

Affordable EVs and Mass Adoption: The Industry Challenge



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01 Foreword

In recent years, the global market for battery electric vehicles (BEVs – defined as “EVs” in this report) has grown exponentially as consumers and governments alike have become increasingly aware of the urgent action needed to alleviate the impact of the climate crisis.



David Krajicek,
CEO, JATO Dynamics

OEMs across global markets have remoulded their business models to fit the new operating environment, diverting investment away from traditional ICE vehicles toward the development and production of new and enhanced EVs.

Thanks to these concerted efforts, the EV offering alongside the range of these vehicles has improved, and EVs are now the preferred choice among many consumers when looking to purchase a new car.

However, despite progress, EVs continue to be more expensive than traditional ICE alternatives in Europe and the US. As a result, many entry-level consumers are being forced out of the new car market and are instead looking to buy second-hand vehicles, delay their purchase, or simply use alternative transport means.

In comparison, China has significantly reduced the price of its EVs. With widespread domestic demand, strong public incentives, and rapid progress across new technologies, EVs have become the norm across the country. China’s focus has been to ensure that EVs were

accessible for the masses, and it has done so to great success, developing its low-entry segments, and allowing demand to shift as smoothly as possible from ICE to EVs.

Conversely, manufacturers across Europe and the US – operating in mature markets, with limited government support – have been unable to produce these vehicles at such a pace. And, if left unaddressed, allowing China to lead the transition to EVs could have significant ramifications for Western markets, particularly given their strong reliance on the automotive industry for economic growth.

Operating in the industry for over 30 years, JATO Dynamics has unparalleled data spanning global markets, and is in a prime position to support OEMs in a period of such significant change. Through this report, we combine analysis of government and industry efforts with current trends and market insights to help manufacturers in the collective effort to drive EV adoption across the globe.

02

How have EV incentives changed since 2021?

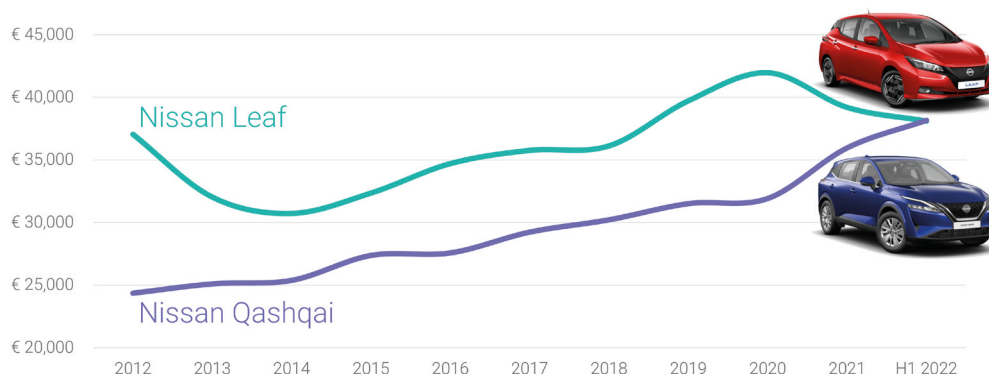
The Chinese government has repeatedly stated ambitions to scale back its costly incentive programme which established the country as the world’s largest market for electric vehicles. Earlier this year, subsidies for all electric vehicles - set to expire at the end of 2022 - were reduced by 30% from 15,840 CNY to 11,088 CNY. However, due to the ongoing impact of COVID-19 and wider economic slowdown, it is likely that subsidies will continue to be available to consumers in 2023. In addition, the planned purchase tax increase to 10% next year is also under review, with policy makers instead considering maintaining the current full exemption or raising it to just 5%.¹ As reflected in the State Council’s NEV Industry Development Plan (2021-2035), China aims to reduce the industry’s current reliance on incentives for EVs, however at present market stability is the primary focus.²

Moving over to the US, the EV incentive landscape has been significantly altered by the introduction of the Inflation Reduction Act. The new system aims to encourage a shift away from ICE vehicles – buyers are eligible for a tax credit of up to \$7,500 for an electric sedan priced under \$55,000, or for trucks and SUVs priced under \$80,000. This is

however restricted to vehicles that undergo final assembly in North America and is only available to individuals earning less than \$150,00, or \$300,000 per year for married couples. According to the Alliance for Automotive Innovation, 72 EVs are available for sale in the US, however the US Department for Energy has published a list of just 21 eligible models. Restrictions related to battery components are also due to take effect in 2024 which will further reduce the number of eligible models.³

The European market has also seen significant shifts over the course of the last year, with some countries taking steps to decouple growth from the support of incentives. In June, the UK Department for Transport announced that it was closing the £300 million plug-in car grant scheme after “successfully kickstarting the UK’s electric car revolution and supporting the sale of nearly half a million electric cars.”⁴ The UK government has committed to refocusing funding towards the main barriers of the EV transition, including public charging. In the UK, the Nissan Leaf – one of the first EVs to hit the European markets – can now be purchased for the same amount as the Nissan Qashqai.

Average Retail Price of the **electric** and **gasoline** versions available in the UK



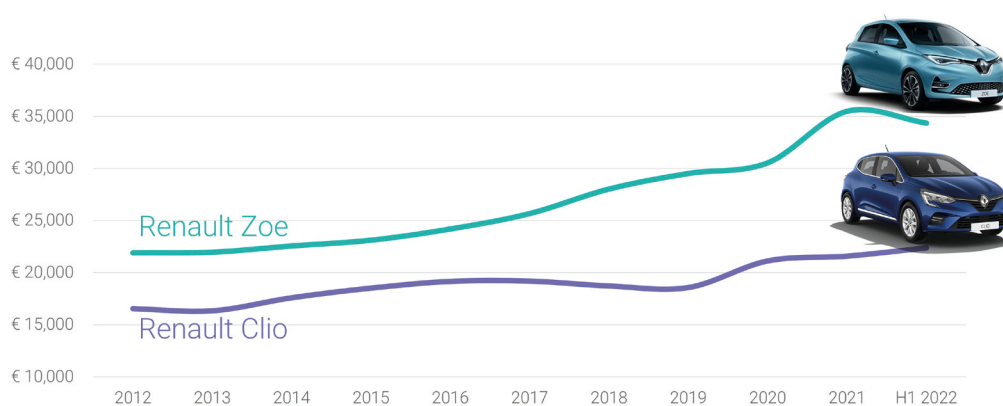
As a result of the growing popularity of EVs, the German government has also announced plans to reduce incentives over the course of 2023. All incentives are set to cease once an allocated sum of €3.4 billion from the budget over the next two years is spent. Support for PHEVs will stop at the end of 2022 entirely.⁵

In France, existing incentives for the purchase of a new full-electric or plug-in hybrid vehicle, as well as trade-in bonuses for cleaner new and used cars, were set to expire in July, however they have now been extended until the end of 2022. In June, Economy Minister, Bruno Le Maire, reaffirmed the government's ambitions

to accelerate the transition away from ICE vehicles as many consumers were still unable to afford an EV without the support of incentives. Today, the average price of an EV is €50,890, 30% higher than the average gasoline vehicle.

The Renault Zoe – Europe's second best-selling electric car in 2021 – stands as an example. Renault has improved the range and capabilities of the Zoe in recent years, but this has led to an increase in prices. While its counterpart, the Clio has also become more expensive, it continues to be far more affordable.⁶

Average Retail Price of the **electric** and **gasoline** versions available in France



In the Netherlands, the €71 million government budget for EV subsidies (enough for 22,000 vehicles) has been exhausted this year. However, the Dutch government has made the decision to relaunch its incentives programme in 2023 and 2024 with a slightly slower premium.⁷

Norway continues to be the Europe's leading country in driving the transition from ICE to EVs – in H1 2022, 78% of all new passenger

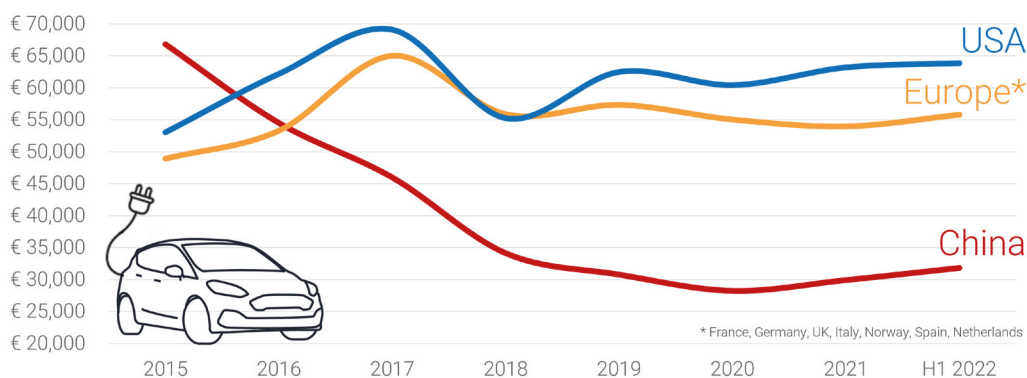
car registrations were fully electric. However, in May this year, Norway announced plans to remove the VAT exemption on electric cars costing more than €49,000, which will come into force at the start of 2023. The VAT for electric vehicles under the new scheme is dynamic – the more expensive an electric car is above the cap, the higher the VAT charge it incurs. At the same time, Norway will launch a subsidy scheme to replace the VAT exemption.⁸



Are EVs becoming more affordable?

Moving from EV incentives to pricing, there is a clear juxtaposing trend between Europe and the US, when compared with China. While there has been some fluctuation in the US and Europe since 2015, prices continue to rise. In contrast, EV prices in China have steadily declined.

Average Retail Price of the Electric Cars available

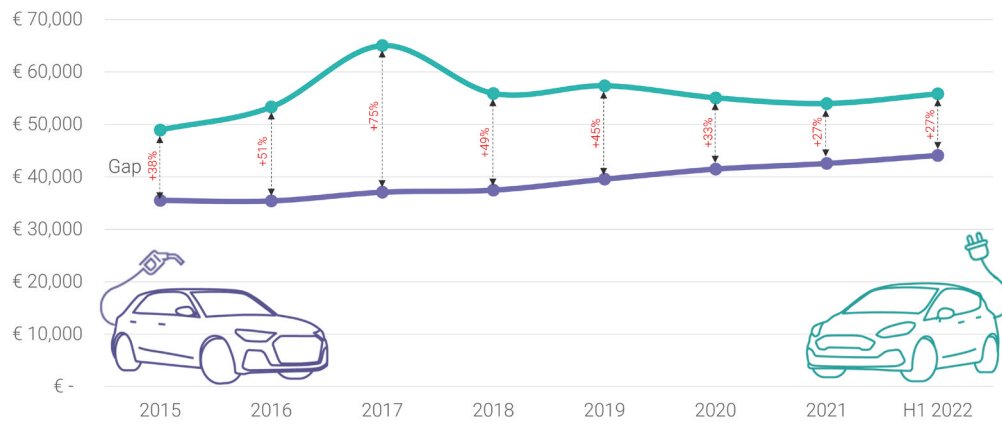
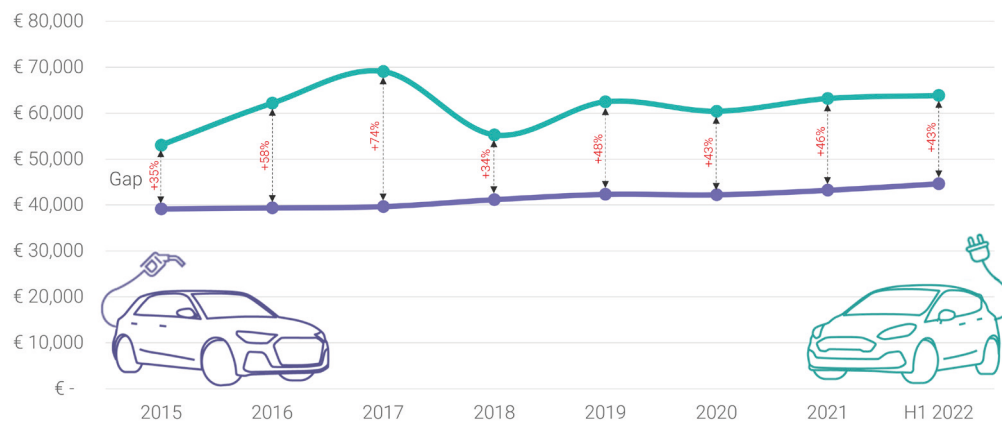


The average price of an EV in H1 2022 was €55,821 in Europe, and €63,864 in the US – up from €48,942 and €53,038 in 2015, respectively. Today, an EV in Europe is on average 27% more expensive than a gasoline car, and in the US the difference in price jumps to 43%.

With little progress in reducing EV prices across the European market, consumers continue to rely heavily on government incentives. This is largely because OEMs have focused their production efforts on premium models and segments within which price sensitivity is low. Since 2020, there have been improvements in the offer of more affordable,

entry-level segments, however prices remain high when compared with comparable gasoline models.

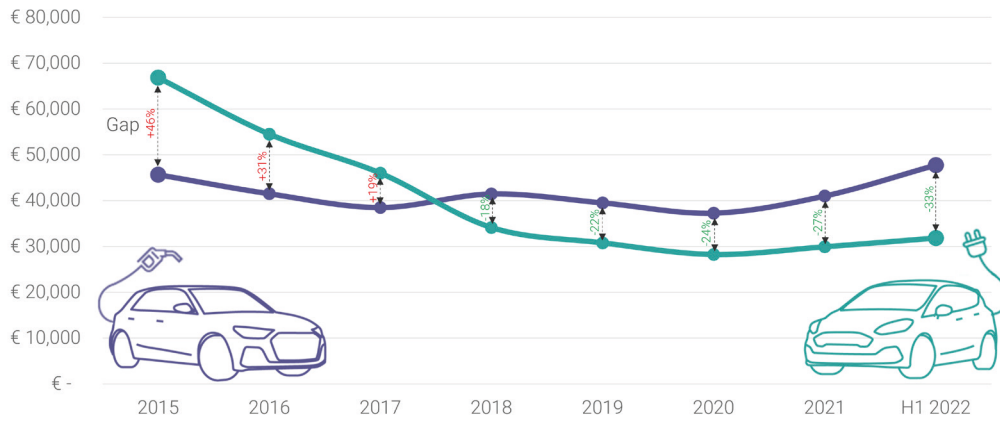
With the exception of Tesla, OEMs in the US have lagged behind their counterparts in Europe and China when joining the electrification race. In addition, the US market faces a specific challenge due to the consumer preference for large trucks and SUVs – traditionally associated with powerful gasoline engines. For this mindset to change, OEMs need to broaden their EV offering, however such a shift will undoubtedly take time.

Average Retail Price of **Gasoline** and **Electric** Cars in EuropeAverage Retail Price of **Gasoline** and **Electric** Cars in USA

The progress made in China is striking. While the average price of an EV in 2015 was higher in China than in both Europe and the US (at €66,819), the concerted effort of the Chinese government to electrify the domestic automotive industry has brought the average price of an EV down to just €31,829 – 33% less than the average price of a gasoline car. There has been

a marginal increase in average EV prices since 2020 due to the rising cost of raw materials used in batteries and the introduction of more models in the upper segments, but demand remains strong and the China Passenger Car Association forecasts EV sales (BEV, PHEV, FCEV) to reach a record 6 million in 2022.⁹

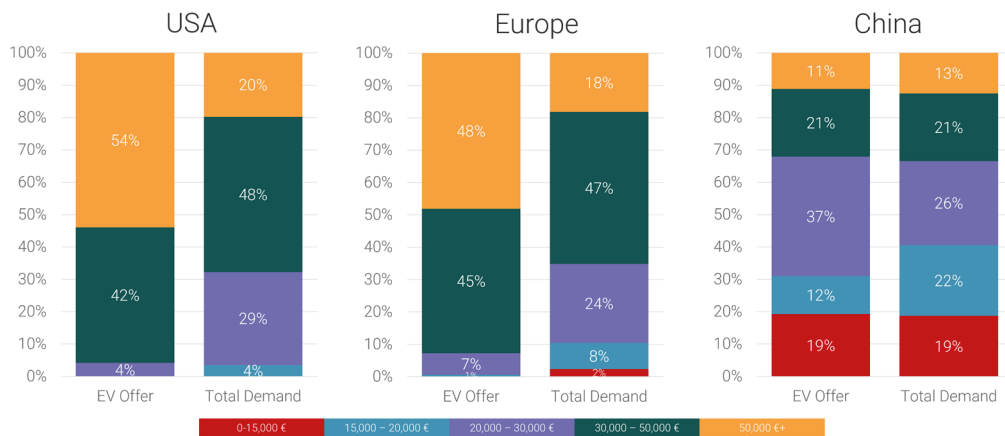
Average Retail Price of Gasoline and Electric Cars in China



In China there is an almost direct correlation between EV offering and sales distribution by retail price. OEMs can therefore meet consumer demand and offset high production costs by ensuring sustainable sales volumes.

In contrast, the US and European markets are poorly balanced. Western OEMs have prioritised the more profitable segments and have failed to create an EV offering that meets the needs of consumers.

H1 2022 Retail Price of Electric Cars by range as percentage of total offer vs H1 2022 Sales distribution by Retail Price range



04 Analysis of key segments: SUVs vs city cars

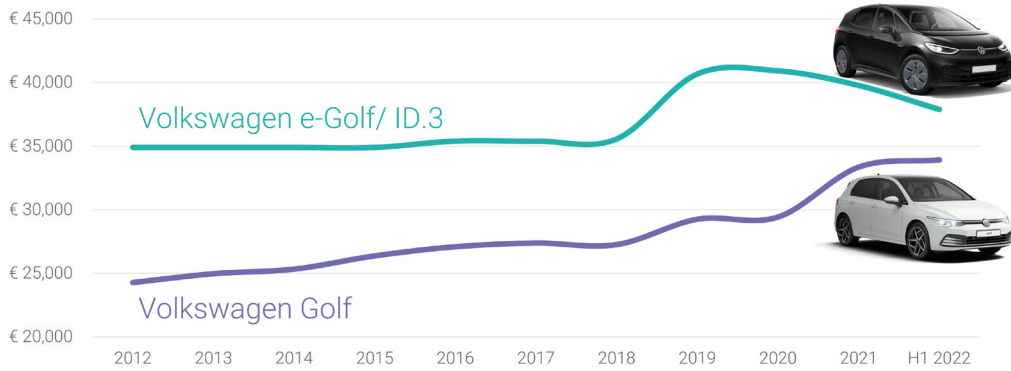
In recent years, the popularity of SUVs has grown rapidly among consumers in Europe, the US, and China. In 2021, these vehicles accounted for 37% of the global EV sales¹⁰, with OEMs actively targeting the segment in their electrification efforts, which has had a significant impact on pricing.

In 2016, the average price of an electric SUV in Europe was €109,506, and € 99,874 in the US. In H1 2022, these prices fell to € 57,461 and € 54,026, respectively. However, despite progress, SUVs continue to be more expensive than their gasoline alternatives which retail on average at €44,373 in Europe, and €43,514 in the US. In contrast, consumers in China can purchase an electric SUV for as little as €35,512. Last year, they accounted for 45% of all passenger vehicles in China, and an electric SUV was on average 5% cheaper than a gasoline SUV.

Much of China's success in driving widespread EV uptake has been attributed to the industry's ability to produce affordable entry-level vehicles for the masses. Today, the average price of an electric city car is €10,131, down from €29,918 in 2015. While A and B segment cars accounted for only 16% of total volume in 2021, the Chinese government has long recognised the importance of reducing the price of these smaller vehicles to ensure that a significant proportion of the population is not excluded from the transition to EVs.

Moving over to Europe, the smaller segments present a major challenge for OEMs. While the preference among consumers in China is for compact and large vehicles, the European market is dominated by small cars - in 2021, A and B segment vehicles represented 43% of sales. Pricing of smaller EVs has however failed to fall to levels needed to satisfy this demand. The average retail price of an electric city car in Europe has increased by 15% since 2015 to €28,319, whereas a gasoline city car can be purchased for just €17,527.

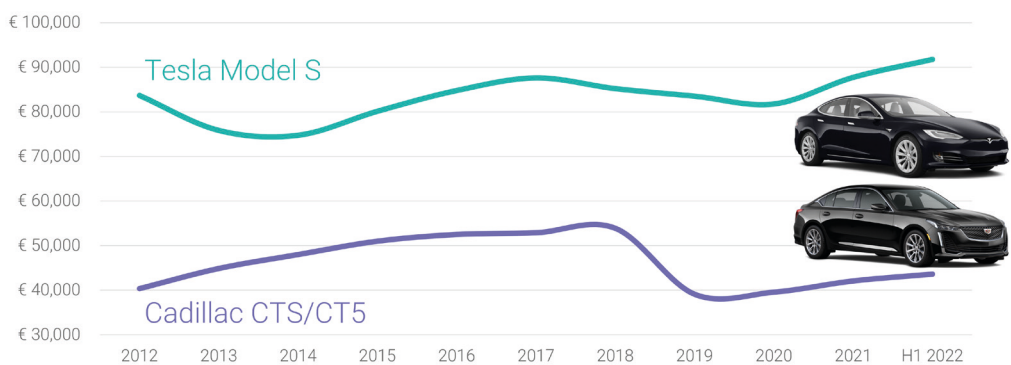
Average Retail Price of the **electric** and **gasoline** versions available in Germany



In the US, the smaller segments are far less popular among consumers, outsold even by luxury cars. Compact sedans and SUVs account for 31% of the market, followed by large and midsize vehicles with 28% and 25%, respectively. In H1 2022, the average price of a gasoline midsize sedan was \$41,075 dollars compared to \$51,748 dollars for an EV. Meanwhile, the average retail price of the electric version Ford F-150 – the country’s

top-seller – was 43% higher than the average price of the gasoline version. While the Tesla Model S has lacked direct rivals in recent years, it sits alongside a range of gasoline sedans in the executive segment. With the arrival of the Model 3, Tesla saw an opportunity to improve the flagship Model S and increase its price as a result. In contrast, prices of gasoline models have remained relatively stable.

Average Retail Price of the **electric** and **gasoline** versions available in USA



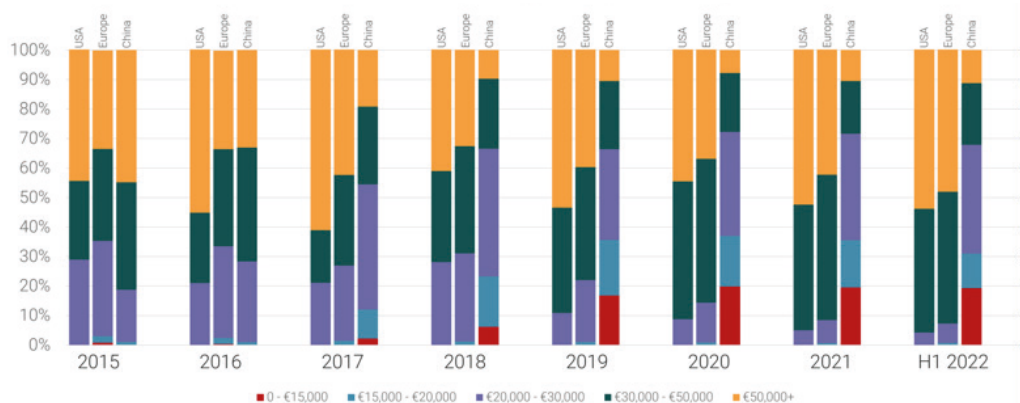
05

China's global ambitions

A driving factor behind China's success in enabling widespread EV adoption has been industry's ability to produce affordable, entry-level cars. Due to the high development costs for EVs, China's OEMs recognised the need to prioritise volume to ensure profitability. Established automakers like SGMW, BAIC, Changan, GAC, BYD, and Chery, alongside many start-ups, have launched cars in the smaller segments and have seen prices fall as a result.

In 2015, the EV offering China was similar to that of US and Europe, with prices starting at €20,000 while a significant portion were priced above €50,000. In H1 2022 however, vehicles priced below €15,000 represented almost 20% of the total EV offering. Contrastingly, in the US and Europe today, there are no EVs priced below €20,000.

Retail Price of Electric Cars by range as percentage of total offer



While this approach has helped finance and accelerate the growth of China's domestic EV market, several OEMs now have their sights set on Europe, identifying potential to boost profits due to the market's higher purchase prices. As a result, automakers have made efforts to broaden their offering with more

refined models, aligned with the preferences of European consumers. NIO, an EV startup founded in 2014, now has seven different models in its line-up with prices ranging from €51,000 to €81,000, and the company has major ambitions to enhance its European presence.



Hui Zhang

Vice President, NIO Europe, commented:



“We see the market entrance in Europe as a must, and last year we made the first step. We have already launched successfully in Norway with Germany, Sweden, Netherlands, and Denmark starting this year. We’re working closely with supply chain partners and expect to accelerate vehicle production in Q3 2022. By 2025 we plan to offer services to users in over 25 markets across the globe.

Our target is the premium EV sector. We believe our cars will be competitive, offering the very latest features (with the ability to update via FOTA) plus the very best materials and technologies. We feel very comfortable that with our 2.0 platform we can deliver value without compromise.”

To date, China’s OEMs have struggled to gain a foothold in European markets dominated by the world’s most established brands, partly because (rightly or not) consumers have traditionally associated Chinese manufacturing with mass-production and low quality. However, perceptions are changing. In H1 2022, EVs manufactured in China accounted for 19% of total new EV registrations in Europe– the second highest market share behind only Germany at 21%.

MG, the former British manufacturer now controlled by Chinese OEM, SAIC, has made

progress in several overseas markets including Europe, Latin America, the Middle East, and Southeast Asia. In 2021, MG sold more than 366,000 units globally, 55% of which were sold outside China. The Chinese-Swedish brand, Lynk & Co, founded in 2016 and owned by Geely began global expansion last year entering the European market with one its 6 models, the 01, and sold 8,400 units. In H1 2022, Lynk & Co exceeded these results registering 9,500 units across 8 European markets. In the first half of this year, the 01 was the 12th best-selling model in the Netherlands.



Battery technology

Since the beginning of the EV transition, range has frequently been cited as one of the main barriers to adoption for many consumers. While there are discrepancies between real-world range and the official figures published by manufacturers, there has undoubtedly been significant progress in recent years.

In 2010, Nissan launched the first-generation Leaf – a compact hatchback with a range of 170 km (106 miles). Renault followed in 2012 with the Zoe that has a claimed NEDC cycle range was of 201 km (130 miles) with a 22 kWh Li-ion battery pack.¹¹ BMW then entered the EV market with the i3, capable of driving up to 160km (100 miles) using a single battery, and almost double this with the addition of a range extender.¹² In 2012, Tesla introduced the Model S with a claimed range of 258 to 483 km (160-300 miles) thanks to industry leading battery technology.¹³

In China, the best-selling car in 2021 was Wuling's Hongguang Mini, an affordable city car with a range between 120 km to 170 km.¹⁴ For most Chinese consumers that drive primarily in urban environments, when supported by the country's vast charging infrastructure, this range is more than adequate.

In Europe and the US, different driving habits makes range a more significant challenge for automakers, alongside the time it takes to charge a vehicle. One solution to this problem that has recently arrived in Europe is battery swapping.

Hui Zhang, Vice President, NIO Europe, continued:



“Battery swapping provides a power solution that is more convenient than refuelling at gas stations and gives the flexibility to upgrade battery technology and battery size – users don’t need to worry about battery technology becoming obsolete during their tenure of the car.

But battery swapping is just one piece of the jigsaw. Users’ primary concern when buying an electric car is range, so providing a variety of solutions to relieve the anxiety and worry holding people back from purchasing an electric vehicle is a priority.”



NIO is not the only automaker to have identified battery swapping as potential solution to the twin challenges of range and charging anxiety - Tesla trialled the technology in 2014 before making the decision to abandon the service, instead diverting investment into its Supercharger network. Critics argue that battery swapping is too capital intensive, and that issues around compatibility may prove too problematic for OEMs and consumers.¹⁵

Hui Zhang, Vice President, NIO Europe, added:

“It will take time and investment to create the infrastructure, and nurture acceptance of this innovative technology and the business model, but we are committed. We have our second station in Norway and over 1,100 stations in China. We plan to build 1,000 Power Swap Stations outside of China by 2025 to implement BaaS. By this time, the total number of NIO stations will exceed 4,000 worldwide and to accelerate this, we are working with partners including Sinopec and Shell.”

Automakers in China like those in the West are currently navigating a complex and unpredictable environment due to global challenges such as the increasing cost of raw materials and the current inflationary crisis. But thanks to technological innovation and continued government support, Chinese OEMs have been able to develop a product offering that can rival and potentially surpass that of the West. In the coming years, China's incursion is only likely to accelerate.

07 Emerging markets

As this report has made clear, the global EV market is currently dominated by China, Europe, and the US. However, as greener, sustainable transport becomes increasingly appealing to consumers and fleets across the globe, new countries are beginning to ramp up efforts to bolster the production and sales of EVs in their markets.

Several emerging markets are looking to take advantage of the increasing demand, hoping to successfully compete in the marketplace and grow their own share. And, with the International Energy Agency, (IEA) predicting that the quantity of electric vehicles (all fuel types) including trucks, vans, and buses, are due to rise to 145 million by 2030, the opportunity for these markets is abundantly clear.

One emerging market that is making great strides in this respect is India. Supported by a government strongly committed to increasing the quantity of EVs, India's automotive sector is picking up at speed.

According to the Society of Indian Automobile Manufacturers, India has already overtaken China as the world's largest market for two-wheeled vehicles, and now a significant opportunity for its mobility is the transition to EVs.

As a key element in India's efforts to reduce its dependence on fossil fuels and reach net zero by 2070, its government predicts that sales of EVs (BEV, PHEV) will reach 6.7 million by 2027 and has ambitions for EVs to account for 30% and 70% of private car and commercial vehicles sales by 2030, respectively.

According to JATO data, BEV passenger car sales in India grew from 747 vehicles in 2017 to 19,791 in the first half of 2022 - almost the same quantity it sold over two years between 2019 and 2021.

As one of the fastest growing EV markets, it is currently projected that India's EV market will be worth \$150 billion by the end of the decade, and the Delhi government is supporting its growth, offering EV incentives and investing in charging infrastructure.



Ravi Bhatia

President and Director,
JATO Dynamics India,
commented:



“Public charging infrastructure is nascent at this stage and consumers have limited access. In India, car prices are on average a quarter of weighted prices seen in Europe and the US. Moving forward, EV penetration will remain low unless we see improvements in the entry level to mid-level offering as subsidies are not very aggressive.”

“Despite interest from the likes of Tesla, the Government of India is committed to supporting the country’s local manufacturing. Maruti Suzuki, for example, recently announced a new battery plant in Gujarat. While this will act as a barrier, it will provide opportunities for India’s homegrown OEMs. And given the attractiveness of the market, we may see foreign OEMs announce local investments in the near future.”

Another emerging market that is making concerted efforts to increase EV production is Turkey. According to JATO data, sales of BEV passenger cars in Turkey grew from 77 vehicles in 2017, to 2,126 in H1 2022.

Looking to become “an EV manufacturing hub and boost its industrial competitiveness” the country’s automotive industry is stepping up the pace of production - particularly as its main export market, the European Union, tightens restrictions on ICE vehicles.

According to Industry and Technology Minister, Mustafa Varank, the country will soon become a “global hub for electric vehicle production,” with Turkey’s own electric vehicle, TOGG, being an important first milestone for the country’s move into EV production.

This year, Ford Otosan, the joint venture between Ford Motor Co and Turkey’s largest conglomerate Koc Holding, began production of the Ford Transit EV model, with a \$2.2 billion investment. As the first automotive company to produce a BEV in Turkey at scale, the country will look to export to Europe, while upping factory vehicle production from 455,000 to 650,000 each year.

While a number of emerging markets are beginning to rapidly grow, in comparison to China, Europe and the US their market share is still marginal. And there is still a lot of work to be done to bring this new way of mobility into the developing markets successfully - particularly as the cost of these new vehicles significantly outweigh the purchasing power of local consumers.



The future of the industry

The global automotive industry is arguably experiencing the most intense period of transformation and innovation since the internal combustion engine went into mass production in the early 1900s. The rapid shift away from traditional powertrains toward zero-emissions mobility has created new opportunities for both established OEMs and emerging players, and an entirely new ecosystem is fast being developed that will require an array of new services, solutions, and technology in the coming years.

Unprecedented progress has been made, however there are many challenges on the road ahead. While manufacturers continue to improve the range of their vehicles – and private and public industry players join forces to develop and employ better charging infrastructure – more significantly, governments and manufacturers must now address the current pricing imbalance seen across markets. Currently, a significant proportion of the population is excluded from the EV transition due to issues of vehicle affordability, and without mass adoption, emissions reduction targets will ultimately be unattainable.

The outlook for the industry differs dramatically in Europe, the US, and China. Thanks to the strength of China's domestic market,

technological advancement, and continued government support, OEMs and start-ups in the country are in a prime position to accelerate their plans for global expansion.

In the short term, at least, the future for Europe and the US appears less promising. Consumers are responding positively to the broader range of available EVs, however both markets have, to date, failed to bring down prices to satisfy the demands of car buyers on lower and middle incomes. Without an affordable offering, private mobility will not be accessible for many consumers moving forward. The risk for Europe and the US is that China could acquire a crucial portion of the market which has until now been dominated by the industry's most established OEMs.

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