

Save Mobility, Not the Car

A European Mobility Manifesto

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Europe built an industry around the private car and became exceptionally good at it. Electrification, Chinese competition and autonomous driving now challenge the product, the factory and the business model at the same time.

This is a European argument for informed readers who follow the car industry, work around it or care about industrial policy. It draws on decisions I saw inside European and Chinese vehicle businesses, where product logic, engineering discipline and organisational habit often pulled in different directions.

The car gave millions of people individual mobility. Europe should protect that freedom while allowing the machine, its ownership and the industry around it to change. Defending the present car as an end in itself will make the transition slower, dearer and less European.

The argument has three steps. The automobile won because an entire system grew around it. Europe later mistook mastery of that system for a permanent advantage. Electric and autonomous vehicles have reopened choices the industry treated as settled.

Foreword: Ride the Wave

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Germany is in an unsettled mood. On 6 September, the AfD won 43.8 per cent of the vote in the state election in Saxony-Anhalt and took 39 of the Landtag's 83 seats. This was a regional result, not a national one. Even so, it captured a wider sense that change is happening to people rather than with them.

The motor car has become part of that argument. In Germany, resistance to battery-electric vehicles is often more emotional than technical. The combustion engine stands for engineering skill, good employment and a period in which German companies seemed to set the terms. A battery car can therefore feel like an accusation: yesterday was wrong, familiar competence counts for less, and somebody elsewhere has decided the future.

That reaction deserves to be understood. It also leads to the wrong industrial conclusion. Politicians can alter European targets, subsidies and timetables. The European Commission has already proposed more flexibility for the 2035 rules, reducing the tailpipe-emissions target for new cars from 100 to 90 per cent and requiring the remainder to be compensated. Europe can slow its own adjustment. It cannot reverse China's scale, supplier learning, battery economics or development speed.

The numbers are blunt. China produced nearly three quarters of the world's electric cars in 2025 and more than four fifths of its battery cells. Chinese manufacturers supplied 60 per cent of global electric-car sales. In China, 70 per cent of battery-electric cars sold that year were already cheaper than the average conventional car. Electric cars have moved beyond climate policy. They are becoming a cost and industrial proposition.

That does not make every battery-electric car cheap in Germany today. Purchase price, running cost and system cost must be kept separate. Many European models remain expensive to buy. A driver with home charging and high annual mileage can already save substantially in use. A city resident dependent on costly public charging may save much less. At system level, the simpler drivetrain and the possibility of shared autonomous fleets create a further reduction that has barely begun. The direction is clear even while the individual calculation varies.

A policy retreat may briefly protect margins on familiar vehicles. It would also delay affordable European electric cars, charging, battery capability and the operating experience needed for the next mobility system. That is retreating into the fort while the battlefield moves outside its walls. The longer we remain there, the less equipment, knowledge and time we will have when we finally emerge.

In 1888, Bertha Benz did not wait for a complete road system, a filling-station network or public consensus. She drove from Mannheim to Pforzheim, found fuel at a pharmacy and solved problems on the road. Her journey did more than demonstrate a machine. It helped

society imagine a use for it. Germany honours that act of practical courage. We should apply the same instinct now.

We need to ride the wave of change early enough to shape it. Germany still has engineers, suppliers, factories, capital and demanding customers. Europe still has the scale to set useful rules and build a mobility system suited to dense cities, rural regions and open borders. Those assets retain their value only if they are put to work on the transition. If Germany refuses to adapt, they will gradually lose it.

This book is about that choice. It argues for preserving the freedom the car created while letting its technology, ownership and economics evolve. The future will still contain cars. It need not contain the same number of them, built in the same way, sold through the same system or owned for the same reasons.

Why I am writing this

I joined Ford's Premier Automotive Group in 1999, became its Asia-Pacific president in 2004 and Volvo Cars China CEO in 2007. In 2018 I joined Aiways to lead its business outside China. I now lead EuroEV and KM Electron. These roles put me inside decisions about brands, product programmes, China, electric vehicles and the difficult passage from strategy to execution.

I do not claim distance from the industry. My argument comes from having worked within it, admired much of what it can do and watched good organisations defend assumptions that had once made them successful. The firsthand examples in these pages are included for that reason. They are the evidence behind the judgement.

Part One When Nobody Knew What a Car Was

Opening: Reutlingen

I was born in Munich, but I grew up in Reutlingen, at the foot of the Swabian Alb. My first taste of individual mobility came on a moped. For teenagers in and around Reutlingen, mopeds were more than toys or early expressions of enthusiasm for engines. They offered independence: a way to meet friends, reach school or work and move beyond the immediate neighbourhood.

That mattered because Reutlingen is not an easy place to serve with public transport alone. The city draws people from a broad surrounding area, yet it is neither large nor dense. Its geography is hilly, and adding rail routes is difficult. A timetable can connect fixed points at fixed times, but it cannot always deliver the freedom a young person wants. As soon as we were old enough, we wanted a Mofa, a moped or, later, a car. Without some form of individual mobility, it was easy to feel excluded simply because you could not get where other people were.

I did not become as devoted to cars as I had been to my moped. What stayed with me was the freedom it represented. Individual mobility gave me a measure of control over my surroundings rather than leaving my surroundings in control of me. Only much later did I understand that I had grown up in a place that had helped define individual mobility on a far larger scale.

The history was present, but mostly as background. I knew stories about the Bruderhaus and about Gmindersdorf, stories of social responsibility from a time before the phrase became fashionable. In the nineteenth century Gustav Werner's Bruderhaus combined education, social purpose, workshops and industrial production. Wilhelm Maybach arrived there as a young orphan and was educated and trained in its workshops. Gottlieb Daimler later came to the Bruderhaus, and the two men met.

Growing up, I did not attach great significance to this. Maybach and Daimler belonged to local history, not to an argument about the future. I learned only much later how directly their meeting connected Reutlingen to the birth of the automobile. They were not entering an established car industry. There was no settled product, no accepted architecture and no dominant business model. They were working at a time when the basic question was still open: what is the best way to move a person or a load from one place to another?

A second local story made that openness more vivid for me. I had always been fascinated by the cogwheel railway at Honau. I still knew the train that reached the bottom of the mountain, although not the rack section that had once climbed it. My mother had taken the railway to her first job. When I later read about the line, I became interested in Adolf Klose, the engineer responsible for the solution that allowed trains to climb the steep route onto the Alb.

Klose lived through a mobility revolution that ran from the horse-drawn carriage through railways to electric and petroleum-powered vehicles. He seems to have cared less about defending one technology than about finding the best fit for each mobility problem. Rail, steam, electricity and petroleum were tools with different strengths, limits and uses. If one approach was not ready or did not fit the task, another might.

This was a pioneering period, but it was not a smooth march toward an obvious winner. New forms of mobility faced resistance. They required entrepreneurs to invest in unfamiliar machines, infrastructure and services before demand was certain. The industry did not change everywhere at once. It solved one problem after another. Many companies failed. Those that survived had to keep changing their assumptions as technology, customers and infrastructure changed around them.

Even the innovators began with familiar forms. The first motor vehicles inherited much from the horse carriage, just as many early battery-electric vehicles inherited the architecture and expectations of the combustion-engine car. Everyone started from the old world. Some treated the inherited form as permanent. Others kept inventing as the new technology revealed different possibilities.

That is the lesson I take from Reutlingen. Be humble about the solution that currently seems inevitable. A new technology, a different cost structure or an unexpected customer response can overturn a plan that once looked secure. The early automobile industry learned this under pressure. Its eventual winners were not protected from uncertainty. They became successful because they learned through it.

More than a century later, the European automobile industry faces another period of uncertainty. Electrification is changing the architecture of the vehicle. China is changing the relationship between cost, speed, software and engineering. If autonomy matures, it will remove the driver and reopen many of the assumptions around which the car has been designed. Much of the industry still begins with a fixed picture of a car and asks how new technology can be fitted into it.

The pioneers around Reutlingen had no such constraint. They could consider a railway for one problem, an electric vehicle for another and a petroleum engine for a third. They began with the mobility need instead of the product they already knew how to manufacture. Uncertainty was their advantage. Nobody had yet told them what a car was supposed to be.

Chapter 1: Mobility Changed the World

The ordinary day the car made possible

At fifteen, my Mofa changed the geography of an ordinary week. Tennis practice was on the other side of Reutlingen. Evening gatherings were often beyond the reach of public transport. A bicycle could have covered some of those journeys, but I knew that I was not going to make every trip that way. The Mofa made them mine.

My family often spent weekends at a small hut outside the city. At twelve, I loved going with them. By sixteen, I wanted Friday or Saturday night with friends. The Mofa removed the choice. I could stay in the city and join my family later. From an adult perspective, that sounds minor. At that age, it was the difference between accepting someone else's timetable and arranging my own life.

Basketball showed the reverse. I gave up the one team sport I played because away games depended on my parents acting as a shuttle, and they did not want that role. Individual transport did more than save time. It decided which commitments were realistic. The same mechanism shapes adult choices about work, education, care and friendship.

What individual mobility must provide

Individual mobility feels free when it is available, private enough for the journey and capable of carrying the people and objects involved. The traveller chooses the departure

time and can change the route without asking permission. Ownership delivered these qualities in one durable package.

The same system excludes people who cannot drive or cannot afford the full cost of a car. Children, many older people and people with disabilities depend on someone else's time even when a vehicle stands outside the house. Congestion and parking also transfer part of the private convenience into public cost.

These limits matter because the objective is freedom of movement, not a universal instruction to own a car. A new system succeeds only if it preserves agency for existing drivers and expands it for people whom the present model leaves dependent.

How mobility broadens people's choices

Physical and social mobility reinforce one another. Education, employment and useful networks are spread across space. Reliable access increases the number of choices a person can realistically accept. Weak access narrows them before talent or ambition enters the calculation.

The European car deserves respect because it solved this access problem at enormous scale. That success does not freeze the solution. It sets the standard that any replacement must beat: practical reach, short notice and control over the journey.

This is the test for the rest of the book. Electrification matters when it lowers the cost and burden of mobility. Autonomy matters when it gives more people dependable access. Industrial policy matters when it keeps Europe's ability to build and operate the next system alive. Paying to hold the old one still fails that test.

Chapter 2: How One Solution Won

A contest of possible systems

The dominance of the petroleum car can look inevitable in retrospect, although the outcome was open. The nineteenth and early twentieth centuries contained competing ways to mechanise movement: railways, steam vehicles, electric vehicles and several forms of internal combustion. Each technology solved a different combination of range, speed, payload, flexibility and infrastructure. Engineering merit alone did not select the winner.

New forms of movement arrived in societies organised around older ones. Roads, laws and habits were designed for pedestrians, horses and carriages. Early mechanical vehicles were dangerous and disruptive, and regulation tried to fit them into the existing road system. Some rules protected the public. Others made a new technology almost impossible to use.

Britain's Locomotives Act 1865 applied to road vehicles propelled by steam or other mechanical power. It required at least three people to operate a locomotive and ordered one of them to walk at least sixty yards ahead carrying a red flag. Speeds were limited to four miles an hour in the country and two in towns. In 1896 Parliament exempted light locomotives from those restrictions and allowed speeds of up to fourteen miles an hour. The law changed when the vehicle no longer fitted the assumptions behind the safeguard.

An often-repeated line attributed to Gottlieb Daimler predicts that car sales would be limited by the number of available chauffeurs. Versions put the ceiling at five thousand vehicles or one million. No contemporary source has been established, and versions dated 1905 are impossible because Daimler died in 1900. The quotation should be treated as an automotive myth, but the assumption behind it was real. Early motorists often relied on chauffeur-mechanics because the machine demanded specialist knowledge. As controls became more standard, owners learned to drive and repair expertise moved from the driver's seat to workshops. The market expanded because the social system around the technology changed with the machine.

This error still appears in forecasts. A new technology is placed inside today's organisation, cost structure and behaviour, and its limit is calculated from those conditions. The calculation can be sensible and still miss the change that adoption will produce around the product.

How the automotive ecosystem developed

Early motorists did not inherit a mature fuel network. On Bertha Benz's pioneering journey from Mannheim to Pforzheim in 1888, fuel had to be obtained from a pharmacy. Repair skills, reliable parts, paved roads, road signs, finance, insurance and filling stations all developed later. The automobile became practical because entrepreneurs and institutions solved one bottleneck after another.

This sequence matters for present transitions. People often judge a young system by comparing its incomplete infrastructure with the fully developed infrastructure of an incumbent. That comparison is understandable but misleading. The petroleum car of the early years did not arrive with the convenience of the petroleum car a century later. Investors took risks before demand was certain, customers tolerated inconvenience and governments slowly adapted public rules and assets.

Why petroleum pulled ahead

Petroleum vehicles combined several advantages at the right moment. Liquid fuel was energy-dense and quick to transfer. A vehicle could travel independently of rails and schedules. Manufacturing scale lowered prices, while standardisation improved reliability. As more people bought cars, more roads, filling stations, workshops and dealerships appeared. Each addition made the next car more useful. A product became a network, and the network strengthened the product.

Once that feedback loop took hold, competing ideas had to challenge more than an engine. They had to challenge accumulated investment, skills, regulation and expectation. Customers stopped asking "Which mobility system should I use?" and asked "Which car should I buy?" That narrowing became one of the industry's greatest achievements. In time, it also became one of its greatest constraints.

Engineering for a specific purpose

The work of Adolf Klose offers a useful counter-image to the universal design. Challenging railway conditions demanded mechanisms adapted to terrain, curvature and operation. His example interests me because engineering begins with the mission. When the conditions change, excellence calls for a different architecture, not another layer on the familiar one.

What interests me about Klose is his pragmatism. He did not need to predict a complete transport future. He saw a problem in the real world and developed a mechanism suited to it. His work is valuable here because it shows implementation without ideology: understand the terrain, define the task and build what the task requires.

For decades, the car industry was good at precisely this kind of practical adaptation. It made engines more reliable, production more efficient and vehicles more usable. But success also stabilised a dominant answer. Once Europe had built its economy, identity and institutions around that answer, changing it became an organisational and cultural problem as much as a technical one.

Chapter 3: The Industry Learns Through Crisis

An industry formed by instability

The European car industry did not grow through calm, linear progress. It was shaped by wars, shortages, financial crises, technological changes and repeated waves of consolidation. Companies disappeared, merged or survived under new ownership. Brands that now appear permanent were often contingent outcomes of decisions made under pressure.

This history created formidable capabilities. Manufacturers learned to coordinate complex supply chains, industrialise precision and improve products over decades. It also left the past embedded in the organisation. Plants, dealer networks, engineering disciplines and brand identities embodied earlier decisions. In a stable market they were strengths. When the assumptions changed, the same structures became obstacles.

Why integration fails in practice

The experience of Premier Automotive Group showed how persuasive an integration can appear on paper. Several brands can share technology, purchasing power and capital

while preserving distinct identities for customers. Brand engineering can work for a time. The real difficulty lies in aligning people who carry different histories, status systems and ideas of what a good vehicle is.

Cultures do not merge because the spreadsheet says they should. If they remain misaligned, every shared decision becomes a negotiation over identity and control. Sometimes a group needs a strong common culture. Sometimes it needs a deliberate transformation that names what will be lost as well as gained. Otherwise organisational friction consumes the economic logic.

PAG preserved separate decision-making for the individual brands and tried to combine mainly the British businesses. This limited the shared organisation before it had a chance to create the expected scale. The brands remained protected, but so did the boundaries that made common engineering and sourcing difficult.

Six common parts

In 2006, I helped implement two vehicles from the same corporate platform in one Chinese plant. The programme began with an expectation of roughly sixty per cent common value. From a distance, this looked like a straightforward opportunity to simplify production and sourcing.

In the end, only six simple parts were truly common. I no longer remember which six, but I remember the windscreen because it exposed the problem. The glass could be shared. The adhesive was different, which required different treatment of the vehicle before bonding. Similar small variations had accumulated throughout the cars.

Colleagues initially found the number difficult to believe because the platform strategy implied far more commonality. The company began developing a more rigorous way to measure commonality after the programme. A shared architecture does not automatically remove thousands of brand decisions. If those decisions remain separate, minor variations consume the sourcing and manufacturing savings that justified the platform.

Why organisations resist a crisis

Leaders often say that a crisis creates the permission to change. In practice, the crisis must first be visible and accepted inside the culture. That is rare. A business can explain weak results as a temporary cycle, a regional issue or the consequence of insufficient support. Parts of a group may believe they would perform better alone. When that belief is strong, restructuring becomes a contest over the diagnosis before it can become a programme of action.

PAG was eventually dissolved, with businesses taking different paths under different owners. Later owners sometimes imposed changes that the earlier structure could not. Separation is no universal answer. The history shows how strongly ownership, culture and decision rights shape the value of proposed technical synergies.

The later growth of the Chinese market gave European manufacturers volume, profit and time. It also risked masking weaknesses at home. When a rising market compensates for slow decisions or high cost, the organisation can mistake favourable conditions for structural health. When the market stops growing, the old problems return with less time available to solve them.

Mini, Land Rover and the value of a clear system

I observed both the Mini and Land Rover cases directly. They taught me that integration and separation are tools, not answers. The new owner must identify whether the product needs a break with inherited routines or protection of a mission that still works.

In Mini's case, I saw engineering routines inherited from the wider MG Rover environment that had normalised shortcuts and weakened the quality discipline. The planned vehicle would not have survived the scrutiny BMW expected from German customers. Moving the programme into BMW's Munich engineering system changed the standard as well as the owner. BMW's distribution strength and a new production arrangement then gave the brand a credible route to market.

I had seen one of those routines years earlier, while studying in Britain, on a visit to a Rover plant. The stamped bodies varied enough that doors had to be matched to individual cars. Rather than remove the variation in the pressing process, engineers had created a system for finding the door that fitted each body. It was clever, industrious and completely revealing: a workaround had become part of the production logic.

Land Rover benefited from a different kind of continuity. Its vehicles had been designed and engineered for heavy off-road use, and later owners retained that direction. A clear product purpose and a strong competitive position generated the cash to keep investing. Mini needed a sharper break with inherited routines. Land Rover needed continuity around a product logic that still worked.

The present pressure on European brands, including the struggle to reposition Jaguar, goes well beyond styling or communications. It tests whether an organisation can accept that the conditions supporting its earlier identity have changed, then act before a crisis removes its choices.

Part Two When Europe Became Certain What a Car Was

Chapter 4: Europe Fell in Love With Its Product

When excellence becomes an assumption

European manufacturers learned to make exceptionally capable cars. Precision, high-speed stability, steering feel, durability and mechanical refinement became sources of

pride. These qualities were real, and customers rewarded them. The danger began when the organisation assumed that every further increment of technical excellence must also be an increment of customer value.

An engineer can admire a chassis that keeps every wheel controlled in an extreme condition. When that condition is rare, expensive to engineer for and invisible to most customers, the achievement is technically impressive and commercially weak. Chinese manufacturers have often been more willing to simplify or remove the requirement. European engineers understand the trade-off. Product management has to act on it.

Durability is valuable when it serves a real use

Durability and deep engineering matter when they serve a clear use. The original Land Rover Defender built loyalty because longevity and repairability supported its mission. The first-generation Volvo XC90 remained in Swedish production for twelve years and then continued in China as the XC Classic. The Mercedes-Benz G-Class has shown similar persistence, although it evolved into a luxury product. Long lives can show that the concept is strong and the customer need is stable.

The distinction is between engineering that creates durable usefulness and engineering that adds cost because the organisation knows how to provide it. A feature deserves its place when it meaningfully improves the owner's experience, safety or total cost. Tradition alone is not enough.

Complexity disguised as choice

Long option lists offered customers personalisation and manufacturers profitable differentiation. They also created complexity in design, purchasing, production, sales and use. A remote-controlled auxiliary heater on a BMW was genuinely useful, but only if the customer selected it, understood it and remembered to switch it on early enough.

I used one in about 1996 while living on the third floor. When the car was parked below, the remote signal reached just far enough to start the heater. It needed about ten minutes. Too often I remembered only as I was leaving the flat, when the minute-long walk to the car was useless. The engineering worked. My behaviour prevented the benefit.

Massage and ventilated seats raise a similar question. They are impressive systems, and some customers value them. The benefit can still be marginal, particularly when ventilation is added to a car with effective air conditioning. The feature often distinguishes the specification more clearly than it improves the journey.

Software made the same problem more visible. Every Volvo sold in China from 2005 onward needed native navigation that could display Chinese characters. The system could not. We wanted an urgent update from a Taiwanese supplier, while Swedish management and test engineers insisted that it pass the full vehicle-validation process. The same

question later returned at Aiways: why should a carmaker spend heavily to reproduce a service that Google Maps already performed better for many users?

The Swedish team was defending more than pride. Volvo's in-house system had passed the company's durability standards. At the time, a full validation cycle across climates from tropical heat to polar cold could take about two years. Management and test engineers believed that an update inside the vehicle should meet the same standard as the rest of the car.

They had a point. A vehicle system could continue operating at temperatures in which a consumer phone might fail. The cost was time. While the supplier's update waited for a full test cycle, external software kept improving. The trade-off was between environmental robustness and the rate of improvement customers already experienced elsewhere.

The design question was simple to ask and hard to organise around: which functions required automotive-grade validation, which could be updated independently, and how could the car use a better external service without losing dependable operation? Treating navigation as one indivisible component made the choice harder.

The enthusiast is not the whole market

Automotive journalists and enthusiasts understandably reward the qualities that distinguish one car from another: steering response, engine character, material detail and dynamic balance. Their vocabulary helps maintain demanding standards. But it can also cause the industry to overestimate how strongly mainstream customers value those distinctions.

Tesla exposed part of this gap. Traditional reviewers found shortcomings in finish, controls and chassis behaviour, while many customers valued a different package: a coherent digital experience, a charging network, straightforward performance and the feeling that the product belonged to the future. Traditional quality still mattered. Its place in the hierarchy had changed.

Even engine sound illustrates the power of learned expectation. Some enthusiasts hear a combustion engine as emotional and authentic, but that association is acquired. A new generation can attach emotion to instant response, silence, software or an entirely different experience. Product blindness begins when the industry treats its own trained preferences as natural laws.

The question Europe must ask is uncomfortable but practical: which elements of its celebrated excellence still create value for the next customer, and which survive mainly because the organisation is proud of them?

Chapter 5: China Changes the Question

Looking east before it was obvious

China entered my imagination before it entered the centre of the global car industry. In 1984, my grandfather told me that China would become important again. I travelled there about a year later and did not understand what he saw. Only in the early 2000s did I realise that his remark had stayed with me and influenced the direction of my own work.

When China's growth accelerated, European manufacturers saw an extraordinary sales opportunity. Their brands carried status, quality and international recognition. The meaning of those brands travelled less completely. Heritage that resonated in Europe could be irrelevant to a new customer. A Porsche Cayenne communicated success immediately. The cultural story that made the 911 sacred to a sports-car purist rarely came with the badge.

Brand without inherited memory

Brand mattered in China, especially as rising wealth turned consumption into a public signal of achievement. BMW could sell luxury, status and recognition. Its European idea of the 'driving machine' did not carry the same inherited meaning. European companies made a costly assumption when they treated demand for the badge as proof that customers shared the company's history.

That distinction becomes decisive when local products close the quality gap. A former BMW colleague put the commercial risk to me in rough terms: once comparable Chinese products deliver similar visible luxury and equipment, a fully equipped European car struggles to justify a price difference of roughly thirty per cent. This was an informed judgement, not a market estimate.

The wider market evidence now points in the same direction. The International Energy Agency reports that nearly seventy per cent of battery-electric cars sold in China in 2025 were cheaper than their combustion-engine equivalents before incentives. Germany also became more affordable in 2025, but fewer than ten per cent of battery-electric models available in Europe were priced below EUR 30,000, compared with about a quarter of combustion models. The exact BMW comparison remains anecdotal. The affordability pressure does not.

How speed changes cost

In 2024, in the industrial hinterland of Shanghai, a supplier showed me an off-the-shelf heating, ventilation and air-conditioning system available to any manufacturer. It had already delivered a cost reduction of about forty per cent and the supplier offered the same result to us, provided that the vehicle abandoned its brand-specific HVAC layout. This was a realised result, not a presentation target. The saving came from designing the vehicle around a reusable system.

At another supplier, cold roll-forming replaced stamping for some structural sections and opened different choices in tooling and body design. Both visits exposed the same hidden decision: the inherited vehicle layout carries a price, even when nobody lists it as a cost item.

This is what a faster operating model can achieve. Chinese teams test architectures, remove cost, launch credible products and improve them through use. European programmes more often try to settle the complete solution before launch. The slower method can produce exceptional reliability. It can also preserve a costly answer long after the question has changed.

Chinese teams reopen architecture, specification and manufacturing together instead of treating the existing bill of materials as fixed. This exposes requirements that European programmes kept long after customers stopped paying for them.

Limits of the Chinese model

The Chinese model has vulnerabilities. Building distribution, service and trust in foreign markets is slower than developing a compelling product. Rapid experimentation can make medium-term product planning and operational discipline harder. A feature or price advantage is not automatically defensible when competitors can copy it. Companies that expand quickly must still support vehicles, manage residual values and persuade customers that the brand will remain.

Europe should avoid replacing complacency with fatalism. Chinese manufacturers are neither temporary imitators nor invincible winners. They are competitors shaped by a different market, cost base and pace. Their rise changes the question from “How can Europe sell more of its existing cars in China?” to “What kind of mobility product will customers anywhere choose when European heritage is no longer enough?”

A different kind of car

Electric propulsion, integrated electronics and software-led development are producing vehicles that need not inherit every assumption of the combustion era. China has moved quickly because its manufacturers had fewer reasons to defend that inheritance. Europe should study those decisions and recover the curiosity to question its own.

Chapter 6: The Price of Perfection

Why a cheap European car is difficult

European manufacturers know how to build small cars. The harder question is why they struggle to build genuinely inexpensive new ones. Part of the answer lies in regulation, but blaming regulation alone is too convenient. Cost also accumulates through

engineering assumptions, supply relationships, optional equipment, manufacturing footprints and an organisational preference for carrying proven solutions forward.

Carryover is usually presented as the low-risk choice. A validated component avoids development expense and protects quality. Yet it was often designed for a more expensive vehicle, a different architecture or a requirement that has outlived its usefulness. Reuse then prevents a cheaper system from being conceived. Supplier negotiation can trim cost. Product design has to remove it.

Carryover in an electric architecture

The move to a battery-electric vehicle makes the cost of carryover particularly visible. The package is different enough that heating, ventilation and air conditioning can be reconsidered rather than moved from the combustion vehicle. New space becomes available, heat sources change and energy use has a direct effect on range. A system inherited without reconsideration can preserve cost and compromise the new layout at the same time.

Electronic controllers create another problem. A proven controller reduces immediate programme risk, but its processor, memory and communications standard are often several years old when the vehicle launches. In a software-dependent electric vehicle, the carried-over part becomes an early limit on functions and updates. Low component risk creates high obsolescence risk for the vehicle.

Every requirement has a price

Europe has created many vehicle requirements for good reasons: cleaner air, occupant protection, pedestrian safety, cybersecurity and assistance for human drivers. Each can be defensible on its own. Together, they raise the fixed cost of every vehicle, and the burden falls most heavily on the smallest and cheapest models.

Safety deserves particular care because the gains are real. Germany recorded 19,193 road deaths in 1970 and 2,770 in 2024, even though mobility and the vehicle fleet grew over that period. Road design, enforcement, emergency medicine, vehicle structure, restraints and driver-assistance systems all contributed. The aggregate result cannot assign the gain to any one device.

A credible cost-benefit test must start with the accident class a system is designed to prevent, estimate how many such accidents occur and then ask how many the system could realistically avoid. Exposure, vehicle age, road design, enforcement and driver behaviour must be separated where the data allow. This narrower method is less dramatic than citing the national total, but it makes the relationship between cost and safety benefit visible.

The small-electric-car penalty

A small battery-electric car faces an additional difficulty. Even a modest battery, power electronics, charging hardware and thermal system represent a large share of the vehicle's price. A larger combustion car traditionally carried more engine, material and margin. A small combustion car could use a simple, mature drivetrain. In an electric vehicle, some of the expensive systems do not shrink in proportion with exterior size. The affordability problem is therefore architectural as well as regulatory.

Autonomy will change the calculation again when the human driver disappears. Devices designed solely to monitor, alert or protect that driver can then be reconsidered. Those savings belong to a future vehicle and should stay out of today's business case. The immediate lesson is to write rules around the function being performed, rather than the familiar form of a car.

Three ways to measure cost

Claims that electric cars are cheaper often mix three different calculations. The first is purchase price. Here Europe still has work to do: too many electric models begin above the budgets of ordinary households, even though prices are falling and model choice is growing.

The second is running cost. Electric motors use energy efficiently and require less routine maintenance than combustion drivetrains. The saving depends on mileage, electricity price, fuel price and access to home or workplace charging. A blanket promise would be misleading. For many high-mileage drivers and fleets, however, the advantage already exists and grows as the purchase-price gap closes.

The third is system cost. A simpler powertrain, fewer parts, managed charging, longer daily utilisation and eventually driverless operation can reduce the cost of providing a kilometre of mobility. Capturing that saving requires redesigned vehicles and services. Replacing an engine with a battery while preserving every other assumption leaves much of the opportunity untouched.

When success reduces the market

European cars remain in service for a long time. The average passenger car in the European Union was about twelve and a half years old in the latest published fleet data. That is good for owners and resource efficiency, but long replacement cycles also reduce demand for new vehicles. For years, growth in China helped manufacturers overlook the consequences of a mature European market. When that growth slowed, high costs and excess industrial capacity became harder to separate.

The used fleet is part of the transition

The transition to electric mobility will move at different speeds for different drivers. High-mileage users can justify a new electric vehicle sooner because energy and maintenance savings accumulate quickly. Low-mileage users will often keep an existing vehicle longer, which can be environmentally rational when manufacturing a replacement would save little during use.

Used vehicles can connect these different rhythms. A newer electric car can begin with a high-mileage user and later move to someone who drives less, allowing more people to try the technology without requiring every household to buy new. Policy that looks only at new registrations misses the fleet through which most drivers actually experience change.

The mechanism begins with total cost of ownership. A high-mileage user feels the lower energy and maintenance cost of a battery-electric vehicle quickly, so the economic case for buying new becomes strong earlier. After that first use, the vehicle enters the second-hand market with much of its useful life remaining.

That creates availability for a low-mileage driver who could not justify the price of a new electric vehicle. The first owner captures the operating savings. The second owner gains access at a lower purchase price. The transition can therefore move faster through a sequence of different users than through a policy that expects every household to buy new.

Europe's affordability problem is therefore not solved by demanding a cheaper version of the same fully specified car. It requires explicit choices about requirements, architecture, ownership and the sequence by which vehicles move through the market.

Part Three When Nobody Knows What a Car Is Again

Chapter 7: When the Hardware Becomes Good Enough

The motorised carriage returns

The first motorcars inherited the shape and assumptions of the horse-drawn carriage. That was sensible: users, builders and roads already understood the carriage. Only later did the automobile develop an architecture of its own. Many battery-electric vehicles are at a comparable stage. They replace the engine and fuel tank while preserving the platform, proportions and commercial logic of a combustion car.

This translation phase reduces risk and helps customers cross from one technology to another. It also conceals what the new technology makes possible. Batteries can be distributed through the floor. Electric motors can be placed differently from an engine

and transmission. Software can coordinate functions that were once separate mechanical systems. When the old package is treated as permanent, these freedoms are spent on imitation.

Change comes in stages

A different architecture will not appear in one clean break. Factories, regulations, supply chains and customer expectations cannot be replaced simultaneously. Some vehicles will remain close to combustion-era forms, others will combine new platforms with traditional ownership, and a smaller number will explore purpose-built services or autonomous operation.

Transition products keep revenue flowing while customers and manufacturers learn. The danger is treating them as the destination. An electrified version of today's car can fund the next architecture. It cannot define it.

Ford and production redesign

Ford illustrates the difference between converting an inherited system and redesigning product and production together. In Europe, it spent about two billion dollars converting its historic Cologne plant into an electric-vehicle centre. The Explorer entered production there in 2024, followed by the Capri. The investment created a new line and battery assembly, but the vehicles still emerged from a strategy built around existing assets and partnerships.

Ford's next American programme starts from a different production question. Its Universal EV Platform is paired with an 'assembly tree': front, rear and structural-battery sub-assemblies move on separate lines and then join. Ford says the platform uses twenty per cent fewer parts than a typical vehicle and that the first Louisville product, a midsize electric pickup planned for 2027, should net out at fifteen per cent faster assembly than the plant achieves today.

The comparison cannot isolate the cause of Ford's European difficulties. Demand, pricing, product choice and regulation also matter. Still, Ford now treats platform, cost and assembly as one design problem. The same principle appeared in the Chinese HVAC and roll-forming examples: cost changes sharply when the architecture is allowed to change.

When performance stops differentiating

Electric vehicles make impressive acceleration, smoothness and quietness easier to deliver across brands. Battery range and charging speed will continue to matter until most products pass the threshold of being good enough for most journeys. Once core hardware performance becomes commonplace, value moves elsewhere.

Design, software, service, energy integration, reliability and total cost then become more important. So does confidence that the product will be supported. Brand can return strongly in that environment, with a different meaning. It will certify a trustworthy experience, a community, a style or a relationship that continues after purchase instead of a particular engine heritage.

The brand that can still create an emotional response will have an advantage. In the combustion era, that emotion could be the freedom to drive fast or the pleasure of controlling a particular machine. Electric performance is easier to reproduce, so the old promise will not distinguish every brand for long.

The next emotional promise is still open. Visible features can signal novelty, yet novelty fades quickly. A durable brand will make ease, comfort or fitness for a real journey emotionally recognisable. Another screen animation will not do it.

How autonomy changes the service

Autonomy widens the design space again. If nobody must drive, the vehicle can be organised around the work, rest, conversation, privacy or cargo required during a particular journey. One universal automobile becomes less necessary. A small urban pod, a shared shuttle, a long-distance room and a specialist rural vehicle may all be better answers than a single privately owned compromise.

The important shift is from asking how to preserve every characteristic of the car to asking which combination of hardware and service gives people the mobility they value. This is the threshold between the second revolution and the third.

Chapter 8: When Nobody Drives

The service that a driver made too expensive

I spend many weekends in the Chiemgau outside Munich. I did not use Rosi, the region's on-demand bus, but I watched it being praised as an answer to a familiar rural problem. Since May 2022, passengers have been able to book small electric vehicles by app or telephone, without a fixed timetable, for journeys between a dense network of stops. The service was designed to cover the last mile that scheduled buses and trains serve badly.

Demand was not the main failure. In 2024, Aschau described strong use and high occupancy, but also rising costs. The municipality had originally budgeted EUR 175,000 for six years. By September 2025, it projected that its contribution could reach about EUR 193,000 by the end of the fourth operating year and withdrew from the project. Rosi continued in nine other municipalities, with prices and operating rules adjusted to control deficits.

Rosi shows why autonomy matters outside the robotaxi districts of large cities. Rural demand exists, but it is scattered. A paid driver waits or travels empty between a small number of passengers, and long cross-region trips are expensive. Removing the driver changes that cost. Geography remains: some routes will still need public support, coverage obligations or guaranteed booking windows.

What changes when the steering wheel disappears

Assume that the vehicle can complete its journey safely. The first decisive product choice is whether it still carries a steering wheel. A car with controls feels familiar because the passenger retains the option to take over. Remove them and the product announces that the driver has disappeared.

That change releases cabin space and may remove cost and one route of crash intrusion. The complete vehicle must prove those gains. The emotional effect needs no test: many passengers will see the missing wheel as evidence that they have surrendered the last means of control.

Manufacturers cannot keep both architectures forever without paying for both. Retaining controls preserves the old seating position, dashboard and validation burden. A fully driverless vehicle can use the space and structure differently. The industry will eventually have to choose.

Different journeys need different vehicles

Today's car commutes through a city, travels quickly on a motorway and carries a family on holiday. Most journeys use only a fraction of that capability. With the driver gone, the vehicle can be designed for passenger and mission.

A compact city vehicle can prioritise easy entry and frequent cleaning. A long-distance vehicle can offer work or rest. A family version can organise the cabin around children and luggage. An accessible vehicle can start with boarding requirements instead of adding them after the architecture is fixed.

Sharing makes these specialised products useful because the traveller can call a different vehicle for each job. The old car carried spare capability everywhere. The autonomous fleet can distribute that capability across vehicles.

Passengers will still care about speed, quietness, body control and the response to a poor road. European competence in ride and handling remains valuable, but the experience moves from the controls to the cabin. Steering feel survives in vehicles built for people who still want to drive.

The market will split. High-volume autonomous vehicles will sell dependable transport. Luxury products will sell privacy, space, materials and a distinctive ride. These are likely to become different machines instead of trim levels on one universal car.

Driver-focused components disappear from fully autonomous vehicles or retreat into specialist products. Suppliers must redirect development towards adaptable interiors, cleaning, communications, passenger comfort and the hardware that keeps a heavily used vehicle available.

The buyer will increasingly be a fleet operator. It will judge a feature by utilisation, downtime and passenger demand. A supplier that improves the journey or removes ten minutes of cleaning creates more value than one that adds another option to the showroom specification.

Manufacturers face the same shift. The volume market can become an industrial service business, while privately owned luxury cars retain a familiar brand relationship. Rental companies are obvious candidates to become major fleet owners. Platform operators will control vehicle choice, availability and payment.

Dealers either change business or disappear

Dealers can sell and maintain autonomous cars that remain privately owned. They can also become fleet service hubs, charging centres or places where customers compare mobility plans. These activities demand new economics and operating disciplines.

If fleet ownership becomes dominant, the traditional showroom loses its reason to exist. Platform outlets will display service levels and vehicle types. The recurring customer relationship will belong to the operator that guarantees the journey.

Rail gains the missing kilometres

A long train journey can already be more useful than driving because the traveller can work, read or rest. The journey often fails in its last twenty or fifty kilometres. A weak local connection turns a good rail line into an impractical door-to-door trip.

An autonomous vehicle can bridge that distance without forcing a driver to wait. Rail carries the efficient long leg. The vehicle supplies the irregular local one. This combination can make rail relevant to destinations that fixed routes will never serve well.

Autonomy cannot rescue a bad railway. The train must still be reliable, competitive and connected. Where that backbone exists, driverless vehicles extend its reach. Where it does not, the car will continue to win the complete journey.

Autonomous vehicles will not empty every parking space. Privately owned cars still wait, and fleets still need somewhere to stand between peaks. Cities should resist making land-use promises on a timetable the technology has not earned.

Fleet vehicles also need cleaning, inspection, charging and repair. Cities may use less central land for long-term parking and more kerb or depot space for active operations.

The balance will depend on vehicle ownership, passenger behaviour and how much servicing the cabin requires.

Music once lived in the car on tapes, CDs or a stored library. The phone removed that reason for permanence. Sports equipment, child seats, work materials, snow chains and personal objects are harder. They reveal how much ownership depends on storage and readiness rather than the act of driving.

A platform can sell temporary possession: one vehicle for a day, a chain of journeys or a weekend. The user keeps belongings inside and releases the vehicle when the period ends. That promise reaches further into the value of ownership than a service that resets after every ride.

Forgotten objects remain a serious operating problem. Detection can alert the passenger, but the operator still needs rules for identity, storage and return. Families will judge shared mobility by these mundane failures, not by the elegance of the autonomy demonstration.

What passengers expect from a service

A private autonomous operator need not become a public transport authority. It should still provide universal access within the service it offers. A suitable vehicle must arrive when promised, with workable child-seat and accessibility options. The operator must explain which journey and cabin data are recorded, who can access them and how long they remain.

Integrated ticketing would make the service more useful, especially when a journey continues by rail or bus. Geographic coverage can also be required, but uneconomic coverage needs explicit government support. Otherwise a nominal obligation will produce poor availability or hidden cross-subsidies.

Deliver those promises and a traveller can use a vehicle almost as if it were owned. Fail on certainty, privacy, equipment or coverage and cheap autonomy will strengthen private ownership instead. Autonomy removes the driver, but the larger industrial change is the move from selling a universal machine to operating dependable access.

Chapter 9: Three Autonomous Futures

One family in three futures

To make the alternatives concrete, consider the same family in each future. They live in Germany outside a large metropolis but not in open countryside. Their children are

twelve and nine. Both parents work: one commutes to the nearest large city, while the other works locally.

Public transport has improved, but it still does not fit the combination of work, school and family activities well enough. The family lived in the city before the children were born and then needed only one car. In their present location, both adults need access to individual transport. The three scenarios differ in how that access is provided and in what the family still chooses to own.

Scenario A: Autonomous Car, Same World

In this future, the family owns two vehicles. The newer one can drive autonomously. The parent with the longer commute uses it to answer email, make calls or prepare for the day while travelling to the city. The second vehicle is older and has fewer capabilities, but it remains useful for local journeys and for trips across city or national boundaries where autonomous rules and coverage differ.

The autonomous vehicle also changes the children's journeys. In this scenario, law and operator policy permit an unaccompanied passenger from the age of twelve. One child can return from an activity or school without a parent interrupting work, while the other still uses the bus or travels with a parent. The age threshold is an assumption for the thought experiment, not a description of current German law.

Ownership remains attractive because the vehicles carry the family's equipment. Child seats, sports gear and other belongings stay where they are needed. The family accepts the cost and low utilisation because the vehicles provide certainty and because one of them can now convert commuting time into usable time.

Scenario B: The Hybrid World

In the hybrid future, the family gives up the owned autonomous vehicle but keeps one conventional family car. The retained car holds their belongings and covers holidays, hobbies and journeys beyond the dependable operating area of autonomous services.

The city commuter has a standing weekday booking with an autonomous operator. The vehicle arrives within an agreed window and can wait for up to thirty minutes without an extra charge. After delivering the commuter, it works in the city fleet during the day and returns for the evening journey. The family buys dependable access to the same service without paying to own a vehicle that would otherwise remain parked.

Employers can adapt the company-car benefit by paying for a defined mobility service instead of assigning one physical car to an employee. The exact arrangement depends on national tax and employment law. The commercial idea is straightforward: preserve the employment benefit while raising utilisation of the asset.

For many city households, even the retained family car disappears. For this family at the edge of the metropolitan area, one owned vehicle still covers the journeys and personal storage that the service does not handle well. This is the missing middle between universal ownership and universal sharing.

Scenario C: Mobility Without Mass Ownership

In the third future, autonomous fleets are dense enough that households in cities and surrounding settlements no longer need a car. The family books different vehicles for different tasks and combines them with rail. An autonomous vehicle supplies the first and last part of a longer journey, so rail feels as if a personal car were available at the other end without the family carrying that car for the entire distance.

Ownership does not disappear completely. Some city residents still own vehicles as luxury goods or status symbols. Rural households continue to own them for a more practical reason: there are too few customers to support a dense service at an acceptable waiting time and price. The border between service and ownership follows population density more closely than technology.

This future also assumes that operators have solved behaviour inside shared vehicles. Cleaning, damage and vandalism are not side issues. If users do not take reasonable care of the vehicle, the operator's cost rises and the experience becomes unpredictable. Cheap autonomous hardware does not create cheap shared mobility until the operating model can manage those human costs.

Signals and decisions

Two variables decide which future arrives. The first is the cost of autonomy. The second is whether operators can keep vehicles clean, available and trustworthy. Cheap technology without credible service will make autonomous ownership more attractive than autonomous sharing.

Geography will split the market. Dense cities can support short waits and high utilisation. Rural regions need higher prices, public support or guaranteed booking windows. Urban areas will move towards services first. Ownership will remain stronger where customers are sparse.

Some investments are useful in every scenario. More convenient charging supports privately owned electric cars, shared autonomous fleets and the mixed world between them. Other decisions depend heavily on timing. A city that assumes autonomous fleets will quickly release large amounts of parking space risks committing land years before the vehicles or behaviour justify it.

Low-cost autonomy supports two opposing outcomes. It can make fleets economical and put privately owned autonomous cars within reach of more households. Removing the driver does not decide ownership. Service quality and local density do.

Chapter 10: Fewer Cars, More Mobility

The two assumptions that matter most are daily hours in service and vehicle life. A privately owned car moves for only a small part of the day. A fleet vehicle can work through the morning commute, daytime trips and the evening peak. Each vehicle then supplies far more kilometres of mobility.

Higher utilisation does not mean that one vehicle lasts forever. A fleet vehicle can reach its commercial mileage limit far sooner than a private car, even if its calendar age is low. The fleet can therefore contain fewer vehicles at any one time while replacing or refurbishing them more frequently.

That faster cycle brings new technology into service sooner. It also changes the meaning of durability. A fleet vehicle must survive intense daily use predictably over a defined duty cycle. That is a different engineering task from preparing a car for decades of uncertain use across several private owners.

Refurbish or replace

At the end of the first duty cycle, the operator faces a choice. The vehicle can be refurbished for another period, broken down so that expensive modules return to service, or replaced by a new vehicle. The answer will depend on the condition of the body, battery, interior and autonomous hardware, and on how quickly the technology has improved.

The mobile-phone industry offers a partial analogy because a rapid product cycle moves new technology into the market and returns old devices for reuse or recycling. A car is far more expensive, resource-intensive and repairable, so disposable economics would be unacceptable. The useful lesson is modularity: valuable systems should be replaceable without discarding the complete vehicle, and the operator should know which parts retain value after heavy use.

This creates a business that sits between manufacturing and maintenance. Fleet operators will need industrial processes for inspection, cleaning, software support, battery assessment and refurbishment. Residual value will depend less on retail fashion and more on the remaining productive life of the asset.

Cheaper and easier travel will create additional journeys. Some people who cannot drive today will travel more, and others will accept longer distances because the time can be used. That rebound will offset part of the reduction in vehicle numbers, but it need not eliminate it if each fleet vehicle still serves many users in a day.

Autonomy can also make intermodal travel more attractive. A traveller can take rail for the efficient long leg and use an autonomous vehicle at the destination. The experience resembles having one's own car waiting at the other end, without moving that car hundreds of kilometres or paying a driver to wait.

This is where autonomy can strengthen rail rather than compete with it. The autonomous vehicle solves the irregular local connection, while the train carries large numbers efficiently between regions. The most useful unit of analysis is the complete journey, not the market share of either mode in isolation.

Dealers and independent repair shops will not simply disappear, but their customers and economics will change. A fleet operator buys fewer vehicles in larger transactions, demands predictable uptime and measures maintenance cost by the hour a vehicle is unavailable. Retail selling becomes less important than keeping the fleet productive.

Some dealer capabilities can move into fleet charging, maintenance, refurbishment and local service hubs. Independent workshops may specialise in high-use components or operate under data and software access rules set by the fleet owner. Both will need processes designed for scheduled industrial work rather than occasional repair for an individual owner.

Fleet operation therefore becomes a central part of the mobility value chain. The organisation that controls dispatch, utilisation, cleaning, charging and maintenance will capture more of the customer relationship than the company that assembled the vehicle. Lower unit volume is only the first threat to manufacturers. The second is losing the recurring operational value created after the vehicle leaves the factory.

The threat is fewer cars

China and electrification are visible competitors. Utilisation attacks the volume model itself. If each autonomous fleet vehicle supplies several times the mobility of a private car, Europe can win the technology contest and still sell far fewer vehicles.

Chapter 11: The Missing Middle

Beyond two utopias

Mobility policy is trapped between two fantasies. One expects autonomous algorithms to eliminate waiting and ownership. The other expects public transport, walking and cycling to absorb almost every journey. Both erase the awkward variety of real lives.

Each vision contains useful tools. Driverless fleets can raise utilisation. Rail and active travel use space efficiently. Trouble begins when a tool becomes a prescription for every household and region.

Human lives vary too much for one solution. A commuter with a predictable journey, a parent carrying two children, a person with limited mobility, a tradesperson with tools and a rural household all want different things from transport. Kilometres are only the start. People also pay for certainty, privacy, storage, identity, spontaneity and the ability to change a plan.

The objective should therefore not be to maximise or minimise the number of cars. It should be to maximise people's practical ability to move, while using less money, energy, space and material to provide that ability. Once that is the objective, a large territory opens between universal ownership and universal public transport. That territory is the missing middle.

Individual mobility feels free partly because something remains under individual control. A privately owned vehicle is available without negotiation. It can hold a child seat, sports equipment, work material or a personal object that signals whose space it is. Leaving something in the car sounds trivial, but it removes a sequence of decisions from the next journey. The vehicle is transport and a small piece of controlled territory.

There is also the freedom of controlling a machine. A convertible on an open road can create a physical sense of release that has little to do with efficient transport. The driver directs speed, route and movement for a period of time and feels less constrained by the body and by ordinary surroundings. A fully automated service may reproduce the journey and still remove that experience.

These freedoms matter differently to different people. One traveller wants privacy. Another enjoys driving. A third cares mainly about knowing that a vehicle will be there at six in the morning. Any service must take the emotional value of ownership seriously. It should reproduce the parts that can be offered more efficiently and recognise the parts that will continue to justify ownership.

Control need not mean permanent ownership. A service can give a user exclusive command of a vehicle for a defined period: a return journey, a working day or a weekend. During that period the vehicle waits, keeps the user's belongings and remains available when plans change. The less advance planning the system requires, the closer it comes to the freedom associated with a private car.

The practical tests for a shared system

A missing-middle service has to pass practical tests. An autonomous vehicle demonstration proves very little on its own. Availability comes first. In a dense city, fleet size and high demand can support a short wait. Outside the city, the operator needs

advance positioning, scheduled guarantees or a different price. A service that works beautifully only where alternatives are abundant fails to replace the freedom of the car.

Continuity matters as much as arrival time. Many journeys are not isolated trips from A to B. They are chains: school, work, shopping, sport and the return home. A user may need the same vehicle to remain available throughout that chain. If every stop requires a new booking, unloading and uncertainty, the service has optimised individual legs while making the day worse.

Belongings and children expose the same gap. Child seats need to be present and correctly fitted. Personal equipment may need to stay in the vehicle. The system should detect forgotten items and remind the user before the vehicle departs, but it must also respect the fact that some items are intentionally left there. Convenience depends on recognising the difference.

Privacy cannot be treated as a settings page. A shared autonomous vehicle will know who travelled, where they went, who joined them and what happened inside the cabin. Some passengers will accept that record in exchange for price and convenience. Others will refuse. A credible system needs limits on collection, clear control of access and a trustworthy answer to the simple question: who can reconstruct my journey?

Accessibility must be designed into the fleet rather than added as a special request that rarely arrives. A traveller with a wheelchair, a visual impairment or reduced strength needs predictable boarding and assistance. Children travelling without an adult create a different requirement for identity, supervision and responsibility. In both cases, the operational system matters as much as the vehicle.

The missing middle already exists in fragments

Free-floating car sharing provides an early example. In my experience, Free2move in Munich occupies a space between owning a car and using conventional public transport. The user gains access to an individual vehicle without taking responsibility for purchase, maintenance and parking over its entire life. The service does not yet reproduce every advantage of ownership, but it shows that the categories are not fixed.

Its limitations are instructive. The vehicle may not be nearby at the required moment. It usually cannot be treated as a private store of belongings. The user may not be able to take it into the countryside for a weekend and know that the same vehicle will wait for the return. These are not minor imperfections around an otherwise complete model. They define the product that still has to be invented.

A more complete service would sell temporary possession. A customer summons a vehicle quickly, keeps it for a sequence of journeys and releases it when the period of use ends. The commercial unit expands beyond the minute or kilometre to a guaranteed window of control, with different vehicles and service levels for commuting, children, disability, work or leisure.

This model will leave private cars in many places. Rural demand is sometimes too thin for short, economical waiting times. Enthusiasts will continue to own vehicles because control of the machine is the point. Wealthier households will buy privacy and status. Many other users will choose a service if it offers certainty without asking them to carry the full cost of an asset that stands still most of the day.

The missing middle is a family of arrangements that separates access from permanent ownership while preserving the traveller's agency. Some will combine a retained household car with autonomous commuting. Others will combine rail with a vehicle that waits at the station or remains with the family for a weekend. The right mix will change with geography, income, age and purpose.

This makes mobility harder to describe but easier to improve. What matters is whether the complete system gives people dependable movement with fewer idle assets and less compulsory expense. A platform deserves to replace ownership only when it expands practical freedom rather than rationing it.

Chapter 12: Europe After the Car

If the car industry becomes smaller

Europe does not need to predict the disappearance of the automobile industry to confront a harder possibility. The European Commission estimates that the sector supports about thirteen million direct and indirect jobs, contributes roughly EUR 1 trillion to GDP and accounts for a third of private research and development investment in the European Union. It can survive and still lose part of that extraordinary economic position as vehicles become cheaper, move into fleets or require fewer units to provide the same mobility.

That possibility changes the policy question. If the objective is to preserve every existing product, plant and job, structural change will always look like failure. If the objective is to preserve the capacity to create complex products, useful services and good employment, then some parts of the present industry can shrink while their capabilities move elsewhere.

Europe has seen this pattern before in textiles, shipbuilding, consumer electronics, telecommunications hardware and cameras. The histories differ and parts of each industry survived. One lesson is common: expertise in a successful product never guarantees control of the next value chain. Protecting the old output delays the transfer of people, capital and institutions towards the next source of demand.

The automobile deserves particular care because it connects so many capabilities: industrialisation, engineering, power electronics, energy, automation, insurance, finance,

repair and recycling. Europe must keep that accumulated competence moving. Otherwise it becomes trapped inside a product whose economics are changing.

Capabilities are more durable than products

European car manufacturing is a system for producing complex technical goods at high and repeatable quality. That capability can serve other products. The same is true of supplier management, validation, safety engineering, tooling, industrial automation and the coordination of thousands of parts. A plant is not infinitely flexible, and conversion is never painless, but the organisation behind the plant is more adaptable than the badge on its gate suggests.

Europe also has long experience of designing for diverse environments. Roads, climates, languages, regulations and customer habits vary over short distances. That fragmentation is often described only as a disadvantage because it limits scale. It can also train companies to detect differences that a single large market overlooks. Ride and handling on European roads are one concrete example, but the broader capability is system design under varied conditions.

This position sits between two powerful models. Chinese companies can develop around enormous scale, dense supply networks and rapid implementation. American companies can grow around a large, comparatively uniform market and deep pools of software and financial capital. Europe will not win by imitating either model incompletely. Its opportunity is to connect industrial quality, fundamental research and careful adaptation to real customer needs.

The weakness is familiar: Europe is often stronger at generating knowledge than at turning it into a growing business. The next wave may include robotics, practical applications of artificial intelligence, energy systems and commercial space, as well as mobility. The relevant question for the car industry is which engineers, factories, research institutions and operating disciplines can move into those fields before declining demand forces the move under worse conditions.

Helping companies convert

A transition policy should help companies convert rather than pay them indefinitely to remain unchanged. Conversion may mean a supplier using precision-manufacturing skills in a different sector, a dealer becoming a fleet service hub, or a vehicle plant producing fewer complete cars while refurbishing batteries and valuable modules. The aim is continuity of productive capability, not continuity of every present task.

This distinction is severe but necessary. Europe should fight for the car industry while asking which parts remain worth saving. Cheaper autonomous electric vehicles and higher fleet utilisation would weaken the economics of high-volume manufacturing. Luxury will remain valuable, but it cannot absorb the employment and industrial base of today's mass market.

Nor should Europe preserve activities in which it has no advantage and which competitors can copy easily. It should retain and deepen the capabilities that remain distinctive: understanding European roads and users, integrating complex systems, validating them across demanding environments and operating infrastructure with public legitimacy. Those capabilities can create value even when the shape and ownership of the vehicle changes.

The transition will create hardship if it is left until the old economics collapse. Early conversion gives workers and regions time to build adjacent businesses, training and infrastructure. Late protection concentrates risk: more money becomes tied to the old model, and the eventual adjustment arrives faster. Industrial policy should buy the capacity to change, not a promise that change will never come.

A European mobility system

A successful European mobility industry twenty years from now will look less like a collection of national car factories and more like a coordinated operating system. Its public core will be a clockwork-like rail network. Around each hub, affordable autonomous services will handle the irregular first and last kilometres that fixed routes serve badly.

Picture a typical journey: a short walk to a summoned vehicle, a train between regions and another vehicle waiting at the destination. A traveller from the countryside stays in the autonomous vehicle until the city edge and transfers to rail. For a weekend, a family calls a suitable vehicle and keeps it for the whole trip. One account and one reliable service promise join modes that now feel like separate systems.

Employment would move towards keeping that system dependable and improving the customer experience. Fleet charging, cleaning, maintenance, refurbishment, software support, station operations and assistance for travellers would become central activities. Exports would extend beyond vehicles and components to complete operating models: the integration of rail, energy, fleets, insurance, payment and public rules.

This is a demanding form of systems integration, and it suits Europe's diversity. A service that works across different cities, rural regions and national systems must adapt without fragmenting into incompatible islands. Trusted regulation can be part of the product if it establishes clear responsibility, data protection and access while still allowing the service to improve.

Choose a direction and learn by doing

Industry and policymakers cannot know which ownership model will dominate, but they can stop pretending that postponement is a strategy. The first decision is to continue the transition towards battery-electric propulsion. Its advantages extend beyond carbon emissions: a simpler drivetrain, connection to the electricity system, new packaging choices and compatibility with automated fleet operation. Maintaining parallel propulsion

systems for longer diverts capital from the products, charging and services Europe needs to learn how to build.

The second decision is to prepare for fewer privately owned vehicles, lower vehicle prices and more value in operation. That means building charging where it will support both households and fleets, strengthening rail as the high-capacity backbone and allowing land use to adapt gradually. It does not mean assuming that parking demand will disappear on a particular date.

The third is to allow more experimentation with autonomous services. Regulation must protect passengers and other road users, but it should compare automated systems with the actual risk of human driving, not with an imaginary world of zero accidents. Carefully bounded trials can reveal how the technology behaves, how passengers use it and which operating rules are necessary. Refusing to learn is also a safety decision.

These choices cannot guarantee European leadership. They create the conditions in which capability can migrate towards the next value chain. The strategic objective is Europe's ability to create value from mobility and to give ordinary people dependable access to it.

Relaxing a target in Brussels does nothing to slow a Chinese battery plant, supplier or vehicle programme. It changes the pressure felt inside Europe, and pressure can be badly designed. Yet removing pressure without replacing it with a credible industrial direction simply gives competitors more time. Europe should argue about how to make the transition cheaper and fairer, then move.

Conclusion: Save Mobility, Not the Car

Return to Reutlingen

Return to the landscape around Reutlingen and to the moped. For a young person, that small machine represented far more than its engine, frame and wheels. It made the surrounding world reachable without a parent, a timetable or a request for permission. It was a way to roam, to discover a place, to meet people and sometimes to do precisely what had not been prescribed.

The pioneers of mechanised transport did not know which machine or business model would win. They saw practical problems and tried different solutions. That uncertainty created room for the work of pragmatic implementers as well as visionaries. The automobile eventually won spectacularly because it combined speed, range, flexibility and individual control in a form that could be produced for millions.

Germany became one of the automobile's greatest masters. Its companies learned to engineer performance, quality and identity into an extraordinarily complex product. That

mastery created prosperity and pride. It also made the existing answer difficult to question. When an organisation has spent a century learning how to perfect a product, almost every new problem looks like a reason to add another feature to that product.

China has reopened the product question by showing that the electric vehicle can be designed, produced and experienced differently. Autonomy will reopen the larger mobility question by separating the ability to travel from the need to drive or permanently own the machine. The winning form remains uncertain, but the present European car should no longer be treated as final.

What is the moped of the future?

The important question reaches beyond replacing the combustion engine. What will give the next generation the feeling that the moped once gave: movement at will, exploration beyond the familiar and a private space in which adulthood can begin? A mature car industry will struggle to provide that freedom by making the same product faster, safer and more expensive.

No single answer is required. It can be a small electric vehicle, an autonomous service, temporary possession of a family vehicle, or a combination that has no settled name. It must offer more than transport efficiency. It must leave room for agency, privacy and the unplanned journey. A system that schedules, monitors and optimises every movement for someone else's purpose will lose an important part of freedom.

At the same time, freedom cannot mean that every household must carry the cost of several underused machines. A better system can make a suitable vehicle available quickly, allow the user to keep it while it is needed and connect it to public transport for journeys where rail is superior. The real achievement would be to remove compulsory ownership as the price of participation while keeping the car available when it is useful.

Preserve the achievement

The automobile's great achievement was mass individual mobility. It allowed ordinary people to choose where to live, work, meet and explore. We should preserve and extend that achievement without insisting on every feature of the machine that delivered it in the twentieth century.

That requires openness to the possibility that the internal-combustion engine is becoming a thing of the past. It also requires openness to a smaller market for privately owned cars. Neither possibility is an argument for passivity. They are reasons to move engineering, capital and policy towards the parts of the future system where Europe can still create distinctive value.

Europe has survived technological transitions before: mechanised production, steam power, railways, and the decline of coal and mass steel employment. The transitions imposed real personal hardship, and their benefits were not shared automatically. Yet

Europe as a whole became more prosperous when it adopted more productive systems and built institutions around them.

Change worked better when it was recognised early enough to shape. It worked worse when accumulated entitlements were allowed to substitute for an argument about the future. Protecting people through a transition is essential. Protecting every inherited activity from transition is impossible, and delaying the distinction makes the eventual cost larger.

Save mobility, not the car

Industry leaders should ask which capabilities remain valuable when fewer cars are sold. Policymakers should build the rail, energy and digital backbone that several possible futures can use. Regulators should permit trials that produce evidence and judge safety against the real alternative. Companies should receive help to convert before weak demand makes the old model untenable.

Readers do not need to accept one forecast. They need only separate the freedom of mobility from the current design of the car. Seen this way, electrification, Chinese competition and autonomy become parts of a larger choice about how freedom of movement will be produced. Their significance reaches beyond engine tradition, brand rivalry or another feature on the vehicle.

Some people will still own cars, often with more passion than before. Others will buy access to a dependable system. Success means that more people can move where they need and want to go, with less cost and constraint than today.

Mastery can become an expectation of continuity. Europe has changed before and can change again. The next moped is still waiting to be recognised. We will find it by moving early, learning in public and treating change as material to work with. Europe should ride the wave instead of waiting behind the walls for it to pass.

Research Notes and Sources

Figures and policy references were checked on 11 September 2026. These sources support the factual examples. The interpretation and firsthand accounts remain the author's.

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