corresponding to a 33 per cent year-over-year growth (CAAM, 2024), bringing the overall sales volume for the first 8 months of 2024 to around 7 million EVs. As elsewhere in the world, government support has been critical for the establishment of the EV sector in China, which is an important component of energy transition and pollution reduction efforts. Kennedy (2024) estimates that the Chinese government's cumulative support for the EV sector totaled \$230.9 billion during 2009 through 2023.<sup>6</sup> Going forward, the strength of China's domestic demand, the scope of government incentives and access to export markets are expected to shape the overall outlook of the EV sector.

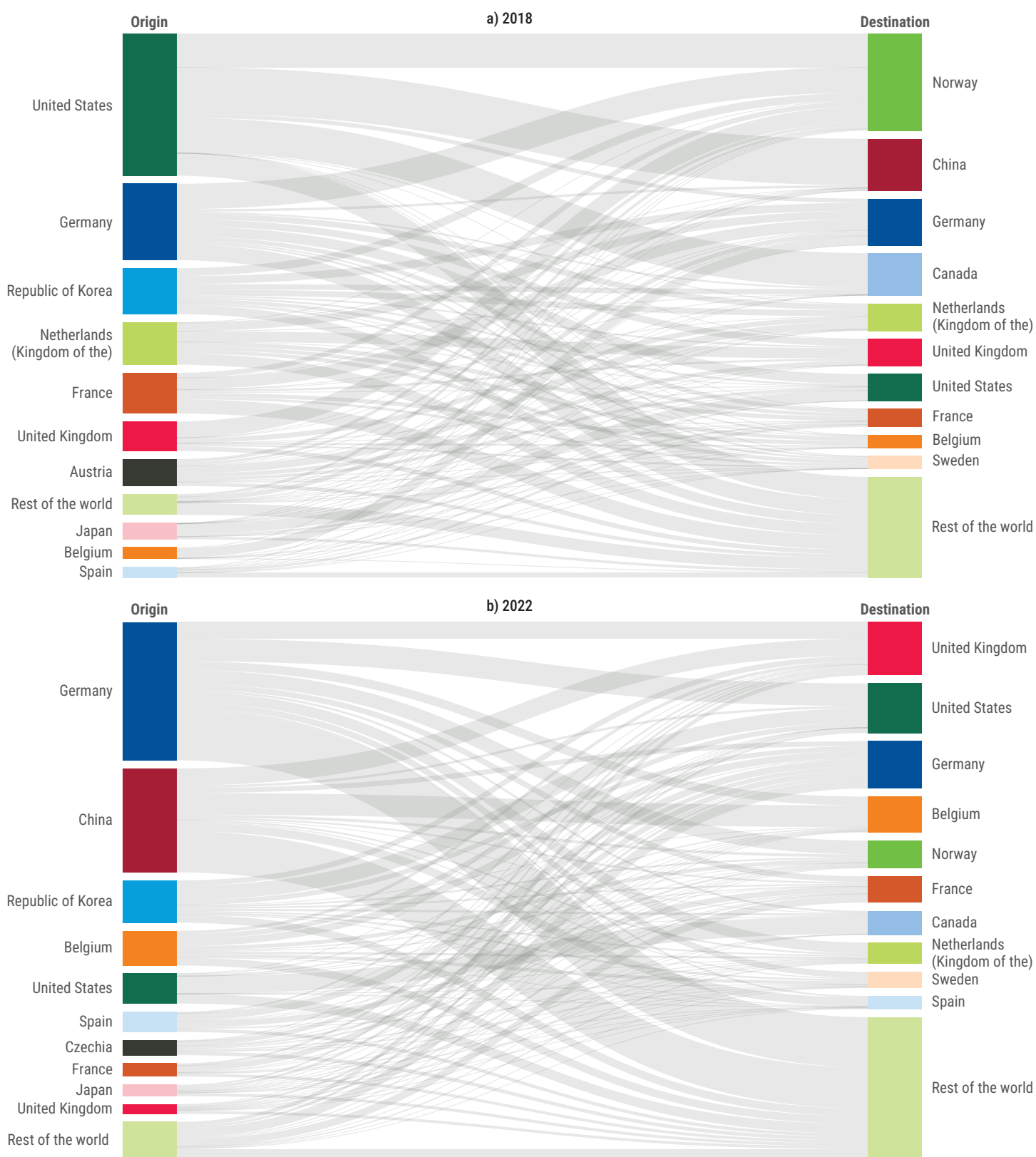
### Changing trade patterns in electric vehicles

As the sales dynamics of EVs evolve, the structure of supply and global trade patterns are undergoing significant transformations. As depicted in figure 5, in 2018, the United

<sup>6</sup> These estimates reflect the combination of five kinds of support: nationally approved buyer rebates, exemption from the 10 per cent sales tax, government funding for infrastructure (primarily charging poles), R&D programmes for EV makers, and government procurement of EVs.

Figure 5

# Export flows of battery electric vehicles (passenger cars), in value terms



Source: UN DESA, based on data from UN COMTRADE (HS code: 870380).



States was the world's largest exporter of BEVs (passenger cars), accounting for over 30 per cent of global exports in value terms. However, by 2022, its share had plummeted to less than 7 per cent. In contrast, Germany's share grew substantially from 17 per cent to over 30 per cent during the same period, while China experienced a remarkable surge, capturing over 20 per cent of the value of exports in 2022, up from only 1 per cent in 2018. Other important actors include the Republic of Korea (9 per cent of global exports), Belgium (8 per cent) and Spain (4 per cent); the remaining 20 per cent of exports originate from the rest of the world. These massive shifts in export shares reflect the rapidly evolving landscape of the BEV industry, where traditional automotive powerhouses like Japan, Germany, the Republic of Korea or the United States are facing intense competition from emerging players, most notably China. It is worthwhile to also note that China, the second largest importer of BEVs in 2018, dropped out of the top 10 importer countries in 2023, as local producers captured a larger market share, supported by the establishment of the Tesla Gigafactory in 2019. Norway was a clear early adopter in 2018, and in September 2024, the number of EVs in Norway exceeded the number of ICE cars. The increasing importance of the United Kingdom and the United States as BEV importers reflects a growing ambition to scale up electrification efforts. The rising share of the rest of the world as importer countries of EVs partly reflects growing demand for EVs in developing countries. In terms of recent bilateral trade flows, it is worthwhile to note that the United States relies heavily on imports from Germany and the Republic of Korea, rather than from China, to fulfil its demand. These changing trade patterns underscore the need for carmakers and governments to adapt their strategies to remain competitive in the global BEV market.

Mazzocco and Sebastian (2023) highlight two critical factors that have contributed to China's success as an EV exporter: the growing capabilities of the Chinese EV automakers and China's global importance as an EV manufacturing hub. While the joint venture requirement for foreign investors helped stimulate the domestic capacity of the car industry, technological advances have been attained also through dedicated research and development (R&D) efforts in areas such as battery efficiency, design and digital interfaces. The cost advantages gained through its lead position within the battery industry allow it to offer competitive prices, while a dedicated effort at improving styling, design, and connected-vehicle features has increased consumer appeal, particularly in the domestic market. For example, BYD successfully transitioned from producing smartphone batteries in the 1990s to EV batteries, and full EV production. Currently, BYD ranks first in China for patented technologies, owning or filing nearly 30,000 patents (Reid, 2023). Western carmakers have acknowledged the growing competitiveness of Chinese electric vehicle companies, as

exemplified by Volkswagen's acquisition of a stake in the Chinese EV startup Xpeng. This deal allowed Volkswagen to gain access to Xpeng's expertise in areas like EV software and autonomous driving technologies (Waldersee, 2023).

China is a key EV manufacturing hub for both Chinese firms and international actors. Scale and network effects as well as supportive business environment make manufacturing EVs in China very cost efficient. The value chain and production capabilities have also driven large price reductions on Chinese-made EV batteries, with costs of lithium iron phosphate (LFP) battery cells falling by 51 per cent to \$53 per kilowatt-hour over the last year (Gupta, 2024). In 2023, China's export of lithium-ion batteries constituted 56 per cent of global exports, signaling a large dependence of global EV manufacturers on EV parts and components' imports from China. The joint venture requirement for foreign production of EVs was phased out in 2018. Hetzner (2024) reports that Tesla, the first foreign car manufacturer allowed to build a wholly owned plant in China, manufactures more than half of cars built globally in Shanghai, with around a third of its volume destined for export. Western carmakers continue to cooperate with Chinese partners in the EV sector and are aiming to expand EV production in China.

## Geopolitical issues and outlook for the sector

The growth outlook of EVs is intertwined with key global geopolitical considerations such as growing economic, trade and political rivalry between the United States and China, strategic global value chain (GVC) vulnerability concerns raised by actors such as the European Union (EU), and the slow and uneven pace of the green transition. The importance of critical minerals for the production of EVs has exposed the sector to price and supply volatility, as well as to risks tied to an uncoordinated global policy response. Developed countries which do not possess domestic mineral deposits undertake partnerships, investments, and agreements to secure their supply, while mineral-rich developing countries negotiate contracts and investments which allow for further domestic processing and downstream engagement of local firms.

Trade policy responses in developed countries have sought to counter the rise of China as a key producer and exporter of EVs. In May 2024, the United States Government increased the tariff rate on electric vehicles imported from China from 25 per cent to 100 per cent, while also raising the tariff rates on lithium-ion batteries (the tariff rate on lithium-ion EV batteries will increase from 7.5 per cent to 25 per cent in 2024), battery parts, and selected critical minerals (The White House, 2024). In July 2024, following an extensive investigation into the subsidies provided for the EV industry in China, the European Commission imposed provisional countervailing duties on imports of electric

vehicles from China, ranging from 17.4 per cent to 37.6 per cent ([European Commission, 2024](#)). In the EU, the tariff hikes are being justified as a countervailing measure for heavy subsidies provided by the Chinese government to the EV industry. The EU comprised the destination market for almost 40 per cent of Chinese EV exports in 2023. In August 2024, Canada's Government announced its intention to implement a 100 per cent tariff on Chinese EVs, effective October 1, 2024 ([Government of Canada, 2024](#)). The tariffs, conceived as a measure to safeguard domestic automotive industry, may however have several adverse effects in the host economies. Notably, the tariffs would lead to higher consumer prices resulting in slower adoption of EVs and may temporarily limit competitive pressures on the automotive industry, discouraging innovation.

[Gasiorek and Papadakis \(2024\)](#) stress that in the case of the United States, the tariffs seem to have a pre-emptive role, given that in 2023 Chinese exports accounted for only around 2 per cent of total United States EV imports ([USITC, 2024](#)). The United States Inflation Reduction Act includes provisions for up to \$7,500 in federal incentives for EV purchases through 2032. To qualify, vehicles' final assembly must take place in North America. Additionally, battery critical minerals must be "extracted or processed in the US or any country with which the US has a free trade agreement".<sup>7</sup> This aims to boost domestic automotive manufacturing and supply chains. China filed cases at the WTO, disputing the countervailing tariffs applied by the EU and Canada, as well as certain tax credit requirements under the US Inflation Reduction Act.<sup>8</sup> The outcome for these disputes is unclear due to the lack of a functioning appellate body at the WTO, limiting its capacity to resolve trade disputes.

The outlook for trade patterns in the EV sector remains uncertain due to its close connection with unpredictable geopolitical dynamics as well as ongoing developments in international trade policy, environmental regulations, and industrial strategies across countries. The tariffs already imposed by the EU, the United States and Canada are likely to have an impact on the global EV trade landscape. [Coffin et al. \(2024\)](#) analyzed the potential effects of increased trade restrictions on Chinese EVs and their components. In their hypothetical scenario where all parties raise tariffs on Chinese EVs by 20 per cent, exports from China to five key markets would decline by 53 per cent to 62 per cent. Meanwhile, exports from the EU and Japan would rise by 20 per cent and 13.6 per cent, respectively. On the other hand, imposing tariffs on Chinese EV parts would lead to a significant decrease in the EU's EV exports.

The tariff hikes for Chinese EVs may lead to an increased effort by Chinese manufacturers to produce EVs within or close to the local destination markets. For example, [Reuters \(2024\)](#) reports that Volvo (majority-owned by China's Geely) is considering moving production of its EVs to Belgium, while BYD is planning to construct two manufacturing plants in Europe to avoid new tariffs. Similarly, Mexico is eyed by numerous Chinese actors as a possible location for EV manufacturing plants, in order to circumvent the new tariffs through the US-Mexico-Canada trade deal ([AEA, 2024](#)). While European policymakers are amenable to accommodate Chinese EV investments in Europe, the prospect of Chinese EVs entering the US market through Mexico is sparking strong controversy, with several declarations of possible further preventative measures (see for instance, [Krisher, 2024](#)).

The limitations of access to developed markets may entice Chinese manufacturers to focus some of their efforts in growing their market share in emerging economies. According to [Fastmarkets \(2024\)](#), as of September 2024, several developing countries such as Indonesia, Malaysia, the Philippines and Thailand have waived their EV duties. While developing countries stand to gain from the low prices of Chinese imports, concerns around potential effects on domestic manufacturing industries are fueling increasingly protective trade measures and calls to bolster local investment. For instance, in 2024 Brazil and Turkey both imposed EV import levies to ensure that BYD, China's largest electric vehicle manufacturer, followed through on plans to construct local assembly plants as the company moves forward with its global expansion efforts. ([Cotterill et al, 2024](#)).

The green transition has significantly transformed technologies, production methods, and trade patterns across various product categories, including EVs. Improvements in cost-effectiveness could accelerate EV adoption, particularly in emerging markets. However, sustained government investments in charging infrastructure and renewable energy sources are crucial for ensuring the sustainability and global expansion of the EV sector. Additionally, global collaboration on the extraction and processing of critical minerals, and continued commitment to reach multilateral solutions to geopolitical challenges, are important for the sector to continue to thrive. Continued rapid expansion of the EV sector is vital to meet CO<sub>2</sub> reduction targets. According to IEA (2023), to meet the 1.5-degree goal, electric car sales should reach a market share of around 60 per cent by 2030.

<sup>7</sup> Federal Tax Credits for Plug-in Electric and Fuel Cell Electric Vehicles Purchased in 2023 or After ([fueleconomy.gov](https://www.fueleconomy.gov)).

<sup>8</sup> See WTO Cases [DS627](#), [DS623](#), [DS626](#).

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