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Automotive in Europe: what has been and what comes next

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I would like to thank my thesis supervisor Professor Marengo, for accepting with great enthusiasm my proposed topic and for his constant support and guidance throughout the writing of this thesis.

To the best three years of my life.

And to many more ahead.

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Chapter 1: Introduction and scope of the thesis

The automotive market has long been a cornerstone of European economic and industrial strength. Beyond its contribution to GDP, employment, and exports, the sector plays a central role in the daily lives of consumers, shaping mobility, identity, and financial decisions. Over the last decade, however, the industry has undergone one of the most radical transformations in its modern history.

This thesis focuses on understanding the recent evolution of Europe and its automotive market (the analysis is limited to passenger cars, thereby excluding light commercial vehicles, trucks, and other heavy-duty vehicles). It aims to compare the situation in 2014, with the context in 2023, almost a decade later. The year 2014 represents the end of a long-standing situation, where internal combustion engines dominated European roads, and where environmental concerns had not yet triggered the structural changes that would soon reshape the industry. In contrast, 2023 presents a different scenario: new powertrain technologies are increasingly mainstream and regulatory frameworks have become more aggressive, and automakers are operating under completely new strategic imperatives.

By anchoring the analysis in these two reference points, the thesis aims not only to document what has changed over the past decade, but also to explore why these changes occurred and what they imply for the future. To do this, the thesis adopts a data-driven approach, analyzing key indicators such as average income, car prices, the market share of electric versus combustion-powered vehicles and more.

The thesis ultimately seeks to provide a strategic outlook on the future of the automotive market reporting various forecast from sector experts, with a particular focus on Europe and European consumers. In this way, the thesis not only serves as a retrospective analysis, but also offers forward-looking reflections on the challenges and opportunities facing the automotive industry in the coming years.

Why 2014?

Although Dieselgate officially emerged in September 2015, the practices that led to it were fully in place throughout 2014. For this reason, 2014 can be considered the final moment of “business as usual” for the automotive industry. The vehicles sold, the way

emissions were tested, and the dominant role of ICEs (especially in European countries) all reflected a status quo that would soon be disrupted on multiple levels.

Countries in the analysis

As previously stated, this thesis adopts a European scope. Whenever available, aggregated values for the European Union will be presented. These refer to the EU composition after 2020 (UK not included) even for data referring to the year 2014.

In addition to the EU-wide figures, the analysis focuses on a selection of individual countries: Germany, Italy, Spain, the Netherlands, and Norway. These countries were chosen based on their economic and strategic relevance within the European automotive market, as well as their diversity in terms of geography, income levels, regulatory approaches, and consumer behavior.

A special note for Norway. Although it is not a member of the European Union, it has been included due to its geographical position within Europe and its pioneering role in the transition to electric mobility. Norway represents a benchmark case for early adoption and policy effectiveness, offering valuable insights that complement the broader European narrative. For this reason, while Norway is not part of EU-level averages, its inclusion enhances the comparative depth of the analysis.

Chapter 2: the 2014 automotive market

2.1 Macroeconomic and Consumer Context

Europe was coming out of one of the most challenging economic decades since World War II in 2014. Particularly in Southern Europe, the effects of the global financial crisis and the unrest surrounding sovereign debt were still evident. Even though the worst of the Eurozone crisis was over, the recovery was still erratic, precarious, and extremely cautious. Technically, many European economies were growing, but slowly. Consumer sentiment was still affected by the aftereffects of austerity measures and public finance constraints, and GDP growth rates were modest.

While households throughout the continent were still getting used to years of income loss or stagnation, youth unemployment rates in Italy, Spain, and Greece were significantly higher than 30% (data will be examined in the next chapter).

Although interest rates were still near the lower bound and monetary policy had not yet taken the aggressive turn it would in the ensuing years, the European Central Bank had started laying the foundation for its first significant unconventional monetary interventions due to extremely low inflation and the resulting fears of deflation in some economies.

The time was characterized socially by re-prioritization and caution. More frugal spending habits had been promoted by the financial crisis' aftermath. Household consumption was still comparatively low, even though some sectors had started to recover. In both public and private discourse, the concept of financial prudence predominated. Uncertainty about long-term economic prospects influenced major purchase decisions, including those pertaining to car ownership, and consumers were less willing to take on debt.

In light of this, Europe's automobile industry was recovering slowly and hesitantly. Following years of precipitous drops in automobile sales from 2008 to 2013, demand started to level off and then progressively increase in 2014. However, the continent-wide recovery was not consistent. While markets in Southern Europe continued to struggle with weak internal demand and credit constraints, core economies such as Germany and

the UK saw stronger recoveries. Automobile manufacturers were acting more cautiously, concentrating on core models, cutting production, and reconsidering investment plans in response to narrower profit margins.

Internal combustion engines continued to dominate the market in terms of technology. Diesel remained the talk of the town, especially in Western Europe. In addition to long-standing financial incentives and cheaper fuel prices, the widespread use of diesel vehicles was also bolstered by the belief that diesel technology provided higher efficiency and reduced CO2 emissions. Diesel was the sensible option for many fleets and consumers due to these benefits, especially in an environment where economic sensitivity is still prevalent.

There were hybrid and electric cars, but they were in the background. They continued to hold a small portion of the market and were rarely at the center of automakers' strategic planning. Although it had started in theory, the switch to alternative powertrains had not yet materialized. Public awareness was still low, incentives differed greatly by nation, and charging infrastructure was scarce. Plug-in hybrid models were frequently viewed as compliance tools rather than significant product lines, and EVs were perceived more as technical oddities than practical solutions.

Cars' technological advancements were more gradual than revolutionary. Although early driver-assistance tools, parking sensors, and simple infotainment systems were becoming more common, the car had not yet evolved into the networked digital platform it would eventually become.

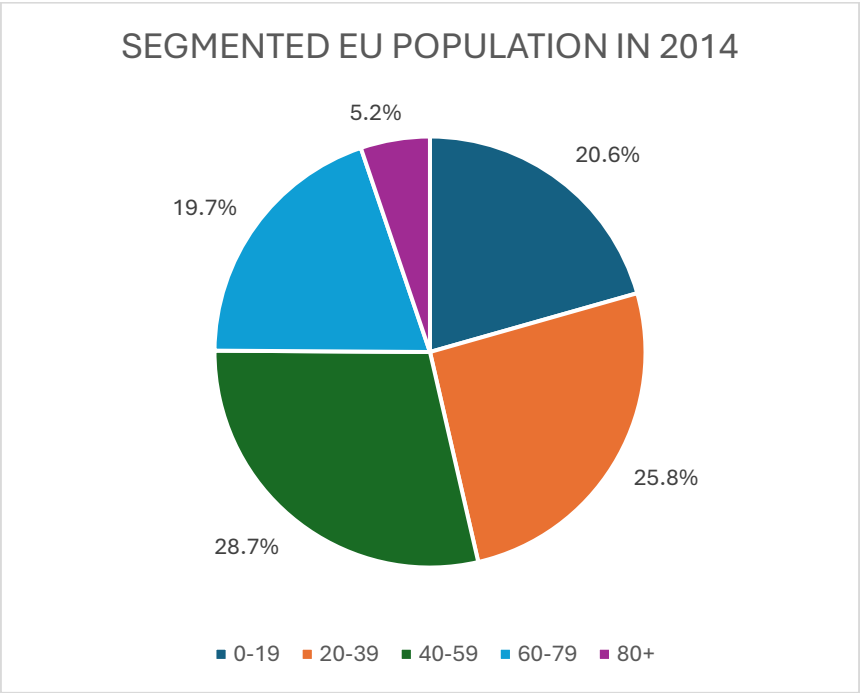
In many respects, 2014 marked the last period of stability prior to the significant upheavals of the ensuing ten years. Consumer priorities were still determined by traditional automotive values like mechanical dependability, fuel economy, and ownership identity during this year that was sandwiched between crisis recovery and future change.

2.1.1 Population and Age distribution

POPULATION IN EUROPE[1]

	2014
European Union	442,266,046
Germany	80,767,463
Italy	60,345,917
Spain	46,495,744
Netherlands	16,829,289
Norway	5,109,056

Over 442 million people lived in the European Union as of 2014, though there was significant variation among its member states. With over 80 million inhabitants, Germany was the most populous nation, followed by Spain and Italy. About 16.8 million people lived in smaller nations like the Netherlands and 5.1 million in Norway, respectively.



2.1.2 Disposable Income

One important measure of the amount of money available for large purchases like cars is the gross disposable income per household in 2014. The general HICP (Harmonized Index of Consumer Prices), which measures overall household inflation, has been used to convert the data, which came from Eurostat, to real 2023 euros. This makes it possible to compare purchasing power consistently across nations and offers a better understanding of how the economy was influencing the affordability of cars at the time.

PRE INFLATION[3]

	2014
European Union	16,079
Germany	21,339
Italy	16,950
Spain	14,503
Netherlands	16,969
Norway	27,868

GENERAL HICP[7]

	2014	2023	Inflation Rate 9y
European Union	99.89	126.38	27%
Germany	99.30	125.90	27%
Italy	99.90	120.90	21%
Spain	100.63	119.89	19%
Netherlands	99.79	127.81	28%
Norway	98.00	131.60	34%

AFTER 2023 INFLATION ADJUSTMENT DISPOSABLE INCOME IN EURO

	2014
European Union	20,343
Germany	27,055
Italy	20,513
Spain	17,279
Netherlands	21,733
Norway	37,423

The 2014 household disposable income varied significantly among the chosen countries when expressed in 2023 euros. Spain showed less purchasing power, whereas Norway stood out with much higher income levels. Other nations with moderate variations in household financial capacity, such as Germany, Italy, and the Netherlands, clustered closer to the EU average.

2.1.3 Total Unemployment Rate

One important indicator of the larger economic climate in which consumers make decisions is the unemployment rate. In addition to decreasing household stability and delaying important financial commitments like car purchases, high unemployment is a reflection of structural flaws in the labor market. Long-term planning, credit availability, and general consumer confidence are also impacted.

TOTAL UNEMPLOYMENT RATE[4]

	2014
European Union	32.4%
Germany	23.3%
Italy	40.5%
Spain	40.1%
Netherlands	23.7%
Norway	19.9%

Unemployment rates were very different throughout Europe. Norway had the lowest numbers, while southern nations like Italy and Spain had the highest. A more stable labor market is reflected in the intermediate levels maintained by Germany and the Netherlands. These variations show how different households' levels of financial security varied during this time.

2.1.4 Youth Unemployment Rate

Youth unemployment provides more detailed information about the economic prospects of first-time car buyers, a crucial and ever-present segment of the automotive market, while overall unemployment provides a broad picture of the health of the labor market. People under 25 frequently make up a larger percentage of new drivers, many of whom are starting to think about their personal mobility options or are buying their first independent car. The demand for new mobility solutions, small cars, used cars, and entry-level vehicles is greatly influenced by this group.

Because job insecurity restricts access to credit, lowers disposable income, and delays important life milestones, high youth unemployment can delay or completely suppress this demand. In this regard, looking at youth unemployment sheds more light on the barriers that younger consumers must overcome and offers additional insight into the dynamics of automotive market entry in various geographical areas. The information used in this section focuses on those who are most likely to be entering the car market by specifically referring to unemployment among non-students between the ages of 15 and 25.

YOUTH UNEMPLOYMENT RATE[5]

	2014
European Union	24.1%
Germany	8.3%
Italy	42.7%
Spain	53.2%
Netherlands	13.8%
Norway	10.0%

In 2014, youth unemployment was still a significant problem throughout Europe, with the Southern nations experiencing especially high rates. Germany, Norway, and the Netherlands maintained significantly lower rates, while Spain and Italy had the highest. While less than 10% of young people in Germany or Norway were unemployed, the majority of young people in nations like Spain (or Italy, to a lesser extent) were unemployed. This disparity draws attention to the unequal access to private mobility that young Europeans had during this time.

2.1.5 Household Spending on Transport

Per capita transportation spending provides information about household affordability as well as general mobility trends. It takes into account things like national transportation systems, infrastructure, and fuel prices. The HICP Transport index, which particularly monitors inflation in car purchases, fuel, maintenance, and public transportation, was used to adjust 2014 values in order to guarantee comparability with more recent circumstances. The resulting numbers, which are expressed in 2023 euros, give a more accurate picture of the financial cost of international mobility.

HOUSEHOLD SPENDING ON TRANSPORT (IN EURO, PRE INFLATION)[6]

	2014
European Union	1860
Germany	2640
Italy	2080
Spain	1640
Netherlands	2190
Norway	NA

INFLATION INDEX FOR TRANSPORT ONLY[7]

	2014	2023	Inflation Rate
European Union	102.83	127.39	24%
Germany	101.4	129.6	28%
Italy	102.8	123	20%
Spain	105.48	121.04	15%
Netherlands	101.83	129.21	27%
Norway	98.9	135.8	37%

HOUSEHOLD SPENDING ON TRANSPORT (IN EURO, POST INFLATION)

	2014
European Union	2304
Germany	3374
Italy	2489
Spain	1882
Netherlands	2779
Norway	NA

When converted to 2023 euros, per capita transportation spending in 2014 revealed a significant national variance. Of the values examined, Spain reported the lowest value

and Germany the highest. Italy's spending stayed near the EU average, while the Netherlands' spending was above average. Although Norway's data was not available, the figures show that the financial burden associated with transportation varies throughout Europe.

2.1.6 Urban vs Rural distribution

Mobility needs are significantly shaped by geographic context. While rural residents usually face limited public transit and longer travel distances, necessitating car ownership, urban populations may benefit from alternative transportation options that lessen reliance on private vehicles. To put national variations in vehicle use and transportation spending into perspective, this section examines each country's percentage of rural residents.

PERCENTAGE OF PEOPLE LIVING IN RURAL AREAS[8]

	2014
European Union	26.3%
Germany	22.8%
Italy	30.7%
Spain	20.6%
Netherlands	10.3%
Norway	19.3%

Approximately 25% of EU citizens resided in rural areas in 2014, and mobility needs vary by country. Of the nations examined, Italy had the largest percentage of its population living in rural areas, while the Netherlands had the lowest. Indicating a combination of decentralized settlement patterns and urban density, Germany, Norway, and Spain displayed intermediate values.

2.1.7 Car ownership rate

Car ownership one of the most direct measures of private mobility access. Customers' practical reliance on cars as a result of their living arrangements and the design of transportation systems is reflected in addition to their financial capability.

CAR OWNERSHIP RATE PER 1000 INHABITANTS[9]

	2014
European Union	506
Germany	547
Italy	615
Spain	475
Netherlands	472
Norway	495

Italy had the highest rate of ownership among the nations examined, with an average of 506 passenger cars per 1,000 people in the EU in 2014. While Spain, the Netherlands, and Norway continued to have values below the EU average, Germany also displayed above-average values. Different economic situations, levels of urbanization, and national preferences for private mobility are reflected in these numbers.

2.2 Automotive Overview in 2014

The demographic and economic factors influencing consumer behavior were discussed in the previous section, now this chapter focuses on the 2014 automotive market's composition and structure.

This chapter provides an overview of the supply-side environment by presenting data on the stock of vehicles in use, their fuel types, average age, and purchase patterns. In addition, it looks at the quantity and makeup of new car registrations, discusses pricing dynamics, and looks at the market share of different fuel types in sales of new cars. Taken together, these indicators provide a comprehensive picture of the pre-Dieselgate automotive situation in Europe, one still largely reliant on internal combustion engines.

2.2.1 Cars in Europe

The absolute value of passenger cars in use in each nation in 2014.

NUMBER OF CARS (in thousands)[10]

	2014
European Union	224,317
Germany	44,403
Italy	37,081
Spain	22,030
Netherlands	7,979
Norway	2,555

In 2014, over 224 million passenger cars were in circulation across the EU, with Germany and Italy representing bigger portion of it compared to other nations taken in analysis.

2.2.2 European fleet by fuel type

The distribution of fuel types provides a clear picture of the nation's automobile fleets.

The fuel composition of fleets of passenger cars in a few European nations is shown in this section. The selected nations reflect a wide range of policy environments and fleet structures, even though an EU-wide average is not possible due to data limitations. The electrification process was still in its infancy at the time, as evidenced by the almost complete lack of hybrid and electric vehicles. As consumer expectations and regulatory changes reshaped powertrain preferences throughout Europe in the ensuing decade, these numbers provide a crucial point of reference for comprehending the magnitude of the transformation that took place.

CARS PER COUNTRY (in thousands) ORDERED BY FUEL TYPE[11] *(source is the same for every table provided in 2.2.2)*

	Gasoline	Diesel	Hybrids*	Electric	Alternative	Others	Total
Germany	29,838	13,861	0	19	575	110	44,403
Italy	18,895	15,238	0	3	2,876	69	37,081
Spain	9,664	12,302	0	3	2	59	22,030
Netherlands	6,332	1,314	0	7	168	158	7,979
Norway	1,329	1,187	0	39	0	0	2,555

Diesel and gasoline continued to dominate the European market in 2014, with internal combustion engines still accounting for nearly all of the market. With the help of advantageous taxation, diesel in particular stood out as a characteristic of the pre-Dieselgate era.

An overview of the national passenger car fleet composition in five European nations as of 2014 is provided in the table above. It demonstrates unequivocally how gasoline and diesel vehicles dominated the road, making up the vast majority of all automobiles. In addition to having large fleets overall, Italy and Germany are notable for having a high proportion of diesel vehicles, which reflects both consumer preferences and long-standing policy incentives. Norway, on the other hand, had a relatively high number of electric vehicles, indicating its early push toward electrification, despite having a much smaller total volume. Electric vehicles remained marginal in all countries except Norway, and hybrids were not yet separately reported in official datasets.

The following subsection deconstructs the relative weight of each fuel type within a few chosen countries to provide a better understanding of how national preferences influenced the 2014 car fleet structure.

Gasoline(in thousands)

	2014	% of country's total
Germany	29,838	67.2%
Italy	18,895	51.0%
Spain	9,663	43.9%
Netherlands	6,331	79.4%
Norway	1,329	52.0%

With 79.4% of its fleet using gasoline, the Netherlands had the largest relative share, as can be seen in the above table. Diesel plays a significant role in those markets, as evidenced by Spain and Italy's lower shares, which were 43.9% and 51.0%, respectively. Norway reported a balanced figure of 52.0%, just over half of its national fleet, while Germany, despite its reputation as a country that relies heavily on diesel, continued to maintain a dominant gasoline base at 67.2%.

Diesel (in thousands)

	2014	% of country's total
Germany	13,861	31.2%
Italy	15,237	41.1%
Spain	12,302	55.8%
Netherlands	1,313	16.5%
Norway	1,187	46.4%

Spain stood out among the nations examined in 2014, having the largest diesel share in the group at almost 56%. This is in line with southern Europe's long-standing preference for diesel-powered automobiles, which has been primarily fueled by cheaper fuel prices, advantageous taxation, and policy incentives that prioritized CO_2 reduction. Despite having different overall fleet sizes and market structures, Italy and Norway also reported high diesel shares, at 41.1% and 46.4%, respectively.

Germany, which is frequently linked to diesel engineering and exports, surprisingly had a lower internal diesel share of 31.2%. This is probably because of its stronger gasoline

base and wider market offering. In contrast, the Netherlands had a much lower diesel penetration rate (16.5%), which was a result of stricter environmental regulations, a high diesel tax, and early urban air quality concerns that deterred widespread diesel use.

Hybrids (plug-ins & full hybrids)

Hybrid cars were still in the early phases of their market development and did not yet account for a statistically significant portion of the European automobile fleet at the time of this analysis. In 2014, hybrids were either not listed separately in official vehicle statistics or were frequently included in larger "alternative fuels" categories. Consequently, no country-level data that separates hybrid fleet presence or registrations is available at this time.

Their small number and lack of market significance have no discernible impact on the section's overall findings. Instead, the lack of trustworthy hybrid-specific data supports the idea that 2014 was still a pre-electrification year, with internal combustion technologies dominating the market. Hybrids would only begin to gain meaningful traction in the years following Dieselgate, particularly after 2016.

Alternative Fuels (in thousands)

	2014	% of country's total
Germany	575	1.3%
Italy	2,875	7.8%
Spain	2	0.0%
Netherlands	168	2.1%
Norway	0,1	0.0%

Vehicles that run on fuels like LPG (liquefied petroleum gas), CNG (compressed natural gas or methane), and in a very small number of instances, hydrogen, fall under the "Alternative Energy" category. Because of their unique technological and regulatory characteristics, electric vehicles are reported separately and are not included in this category.

Italy stood out with a noteworthy 7.8% share of alternative-fuel vehicles, according to the data. While Spain and Norway recorded small numbers, Germany and the Netherlands also had quantifiable shares, albeit smaller ones.

Why was Italy a leader in LPG and Methane vehicle adoption in 2014?[17]

Policy, infrastructure and consumer behavior all contributed to Italy's 2014 dominance of alternative fuel vehicles (LPG and methane). In addition to having one of the largest refueling networks in Europe, the nation's LPG and methane prices were consistently lower than those of gasoline and diesel. Adoption was further aided by government incentives like tax breaks and purchase subsidies. Additionally, factory-fitted bi-fuel models were offered by Italian automakers, most notably Fiat, which strengthened consumer confidence. These elements, along with the economic strains of the years following the crisis, made alternative fuels an affordable and sensible option for millions of drivers, particularly in high-mileage and rural areas.

Electric (Absolute value)

	2014	% of country's total
European union	76,277	0.0%
Germany	19,000	0.0%
Italy	3,430	0.0%
Spain	2,832	0.0%
Netherlands	6,825	0.1%
Norway	39,000	1.5%

With incredibly low adoption rates in every country examined, electric vehicles were still in their infancy in 2014. The continent was very early in the shift to electrified mobility, as evidenced by the fact that the total number of battery electric vehicles remained insignificant in the majority of markets, falling below 0.1% of the national fleets. Only an outlier is present. With 39,000 EVs (1.5% of its fleet) Norway stood out among the nations displayed.

Why was Norway the first to embrace electric mobility in Europe?[18]

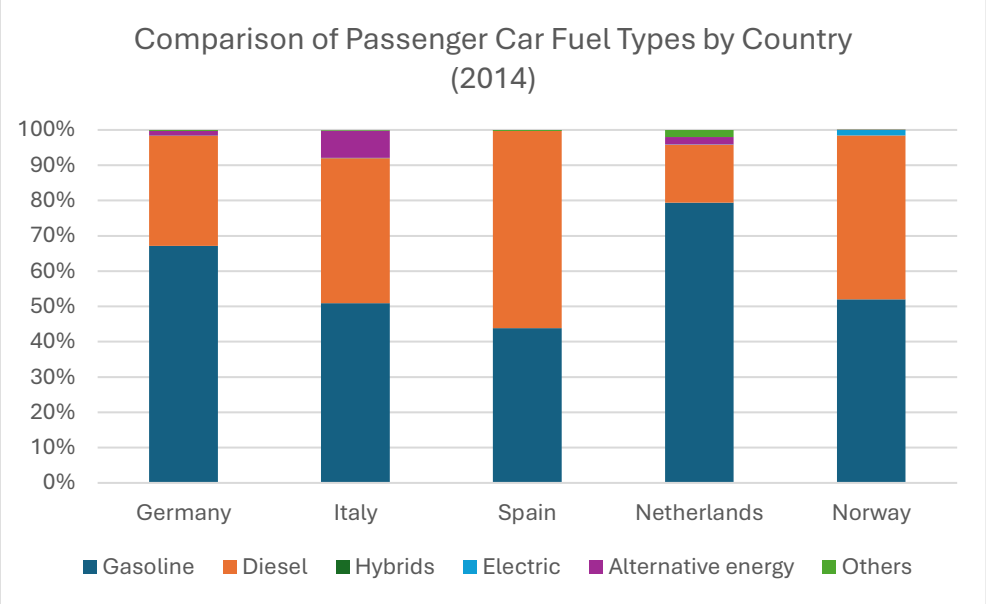
As early as 2014, Norway was clearly leading Europe in the adoption of electric vehicles, despite being a major exporter of gas and oil, as The Guardian mentions. This transition was made possible by a number of structural and policy factors, including a comparatively small population, plenty of land for infrastructure, and one of the most generous welfare and public support systems in the world. Due to these circumstances, the state was able to establish and maintain aggressive incentives that significantly lowered the total cost of ownership for electric vehicles, including free access to toll roads, privileged parking and lane access, and exemptions from VAT and registration taxes.

Beyond incentives and infrastructure, however, Norway's early electrification leadership demonstrates a long-term, strategic approach to sustainability. A model of forward-thinking policy that acknowledged the need to get ready for a post-oil future, the nation's wealth, which came from exporting fossil fuels, was partially reinvested in a greener domestic economy. In this regard, Norwegian institutions and consumers' actions can be viewed as forward-thinking, adopting electric mobility long before other European markets or laws required it.

This information supports the idea that, in 2014, electric mobility was still in its infancy, restricted to early adopters, and largely driven by local regulations rather than supplier or consumer demand. The stark contrast with 2023 (Chapter 3) will demonstrate the extent of the change that took place in other nations as well in less than ten years.

Side-to-side comparison

To better illustrate the contrasts between national markets, the following visualization presents a comparative analysis of fuel type distributions across selected European countries via a 100% stacked bar graph.



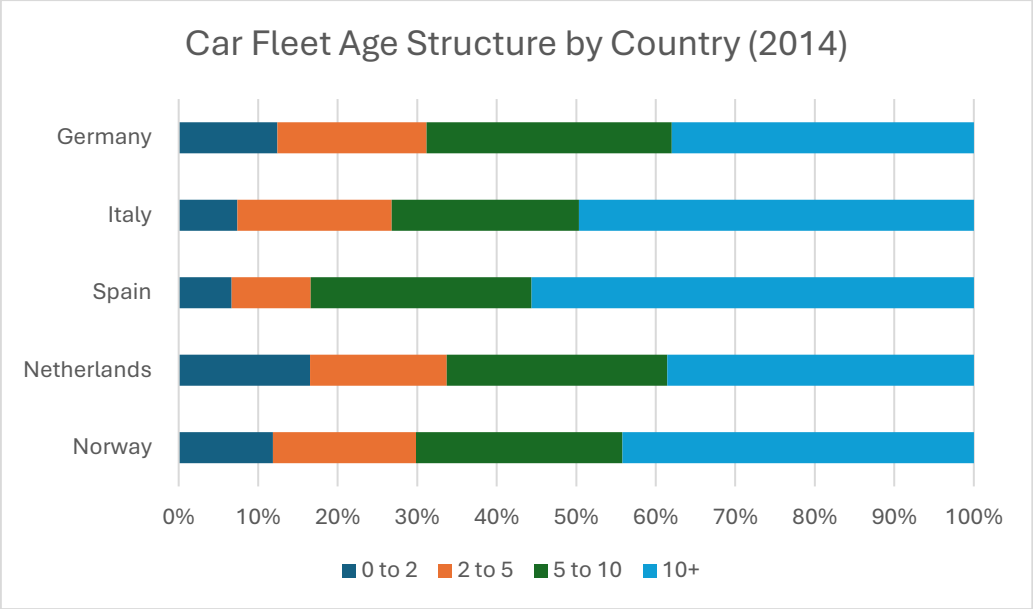
2.2.3 Age Structure of the Vehicle Fleet

The fleet's age distribution provides important information about a nation's economic situation, replacement cycles, and level of technological modernization in daily mobility. A more detailed understanding of the composition of national fleets is made possible by this breakdown. While older vehicles suggest slower renewals, a high proportion of newer vehicles typically reflects an higher exposure on latest technologies.

AGE STRATIFICATION OF COUNTRY'S FLEETS[12] *(Each age bracket excludes the upper bound. For example: vehicles aged 2 years fall into the 2–5 category, not 0–2).*

	0 to 2	2 to 5	5 to 10	10+
Germany	12.4%	18.8%	30.8%	38.0%
Italy	7.4%	19.4%	23.6%	49.6%
Spain	6.7%	10.0%	27.8%	55.6%
Netherlands	16.5%	17.2%	27.8%	38.5%
Norway	11.9%	18.0%	26.0%	44.2%

The age distribution of the automobile fleet in European nations varied significantly. Germany, Netherlands and Norway had the largest percentages of newer cars, indicating more active replacement dynamics. Italy and Spain maintained a large percentage of cars older than ten years, with lower shares of newer models.



2.2.4 New Car Registrations

Registration data shows more recent trends, whereas the overall fleet reflects the results of previous purchasing decisions. It provides information about replacement cycles, current preferences, and the early adoption of new technologies. These figures help illustrate the scale of market turnover and the pace at which newer vehicles were entering circulation.

NEW CAR REGISTRATIONS IN 2014 (in thousands)[13]

	2014	New cars per 1000 inhabitants
European Union	10,064	23
Germany	3,037	38
Italy	890	15
Spain	1,376	30
Netherlands	388	23
Norway	150	29

Of the nations examined, Germany registered the most new passenger cars in 2014. With only 15 new cars per 1,000 people, Italy had the lowest rate per capita. While the Netherlands and the EU average stayed more moderate, Spain and Norway displayed more dynamic registration levels.

2.2.5 New Car Registrations by Fuel Type

EU-wide statistics on new car registrations by fuel type in 2014 provide a clear picture of broader market trends, even though country-level data is not always available. Norway is not included in this overview because, as was already stated in the introduction, it is not a member of the EU. The breakdown of recently registered vehicles shows current consumer preferences and the early indications of technological change, in contrast to the fleet as a whole, which represents long-term accumulation.

EUROPEAN UNION NEW REGISTRATIONS BY FUEL TYPE[14]

European Union	2014
Gasoline	44.3%
Diesel	53.0%
Renewables*	2.7%

*Renewables=**(alternative + electric)**

In 2014, 53% of new passenger car registrations in the EU were diesel vehicles, demonstrating more than just a commanding market share. Diesel was hailed for its fuel

economy and lower CO_2 emissions per kilometer when compared to gasoline, making it the responsible and effective option. Political incentives and well-known marketing initiatives, like Volkswagen's "Clean Diesel" strategy, which positioned diesel as a sustainable and cutting-edge technology, helped to strengthen this impression. Although they were increasingly seen as being less in line with environmental goals, gasoline-powered vehicles still accounted for a sizable portion of the market (44.3%). Just 2.7% of new registrations were for alternative fuel vehicles, such as electric and hybrid cars.

2.2.6 Average vehicle prices

Determining the average cost of new cars in 2014 is crucial for evaluating consumer purchasing power as well as the accessibility of cars in general at the time. The average per capita spending on new car purchases[16], the total population[1], and the number of new car registrations[13] are macroeconomic indicators that are combined to provide a simplified estimation due to the lack of overview data.

The 2014 result is adjusted for inflation using the transport sector-specific Harmonized Index of Consumer Prices (HICP) (as previously used) to guarantee comparability with 2023 prices in later chapters. This adjustment reflects the actual increase in vehicle-related prices over the past ten years.

SOURCES = (16)(13)(1)

$$Average\ car\ price = \frac{Per\ capita\ Spending\ on\ new\ car\ purchase \times Population}{New\ registrations} \times Inflation\ rate$$

	2014
Population	442,266,046
Average spending per capita on car purchase	420
New registrations	10,064,368
Average Car Price	**18,456.37**
Inflation for Transport	24%
Inflation Adjusted	**22,864.51**

Chapter 3: the 2023 automotive market

3.1 Macroeconomic and Consumer Context

By 2023, Europe had experienced ten years of change, characterized by a series of shocks that altered the continent's politics, economy, and industries rather than a single crisis. The early 2020s were marked by turbulence, adaptation, and acceleration, in contrast to the caution and fragility of 2014. Consumer behavior, labor markets, and supply chains were all significantly impacted by the COVID-19 pandemic. The war in Ukraine caused a significant energy crisis shortly after the worst of the pandemic ended, exposing the continent's reliance on foreign energy sources and driving inflation to levels not seen in decades. The European Union's drive for decarbonization and energy independence was accelerated at the same time by a redefining of its strategic priorities brought about by geopolitical tensions and a growing sense of urgency surrounding climate change.

In terms of the economy, 2023 was a year of change. Although it had started to decline from its 2022 peak, inflation (which was initially caused by demand shocks following the COVID-19 pandemic and subsequently by energy prices) was still high. In response, European central banks raised interest rates sharply, which put an end to the period of extremely low credit and had an impact on everything from consumer loans to mortgages. The cost of living had sharply increased throughout much of the continent, putting pressure on household budgets and raising social tensions in both developed and developing areas, despite the comparatively high employment levels.

The automotive industry had to navigate a complicated terrain of opportunity and constraint within this macroeconomic framework. Once a new trend, electrification has evolved into a structural change. Major European nations were aggressively encouraging the adoption of electric vehicles (EVs) through financial incentives, regulatory frameworks, and infrastructure investment. Additionally, they had set legally binding deadlines for the phase-out of internal combustion engine (ICE) vehicles, most notably the EU's 2035 ban on new ICE car sales, which has since been postponed. This required a thorough reevaluation of capital allocation, supply chains, and product portfolios for automakers.

Plug-in hybrids (PHEVs) and battery electric vehicles (BEVs) have transitioned to the mainstream, as will be shown in the chapter. Although high prices continued to be a barrier for many households, interest in EVs was increasing across income brackets.

Additionally, new dynamics of competition had surfaced. Chinese automakers, who had previously been aloof observers of the European market, have become more and more involved, particularly in the electric sector. The dominance of traditional European OEMs was challenged by their models, which were frequently technologically sophisticated and competitively priced, especially in value-conscious markets. At the same time, Tesla had solidified its position as a major player and was no longer regarded as a niche innovator but rather as a standard in terms of both brand positioning and pricing.

The preferences of consumers kept changing. As a number of manufacturers experimented with direct-to-consumer or agency sales frameworks, the dealership model was being rethought. Furthermore, new ownership models like car subscriptions, leasing, and shared mobility have grown in popularity, particularly among younger consumers and in urban areas.

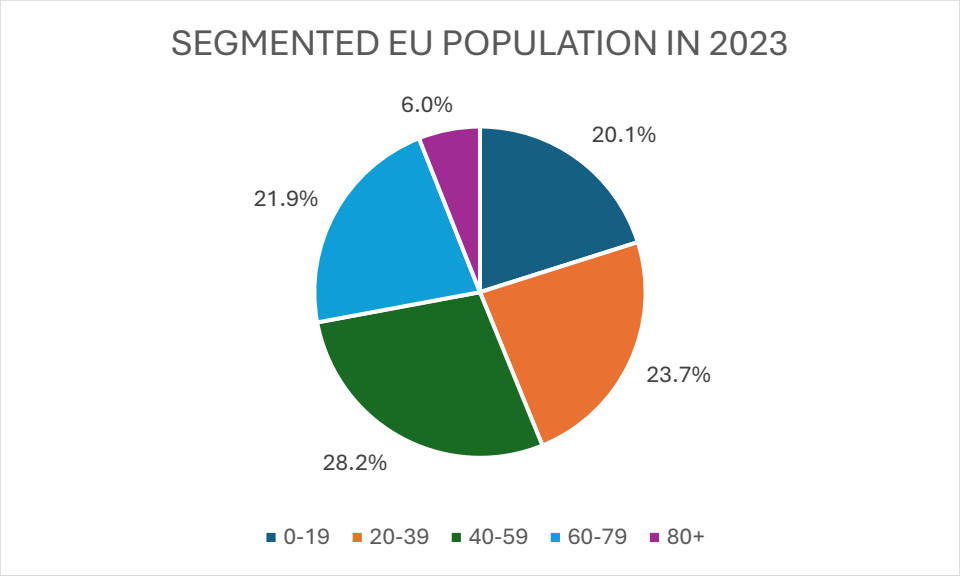
In 2023, the automotive industry was no longer just recuperating or responding. Due to competition, technology, regulation, and changing customer expectations, it was (and still is) undergoing a strategic reconfiguration. This chapter will examine the features of this changing environment, laying the groundwork for a more thorough comparison with the 2014 pre-transition situation.

3.1.1 Population and Age distribution

POPULATION IN EUROPE[1]

	2014	2023	% of change
European Union	442,266,046	447,695,350	**+1.2%**
Germany	80,767,463	83,118,501	**+2.9%**
Italy	60,345,917	58,997,201	**-2.2%**
Spain	46,495,744	48,085,361	**+3.4%**
Netherlands	16,829,289	17,811,291	**+5.8%**
Norway	5,109,056	5,488,984	**+7.4%**

National dynamics differed, even though the EU's total population increased marginally between 2014 and 2023. Italy continued a demographic trend influenced by low birth rates and an aging population, becoming the only nation in the group to experience a decline. Norway and the Netherlands, on the other hand, experienced the largest increases, both exceeding 5%, suggesting that their populations are continuing to grow. While the EU as a whole stayed largely stable, Spain and Germany saw more modest increases.



3.1.2 Disposable income

DISPOSABLE INCOME[3]

	2014	2023	% of change
European Union	20,343	30,957	**+52.2%**
Germany	27,055	39,198	**+44.9%**
Italy	20,513	32,042	**+56.2%**
Spain	17,279	28,826	**+66.8%**
Netherlands	21,733	33,608	**+54.6%**
Norway	37,423	NA	**NA**

Using the general HICP index to account for inflation, disposable income increased significantly across all nations. Italy and Spain saw the largest increases. Situation is

partially explained by the fact that they were starting from lower levels because of the consequences of the previous sovereign debt crisis. The gap between Southern European countries and Central European ones has narrowed, despite the fact that nations like Germany and the Netherlands continue to have higher income levels in absolute terms. For Norway, there was no updated data available.

3.1.3 Total Unemployment Rate

TOTAL UNEMPLOYMENT RATE[4]

	2014	2023	Change P.P.
European Union	32.4%	24.7%	**-7.7%**
Germany	23.3%	18.9%	**-4.4%**
Italy	40.5%	33.7%	**-6.8%**
Spain	40.1%	29.5%	**-10.6%**
Netherlands	23.7%	16.5%	**-7.2%**
Norway	19.9%	19.6%	**-0.3%**

There are still significant disparities even though unemployment rates decreased generally between 2014 and 2023. Despite making the most improvements again, Southern European nations continue to report high unemployment rates in comparison to the rest of the group. Their 2023 numbers are still significantly higher than the EU average, even with a robust recovery. Throughout the period, rates in Germany, the Netherlands, and Norway remained significantly lower, indicating that their labor markets were more stable. Although there are clear regional differences, the overall trend for the EU indicates improvement.

3.1.4 Youth Unemployment Rate

YOUTH UNEMPLOYMENT RATE[5]

	2014	2023	Change P.P.
European Union	24.1%	14.5%	**-9.6%**
Germany	8.3%	5.9%	**-2.4%**
Italy	42.7%	22.7%	**-20.0%**
Spain	53.2%	28.7%	**-24.5%**
Netherlands	13.8%	8.2%	**-5.6%**
Norway	10.0%	11.0%	**+1.0%**

A similar situation is reproposed for the youth unemployment rates. Spain and Italy saw the largest improvements, cutting their rates by around 20 percentage points. Both continue to face some of the highest youth unemployment in Europe, with figures well above the EU average. Germany and the Netherlands maintained low levels throughout the period. Norway rate remains moderate even if a small positive sign is present in the change column. The gap between Northern and Southern Europe remains clear.

3.1.5 Households Spending on Transports

HOUSEHOLD SPENDING ON TRANSPORT[6]

	2014	2023	% of change
European Union	2304	2540	**+10.2%**
Germany	3374	3610	**+7.0%**
Italy	2489	2740	**+10.1%**
Spain	1882	2070	**+10.0%**
Netherlands	2779	3280	**+18.0%**
Norway	NA	NA	**NA**

Even after the 2014 figures were modified using the transport-specific HICP index, household spending on transportation increased in every country for which data was available. They indicate that transportation has gradually taken up a slightly larger share

of household budgets (because it is more expensive), even though the increases were not significant and were consistent across the continent. Germany saw a smaller change, while the Netherlands saw the largest increase. Although the causes may vary from nation to nation, this generally suggests that European transportation is growing gradually.

3.1.6 Urban vs Rural Distribution

PERCENTAGE OF PEOPLE LIVING IN RURAL AREAS[8]

	2014	2023	Change P.P.
European Union	26.3%	24.3%	**-2.0%**
Germany	22.8%	22.2%	**-0.6%**
Italy	30.7%	28.0%	**-2.7%**
Spain	20.6%	18.4%	**-2.2%**
Netherlands	10.3%	6.8%	**-3.5%**
Norway	19.3%	16.0%	**-3.3%**

Across Europe, there has been a deurbanization trend. This is visible in all countries considered, with the Netherlands and Norway showing the largest declines in rural population share. As more people move into cities, the need for private cars may evolve: urban residents often rely more on public transport or shared mobility, while those in rural areas tend to depend heavily on private vehicles.

3.1.7 Car Ownership Rate

CAR OWNERSHIP RATE PER 1000 INHABITANTS[9]

	2014	2023	Change
European Union	506	570	**+64**
Germany	547	588	**+41**
Italy	615	694	**+79**
Spain	475	551	**+76**
Netherlands	472	498	**+26**
Norway	495	520	**+25**

Between 2014 and 2023, car ownership rates rose in every nation, but they grew especially in Italy and Spain. With more than 75 extra cars per 1,000 people, these two nations saw the biggest increases, showing consistency with their notable rises in disposable income over the same time. A greater proportion of the population may have been able to access private mobility as a result of better economic conditions following the 2014 post-crisis low levels. Since Italy has the largest percentage of its population living in rural areas among the countries under study, car ownership is also encouraged by structural factors. But given that Italy is also seeing a significant aging trend, which may lower future mobility demand, this trend may not be long-term viable.

Germany and Norway showed moderate growth, consistent with their already high baseline levels and relatively stable income dynamics. The Netherlands stands out with the lowest car ownership rate, a result that reflects deliberate national choices. A dense, urbanized population, flat geography, and well-developed cycling and public transport infrastructure reduce the need for personal vehicles. On top of this, the Dutch government has long promoted alternatives to car ownership, including high taxes on polluting vehicles and incentives for public and shared transport use.

3.2 Automotive Overview in 2023

3.2.1 Cars in Europe

NUMBER OF CARS (in thousands)[10]

	2014	2023	% of change
European Union	224,317	256,130	**+14.2%**
Germany	44,403	49,099	**+10.6%**
Italy	37,081	40,915	**+10.3%**
Spain	22,030	26,778	**+21.6%**
Netherlands	7,979	9,067	**+13.6%**
Norway	2,555	2,889	**+13.1%**

The total number of passenger cars in the EU increased by over 14% between 2014 and 2023, to exceed 256 million vehicles. Despite growing policy attention to alternative

modes of transportation, this upward trend demonstrates the continued importance of private vehicles in European mobility. Spain had the fastest growth among the nations examined, which was consistent with increases in ownership and disposable income. Despite their more vigorous promotion of public and shared transportation, the Netherlands and Norway also experienced strong growth. These numbers provide a more comprehensive picture of how total fleet size changed in tandem with population dynamics. They also highlight the absolute growth in national car fleets and supplement the earlier analysis on car ownership rates per 1,000 residents.

3.2.2 European fleet by fuel type

CARS PER COUNTRY ORDERED BY FUEL TYPE in 2023 (in thousands)[11]

	Gasoline	Diesel	Hybrids	Electric	Alternative	Others	Total
Germany	30,235	14,142	2,911	1,409	393	8	49,099
Italy	17,717	16,777	2,212	220	3,983	6	40,915
Spain	10,877	14,175	1,385	150	31	160	26,778
Netherlands	6,951	757	810	445	101	4	9,067
Norway	760	1,077	373	689	0	0	2,889

Guide to read following tables

To help interpret the upcoming tables on vehicle fuel types, note that the columns labeled "2014" and "2023" refer to the absolute number of vehicles (in thousands) using a specific fuel type in each country. The adjacent columns, "*Fleet Share 2014 %"* and "*Fleet Share 2023 %"* indicate the percentage share that each fuel type represents within the total national passenger car fleet in the respective year. The "Change" column shows how much the share of that fuel type has increased or decreased over the period, expressed in percentage points (that is the reason for having a negative change sign even though the absolute number of cars in that category expanded overtime).

Gasoline (in Thousands of cars)

	2014	FS2014%	2023	FS2023%	Change P.P.
Germany	29,838	67.2%	30,235	61.6%	**-5.6%**
Italy	18,895	51.0%	17,717	43.3%	**-7.7%**
Spain	9,664	43.9%	10,877	40.6%	**-3.2%**
Netherlands	6,332	79.4%	6,951	76.7%	**-2.7%**
Norway	1,329	52.0%	760	26.3%	**-25.7%**

Across all countries taken into consideration, gasoline-powered vehicles are steadily losing ground, as evidenced by the decline in their national fleet share from 2014 to 2023. In Norway, where the share dropped by over 25 percentage points, the decline is especially noticeable. However, gasoline continues to dominate the market, making up more than 40% of the fleet in all but Norway. In certain countries, such as Germany and the Netherlands, gasoline continues to be the most popular fuel. Gasoline is still a major part of the European car mix, even with the move toward alternative powertrains.

Diesel (in Thousands of cars)

	2014	2014%	2023	2023%	Change P.P.
Germany	13,861	31.2%	14,142	28.8%	**-2.4%**
Italy	15,238	41.1%	16,777	41.0%	**-0.1%**
Spain	12,302	55.8%	14,175	52.9%	**-2.9%**
Netherlands	1,314	16.5%	757	8.4%	**-8.1%**
Norway	1,187	46.4%	1,077	37.3%	**-9.2%**

Although to varying degrees, the fleet share of diesel vehicles has generally decreased across all countries taken into consideration. Only slight declines are seen in southern nations like Italy and Spain, demonstrating how ingrained diesel was and remains in those markets. Conversely, Norway and the Netherlands suffered more severe losses, each dropping more than eight percentage points. It's interesting to note that electric vehicles have advanced the most in these two nations, indicating a quicker and more

noticeable transition from diesel to electric in markets with more robust incentives or policy support (more in chapter 4).

Hybrids (in Thousands of cars)

	2023	2023%	Change P.P.
Germany	2,911	5.9%	**5.9%**
Italy	2,212	5.4%	**5.4%**
Spain	1,385	5.2%	**5.2%**
Netherlands	810	8.9%	**8.9%**
Norway	373	12.9%	**12.9%**

Why the hybrids became so popular in less than a decade?

The Data enables us to identify hybrid cars in the national fleets separately for 2023. However, it should be made clear that the hybrid category comprehend the following subtypes: plug-in hybrids, full hybrids, and mild hybrids. In mild hybrids the combustion engine is supported by a small battery and electric motor, which are especially popular. However, they are unable to run on electricity alone for more than a few meters. Plug-in hybrids, on the other hand, can be externally recharged and provide longer electric-only ranges, whereas full hybrids can only travel short distances on electricity.

This classification helps to explain the rise in hybrid registrations throughout Europe. Infact, many vehicles labeled as "hybrids" are in fact mild hybrids, which gained popularity as a way to benefit from fiscal or regulatory incentives tied to hybrid technology while still maintaining the structure and cost advantages of traditional combustion engines.

Alternative Fuels (in Thousands of cars)

	2014	2014%	2023	2023%	Change P.P.
Germany	575	1.3%	393	0.8%	**-0.5%**
Italy	2,876	7.8%	3,983	9.7%	**+2.0%**
Spain	2	0.0%	31	0.1%	**+0.1%**
Netherlands	168	2.1%	101	1.1%	**-1.0%**
Norway	0	0.0%	0	0.0%	**+0.0%**

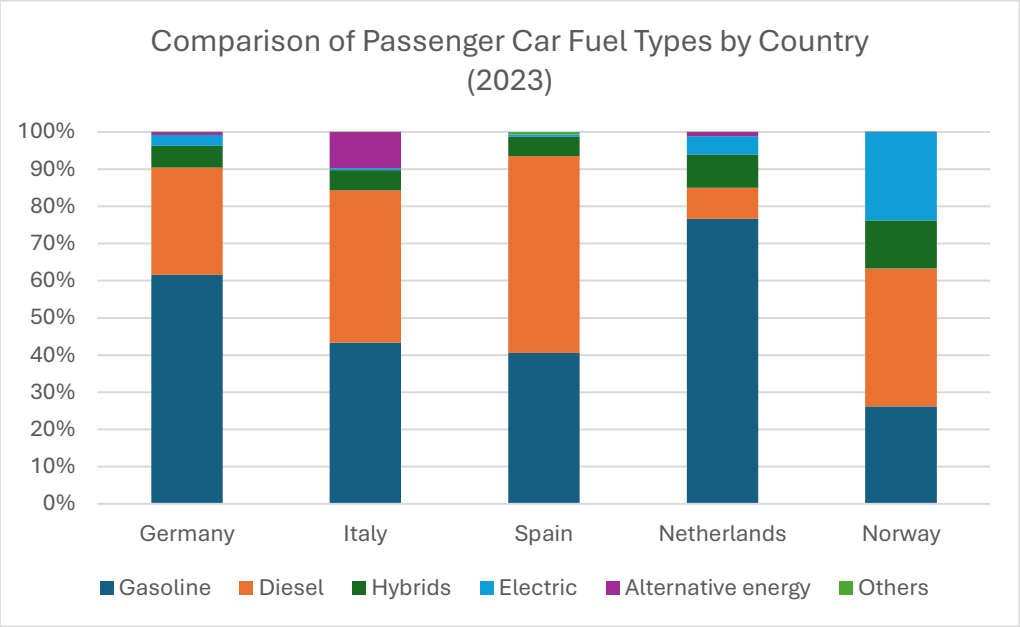
Alternative fuels have maintained a solid presence only in Italy, where they accounted for nearly 10% of the fleet in 2023. This continued popularity aligns with the patterns discussed in Chapter 2, including past incentives and infrastructure availability. In other countries, alternative fuels did not gain significant traction over the years, with shares remaining marginal.

Electric (in Thousands of cars)

	2014	2014%	2023	2023%	Change P.P.
European union	76	0.0%	4,435	1.7%	**+1.7%**
Germany	19	0.0%	1,409	2.9%	**+2.8%**
Italy	3	0.0%	220	0.5%	**+0.5%**
Spain	3	0.0%	150	0.6%	**+0.5%**
Netherlands	7	0.1%	445	4.9%	**+4.8%**
Norway	39	1.5%	689	23.9%	**+22.3%**

The percentage of electric vehicles has increased significantly throughout Europe, though it is still quite low in the majority of nations. The Netherlands and particularly Norway are the only exceptions, as by 2023, electric vehicles accounted for almost 25% of the country's fleet. This noteworthy expansion in Norway will be discussed in more detail in the upcoming chapter, which will focus on electric mobility.

Here follows an overall comparison of the countries' fleets per fuel type (in percentages).



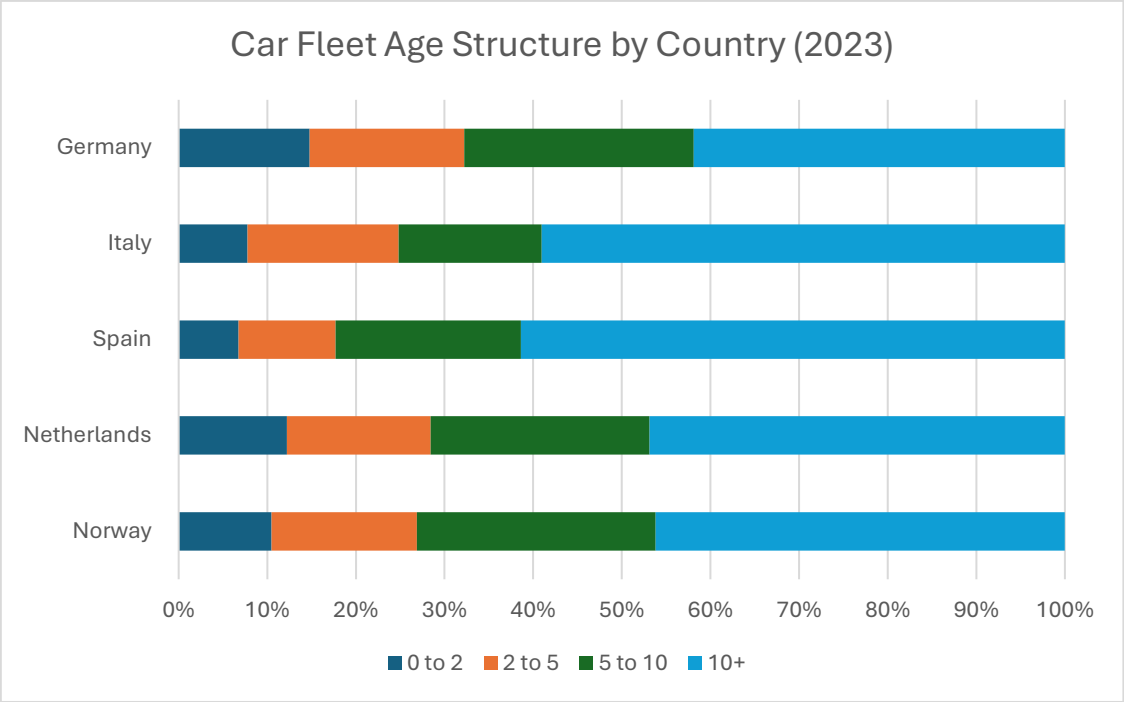
In the next chapter, the change and the partial electrification of Europe will be explored in a dynamic way.

3.2.3 Age Structure of the Vehicle Fleet

AGE STRATIFICATION OF COUNTRY'S FLEETS[12] (Each age bracket excludes the upper bound. For example: vehicles aged 2 years fall into the 2–5 category, not 0–2).

	0 to 2	2 to 5	5 to 10	10+
Germany	14.8%	17.4%	25.9%	41.9%
Italy	7.8%	17.1%	16.2%	59.0%
Spain	6.7%	11.0%	20.9%	61.4%
Netherlands	12.2%	16.2%	24.7%	46.9%
Norway	10.5%	16.4%	27.0%	46.2%

The age structure of national vehicle fleets shows differences across countries, with older vehicles more prevalent in Italy and Spain. Central and Nordic countries analyzed maintain relatively newer fleets.



The following matrix compares how the age structure of national vehicle fleets changed between 2014 and 2023. Each cell shows the percentage point change in that age category. A positive value means a larger share of vehicles now falls in that category, while a negative value means a decrease (e.g. value of +3.9% under the "10+" column for Germany means that 3.9 percentage points more of Germany's fleet is now over 10 years old compared to 2014).

	0 to 2	2 to 5	5 to 10	10+
Germany	**2.4%**	**-1.4%**	**-4.9%**	**3.9%**
Italy	**0.4%**	**-2.4%**	**-7.4%**	**9.4%**
Spain	**0.1%**	**1.0%**	**-6.9%**	**5.8%**
Netherlands	**-4.3%**	**-1.0%**	**-3.1%**	**8.3%**
Norway	**-1.4%**	**-1.6%**	**1.0%**	**2.0%**

The age distribution of the car fleet in each of the five countries under study has clearly and significantly changed, according to the comparison matrix. The categories of 5 to 10 years and 10+ years saw the biggest shifts. The 5–10 year segment decreased dramatically in all but Norway, with declines ranging from –3.1% in the Netherlands to –7.4% in Italy. The category for those aged 10 and over expanded rapidly at the same

time, especially in Italy (+9.4%), the Netherlands (+8.3%), and Spain (+5.8%). This suggests an aging and slower-renewing fleet because many cars that were between 0 and 5 years old in 2014 have simply aged into the 10+ bracket without being replaced.

However, the younger age groups (0–2 years and 2–5 years) stayed largely unchanged, changing by only a few tenths of a point in the majority of nations. This implies that vehicle replacement rates have decreased, particularly in recent years. This is probably because of a number of factors, including rising car prices, economic uncertainty, and perhaps growing reluctance to buy a new internal combustion engine vehicle as the world moves toward electric mobility.

The data overall suggests that while new car inflows have not dropped dramatically, replacement cycles have become longer, and a significant portion of vehicles from earlier years are simply aging within the fleet. This dynamic results in a growing presence of older cars on the road.

3.2.4 New Car Registrations

NEW CAR REGISTRATIONS IN 2014 AND 2023[13]

	2014	2023	% of change
European Union	10,064	10,655	**5.9%**
Germany	3,037	2,845	**-6.3%**
Italy	890	984	**10.5%**
Spain	1,376	1,581	**14.9%**
Netherlands	388	370	**-4.6%**
Norway	150	129	**-14.2%**

NEW CAR REGISTRATIONS IN 2014 AND 2023 PER 1000 INHABITANTS[13]

	2014	2023	% of change
European Union	23	24	**4.6%**
Germany	38	34	**-9.0%**
Italy	15	17	**13.0%**
Spain	30	33	**11.1%**
Netherlands	23	21	**-9.9%**
Norway	29	23	**-20.1%**

Is There a Contradiction with the comparison matrix in section 3.2.3 (Age structure of car fleet)?

At first sight, the numbers might suggest that the automotive sector is picking up speed in countries like Italy and Spain, with double-digit percentage increases in new car registrations. On the other hand, Germany, the Netherlands, and especially Norway show a drop, with Norway registering 20% fewer new cars per 1,000 people than in 2014.

But this doesn't contradict the previous findings about an aging car fleet. In fact, both observations can co-exist, and here's why.

First, a rise in new registrations does not necessarily mean that older cars are being removed from the roads. If many people are keeping their old vehicles longer (for

whatever reason), then new cars just add to the total number, without reducing the average age. Actually, as shown in Sections 3.1.1 (Population in Europe) and 3.2.1 (Cars in Europe), the total number of registered cars in the EU increased by 14.2% between 2014 and 2023. This expansion is particularly striking when compared to the EU population growth, which was only 1.2% in the same period. In other words, the number of cars has grown more than ten times faster than the population, indicating that cars are becoming more common in relative terms, a finding aligned with the increase in car ownership rates per 1,000 inhabitants.

The implication is that even if some countries saw a decline in new car registrations (per capita), the total stock of vehicles still rose. This means cars are staying on the road longer, which contributes to the aging fleet. This helps explain how countries like Italy and Spain can have more new cars but still end up with older fleets overall, as seen in the fleet age distribution and comparison matrix.

Last but not least, countries with declines in new registrations (such as the Netherlands and Norway) also happen to be those with more aggressive electrification policies and stronger commitments to public transport and shared mobility. In these places, fewer people may feel the need to buy new cars altogether, and policies like higher taxes on combustion engines further reduce demand in overall.

3.2.5 New Car Registrations by Fuel Type

EUROPEAN UNION NEW REGISTRATIONS BY FUEL TYPE[15]

	2023
Gasoline	35.3%
Diesel	13.6%
Hybrids	33.5%
Electric	14.6%
Alternative*	3.0%

*Alternative = hydrogen, LPG, methane

To enable comparison with 2014, where hybrid, electric, and alternative fuel vehicles were not reported separately, these three categories have been grouped together under the label "Renewables" for the 2023 data in the following table.

COMPARISON TABLE

	2014	2023	% of change
Gasoline	44.3%	35.3%	**-9.0%**
Diesel	53.0%	13.6%	**-39.4%**
Renewables*	2.7%	51.1%	**+48.4%**

In 2014, over one in two new cars sold in the EU were diesel-powered. Diesel was the most popular option, accounting for 53.0% of the market, with gasoline coming in second at 44.3%. Just 2.7% of newly registered cars were powered by renewable energy.

Ten years later, the landscape has undergone significant change. Diesel used to be the undisputed leader, but it has since lost ground and now only accounts for 13.6% of new car sales. Additionally, gasoline saw a decrease, falling to 35.3%. Renewables (particularly hybrids, which make up 33.5% of all sales in the EU) have replaced them. The conventional fuel hierarchy in Europe has been totally overturned in less than a decade by the rise of clean and alternative powertrains. Even though mild hybrids operate and function nearly identically to vehicles powered solely by internal combustion engines (ICEs), it is important to note once more that they are included in the renewable energy category.

3.2.6 Average vehicle prices

SOURCES= (16)(1)(13)

$$Average\ car\ price = \frac{Per\ capita\ Spending\ on\ new\ car\ purchase \times Population}{New\ registrations} \times Inflation\ rate$$

	2023
Population	447,695,350
Average spending per capita on car purchase	690
New registrations	10,545,912
Average Car Price	**29,291.90**

Comparison Table

	2014	2023	% of change
Population	442,266,046	447,695,350	-
Average spending per capita on car purchase	420	690	-
New registrations	10,064,368	10,545,912	-
Average Car Price	**18,456.37**	**29,291.90**	-
Inflation for Transport	+24%	-	-
Inflation Adjusted	**22,864.51**	**29,291.90**	**+28.1%**

Over the past ten years, the cost of new cars in Europe has increased dramatically. The average cost of a car in 2014 was €18,456. This amount increases to €22,864 in 2023 currency after accounting for inflation related to transportation (+24%). However, the average price for 2023 is €29,291, which represents a real increase of more than 28%.

Cars now cost a lot more than they did in 2014, even after taking inflation into consideration.

There are a lot of reasons for the increase in car prices, and the following chapter will help you understand how they are all related.

Chapter 4: Considerations behind the data

In the previous chapter, we saw how much Europe and especially the European car market has changed between 2014 and 2023. Diesel cars are no longer the most popular choice, electric and hybrid vehicles are growing fast, the average price of new cars has gone up significantly, countryside is depopulating, and population is slowly aging.

In this chapter, we take a closer look at why all of this happened.

Chapter 4.1 The Dieselgate scandal[19]

The Dieselgate scandal was a turning point in the history of the European auto industry and the start of a broad change in consumer attitudes and industry tactics. When the U.S. Environmental Protection Agency (EPA) publicly accused Volkswagen Group of installing so-called "defeat devices" in millions of its diesel vehicles in September 2015, the scandal began in the United States. Under normal driving conditions, the cars were emitting up to 40 times more nitrogen oxides (NO_x) than permitted (the Volkswagen Jetta had the higher delta). These software tools were made to detect emissions testing conditions and temporarily reduce emissions to meet regulatory standards (usually by lowering the power).

Despite the fact that the scandal started in the United States, its effects swiftly extended to Europe, where, as was noted in earlier chapters, diesel had an even greater market presence. Actually, with the help of tax breaks and advantageous fuel prices, European nations had long marketed diesel as a low-CO_2 substitute for gasoline. More than half of all new cars sold in the EU in 2014 were diesel vehicles (Chapter 2.2.5). In addition to harming Volkswagen's brand, the disclosure that a large automaker had falsified test results raised doubts about the legitimacy of diesel technology in general.

Volkswagen was at the center of the Dieselgate scandal, but the European auto industry was swiftly rocked by it. Numerous companies were found to have comparable differences between test-cycle and real-world emissions after investigations were extended to other significant manufacturers, such as Renault, Volvo, Fiat, and others. Even though not all installed defeat devices, the regulatory and public reaction raised questions about the diesel market as a whole and hurt the reputation of numerous companies that had made significant investments in diesel technology. Diesel's status as

a technology standard among manufacturers was weakened by the scandal, which essentially put the entire industry on the defensive.

What made diesel so popular back in the days?[20]

Due to their lower CO_2 emissions than gasoline-powered vehicles, diesel engines were widely considered an environmentally responsible option in Europe prior to 2015. Diesel was actively promoted by national governments through advantageous tax schemes, and consumers viewed it as an affordable and environmentally friendly alternative. But Dieselgate caused the public's perception to drastically change. All of a sudden, attention shifted to pollutants that are harmful to human health, like nitrogen oxides (NO_x) and particulate matter, which are released in greater amounts by diesel engines than by their gasoline-powered counterparts. Diesel lost its reputation as being "clean" as more evidence connected NO_x to respiratory ailments and urban air pollution surfaced. Widespread public mistrust, a decline in used diesel car resale values and growing support for diesel bans in major European cities were the results of the drop.

What consequences did the Dieselgate brought in Europe?[21]

On the regulatory side, it resulted in a tightening of vehicle testing protocols, with the EU introducing Real Driving Emissions (RDE) tests and replacing antiquated lab tests (NEDC) with the more realistic WLTP cycle. These modifications made it more difficult for automakers to downplay their environmental impact and compelled them to adhere to more stringent requirements in practical settings. Dieselgate's covert encouragement of the use of electric vehicles (EVs) was one of its most important and enduring consequences.

The scandal revealed the strategic and reputational vulnerabilities of automakers that relied heavily on diesel. Manufacturers were under increasing pressure to switch to cleaner alternatives as public opinion sharply shifted against internal combustion engines and confidence in diesel crumbled.

As a result, many businesses started shifting their R&D funds from internal combustion engine (ICE) technologies to electric drivetrains. They did this because they realized that, in addition to being more environmentally friendly, EVs also offered a safer long-term investment given the stricter emission regulations. After being at the heart of the scandal, companies like Volkswagen announced significant investments in

electrification, the introduction of new EV platforms, and their commitment to carbon neutrality goals. Simultaneously, this change produced advantageous circumstances for EV-focused businesses and newcomers. Ironically, a crisis that revealed one fuel technology's environmental flaws ultimately served as a driving force behind Europe's rapid electric transition.

4.2 The role of the European Union

At the heart of this shift stands the European Union, whose role has been crucial in guiding the direction of change. By setting the overall policy framework and defining the long-term goals for sustainability and mobility, the EU has acted as both a regulator and a facilitator, shaping the environment in which manufacturers, consumers, and national governments operate. Here follows some

The European Green Deal[25]

The European Green Deal is the European Union's main strategy to address climate change and environmental challenges. It was officially presented by the European Commission in December 2019 with the core objective of making the EU the first climate-neutral continent by 2050. This means that by mid-century, the EU aims to reduce greenhouse gas emissions to net zero, balancing any remaining emissions with actions that remove CO_2 from the atmosphere, such as reforestation or carbon capture.

To reach this goal, the Green Deal sets out a wide range of policies covering sectors like energy, industry, agriculture, housing, and transport, which alone accounts for around 25% of the EU's total greenhouse gas emissions. The plan also includes legally binding climate targets. One of the first steps was the European Climate Law, adopted in 2021, which set an intermediate target of reducing net emissions by at least 55% by 2030 compared to 1990 levels. This target became the basis for a package of policy proposals known as "Fit for 55".

For the automotive sector, the European Green Deal marked a turning point. Since transport accounts for roughly a quarter of the EU's greenhouse gas emissions (over 70% of those come from road transport) cars became a key focus of the EU's climate strategy. Under the Green Deal, the EU committed to sharply reducing emissions from new vehicles, pushing carmakers to shift away from internal combustion engines (ICE) and

accelerate the development of electric and hybrid models. One of the most significant outcomes was the proposal to end the sale of new petrol and diesel cars by 2035, allowing only zero-emission vehicles (such as battery-electric or hydrogen fuel cell cars) to be registered after that date. In addition to vehicle emissions, the Green Deal also emphasized the need for supporting infrastructure, including a dense network of charging stations across the EU.

To effectively drive the transition towards cleaner mobility, the European Union has implemented a system of CO_2 emission performance standards for new passenger cars and light commercial vehicles, as outlined in Regulation (EU) 2019/631. This regulation sets progressively stricter emission targets and imposes financial penalties on manufacturers that fail to comply.

How do the fines work?[22]

Manufacturers are assigned specific CO_2 emission targets based on the average mass of their vehicle fleet. If a manufacturer's average emissions exceed its target in a given year, it must pay an excess emissions premium. This premium is calculated at €95 for each gram of CO_2 per kilometer over the target, multiplied by the number of vehicles registered that year. For example, exceeding the target by 2 g/km across 1 million vehicles would result in a fine of €190 million.

Emissions targets timeline[23-25]:

- 2020–2024: 95 g CO_2/km
- 2025–2029: 93.6 g CO_2/km
- 2030–2034: 49.5 g CO_2/km
- From 2035: 0 g CO_2/km

To help car manufacturers meet increasingly strict CO_2 targets, the European Union introduced several compliance mechanisms. One of the most impactful tools is the ability to form emissions pools, allowing different manufacturers to combine their vehicle fleets and calculate average emissions jointly. This mechanism has been especially beneficial for electric-only carmakers like Tesla, which, having zero or very low fleet emissions, have earned significant revenue by selling their unused emission allowances to more polluting manufacturers. For example, Fiat Chrysler paid hundreds of millions of euros

to pool with Tesla in order to avoid EU fines. In addition, the EU allowed the use of super-credits, letting manufacturers count low-emission vehicles (such as EVs) more than once in their fleet average, further easing compliance.

As the 2025 targets approached, concerns began to grow over the auto industry's ability to comply, particularly due to rising costs and slower-than-expected EV sales in some market segments. In response, the European Commission proposed a temporary adjustment: manufacturers would be allowed to average their emissions over a three-year period (2025–2027) instead of being penalized annually. This flexibility was intended to ease the pressure on carmakers during a complex transition phase. At the same time, several EU member states (mainly ones relying more on car production as economic force) such as Germany and Italy raised concerns about the long-term effects of overly strict targets, citing risks for domestic industries.

These debates have become even more relevant in the context of the EU's flagship climate goal for transport: the phase-out of new petrol and diesel cars by 2035. While the legislation remains in place, it has come under increasing political and industrial scrutiny in 2025. Key stakeholders argue that progress on EV infrastructure and affordability has been uneven, and that some flexibility may be needed to avoid unintended consequences. In this light, the EU is also considering whether certain plug-in hybrid vehicles might remain permissible beyond 2035, provided they meet updated emissions benchmarks. A formal review of the 2035 target is scheduled for 2026, where the EU will assess the feasibility of the current plan and may adjust the framework based on updated market realities. These developments illustrate the EU's attempt to balance ambitious climate objectives with economic resilience—relying not only on fines and bans, but also on adaptive tools, compliance flexibilities, and strategic reviews to guide the sector forward.

4.3 A transition at different paces

While the European Union has set common goals and deadlines for reducing vehicle emissions and promoting electric mobility, the path toward these targets is far from uniform across member states. Electrification is not a one-size-fits-all process: it depends heavily on national policies, infrastructure readiness, economic conditions, and consumer

behavior. Some countries have moved quickly and decisively toward electric vehicles, while others are advancing at a much slower pace.

This difference in speed is not merely technical, it reflects deeper structural differences across European economies and societies. As a result, the timeline for transition cannot be realistically identical across all countries, even though EU regulations often apply in the same way everywhere.

As we have seen in previous chapters, not every country has same habits and same possibilities. Especially when the matter is a transition that is coming at an expensive price tag.

Spain[27] *vs Norway*[28]

A comparison between Spain and Norway reveals just how differently European countries are progressing toward vehicle electrification, despite being subject to the same overarching EU targets and climate ambitions. In Spain, electric vehicle (EV) adoption remains relatively limited. According to McKinsey's Industry and Energy Transition Index, EVs accounted for only 10% of total car sales in Spain in 2022, a share far below the EU average and dramatically behind leading countries. Several structural barriers continue to hinder faster adoption: limited charging infrastructure, lower consumer purchasing power, and uneven policy support across regions. As of late 2023, Spain had fewer than 25,000 public chargers, with many concentrated in urban areas and major highways, making EV ownership far less practical in rural or underserved regions.

Norway instead has become a global benchmark for electric mobility. According to BBC reporting, over 90% of new cars sold in Norway in early 2024 were electric or plug-in hybrid, with full electric vehicles (BEVs) alone accounting for around 82% of registrations. This shift has been made possible by a combination of powerful incentives and well-developed infrastructure. For years, Norway has offered exemptions from import taxes, registration fees, tolls, and VAT for EVs making them more affordable than many fossil-fuel models. In parallel, the country has built an extensive network of over 20,000 public charging points, despite having a much smaller population than Spain. Government support has also been consistent and long-term, sending clear signals to both consumers and carmakers.

But there is more than simple politics behind the Norwegian success and the Spanish slow process of transition.

Spain's economic structure presents clear barriers: the country faces one of the highest unemployment rates in the EU, both overall and among youth, which limits household purchasing power and delays vehicle replacement. Its car fleet is not only one of the oldest in Europe, but also large in absolute terms, making the turnover toward electric vehicles slower and more costly. In contrast, Norway enjoys higher average income levels, lower unemployment, and a smaller total car fleet, both in absolute numbers and relative to its population. These structural differences create two very different starting points for the electrification journey. Moreover, Norway, being outside the European Union, can implement and adapt its EV strategies more independently, focusing policies directly on national priorities without needing to align with broader EU compromises.

As of 2023, the country is registering a growing number of new cars per capita, partly due to the urgent need to replace its aging fleet. With the right combination of national coordination, investment, and consumer support, the pace of transition could accelerate rapidly in the years ahead. However, even in countries ready to embrace change, the success of electrification does not depend on vehicles alone as the next section will show.

4.4 Is electrification a car-only matter?

One of the clearest messages emerging from recent research is that the success of Europe's electric vehicle transition is not depending only on car production. According to a 2023 report by McKinsey[29], the pace of electrification across the continent will be determined in large part by the spread, accessibility, and economic viability of charging infrastructure. The estimated numbers are striking: to align with EV adoption targets and broader climate goals, Europe will need around 3.4 million public charging points by 2030, compared to fewer than 0.5 million installed today. This would require installing approximately 6,000 new public chargers every week until the end of the decade: a scale of effort that is not even comparable to the current one.

The report emphasizes that infrastructure is not only a question of quantity, but also one of location, type, and reliability. Public charging solutions will have to meet the different

needs of drivers in dense cities, rural areas, and highways, with a mix of slow, overnight, and ultra-fast charging options. The rapid growth of EVs will place pressure on Europe's power grid, requiring better integration of smart charging systems and new investment in local grid capacity.

McKinsey estimates that building and maintaining this charging network will demand €240 billion in cumulative investment by 2030, covering hardware, installation, grid connections, and operations. Given this financial scale, the report underscores the importance of sustainable business models, especially for fast-charging providers who often face high capital costs and uncertain early-stage demand. Without coordinated planning there is a serious risk that infrastructure development will lag behind EV uptake, slowing down the broader transition.

Charging infrastructure must be addressed with the same urgency and coordination as vehicle regulation or emissions policy. In short, without a stable and well-financed charging ecosystem, Europe's electrification goals may be unreachable, no matter how ambitious they appear on paper.

Another source, a 2023 report by Ernst & Young (EY)[30], warns that the answer to the same question ("Will infrastructure keep up with EV manufacturing speed?"), so far, appears to be the same as the McKinsey one. While the transition to electric mobility is accelerating in terms of vehicle adoption, the expansion of public charging infrastructure is lagging behind.

This gap is more than a logistical inconvenience: it is a growing structural risk. The EY report warns that without a dramatic acceleration in charging rollout, the transition could stall, undercutting both consumer confidence and the EU's broader emissions reduction strategy. One of the most striking problems is how uneven the current infrastructure is. A disproportionate share of public chargers is concentrated in just a handful of countries (namely the Netherlands, France, and Germany) while much of Southern and Eastern Europe remains largely underserved.

Today, consumers are not simply buying vehicles: they are buying into a mobility ecosystem. Expectations no longer revolve around the car alone, but around the entire

experience it enables: ease of charging, availability of infrastructure, charging speed, and integration with apps or route planners (as will be shown in Chapter 5). A car without accessible charging is no longer seen as usable in the same way as a conventional vehicle. This shift in consumer mindset makes charging infrastructure a core element of perceived value.

There are shown several persistent bottlenecks that continue to hinder infrastructure development. First, there is regulatory fragmentation: each member state operates with its own standards and permitting rules, making cross-border infrastructure planning difficult and slow. Second, bureaucratic delays in permitting and grid connections create significant backlogs, especially in urban areas where physical space is limited. Third, economic uncertainty surrounding returns on investment makes it difficult for private operators to justify large-scale infrastructure projects.

To break this cycle, EY argues that Europe must shift from fragmented local efforts to a more coordinated, strategic approach. This includes harmonizing regulations across countries, streamlining permitting procedures, and offering stable policy frameworks to attract investment. Public-private partnerships are seen as essential, as is the use of smart grid technologies to balance growing energy demand and ensure reliability.

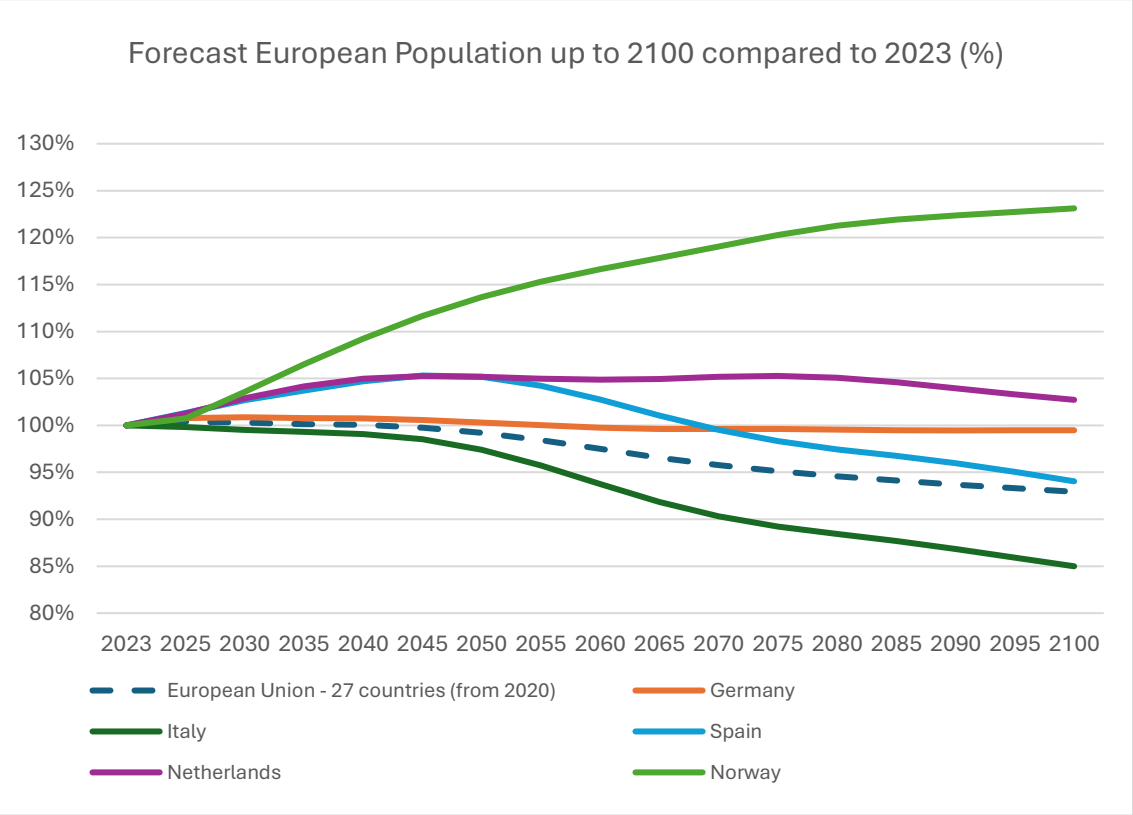
Without the proper charging infrastructure, consumers may hesitate, and manufacturers may fail to meet EU CO_2 fleet targets.

4.5 Will car numbers keep rising in Europe?

At first glance, car ownership in Europe appears stable, sometimes even growing. But this may not last much longer. A deeper look reveals a mix of long-term forces that could soon push car numbers into decline. Across many countries, population growth is slowing or reversing, especially in Southern Europe. In Italy, the country has experienced more than a decade of depopulation, driven by a combination of low birth rates and emigration, particularly from younger age groups. For now, this trend has not significantly affected vehicle demand, because the people reaching driving age today were born around twenty years ago, during relatively more stable demographic periods. In other words, we are still living off the momentum of past birth cohorts. But as the

births persist to be limited, the long-term effect will be fewer new drivers, especially as the population ages and elderly people stop renewing their licenses or buying cars.

FORECAST OF POPULATION IN EUROPE[31]



The population forecast displayed above reinforces this trend: across most European countries, and on average within the European Union, total population is projected to decline steadily throughout the 21st century. As seen in Chapter 3, the share of people living in urban areas has grown in every country analyzed. This combination of fewer people overall and more concentrated living environments suggests a structural shift in how mobility is organized and accessed. In urban areas, where public transport is more available and distances are shorter, the need for private car ownership is significantly reduced. On top of this, car prices have risen far faster than both inflation and average wages in many European countries over the past decade (3.2.5), widening the affordability gap and placing greater challenges on low- and middle-income households. These dynamics make a car ownership growth at the same pace as in previous decades increasingly unlikely. In other words, the upward trajectory of Europe's car fleet is no

longer a given, and the assumptions of uninterrupted growth are increasingly out of step with the continent's economic and demographic reality.

Chapter 5: What's ahead? Goals and strategies

After exploring the past and present of the European automotive market, this chapter turns to the future. In Chapter 2, we analyzed the state of the industry in 2014, offering a baseline view of market structure, consumer behavior, and fleet composition before major disruptions occurred. In Chapter 3, we examined the most recent data available (2023) to understand how the sector has evolved. Chapter 4 provided a bridge between the two, identifying and explaining the main forces that have driven change over the past decade, from electrification and regulation to shifting consumer preferences and affordability challenges. It also showed how some long-term trends visible in 2014 were early signs of broader transformations still underway today.

Now, in this final chapter, we look ahead. What direction is the automotive sector taking in this critical phase of transition? What are companies and consumers setting for the coming years? And more importantly, what strategies are being proposed or implemented to achieve them? To answer these questions, this chapter draws on a selection of forward-looking analyses and expert insights, with the aim of understanding where the market is heading, what obstacles it may face, and which pathways appear most promising in shaping the future of mobility in Europe. It really appears interesting that many experts are forecasting very different scenarios in the future, sometimes even totally different situations and proposing totally different approaches to problem solving.

5.1 Roland Berger - *Automotive Outlook 2040*[32]

In their Automotive Outlook 2040, Roland Berger introduces a strategic framework built around four megatrends: Polarized, Automated, Connected, and Electrified. PACE is infact used to describe the forces shaping the future of the automotive industry. Each element captures a distinct and lasting shift.

Polarized refers to the growing divergence in market dynamics and regulatory environments across regions, especially between the West and East. While this polarization is global in scale, the report stresses that it also exists within continents such as Europe, where northern countries often lead in electrification and infrastructure, while

southern and eastern regions lag behind in adoption rates, policy support, and industrial capacity (Spain vs Norway 4.3).

Automated reflects the increasing role of automation not only in vehicles (acronym for advanced driver assistance systems) but also across the production and supply chain, boosting efficiency and reducing labor reliance.

Connected signals the transformation of vehicles into digital platforms, where software, data exchange, and over-the-air updates drive customer experience and generate new revenue streams.

Electrified highlights the shift toward electric drivetrains, though the report notes that the transition is proceeding at uneven speeds depending on market conditions, regulatory support, and infrastructure readiness.

Roland Berger expresses skepticism toward the scalability and impact of car sharing and other shared mobility services, which have dominated the industry's narrative in recent years. The report points out that approximately 90% of vehicle kilometers are driven outside cities, in areas where car-sharing solutions are neither profitable nor logistically feasible. Even in urban contexts, the profitability of such services remains a major hurdle, casting doubt on their long-term scalability. Roland Berger also raises a critical point often overlooked in mobility discussions: the disconnect between technological innovation and economic sustainability. While car sharing and new mobility services have gained media attention and policy backing, many of these models continue to struggle with profitability, making it not a financially sustainable solution. High operational costs, inconsistent usage patterns, and limited geographic applicability make it difficult to scale such services. This is a reminder that technological feasibility does not guarantee market success, particularly when solutions are optimized for narrow user profiles or high-density environments. In this context, automakers and mobility providers must weigh the benefits of innovation against the reality of cost structures and consumer uptake. The same caution applies to broader electrification and connectivity investments: transformative ideas must be matched by sustainable business models if they are to play a meaningful role in shaping the industry's long-term trajectory. This perspective stands in contrast to optimistic visions of a fast transition to Mobility-as-a-Service (MaaS) and reinforces a central message of the thesis: the transformation of the automotive sector will not be uniform,

and strategic planning must account for profound differences between regions, markets, and modes of use.

5.2 Deloitte - *Global Automotive Consumer Study 2025*[33]

Deloitte sheds light on rapidly shifting consumer preferences that are reshaping the future of mobility. A central finding is the growing tension between enthusiasm for electrification and the practical barriers hindering its progress. While environmental concern and lower running costs drive interest in EVs, charging time emerges as the top consumer priority across markets (even more than accessibility and charging infrastructure availability). Yet, many consumers in mature markets planning to charge at home still lack access to private chargers, revealing a major infrastructure gap. Interestingly, although the industry assumes EV charging must match fossil fuel refueling speed, most consumers are willing to wait up to 40 minutes for an 80% charge, suggesting a nuanced perception of "fast" charging.

On the ownership front, Deloitte finds a sharp generational divide. While private vehicles remain dominant globally, a growing share of younger urban consumers express willingness to shift toward Mobility-as-a-Service (MaaS). This trend is strongest in markets like India and Southeast Asia, and weakest in older economies (such as Europe).

In parallel with this shift, Deloitte highlights growing consumer interest in vehicle subscription models, particularly among younger age groups. These services offer access to vehicles without the long-term commitment of ownership, combining elements of flexibility and convenience. But even there, interest is higher in Asian countries, while markets like Germany (and the Europe in general) show more hesitation. Subscriptions are emerging as a practical compromise: less rigid than ownership, yet more personal and available than traditional MaaS. This trend further reinforces the idea that consumers are exploring a spectrum of access models, rather than shifting collectively toward a single mobility solution.

However, even in enthusiastic markets, personal vehicles still fulfill the bulk of transportation needs, and only a modest reduction is expected within the next five years. This signals that MaaS adoption may remain complementary rather than fully

substitutive. Combined with insights on high costs, range anxiety, and dissatisfaction with public charging, the study highlights that the road to sustainable mobility is not linear. Infrastructure, affordability, and flexibility will all be critical levers.

An important point is then brought up by Deloitte. A rising share of consumers in developing regions are more inclined to switch brands at their next purchase, implying that value propositions, service experience, and connected features will be key battlegrounds. In this evolving landscape, manufacturers must balance consumer-centric innovation with economic feasibility, especially as trust in digital ecosystems and software-driven features becomes more decisive.

5.3 Arthur D. Little – *The Future of Automotive Mobility 2024*[34]

The Arthur D. Little report takes a grounded and somewhat contrarian stance on the industry's progress, challenging widespread assumptions around the CASE paradigm: Connected, Autonomous, Shared, and Electric. While these pillars have dominated strategic roadmaps and EU policy projections for over a decade, the report argues that their large-scale realization is significantly farther off than expected. For the past 15 years, industry voices and regulators alike have positioned CASE as imminent, yet the expected disruption has materialized unevenly at best. ADL points to a resurgence in car ownership, especially in developing markets and rural areas, where new mobility services remain poorly adapted to geography, infrastructure, and lifestyle. Even in urban contexts, shared mobility services such as car-sharing, bike-sharing, and public transport are often used for their flexibility, but fail to provide a full substitute for private vehicle access.

A particularly strong emphasis is placed on consumer pragmatism in the face of electrification. Although battery electric vehicles (BEVs) are advancing technologically, growth remains heavily dependent on government subsidies, and consumers show declining willingness to pay a premium for EVs over internal combustion engine (ICE) vehicles. This dynamic is especially visible in Europe, where satisfaction with public charging infrastructure ranks among the lowest globally, further eroding consumer confidence. The report also draws attention to structural constraints in multi-occupancy dwellings, where installing home chargers remains complex or impossible. Additionally,

ADL notes that EV availability remains concentrated in specific price segments and body types, limiting mass appeal and delaying full market coverage.

A sharp contrast is highlighted: optimistic narratives around rapid transition and actual clients behavior. While policy frameworks continue to encourage electrification and shared mobility, the long standing ICE tradition, cost sensitivity, and infrastructure limitations present formidable barriers. The result is a landscape where private car ownership may continue to dominate for at least the next decade as a rational response to the current limitations of alternative models.

5.4 McKinsey - *Road map for Europe's automotive industry 2023*[35]

McKinsey's strategic roadmap for Europe's automotive sector underscores the urgent need for a paradigm shift to preserve global competitiveness amid intensifying disruption. The report identifies seven priority areas, with particular emphasis on the transition to software-defined vehicles, the development of regionalized supply chains, and the necessity for pan-European industrial cooperation. As software becomes the primary differentiator in vehicle design, European OEMs must switch from hardware-centric models to centralized electronic/electrical architectures, enabling over-the-air updates and integration of digital services. This shift is critical, as electric vehicle (EV) owners exhibit lower brand loyalty compared to internal combustion engine (ICE) vehicle owners (pointed out by Roland Berger as well), making software ecosystems a key battleground for customer retention.

A critical challenge identified by McKinsey is the significant software talent gap within European automotive companies. As vehicles become increasingly software-defined, the demand for skilled software engineers has surged. However, only about 15–20% of R&D staff at European original equipment manufacturers possess software expertise, compared to approximately 45% at new entrants, particularly those from China. This disparity hampers the ability of European firms to innovate and compete in the rapidly evolving automotive landscape. To bridge this gap, McKinsey recommends a multifaceted approach: investing in early talent acquisition through partnerships with educational institutions, reskilling existing employees, and attracting foreign talent by streamlining

work permit processes and offering competitive compensation packages. Additionally, fostering collaborative environments and adopting agile development methodologies can enhance software development capabilities, enabling European OEMs to keep pace with global competitors.

McKinsey also highlights Europe's vulnerability due to its heavy reliance on Chinese-controlled supply chains for batteries and semiconductors. The importance of building resilient and sustainable supply chains is emphasized as well, in order to mitigate risks associated with geopolitical tensions and supply disruptions. The European automotive industry currently relies heavily on imports for critical components such as batteries and semiconductors, with a big portion sourced from China. This dependency exposes the industry to vulnerabilities that could impede production and innovation. To address this, McKinsey advocates for the development of a robust domestic supply chain ecosystem. This includes investing in local battery and semiconductor manufacturing facilities, fostering strategic partnerships across the value chain, and promoting circular economy practices to enhance sustainability. By localizing production and diversifying supply sources, European automakers can reduce dependency on external suppliers, improve supply chain stability, and strengthen their competitive position in the global market.

5.5 Shared Assumptions and Contested Visions

Common Points

Despite differences in emphasis, the industry perspectives reviewed in this chapter reveal several shared assumptions about the direction of Europe’s automotive future. All sources agree that the sector is undergoing a deep transformation, one that goes beyond mere powertrain substitution and involves a broader rethinking of mobility, manufacturing, and digital integration. The electrification of the fleet is seen as inevitable, even if its pace and structure vary widely across markets. There is also consensus on the centrality of software in the vehicle of the future: data, connectivity, and user experience are increasingly core to product design and brand differentiation. Most voices also highlight the importance of charging infrastructure as a critical enabler of the transition. Not only, regional disparities are acknowledged across all reports: both McKinsey and Roland Berger explicitly reference polarization within Europe, and Deloitte and ADL provide evidence of

diverging consumer behavior based on geography, age, and access. All perspectives recognize that consumer expectations are shifting, even if they disagree on how far those shifts will go.

Contested Points

Where the consensus breaks down is in the nature and timeline of the changes. Deloitte and McKinsey express more confidence in a progressive decline of traditional car ownership, with Deloitte in particular highlighting the rise of MaaS and flexible access models, especially among younger, urban consumers from developing markets. In contrast, Arthur D. Little counters this view sharply, describing a return to ownership, especially in developing and rural contexts, where infrastructure limitations and cost realities continue to reinforce traditional patterns. On electrification, Deloitte and McKinsey focus on overcoming cost and infrastructure hurdles, while ADL stresses that current growth is largely subsidy-driven by politics and consumer enthusiasm is becoming lower, especially as price premiums remain and public charging satisfaction stays minimum. Car sharing and shared mobility, praised by Deloitte as part of a broader access-based future, are viewed far more skeptically by Roland Berger and ADL, who question their financial viability and geographical scalability.

Even the notion of innovation itself is interpreted differently: while McKinsey pushes for urgent transformation through industrial cohesion, software reinvention, and supply chain independence, ADL argues that expectations around CASE have been consistently overestimated for more than a decade. Together, these contrasting views demonstrate that the path forward is not a straight line, and that Europe's automotive future will likely be a patchwork of overlapping strategies, uneven progress, and local adaptations, rather than a unified leap into a shared mobility utopia.

5.6 Concluding Remarks

What we learned and observed is that the future of the car industry in Europe is not moving in just one clear direction. Some people believe car ownership will fade, others believe it will remain strong. Some see electric cars as the clear future, while others point out limits in infrastructure and cost that are slowing things down. What's clear is

that the transition is happening, but not everywhere at the same speed, and not in the same way. The future will likely depend on how well the industry can adjust to different needs: from keeping prices affordable, to improving infrastructure, to offering new services without losing trust. If there is one key message from this work, it's that understanding people, their habits, and their limits is just as important as understanding the technology. The way forward will be shaped step by step: by choices, constraints, and opportunities across Europe, in its countries similarities and differences.

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