



Global Economic Insight

Electric vehicles are transforming mobility, economies and payments

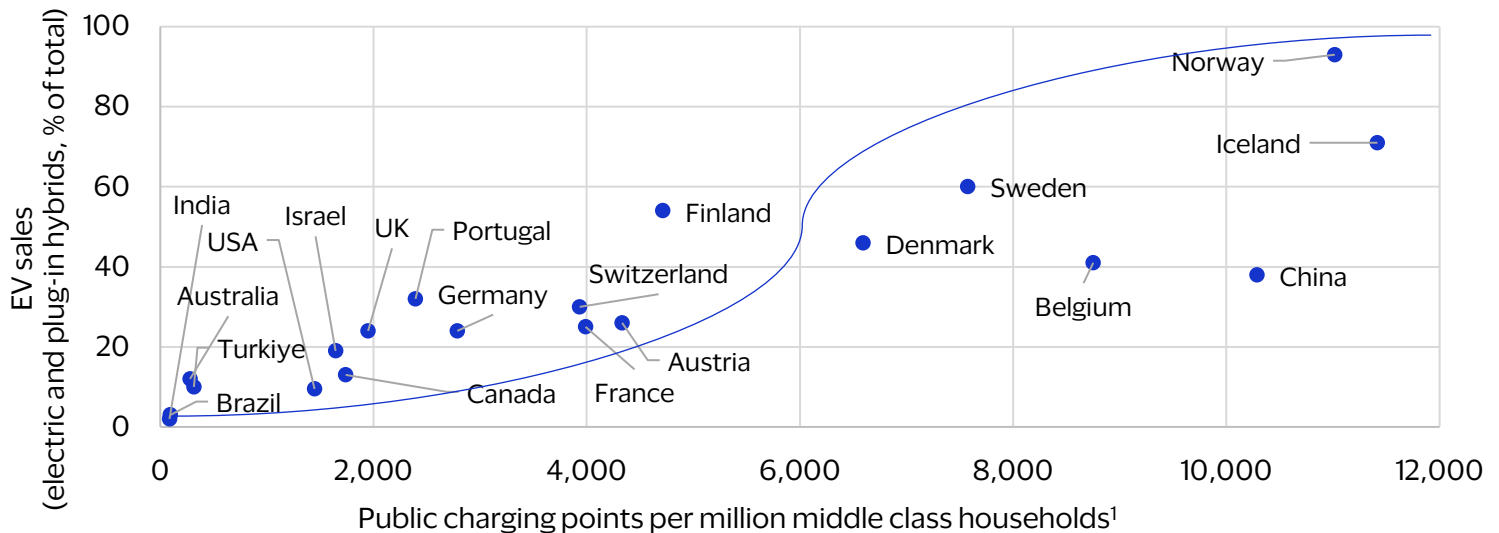
While the journey toward reducing carbon emissions from transportation has taken a few detours, the world is still heading toward a future in which electric vehicles (EVs) will reshape personal mobility. In 2023, EV sales accounted for at least half of all new cars sold in key Nordic countries (Fig. 1), a milestone China also reached in mid-2024. If current projections and public commitments hold, the rest of the world could cross the same threshold by 2030, aided by an expanding network of public chargers.

More than simply a technological shift, EVs represent a transformative economic force. Anonymized transaction data from VisaNet reveals that multi-car households with EVs spend 28 percent less on gasoline and are less sensitive to fluctuations in gasoline prices. Furthermore, businesses located near chargers enjoy higher sales than those farther away, with grocery stores and restaurants benefiting the most. Viewed from a broader lens, EVs are becoming an economical option for younger consumers with the means in emerging economies, where innovative financial and subscription models are reducing upfront costs.

As countries around the world roll back consumer subsidies for EVs, further EV adoption will depend more on delivering a better consumer experience and value. Efficient and user-friendly payment solutions can play a critical role in this next phase of the industry’s development. A frictionless payment approach based on an open-loop system, where a single bank-issued card can be used for all payments—whether contactless or card-on-file—could streamline transactions and enhance the charging experience.

Fig. 1: EV adoption is poised for exponential growth in most economies

Percent share of electric car sales vs. availability of EV public charging points¹ in 2023



Sources: International Energy Agency (2024), Global EV Outlook 2024; Oxford Economics



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EVs are reshaping middle-class living

Automobile ownership has long been a marker of making it into the middle class. At the same time, the costs of running and refueling a vehicle often dictate household budgets and spending. EVs could upend these elements of middle-class living.

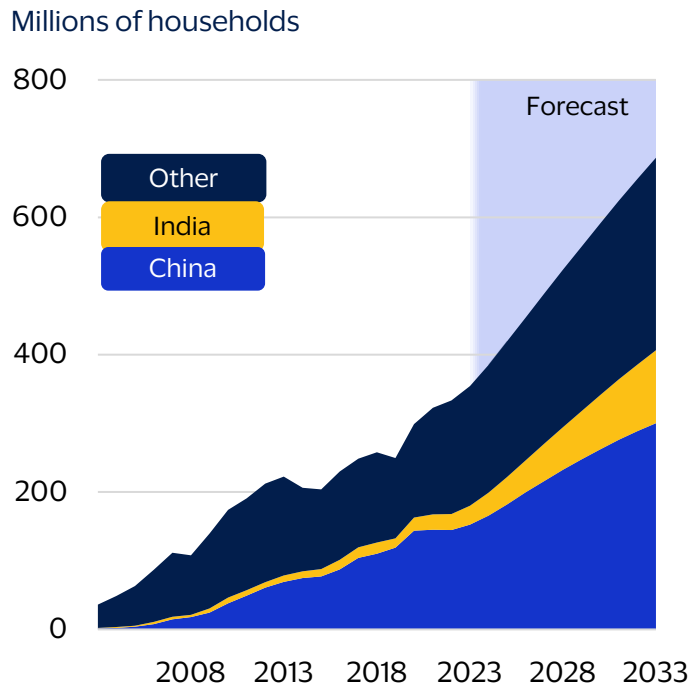
Emerging markets are increasingly reshaping the link between automobiles and the middle class. New automobile sales in emerging markets have consistently outpaced those in advanced economies since 2011. With the number of emerging market middle-class households projected to double over the next decade, that lead will only grow (Fig. 2).

Among emerging markets, China is the leader in auto sales, with Chinese domestic new car sales exceeding new car sales in the EU and the U.S. combined since 2021.² Auto industry trends are now set in China, and the country's future is electric. As of June 2024, half of all new cars sold in China are now EVs, according to data from the China Passenger Car Association. This could rise to nearly 70 percent by 2030, based on earlier forecasts from the International Energy Agency (IEA).

Younger consumers who can afford cars in emerging economies are increasingly considering EVs, thanks to subscription models that lower the costs over the long-run. Consumers, particularly in emerging economies where EVs are made locally and cheaper, are more inclined to buy electric cars. Further, there is a growing eco-friendly mindset. Over half of those who can afford them agree that electric cars are the motor industry's future (Fig. 3). Consequently, this could lead to strong demand for electric cars in emerging markets, where they might be the first choice for young buyers.

Alongside rising demand, the private sector is swiftly building supply side infrastructure, such as battery swapping systems and charging stations, to enhance the ease and convenience of owning an electric vehicle. Already, emerging markets like India are witnessing record EV sales. India is arguably the most innovative market for affordable electric vehicles that have reached the tipping point of cost and convenience. India's EV policy has incentivized more charging stations, resulting in faster growth in electric car sales compared to the global average (71 percent vs. 35 percent in 2023). Moreover, India's battery-as-a-service model facilitates quick battery swaps, similar to traditional refueling times, that enable EV drivers to save time and travel longer distances. Drivers pay a periodic subscription fee to battery service providers over the vehicle's lifespan. This subscription model separates battery costs from the price of the vehicle, further encouraging EV adoption. As electric cars approach price parity with traditional internal combustion engine (ICE) cars and charging points become more widespread, other countries are likely to see similar exponential growth in EV adoption.

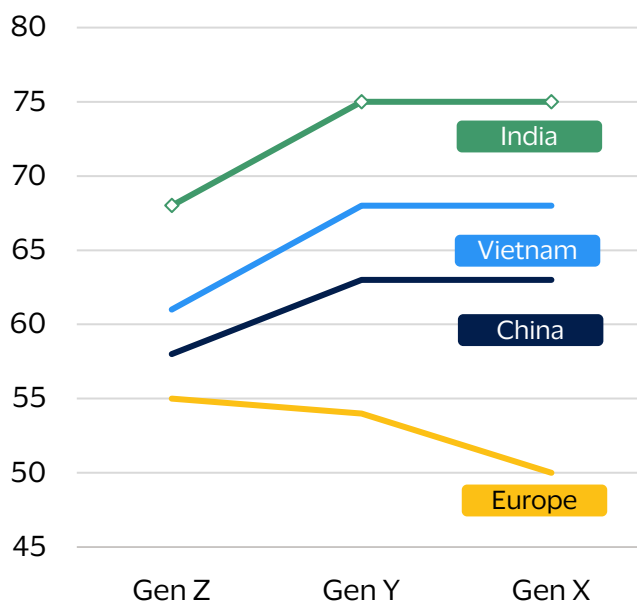
Fig. 2: The emerging market middle class* will double in the next decade



* Households with annual disposable incomes ranging from 2015\$PPP US\$20,000 to US\$70,000
Source: Oxford Economics, November 2024

Fig. 3: Electric cars are the future of the motor industry in emerging markets

Adult respondents of medium-to-high income or wealth who agree with the statement as a share of total (percent)



Source: YouGov Global Profiles, 15 May 2024



EV charging stations benefit businesses in the vicinity

As charging networks continue to expand, consumer spending is shifting toward areas with chargers. Merchants near new charging locations saw a boost in sales with each opening from 2022 to 2023, according to analysis of data from VisaNet and the U.S. Department of Energy. Within the first 90 days of a charging location’s opening, spending at merchants within a half-mile radius increased by 2 percent—equal to 17 more transactions per day.

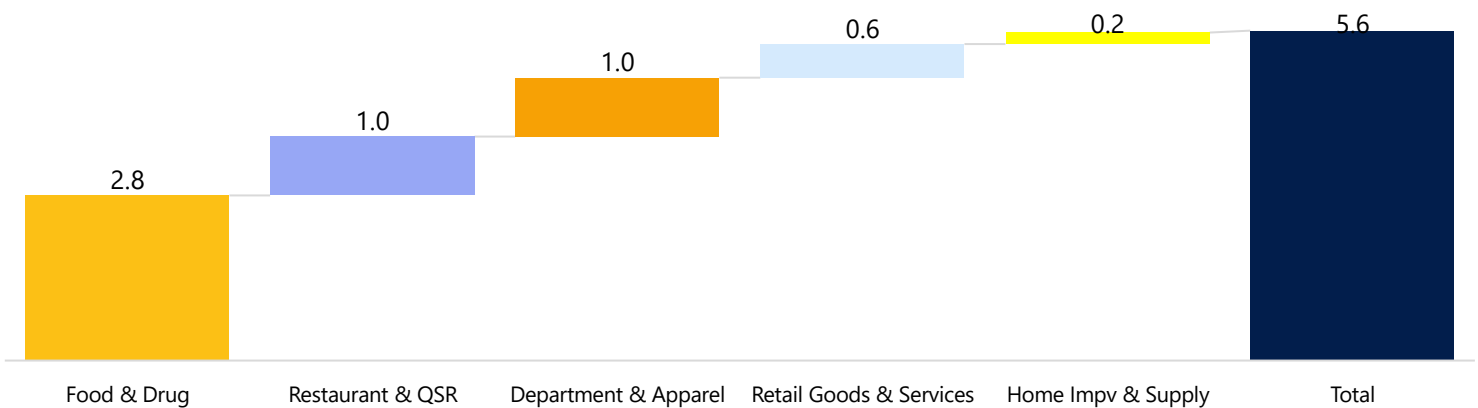
The charging stations in this analysis were in areas with an average of six restaurants and four grocery stores or pharmacies, which are also the types of merchants that see the greatest lift.

Food and drug retailers, for example, saw nearly three more transactions per day, per merchant with the opening of a new charger, followed by restaurants (both full and quick-service) (Fig. 4).

This shift suggests that a significant number of EV drivers are shopping at nearby merchants before, during or after charging their EVs, and potentially selecting merchants based on their proximity to EV chargers. Additionally, it largely reflects spending by affluent homeowners—the largest group that spends on EV charging—as well as by frugal renters, who over-index on spend per average card for EV charging transactions relative to other segments.³

Fig. 4: Merchants within a half-mile (0.8 km) radius of EV charging stations display a lift in sales

Average transaction lift per merchant per day



Source: Visa Business and Economic Insights analysis of VisaNet data

EVs lead to more stable consumption patterns

For consumers, greater EV adoption could buffer their spending from swings in oil markets, leading to more stable spending through commodity cycles. In many markets, motor fuel accounts for the largest cost of operating personal transport. These costs in turn represent between 4.6 percent and 6.2 percent of total consumer spending in emerging markets and advanced economies, respectively. Research has shown that oil prices can have an even greater impact on consumer spending. For example, the sharp rise in gasoline prices in 2022 may have added further fuel to the spike in consumer prices by boosting inflation expectations,⁴ and elevated gas prices in 2007 could have contributed to the U.S. housing and financial crisis by putting further strain on already financially stressed households.

Even in countries where EV adoption is still in its early stages, such as the U.S., oil prices’ impact on consumption is weakening. U.S. EV-owning households tend to be in the top third by income and own multiple cars, according to our analysis of anonymized transaction data.⁵ As the top third of U.S. households account for over 45 percent of all gasoline spending, changes in their spending patterns could impact aggregate gasoline consumption. In fact, analysis of transaction data shows that only 1 in 5 households matching the consumer profile of an EV owner actually owns one, suggesting significant growth potential. On average, multi-car households with EVs save \$325 a year on gasoline. They also have slightly more flexibility to reduce spending during oil price increases. For every 10 percent increase in gasoline prices, EV owners cut their gasoline spending by one percentage point more than their non-EV counterparts.



Removing “speed bumps” on the road to EV adoption

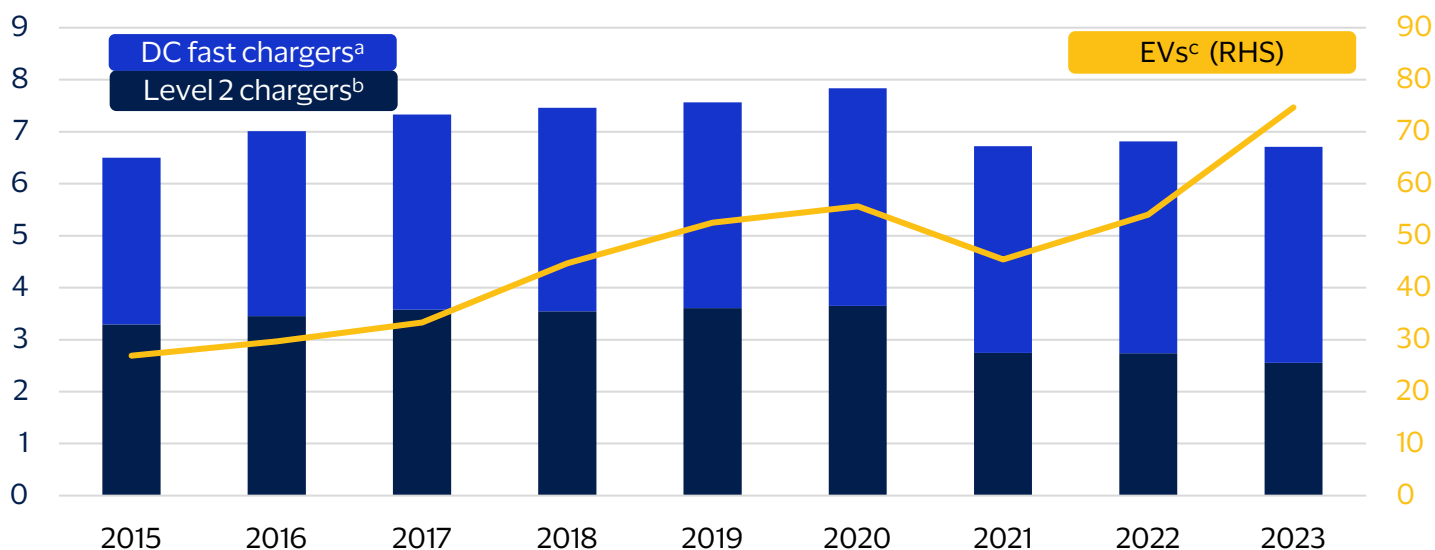
By 2023, nearly 14 million EVs were sold annually, representing an average annual growth rate of 57 percent over the past decade. Over the next decade, maintaining this sales growth faces new speed bumps, as governments end economic incentives to promote greater EV adoption. Already, Sweden has stopped providing incentives for EV purchases as of 2022.⁶ Norway and Germany reduced their incentives in 2023, and, following its recent presidential election, the U.S. is widely expected to follow suit.^{7,8} How far a country is along the EV adoption curve could determine the impact of these policy changes. For example, some studies suggest that the U.S. market is approaching the tipping point where consumers’ increased acceptance of EVs and expansion of the charging infrastructure could be enough to sustain EV adoption if subsidies are pulled.^{9,10,11} Our research, though, shows that EV adoption is still largely limited to early adopters and has not yet developed mass appeal.

Although EV charging primarily takes place at home, access to external charging points will play a key role in further EV adoption. In the U.S., for instance, the number of DC fast-chargers per charging location increased from 3 to 4 between 2015 and 2023, but EV growth during the same period far outpaced it: The number of EVs per charging location jumped from about 27 in 2015 to 75 in 2023 (Fig. 5). Meanwhile, governments are examining not only the availability of public charging stations, but also how convenient they are. For instance, the EU is developing a competitive market with open access to all parties interested in establishing and operating charging points to address the uneven distribution of public charging infrastructure.¹²

While more EV chargers will help, enabling more convenient payments for charging could also accelerate adoption. Currently, drivers must register with multiple EV charging networks, making the process cumbersome. Unlike refueling, EV charging often involves special apps or cards and lengthy registrations. This issue can be addressed through open-loop payments, which allow the use of regular cards or digital wallets without additional steps such as logging into a mobile app or using a proprietary RFID card or dongle. This system would simplify transactions and eliminate the need for proprietary cards. Already, new regulations require public charging points in EU countries to be digitally connected, meaning they can send and receive real-time information with the electricity grid and vehicles. This enables the development of interoperable payment solutions and enhances the charging experience for operators and drivers.¹³

Fig. 5: Growth in electric cars exceeds the rise in charging locations

Number of chargers, electric cars per charging location



Note: The term “electric car” refers to both battery electric and plug-in hybrid cars. Direct-current (DC) fast-chargers take 15 to 30 minutes to charge a vehicle’s battery, while Level 2 chargers take about 4 hours.

- a. The total number of DC fast chargers divided by the total number of locations with DC fast-charging ports.
- b. The total number of Level 2 chargers divided by the total number of locations with Level 2 charging ports.
- c. The total number of electric cars divided by the total number of locations with public and private ports.

Sources: IEA, U.S. Energy Information Administration.

Footnotes

1. Data on public charging points is extracted from IEA (2024), Global EV Outlook 2024, IEA, Paris <https://www.iea.org/reports/global-ev-outlook-2024>, Licence: CC BY 4.0. The deployment of public charging infrastructure in anticipation of increasing EV sales is essential for widespread EV adoption. Data on the size of middle class households is from Oxford Economics. Middle class households are defined as those earning between \$20,000 to \$70,000 annually on a purchasing-power parity adjusted basis in constant 2015 U.S. dollars.
2. Visa Business and Economic Insights analysis of data from the International Organization of Motor Vehicle Manufacturers/Haver Analytics.
3. Visa Consulting & Analytics, "Harnessing payments opportunities in the age of electric vehicles," 2024
4. Nide Cakr Melek, Francis M. Dillon, and A. Lee Smith, "Can Higher Gasoline Prices Set Off an Inflationary Spiral?" Economic Review, Federal Reserve Bank of Kansas, 2022
5. EV owners were identified as those who transacted at a public EV charging station between 2020 to 2023, and the non-EV control group was based on consumers who shared similar characteristics but who did not transact at a public EV charging station during this timeframe.
6. <https://www.regeringen.se/artiklar/2022/11/fragor-och-svar-om-avskaffad-klimatbonus/>
7. <https://www.bmwk.de/Redaktion/DE/Pressemitteilungen/2023/12/20231216-umweltbonus-endet-mit-ablauf-des-17-dezember-2023.html>
8. <https://elbil.no/english/norwegian-ev-policy/>
9. Archsmith, James E, Erich Muehlegger, and David S Rapson, "Future paths of electric vehicle adoption in the United States: Predictable determinants, obstacles and opportunities," Environmental and Energy Policy and the Economy, 2021, 3(1), 71-110
10. Rapson, D.S.; Muehlegger, E. "The Economics of Electric Vehicles"; Working Paper 29093; National Bureau of Economic Research: Cambridge, MA, USA, 2021
11. Gillingham, Kenneth T., Arthur A. van Benthem, Stephanie Weber, Mohamed Ali Saafi, and Xin He. "Has Consumer Acceptance of Electric Vehicles Been Increasing? Evidence from Microdata on Every New Vehicle Sale in the United States." AEA Papers and Proceedings, 2023, 113: 329–35
12. Regulation (EU) 2023/1804 of the European Parliament and of the Council of 13 September 2023 on the deployment of alternative fuels infrastructure, and repealing Directive 2014/94/EU, 2023
13. Regulation (EU) 2023/1804 of the European Parliament and of the Council of 13 September 2023 on the deployment of alternative fuels infrastructure, and repealing Directive 2014/94/EU, 2023



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Accessibility notes

Figure 1: A bubble chart showing the percent share of electric car sales and availability of EV public charging points in 2023 by country. Countries, arranged in descending order of percent share of electric car sales, are as follows: Norway, Iceland, Sweden, Finland, Denmark, Belgium, China, Portugal, Switzerland, Austria, France, Germany, U.K., Israel, Canada, Australia, Türkiye, U.S., Brazil, India.

Figure 2: An area chart showing the projected size of the middle class in 2034 by country. Middle class households (in millions) are projected to grow from 1.5 in 2004 to 300 in 2034 for China, from 0.7 in 2004 to 106 in 2034 for India, and from 34 in 2004 to 280 in 2034 for other emerging markets .

Figure 3: A line chart showing the average share of adult respondents of medium-to-high income or wealth who agreed with the statement, “Electric cars are the future of the motor industry in emerging markets.” The share of respondents who agreed was 68 percent for Gen Z and 75 percent for Gen X and Y in India; 61 percent for Gen Z and 68 percent for Gen X and Y in Vietnam; 58 percent for Gen Z and 63 percent for Gen X and Gen Y in China; and 55 percent for Gen Z, 54 percent for Gen Y and 50 percent for Gen X in Europe.

Figure 4: A waterfall bar chart showing the average transaction lift per merchant per day for merchants within a half-mile radius of EV charging stations. Merchants, arranged in descending order of average transaction lift , are as follows: food and drug retailers, with 2.8 more transactions per day; restaurants (both full and quick-service), with one more transaction per day; department stores and apparel, with one more transaction per day; retail goods and services, with 0.6 more transactions per day; and home improvement and supply stores, with 0.2 transactions per day.

Figure 5: A stacked bar and line chart showing the number of chargers as well as electric cars per charging location between 2015 and 2023. The number of direct current fast charger and level 2 chargers per charging location were 4 and 3 respectively in 2023, compared to 3 each in 2015. Meanwhile, the number of electric cars per charging location rose from 27 in 2015 to 75 in 2023.