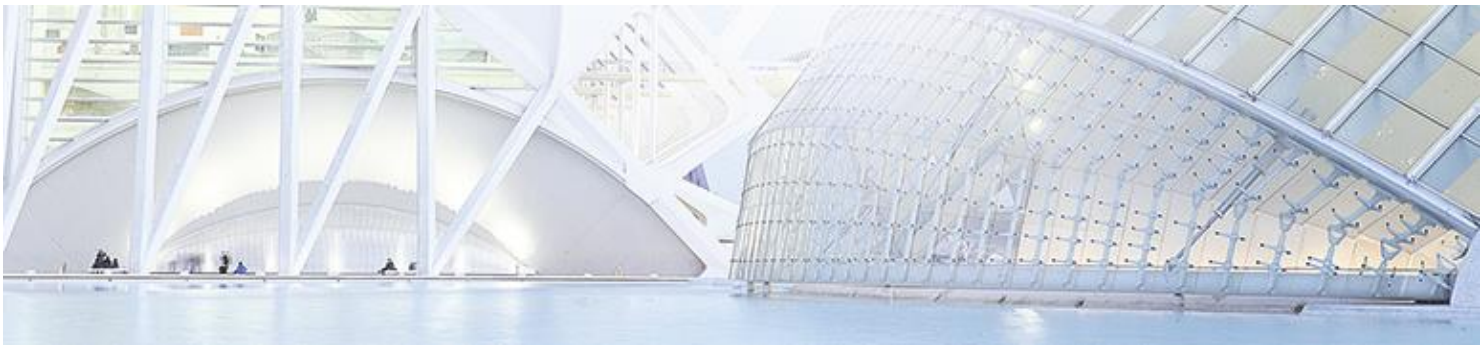

Julius Bär

NEXT GENERATION

FUTURE MOBILITY
EVOLUTION OR REVOLUTION

- Today's mobility is a dead end as congestion and pollution become ever more pressing issues. Electric cars and autonomous driving are two key technologies that are set to profoundly impact the mobility future, alongside the rising Asian middle class and urbanisation.
- The future mobility could follow an evolutionary scenario characterised by Asian growth, fuel efficiency and connected cars. Or the scenario could be revolutionary as today's trends develop disruptive strength and turn the vision of on-demand, self-driving cars into reality. This vision heralds the age of electric mobility, peaking car sales and peaking oil demand by 2035.
- The future will bring significant change to the auto business, with few winners and many potential losers. The implications are positive for car technology suppliers but bear challenges for auto makers. The lithium future looks bright but the hype needs a sanity check.
- Thematic investing is tactical investing. Global car sales are close to a cyclical top and near-term slowdown threats overshadow the long-term structural opportunities. Delphi and Infineon are among our top picks today.

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ENERGY TRANSITION
World energy markets and related industries are undergoing profound structural change. The dependence on fossil fuels, the past decades' high prices, climate change and environmental pollution are only some of many challenges which spurred investments and nourished innovation. We believe that we are in the midst of a transition where new technologies satisfy our growing energy needs without further depleting fossil resources.

Introduction: Mobility, the economy's artery system

Mobility is essential in today's world. Imagine how less exciting life would be if we were not able to simply catch the train to meet friends for dinner or hop into the car to spend some time outdoors over the weekend. Imagine how constricting life would be if excessive commuting limited our work options, not to mention our income, or if supermarkets didn't offer the variety of fresh food we got used to. Mobility is a key determinant of economic growth. It is one of the artery systems of our society, creating wealth and adding to the quality of life by providing people access to goods and services, jobs and markets, family and friends.

The World Bank's statistics prove that mobility measured in terms of road and rail infrastructure is a key economic variable resonating with a country's wealth and development. China was only able to become an economic powerhouse and lift millions of people out of poverty into the middle class by investing heavily and decisively into transport infrastructure. Smoothly operating ports are a prerequisite for exports, a tightly knitted highway and rail system fluidises domestic trade, and reliable urban connectivity supports business exchange and thus investments. Put differently, alongside governance risks the lack of infrastructure too often is the main reason depriving poor countries from sustainably exploiting their full economic potential.

Congestion and pollution raise stroke risks

However, today's mobility is a dead end. Congestion, pollution and dire public finances are becoming ever more pressing issues. Growing traffic volumes are choking roads and highways, increasing congestion costs by the year. Many of us probably can confirm from personal experience that the issue is an everyday phenomenon across the world's urban metropolitan areas. Blunt calculations make

the economic effects of traffic jams tangible. The United States lost an estimated USD 160 billion in 2015 due to congestion, according to the Texas Transportation Institute, or USD 960 per commuter. For Germany, similar studies conclude that congestion burdened German households by USD 1,900 in 2013, or almost half the amount spent on mobility itself per year. At a glance, infrastructure expansions would be the obvious solution. However, dire public finances and the fact that most cities today lack the space to easily accommodate more roads and rails restrain the option to invest ourselves out of the congestion issue.

Pollution is a similarly pressing and similarly difficult to grasp issue. A growing body of scientific studies delivers mounting evidence of urban air pollution's detrimental effects on public health. Filthy air accounts for more than 3 million premature deaths per year globally. Although we have become accustomed to pictures showing Beijing's or Shanghai's skyline dissolving in haze, urban air pollution is not solely an Asian or developing-world problem. In Germany, air pollution causes an estimated 3,000 deaths annually, twice as many as traffic accidents. In the western world diesel engines are the main culprit and the diesel scandal unleashed by Volkswagen's manipulations made the broader public aware of the fact that real-world emissions widely exceed official limits. Scientists warn that even the lately introduced stricter emission standards are too lax to sufficiently curb negative health impacts.

Talk urban mobility, think global economy

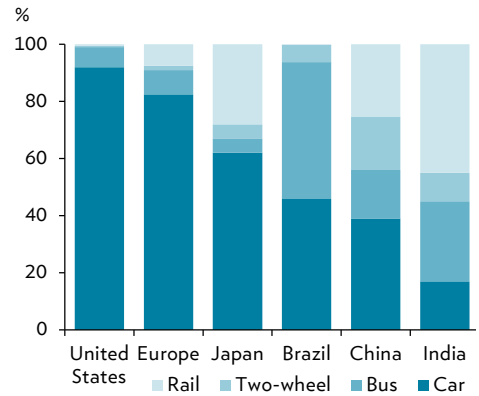
The world's metropolitan regions are the engine of the global economy. While more than half of the world's population lives in cities, they account for 80% of global economic output. Cities are more productive and accumulate more wealth. Urbanisation is a megatrend set to continue. By 2050 the United Nations estimates the number of people living in the world's urban areas is expected to grow by 70 percent, from 3.7 billion to 6.2 billion. This growth makes the issues of congestion and pollution even more daunting. Sustainable global economic growth requires alternatives to today's mobility, solutions that maintain the flow of people and goods without passing burdensome healthcare liabilities on future generations. On the following pages, we will have a look at mobility's status quo, bring to the fore today's trends and assess chances and consequences of possible market and business disruption.

The west drives, the east rides.

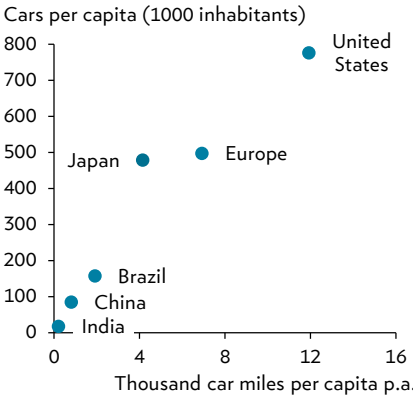
Status quo: Car dominance and China's growth

Cars dominate our mobility. How we commute, if we drive a car, use public transport or ride a bike varies within cities, countries and continents. But a look at the statistics reveals that we primarily rely on cars and roads. This dependence is strongest in North America, where cars represent more than 90% of passenger mileage. The great economic expansion during the last century went hand-in-hand with the rise of cars and private mobility and in consequence highways took centre stage of the city planning. Europe shows a slightly higher share of public transport but cars nevertheless represent more than 80% of passenger mileage. The historically grown dense city centres bode well for subway and rail infrastructure but the past decades' trends to reside outside but work inside a city supported car usage. Asia reveals much different mobility habits compared to the western world. Trains, buses and bikes account for the majority of commutes. That said, Chinese growth was the past decade's main narrative of the automotive industry. The rising middle class has brought a deep pool of first-time buyers and this trend is set to dominate car markets into the foreseeable future.

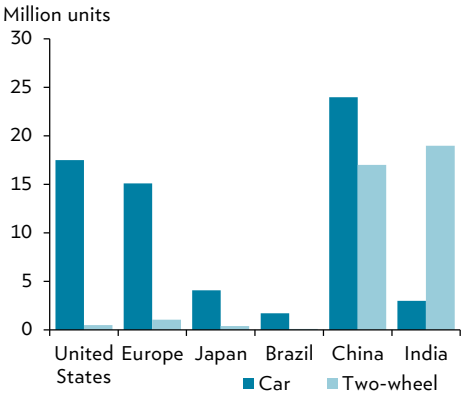
Passenger miles by mode (2012)



Car ownership and use (2015)



Car and motorcycle sales (2016)



Source: US Energy Information Administration, Organisation Internationale des Constructeurs d'Automobiles, China Association of Automobile Manufacturers, Society of Indian Automobile Manufacturers, Julius Baer

Trends: The rising Asian middle class buys cars

Wealth, population and urbanisation are the determining factors of car ownership. China and Asia more broadly are set to remain the growth hot spot for the automotive industry on the back of rising incomes and a rising population. Especially for German manufacturers China has been a key source for profits in recent years, where they were able to successfully defend market share against domestic competitors thanks to their positioning in the high-quality and luxury segment. 'Cars per capita' is the common statistic to assess the future growth potential. However, to assume China will eventually reach comparable ownership levels to the western world is a too simplistic view. The densely populated Asian megacities set limits to car ownership as using cars usually is the more expensive and less convenient option to get around. The megacities are the economic hubs, continuing to expand, and this ongoing urbanisation slows the car market growth path set by rising incomes and population growth. Meanwhile, China's demographics are slowly turning; the working population in fact has already peaked. India is unlikely to follow China's path of economic development on the fast lane and become the next growth hot spot for the automotive industry. Indian cities are already choking from traffic today and an infrastructure stimulus that would alter mobility habits remains unfeasible into the foreseeable future for social, financial and political constraints.

Asia is unlikely to follow
the western world's mobility footsteps.

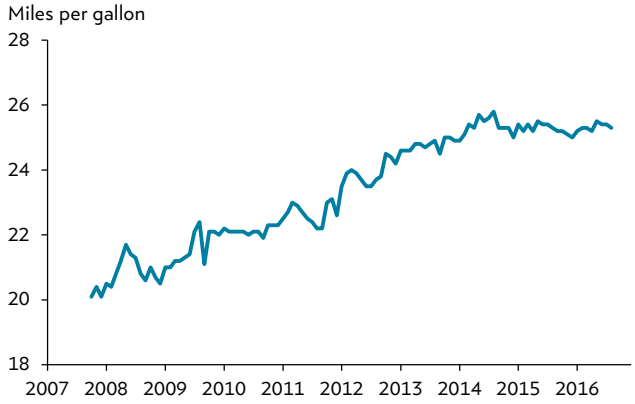
The Asian bike phenomenon

Less noticed from a western world perspective, motorcycles account for a substantial segment of the broader transportation vehicle market in Asia. It was not until 2014 that the number of cars sold in China surpassed the number of motorcycles sold for the first time. While sales are in decline in China, motorcycles remain the hot market in India and most other parts of Southeast Asia. Indian annual car sales of roughly 3 million units are dwarfed by two-wheeler sales of roughly 19 million units. Notoriously congested traffic, cheap purchasing prices and low maintenance costs are the compelling arguments for consumers to prefer bikes over cars. Electric scooters and electric bikes have stepped on the scene particularly in Asia but the trend remains elusive and its impact difficult to quantify. The historically grown, tight residential structures and the many stumble blocks apparent in emerging markets complicating the roll-out of large road infrastructure investments suggest that bikes will remain the vehicle of choice across large parts of Asia, limiting the structural global growth potential for cars.

Trends: Downsizing and hybridisation

Another significant change in recent years happened under the car's hood. To tackle climate change and curb greenhouse gas emissions, governments introduced or toughened fuel efficiency regulations. Transport accounts for about 14% of global greenhouse gas emissions. Within the European Union, the average new car sold must comply with a CO_2 emission target of 95g per kilometre by the end of 2020 down from 130 last year. This translates into a cut of gasoline consumption from 5.6 today to around 4.1 litres per 100 kilometres by 2020. Both the United States and China have a comparable fuel efficiency regulation and its impact is well-visible today. But there is no regulation without loopholes. Preferential accounting allowances for electric vehicles and other low-emission cars mean that the effective fuel consumption of cars put on the road will exceed the mandated rules into the foreseeable future. Also the economic recovery and the consumers' preference for bigger cars over smaller cars caused a temporary slowdown in the fuel economy trends.

US fuel economy of sold new vehicles



Source: University of Michigan Transportation Research Institute

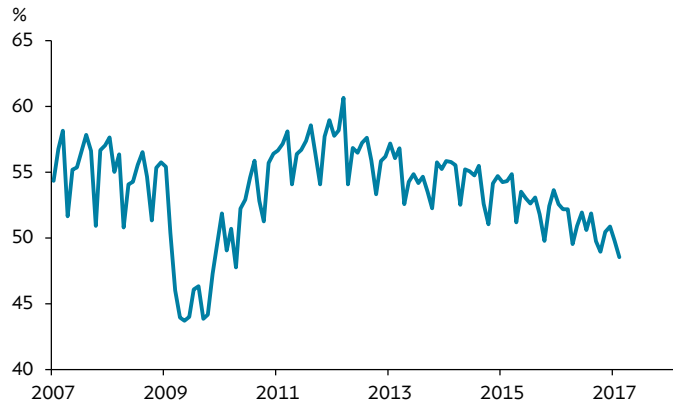
Engine technology has evolved considerably over the past decade, introducing new acronyms. Combustion engines have become smaller and more powerful by adding technologies such as turbo-charging and direct fuel injection. This so-called 'downsizing' improves the engine's thermal efficiencies and cuts fuel consumption. However, combustion engines remain far inferior in terms of energy efficiency compared to electric engines. Car manufacturers are combining combustion and electric engines, the so-called 'hybrids', to reap the benefits of both worlds: the long mileage and convenient refuelling of fossil fuels, and the low emissions and high performance of electric engines. Plug-in hybrids represent the most complex combination. These cars have all of the latest features: downsized combustion engines, sophisticated gearboxes and a complete electric drivetrain including batteries, that enables short-range all-electric driving. Unsurprisingly, plug-in hybrids

are mostly premium cars. Additionally, car manufacturers shed weight by substituting steel with lighter alloys, aluminium or alternative composites. Less weight means smaller engines and lower fuel use.

City emission policies increasingly set the auto business technology roadmap.

Downsized engines and hybrids are the outcome of government intervention and emission regulation. Although fuel efficiency pays off it is mostly not the key criterion when purchasing a car as consumers tend to underestimate the future fuel cost savings. The regulatory risks are small and today's emission rules are likely to be tightened rather than scaled back. The new government threatened to undo fuel economy standards in the United States, but congress and state legislation such as California's strict rulings limits its influence. Some cities have introduced emission regulation on their own and decisions like Paris' future ban on diesel influences the car manufacturers' technology road map. Penetration rates today are in the low double digits but it is estimated that most cars sold over the coming decade will at least feature a simple application of hybrid technology.

Europe: Diesel share of total car sales (Top 5 markets)



Source: Bloomberg Finance L.P., Julius Baer

Electric cars: Powering up, from behind

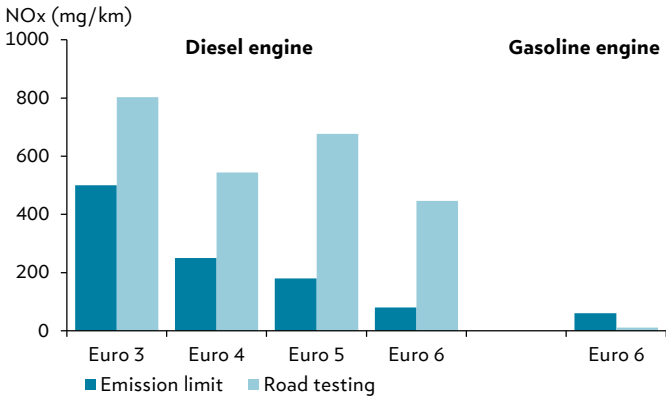
Although catching lots of headlines, plug-in vehicles remain a niche. Plug-in is the term increasingly used to describe any car that primarily uses a battery for driving and includes both purely electric and plug-in hybrid technology. According to EV Volumes worldwide plug-in sales grew by 50% in 2016, 10 times faster than the overall market, but plug-ins still only capture a market share of below 1%. The past year's low fuel prices make these growth figures even more noteworthy. Of course there are special cases. In Norway almost 30% of car sales are plug-ins, thanks to a wide range of support measures including subsidies and

Emission scandal: Diesel's demise?

Diesel cars are largely a European phenomenon. While sales in North America are insignificant and only niche in Asia, roughly every second car sold in Europe sips diesel. Governments have long supported diesel's rise, not least as the technology gave European manufacturers a head start in the domestic market. Compared to gasoline, diesel is subject to lower fuel taxes and less stringent emission regulation in Europe. US emission standards are equally strict for both fuels. The emission scandal puts pressure on the technology. Awareness of air pollution issues increases and diesel as one of its main culprits moves in focus. The scandal unveils the many loopholes in today's emission testing regulation. There is a large gap between test lab and real life emissions, with the latter exceeding the former by a multitude for most cars. For diesel cars, fuel efficiency and clean emissions are substitutes and to have both many manufactures tested the legal limits.

The public debate puts pressure on governments and emission regulation has come under scrutiny. The shift to on-road emission testing will require more advanced and costly treatment systems. In consequence, diesel engines are becoming less competitive in the compact and medium segment and are set to lose market share to gasoline and hybrid technology. Meanwhile, ever more cities introduce temporary bans on diesel vehicles when air pollution exceeds its limits. These measures i.e. driving restrictions weigh on a diesel car's resale value. Consumers seemingly increasingly consider the risks of such future limitations given the latest market share losses of diesel cars in Europe. We believe that this trend will continue.

Euro emission limits and road test results (NOx)



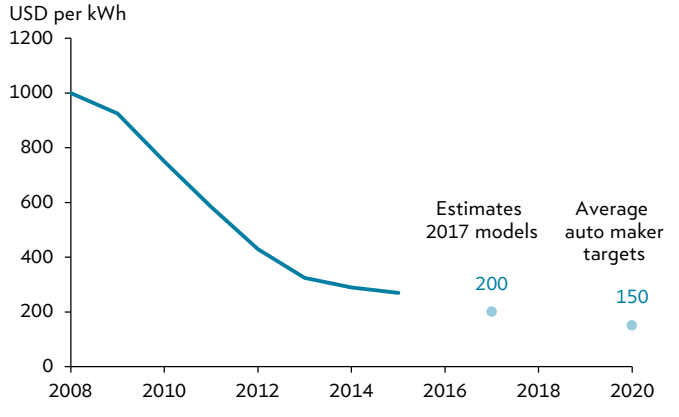
Source: Verkehrs-Club der Schweiz

preferential access to parking and driving lanes. China sells every second plug-in car globally. Subsidies for the so-called 'new energy vehicles' drive demand and plug-ins recently passed the 2% market share mark. China is also the case study for the competitive pressures electric mobility entails due to its low entry barriers. Domestic brands dominate the Chinese plug-in market and foreign companies only serve niches.

Electric mobility gained momentum in 2016.

In 2016 there was a noteworthy pick up in momentum of electric cars. Battery technology evolves faster than expected and auto makers introduce ever more electric cars to their line-up. Leading German car manufacturers recently pledged that 15-25% of their fleet sales will be electric by 2025. The momentum is mirrored in the increasing consensus predictions of future market shares, the rising popularity of the formula-e race series, or a Japanese auto maker's announcement to start developing a platform for battery-driven electric cars and no longer only focus on fuel cell vehicles. Meanwhile, plug-in subsidies in Germany so far failed to impact sales. The coming introduction of mass market cars with more convenient driving range per charge at acceptable prices should propel sales in 2017. Despite the momentum, electric cars continue to face consumer doubts about driving range, everyday convenience and costs. Electric cars serve the niche of homeowners, or at least private parking owners, with regular urban commutes. Despite the high up-front prices, electric cars offer already today competitive mileage costs to frequent drivers thanks to lower fuel and maintenance expenses. Consumers think in purchase prices and not total mileage costs, which disadvantages electric cars.

Battery cost evolution (plug-in hybrids and electric cars)



Source: International Energy Agency, Julius Baer

Battery technology is advancing fast and the price premium to conventional cars melts. Manufacturers have been able to increase driving ranges of their existing models by around 50% as of late. Smarter packaging and not changes to the chemistry have enabled these significant improvements. Most importantly, there is great visibility on further packaging and manufacturing improvements over the coming years. New breakthroughs in battery chemistry are not necessary to bring electric vehicles to the mass market but of course would further increase their competitiveness longer-term. Improving battery technology should erode today's doubts, increase driving range and lower costs. Electric cars are quiet, clean and fast, which should add to increasing consumer popularity going forward. Charging infrastructure concerns are overstated. The data collected suppliers so far shows that electric cars are almost exclusively charged at home or at work. Electric "fuel stations" ease range concerns but are sparsely used. The electric car's addressable market niche should expand beyond homeowners going forward. Asia's urbanisation and shorter commutes in comparison to Europe or North America could translate to faster adoption of electric cars.

Fuel cells: A hydrogen future?

Fuel cell technology has been expected to gain broader adoption for long, especially in the car market. But the expectations are unfulfilled and the hydrogen economy remains a distant vision. Hydrogen fuel cell vehicles offer driving ranges and re-fuelling convenience comparable to (internal) combustion cars and thus are the competing green technology to battery electric vehicles. The vision includes hydrogen production using clean energy.

However, battery technology progress erodes the fuel cell driving range advantage. Expensive fuel cells and the chicken-and-egg issue of building out a costly hydrogen fuel station infrastructure are additional unsolved challenges. The hydrogen economy's green credentials are questionable. The production of hydrogen and its "combustion" in fuel cell entails energy losses exceeding 50%. Leaving clean energy in the grid is the more sustainable solution. Fuel cell cars have challenging economics and questionable sustainability, which suggest they are unlikely to see broad market adoption anytime soon.

Trends: Autonomous driving and connectivity

There is a strong trend towards more technology and software content in cars. Techies are displacing engineers. Estimates suggest that 20% of cars today are connected to mobile networks, and the penetration should rise to a full 100% over the coming decade. Connectivity enables several services such as remote diagnostics or roadside assistance, services drivers are willing to pay for. Connectivity also allows car companies to establish a closer relationship with the drivers and sell customised entertainment content going forward. Importantly, the trend towards more tech content builds on consumer demand and not regulatory needs.

"You'll see self-driving cars by 2020" says Silicon Valley. "Still 15-20 years away" says science.

The question is when rather than if cars will drive autonomously. Unsurprisingly, Silicon Valley exponents are most optimistic and see the vision turning reality by the end of the decade. Scientists and researchers tend to be more cautious and see self-driving cars 15 to 20 years away. The industry differentiates five classifications of autonomous driving. Today most cars sold include various features of advanced driving assistance systems such as cruise control, emergency braking or lane departure warning, commonly referred to as level 2. The latest premium cars have reached level 3 characterised by the car's ability to autonomously drive under certain circumstances, relying on cameras and sensors screening the environment. The driver is still expected to be alert and take over control anytime. Broad adoption of these autopilot functions across the premium segment is expected by 2020. Level 4, autonomous driving under defined conditions, and level 5, autonomous driving under all conditions is expected by 2025 and beyond. A leading supplier recently stated that the equipment and sensors are developed, and that going forward it is the software that needs to learn to enable a broad adoption. Tech giants have been logging miles for long with their self-driving vehicles.

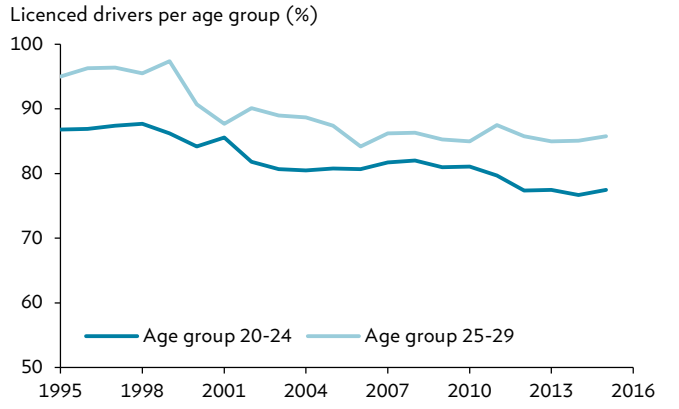
Self-driving cars could have a significant impact. Experts estimate that 90% of accidents are due to human faults. Self-driving cars should reduce traffic accidents and associated costs to society. Autonomous driving technology, combined with electric cars, could revolutionise the taxi business and introduce a new era of mobility services. Last but not least self-driving cars could provide easier access to mobility for people who find it too challenging today to use cars and thus yield social benefits. High consumer popularity and promising business opportunities lend strong support to the vision becoming reality.

Trends: The sharing economy

The sharing economy has gained a foothold especially among the young and urban. Thanks to digitalisation and the convenience of smart phones platforms have spread out on the internet to exchange goods and services. For some needs, sharing has become a more convenient and cheaper option than owning. Switzerland's Mobility (not listed) was the car sharing pioneer, and over the past years similar services have grown across the globe. Worldwide there have been an estimated 6 billion subscribers to car sharing services last year according to the Boston Consulting Group consultancy, mostly in Europe and North America, creating USD 0.7 billion of sales.

Ride hailing services such as Uber (not listed) have disrupted the taxi business. These services have become omnipresent in cities but reliable data on market size is sparse. According to the McKinsey consultancy, about 170 million people use ride-hailing services in China alone and the market leader Didi (not listed) hosts about 20 million rides a day. The trends are similar: in North American, European and Asian cities young people turn away from car ownership because ride-hailing services offer a cheaper and more convenient alternative. The lack of parking, congestion or simply the hassle and cost to obtain licence plates in Chinese cities are the obvious reasons. Unlike social networks, ride-hailing services will see different companies succeed alongside each other. The business is driven by regional rather than global scale but the low entry barriers suggest ongoing fierce competition for market share. The sharing economy is a shift in consumer attitude and facilitates structural change. The trend from owning to using is deeply rooted in the young generation, which comes of age and should drive the economic shift from products to services longer-term.

Share of US licensed drivers among their age group



Source: US Federal Highway Administration, Julius Baer

2030 Scenarios: Evolution ...

These trends outlined before are set to shape the future of mobility into the foreseeable future. To assess the impact on market growth and understand the related business risks and opportunities, we took the following assumptions on the key determinants, alongside population growth:

- **Plateauing western world car ownership.** Urbanisation, the ageing society and the younger generation's preference to use rather than own should weigh on car ownership rates and lengthen the average fleet age.
- **Growing developing world car ownership.** Rising incomes translate into rising car ownership rates but dense city structures and urbanisation suggest that developed markets are unlikely to ever catch up to western world levels. The case in point is China.
- **Rising plug-in market share.** The momentum of electric mobility has grown past the tipping point. Declining costs and the manufacturers' product offensive should translate into rising market shares for plug-ins.

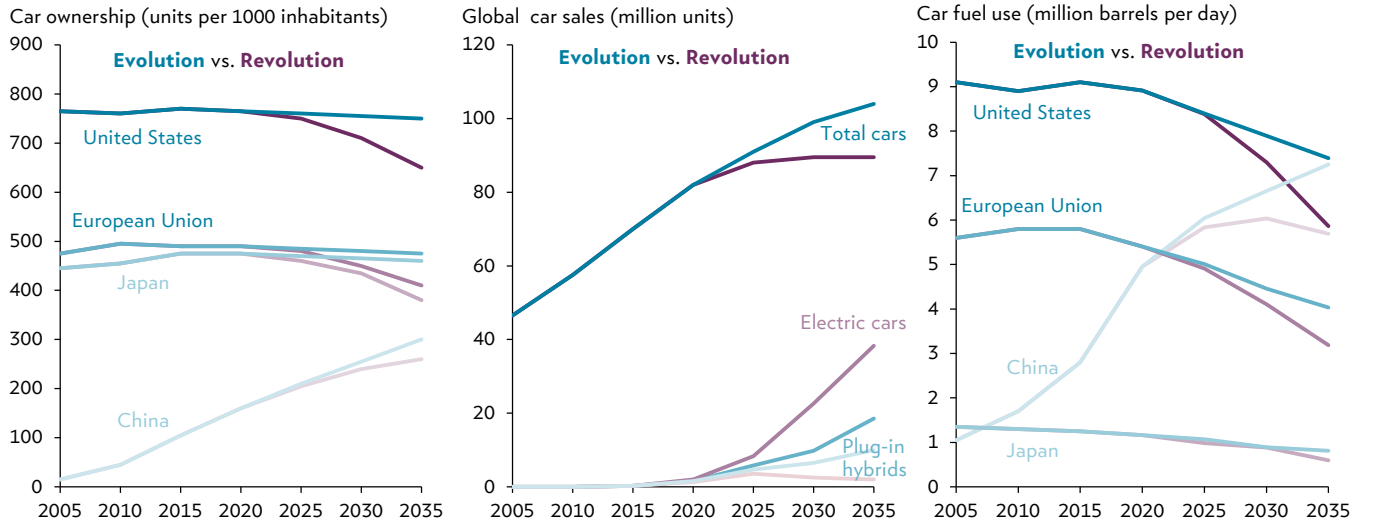
Based on these assumptions car sales continue to expand into the foreseeable future, but at slower growth rates. Western world markets are saturated and growth leadership among emerging markets changes. China car sales plateau over the coming years, while other emerging markets such as India or Indonesia do not provide a similar growth boost. The rising market share of plug-ins and increased use of hybrid technology lowers the fleet average fuel use. In sum, this scenario for 2030 and beyond is evolutionary and brings changes to relative regional market sizes and to technology content of the cars. The main wild cards are if consumers embrace electric mobility and if governments soften fuel efficiency regulation.

... or Revolution

However, electric mobility, autonomous driving and the younger generations' preference for using rather than owning are trends that could together augment their impact and develop a market disruptive force. Urban areas are set to become the nucleus of the future of mobility. There has hardly ever been a vision as clear and uncontested as the coming era of shared, self-driving cars. The inconveniences and high cost of owning a car, the relatively short driving distances and comparably easier mapping make cities the breeding ground of this vision. Autonomous driving and electric cars are technologies that should develop in sync. On-demand mobility will build on fleets of electric cars because they are cheap to maintain and conveniently recharged automatically. The vision of on-demand mobility could develop a strong momentum of its own which would translate into lower car ownership rates, lengthened average fleet age and an even faster pick up of electric mobility as the scale and learning effect lowers technology costs. The consequences of such a revolutionary scenario would be significant and lead to the debate about peak car and peak oil:

- **Peak car.** Global car sales peak around 2030 as car ownership drops and mobility becomes a service.
- **The age of electric mobility.** Electric cars take over and a broader electric mobility ecosystem develops. On-demand mobility breeds a new era of logistics, based on autonomous electric delivery vehicles.
- **Peak oil.** The combustion engine is slowly displaced and global road fuel consumption drops. Peaking oil demand contributes to falling global carbon emissions and mitigates regional air pollution issues.

Future mobility scenarios



Source: Organisation Internationale des Constructeurs d'Automobiles, World Bank, United Nations, Julius Baer (Plug in: plug-in hybrid and electric cars, Shading of colours refers to evolution and revolution scenarios, depicts different regions and types of cars)

Besides the direct impact on mobility the revolutionary scenario would entail additional, indirect consequences. Mobility costs would drop freeing up large parts of the household budget for other expenses. Shared, self-driving cars are estimated to cost around 20 US cents per kilometre*, which compares to an estimated 50-60 US cents for owned conventional cars today. Mobility-related healthcare costs decline as traffic becomes safer and cars environmentally cleaner. Living standards in cities increase as air and noise pollution lessens and obsolete parking frees up space for development. Parking accounts for an estimated 20% of space in cities. On-demand electric mobility could accelerate urbanisation trends. Public transport faces competitive pressure by self-driving taxis which are less expensive and more convenient, and its providers either focus on rail or embrace the vision themselves. Last but not least, government tax revenues on transport fuels collapse and mobility pricing schemes are introduced to cover infrastructure funding.

* Average estimates by McKinsey, KPMG and others.

Fuel tax revenues could collapse.

The main wild cards are technological promises, consumer acceptance and regulatory guidelines. The momentum within both electric mobility and autonomous driving was strong in 2016, with many companies embracing these technologies, which shifted the odds marginally in favour of a revolutionary scenario. Moreover, history shows that trends are hardly ever constant. Although in a somewhat distant future, investors should eye the significant implications for the auto and related businesses.

The winners and losers

Today's car market provides a living for various industries and thousands of companies. The scenarios outlined before trigger large shifts of value pools across the broader auto business. Taking a closer look inside a car and distinguishing the key components, helps to separate and quantify the individual value pools. Owning a car entails various "operating" costs including fuels, insurances, taxes and other items such as maintenance and repair expenses. These "operating" costs represent roughly half of a car's mobility costs, alongside the "fixed" costs i.e. depreciating the purchase price. These "operating" costs reveal that the future mobility impact goes far beyond the auto makers and bears positive or negative implications for a wide range of businesses within the car's entire ecosystem.

- **Auto suppliers: engine technology.** *(●●● high impact, positive implications)* To comply with tightening fuel efficiency regulation engine technology becomes more complex and costlier. Auto makers purchase many components such as hybrid and exhaust gas systems from auto suppliers. This value pool is set to expand into the foreseeable future and would reach maximum extent in an evolutionary rather than revolutionary future mobility scenario.
- **Auto suppliers: electronics.** *(●●● high impact, positive implications)* Autonomous driving, electric powertrains and in-car entertainment requires more electronics such as semiconductors. Electronics content multiplies with electric cars. The auto business has become a key revenue source for the technology sector. Tech content is the most promising growth niche for both scenarios.
- **Materials: batteries.** *(● low impact, positive implications)* Electric mobility needs batteries which fuels demand for functional metals such as lithium or cobalt.

Future mobility scenarios and implications for the auto business

	Today **Status quo**	2015-2020 **Trends**	2020-2035 **Evolution scenario**	2020-2035 **Revolution scenario**
Auto makers				
Growth (market size)	5% p.a. (USD 1.8 trillion)	3-5% p.a. (USD 2.1 trillion)	<2% p.a. (USD 2.7 trillion)	<1% p.a. (USD 2.3 trillion)
Car sales p.a.	72 million	82 million (by 2020)	<105million (by 2035)	<90million (by 2035)
Auto suppliers				
Growth (market size)	7% p.a. (USD 450 billion)	>5% p.a. (USD 625 billion)	<5% p.a. (USD 800 billion)	<2.5% p.a. (USD 700 billion)
Content per car	USD 6400	USD 7500 (by 2020)	USD 7750 (by 2035)	USD 7750 (by 2035)
Electronics				
Growth (market size)	20% p.a. (USD 40 billion)	20% p.a. (USD 130 billion)	<10% p.a. (USD 190 billion)	<10% p.a. (USD 190 billion)
Content per car	USD 550	USD 1500 (by 2020)	USD 1750 (by 2035)	USD 2000 (by 2035)
Batteries				
Growth (market size)	40% p.a. (<USD 5 billion)	30% p.a. (USD 20 billion)	10% p.a. (USD 100 billion)	15% p.a. (USD 170 billion)
Plug-in sales* (Battery cost)	0.55 million (270 USD/kWh)	3.2 million (160 USD/kWh)	30 million (75 USD/kWh)	40 million (70 USD/kWh)
Mobility cost*				
Combustion cars	55 US cents /km	50 US cents /km	40 US cents /km	40 US cents /km
Electric cars	60 US cents / km	50 US cents / km	35 US cents / km	35 US cents / km
Self-driving taxis	-	-	-	20 US cents / km

Source: Julius Baer, Bernstein, Goldman, UBS, Citigroup, Exane (*Estimates represent global averages. Plug-in: plug-in hybrids and electric cars.)

Both markets would almost triple from today's size under the revolutionary scenario. That said, this growth outlook should not distract from the fact that functional metals overall remain a comparably small value pool of the future mobility business and are insignificant from a global mining perspective.

- **Utilities.** *(• low impact, modestly positive implications)* Electric cars consume electricity but the impact on utilities tends to be overestimated. Electric cars are energy efficient and a full charge is far cheaper than a full tank. The clean energy revolution remains a far bigger threat than electric cars represent an opportunity.
- **Auto makers.** *(••• high impact, modestly negative implications)* Car sales growth continues in the near term but plateauing global, peaking western world sales and the loss of content per car to auto suppliers bring headwinds longer-term. The future mobility holds more threats than opportunities for auto makers.
- **Auto retailers.** *(••• high impact, negative implications)* The revolutionary scenario likely bears nightmares for western world retailers, as car sales drop and electric cars need less maintenance. Today, car maintenance adds up to an estimated USD 1500 per year.
- **Energy.** *(•• medium impact, modestly negative implications)* Households spend an estimated USD 1250 per year on fuel per car. Road fuel use continues to grow in the near term but could plateau or peak after 2030 depending on the applied scenario. While the energy business is traditionally diversified into gas and petrochemical operations, which offsets these peak oil headwinds, there is no shelter for western world refiners.
- **Insurance.** *(•• medium impact, modestly negative implications)* Autonomous driving is proven to reduce crash rates, which should shrink the value pool of car insurance premiums in the longer term. Insurance coverage costs an estimated USD 1000 per year per car.

There are fewer winners than losers. Taking into account that western world companies generally have more difficulties accessing emerging markets than their domestic competitors. Put differently, the low mileage costs related to the vision of self-driving taxis is a boon for consumers but entails a shrinking auto business. Structural change is deflationary, which is a main aspect of capitalism. On the following pages, we will have a closer look at the different value pools shifts and the related potential winners and losers. Besides the value pool expansion and shrinking on a macro level, there are additional important factors to consider on a micro level. Companies with financial flexibility to pursue investments, with differentiated products, without distracting legacy issues and with a forward looking and adaptive management are shown to capture market share from laggards in times of structural change.

Auto makers: Road kill risks

There are more threats than opportunities for the estimated 1.8 trillion global car manufacturing industry. Slowing market growth and increased competition in emerging markets suggest that the industry's cash flows will trail global growth over the coming decades. New technology and new services create business opportunities for new entrants, which raises competitive pressure. The structural trends largely bear negative consequences, especially within the revolutionary scenario. The shift towards on-demand mobility based on self-driving cars would shrink the industry's addressable market. Meanwhile, today's market cycle is well-advanced and global car sales look toppish in the near term. The economic improvement is fully reflected in today's western world sales levels while fading tax stimulus provides headwinds in China. The key competitive challenges for car manufacturers are:

- **Volume growth.** Market growth slows and emerging market competition increases. The low and medium car segment is most under pressure from Asian competition and the vision of self-driving cars, as consumers in these segments are cost and convenience focused. Electric vehicles lower the industry's entry barriers as the technology is in large parts available off the shelf. Premium cars could be less at risk from a shift from owning to using, i.e. on-demand mobility.
- **Technology content.** Electric drivetrain and autonomous driving technology means that suppliers take a growing share of the content value per car from the manufacturers, whose intellectual property remains centred on the combustion engine.
- **Battery ownership.** Batteries account for a significant value content of an electric car and manufacturers might decide to own rather than source this technology component. However, batteries are a competitive, low-margin business demanding lots of capital and different manufacturing competence.
- **Software strategy.** Connectivity brings new business opportunities for selling services to the drivers via the on-board software. A car's operating system will become a key differentiating factor of the future car. However, it remains to be seen if car manufacturers will be able to deliver the most user-friendly platform and outcompete the established software giants who are sensing a business opportunity themselves.
- **Mobility services.** Self-driving cars bear the opportunity to sell mobility services not only cars. However, owning a fleet of self-driving cars and charging consumers per ride is an entirely different business to manufacturing. New entrants such as Didi, Lyft or Uber (all not listed) dominate the ride-hailing space, out of which on-demand electric mobility is most likely to emerge.

We believe the combination of the following factors determines a promising competitive positioning and helps to distinguish potential winners from potential losers. The foothold in hybrid technology and electric mobility is essential to understanding and capitalising today's technology trends. A solid financial situation based on a profitable "legacy" business provides the ability and flexibility to pursue investments. High investment needs might be the single-largest challenge for the incumbent auto makers. That said, both integration and sourcing can be successful business strategies. Last but not least, the change of business models requires fresh management minds without distraction from "legacy" business issues. The risks are high that some companies will become road kill as they miss to adjust to market trends, overinvest in the highly competitive technology segment, namely batteries, or overestimate their software capabilities. Future business books might well list a car manufacturer example alongside the well-known solar and mobile phone case studies on company failures.

The early movers are BYD and Tesla, both with a strong focus on electric mobility. Tesla's growth ambitions come with high external capital needs, which make the company particularly vulnerable to any supply or demand-side hiccup. Moreover, the company's focus shifts to an integrated energy company with the recent Solarcity take over and the investments in solar module manufacturing. BYD is a vertically integrated auto maker with significant in-house battery competence and manufacturing scale. The fast followers include the German manufacturers BMW, Daimler and Volkswagen, which generally seem well-positioned thanks to their growing electric mobility competence, solid financial situation, technology partnerships, such as the map provider Here (not listed), and their foothold in the car-sharing and ride-hailing business. To which extent the German car brands suffer from a loss of differentiation in terms of engine technology remains to be seen. Tesla proves that electric car technology can be a value-adding differentiator. We also see General Motors and the Renault-Nissan alliance as fast followers, but both are vulnerable to the vision of self-driving cars given their focus on the non-premium segments. We believe Toyota has largely lost the hybrid technology first-mover advantage, underestimated the advance of battery technology and lack of the autonomous driving competence. That said, the company's recent announcements suggest a strategy shift towards electric mobility and autonomous driving. The Chinese car manufacturers generally have a more positive cash flow outlook compared to their western world peers given the tailwinds from domestic car ownership growth.

Technology ownership and investment needs are the auto makers' great challenges.

Auto makers business positioning

Company	Technology competence*	Financial strength*	Execution & governance*	"Legacy" risks*	Structural exposure* (impact/implications)	Rating (Equity /Issuer)
First movers						
BYD	high	medium	high	low	●●●	Hold / n.c.
Tesla	high	low	medium	low	●●●	Reduce / n.c.
Fast followers						
BMW	high	high	medium	medium	●●●	Hold / Buy
Daimler	medium	high	medium	medium	●●●	Buy / Buy
Geely Automobiles	medium	high	high	medium	●●●	Hold / n.c.
GM	medium	low	low	high	●●●	Hold / n.c.
Guangzhou Automobiles	medium	low	medium	medium	●●●	Hold / n.c.
Nissan	medium	low	low	high	●●●	n.c. / n.c.
Volkswagen	medium	medium	medium	high	●●●	Reduce / Hold
Toyota	high	high	medium	high	●●●	Hold / n.c.
Late movers						
Dongfeng Motor Group	low	low	medium	medium	●●●	Buy / n.c.
Fiat Chrysler	low	low	medium	high	●●●	Reduce / n.c.
Ford	low	low	medium	high	●●●	Hold / n.c.
Great Wall Motors	low	medium	low	high	●●●	Hold / n.c.
Honda	low	medium	low	high	●●●	Hold / n.c.
Peugeot	low	low	medium	high	●●●	Hold / Hold
Renault	low	low	medium	high	●●●	Buy / Hold
Tata Motors	low	low	medium	high	●●●	n.c. / Hold

Source: Julius Baer, (*Technology competence: Hybrid and plug-in sales and model pipeline, R&D expenses. Financial strength: profitability and balance sheet strength. Execution & governance: management execution track record and corporate governance. "Legacy" risks: Fuel efficiency and emission compliance, and non-premium car exposure. Structural exposure: low impact /negative implications (●) to high impact / positive implications (●●●)). Further information on ratings is provided in the respective equity and issuer coverage lists.

Auto suppliers: Tech takes over

Auto suppliers have flourished in the past decade's environment framed by outsourcing and technology growth. Their share of content per car continues to increase and the structural growth story remains firmly in place, estimated at between 5-15% p.a. depending on product and technology segment. That said the evolutionary and revolutionary scenarios paint a binary outcome. Fuel efficiency mandates and the advances of hybrid technology are the sweet spot for the traditional auto suppliers and bear great opportunities to further increase their share of content per car. The shift towards batteries, electric mobility and self-driving cars meanwhile mainly benefits the technology sector, for which the car market becomes an ever more meaningful source of revenues. Peak car equals peak content per car and thus the vision of on-demand mobility is more a threat than an opportunity for the traditional players. The auto supplier industry not only grows in size but also in heterogeneity. The future mobility is closely linked to technology trends and thus a company's product mix largely determines its growth prospects. The following segments should be distinguished:

- **Fuel efficiency and emission technology.** Auto suppliers deliver the components that save fuel such as turbochargers, injectors, exhaust gas recirculation systems or hybrid drivetrains. The incremental cost of hybrid technology ranges between USD 500 for simple start-stop systems and USD 10'000 for complex plug-in packages**. Tighter emission standards suggest that catalysts and filters become more complex, costly and widely applied. Sophisticated emission treatment adds up to USD 1000 to gasoline and up to USD 1500 to diesel engines**. Both examples illustrate the structural content growth potential in an evolutionary scenario.
- **Driving assistance and electronics.** Assisted driving features require lots of computing power and intelligent software to process the huge amounts of data received from sensors and real-time online maps. Autonomous driving adds hardware and software costs of an estimated USD 2500 for advanced features such as lane-keeping and overtaking**. Additionally, ever more electronics is needed to control engines and hybrid drivetrains to maximise fuel efficiency and minimise emissions. The automotive business has become a key market for electronics suppliers and the long-term growth prospects look intact in both future mobility scenarios.
- **Electric vehicles and batteries.** Electric cars are more expensive mainly because of the high battery costs. Cars delivering an acceptable mileage usually include a battery pack costing between USD 7500 and USD 20000**. Also in future it is batteries that will capture the lion's share of the value of electric cars. However, the structural growth story is less compelling than it initially seems.

Auto suppliers business positioning

Company	Fuel effic.	Driving assist.	Electric vehicl.	Other	Financial strength*	Execution & governance*	"Legacy" risks*	Structural exposure* (impact/implications)	Rating (Equity)
Traditional suppliers									
Autoliv		x		x	medium	medium	medium	●●●	Hold
BorgWarner	x				high	medium	high	●●●	n.c.
Continental	x	x	x	x	medium	medium	medium	●●●	Hold
Delphi Automotive	x	x	x	x	medium	high	medium	●●●	Buy
Denso	x	x	x	x	medium	medium	medium	●●●	n.c.
Georg Fischer				x	high	high	low	●●	Hold
Schaeffler AG	x			x	medium	medium	high	●●●	n.c.
SFS Group				x	high	medium	low	●	Hold
SKF				x	medium	medium	low	●	Hold
Valeo	x	x	x	x	medium	medium	medium	●●●	Hold
Electronics suppliers									
Alphabet		x			high	high	low	●	Buy
Mobileye		x			high	medium	low	●●●	n.c.
Infineon Technologies	x	x	x		high	medium	low	●●●	Buy
NXP Semiconductors	x	x	x		medium	medium	low	●●	Hold
Nvidia		x			high	medium	low	●●	Hold
Renesas Electronics	x	x		x	high	medium	low	●●●	n.c.
STMicroelectronics	x	x	x		medium	medium	low	●●●	Hold
U-Blox		x		x	high	medium	low	●●	Hold
Battery suppliers									
LG Chem			x		medium	low	low	●	n.c.
Panasonic			x		medium	low	low	●	Hold
Samsung SDI			x		low	low	low	●	n.c.

Source: Julius Baer. *Financial strength: profitability and balance sheet strength. Execution & governance: management execution track record and corporate governance. "Legacy" risks: combustion engine and gearbox exposure. Structural exposure: low impact /negative implications (●) to high impact / positive implications (●●●). n.c. = not covered. Further information on ratings is provided in the respective equity and issuer coverage lists.
** Cost estimates based on various sources including company statements and industry reports by financial institutions.

First, technology and manufacturing improvements are set to deflate costs. Second, high competitive pressures weigh on margins and profitability. Third, longer-term technology risks threaten today's manufacturing investments. Lithium-ion technology should remain dominant over the coming years, and bears the cost improvement potential to make electric cars fully competitive, but promising alternative battery technology will exit the laboratories and become commercially available.

Alongside the technology offering we believe the financial strength, execution track record and legacy risks are additional factors that determine an auto supplier's long-term competitive positioning. The challenges are many especially for the traditional auto suppliers. The technology complexity requires competence and investments in research & development. The tech suppliers gain market share in terms of content per car, which raises competitive threats and demands decisions on product in- or outsourcing and strategic partnerships. Alliances are forming around autonomous driving, such as Delphi / Mobileye / Intel / BMW, Nvidia / Bosch / ZF /Volkswagen or Continental / Infineon / Daimler, but these partnerships remain in flux and are unlikely to settle anytime soon.

Competitive pressure sours the battery story.

Automobiles are still a small business for today's leading battery suppliers, and the competitive pressures coming from Chinese new entrants weigh on profitability. As mentioned, batteries represent the lion's share of the electric car's value and auto makers will likely venture into battery manufacturing to maintain control over technology, cash flows and jobs, despite the business challenges. This additional competitive threat and the long-term technology risks reduce the attractiveness of battery companies to investors who would like to benefit from electric mobility growth. In fact, battery manufacturers could find themselves in a situation similar to the solar industry some years ago where competitive pressures and cost deflation weighed on cash flows although the underlying solar market grew faster than foreseen. Electronics content is set to grow under both future mobility scenarios. Compared with battery suppliers, tech companies are the more sustainable and less risky option for investing into the future auto market. Compared to traditional auto suppliers, their technology mix has a superior growth profile, not least as their products serve both the electric mobility and autonomous driving trends.

Materials: Adding weight and shifting diets

The average car weight increased over the past decade as consumers took please in sports utility vehicles, comfort features and entertainment options. North American cars weigh around 2 tonnes, European cars 1.3 tonnes and the global average likely is lower. The increased weight directly relates to increased metal content per car. There are three trends to differentiate. First, auto manufactures aim at offsetting the weight gains by increasingly using special strength steel, aluminium or even composite materials. This so-called light-weighting is one measure to comply with tightening fuel efficiency standards. Lighter cars drive equally well with smaller engines. Second, the increased electronics content entails a wide range of additional functional metals. The semiconductors built into driving assistance and engine control systems contain for example silver, gold and copper. The big impact on metals content per car, however, comes from batteries, which depending on the specific model, add between 200 and 500 kilograms of weight. Third, tightening air pollution limits require more effective and complex exhaust treatment systems. Palladium and platinum are key ingredients in car catalysts alongside the engine control software that warrant meeting future emission standards. The following metals and materials are in focus:

- **Lithium** and batteries get most of the attention, although, using the Tesla Motor founder Elon Musk's words, it is only "the salt on the salad". Lithium accounts for roughly 1.5% of the total weight of a battery. The auto sector consumes an estimated 7% of total lithium output today. Based on our assumptions the use in autos alone should increase to 150% (evolution scenario) or almost 300% (revolution scenario) of today's market size, net of recycling.
- **Cobalt, manganese and nickel** are the key ingredients of lithium-ion batteries today and account for roughly 4% of total battery weight each. The most promising chemistries are nickel-manganese-cobalt (NMC) and nickel-cobalt-aluminium (NCA). Nickel and manganese are commonly used industrial metals and the likely growth in automotive battery consumption only has a marginally positive impact on market prospects. Cobalt meanwhile is a niche market and the auto sector consumption could increase to 150% (evolution scenario) or almost 300% (revolution scenario) of today's total output, up from around 7% today. Cobalt is an expensive metal and the most valuable single battery ingredient.
- **Graphite** is the most commonly found material in lithium-ion batteries accounting for roughly 15% of the weight. Graphite is either mined or produced synthetically and so far is primary used in steel making. Car battery use could increase to 40% (evolution scenario) or almost 70% (revolutionary), up from less than 2% of the total market today.

- **Copper** content in cars has constantly increased in recent years largely due to digitalisation and comfort, which led to a multiplication of wiring. In today's cars wires add up to an estimated length of up to 1.5 kilometres. Largely because of the many wires cars contain up to an estimated 25kg of copper and its content will only increase with the shift towards hybrids and electric vehicles. Electric motors and batteries increase the copper content to an estimated total between 35 and 70kg. Batteries contain copper foil and thus the battery size partially determines the additional use. However, copper is broadly used across many applications and products. Despite the projected significant growth of plug-in vehicles, automotive copper use is unlikely to expand much beyond 5% of today's market size. Wire and electric motors recycling is comparably convenient, which curbs the additional demand's long-term market impact. The longer-term opportunities in mobility should be put in perspective with the more medium-term threats inherent to China's ageing society, property overhang and economic model shift from investments to consumption.
- **Aluminium** is possibly the most versatile metal used in cars. Many body parts, engine components, electronic devices and also lithium-ion batteries contain aluminium, which in total adds up to on average 150kg per car today. Despite the projected large growth in plug-in vehicles and the light-weighting trends, automotive aluminium use of total market size is unlikely to expand much beyond 22%, up from roughly 19% today.
- **Palladium and platinum's** future prospects are binary. The slow uptick of plug-in vehicles (evolutionary scenario), combined with tightening emission standards and declining global market share of diesel technology would be highly supportive for palladium demand. Car catalyst use of today's market would increase from around 50% today to roughly 60% by 2025, and decline slightly thereafter because of recycling net effect. The fast adoption of plug-in vehicles (revolutionary scenario) would still translate into near-term demand growth, followed by harsh declines in catalyst demand below 30% of today's market. Electric cars have no tailpipes and the marginal palladium and platinum use in electronics cannot make up for catalysts.
- **Lead** is mainly used in lead-acid batteries and autos account for over 80% of total demand. The shift towards hybrids and plug-in vehicles as well as the possible substitution of lead-acid with lithium-ion batteries in conventional cars should weigh on lead usage.

The future looks bright for lithium and cobalt, but our projections should be taken with a grain of salt. Future demand is not only subject to the unclear growth in plug-in vehicles but also to the uncertainties surrounding battery technology and recycling rates. Solid-metal batteries are superior to lithium-ion solutions in terms of storage capacity and safety and should exit the laboratories and enter commercial production eventually after 2025. Recycling of lithium-ion batteries is proven but in its infancy. The reuse rates are yet unknown but will become the determining element of the amplitude of the market cycle. Further risks include power electronics, where the looming shift of semiconductor materials used would bring a sea change in terms of energy efficiency and thus battery capacity needs. Incremental metals use in autos could peak around 2030 depending autonomous driving, car ownership and recycling rates.

Metals car use assumptions

Commodity	Weight	Value	Use
Electric vehicles specific (battery pack: 40kWh, 335kg)			
Lithium	5kg	250-300USD	Battery
Nickel	13.5kg	100-150USD	Battery
Cobalt	13.5kg	400-600USD	Battery
Manganese	13.5kg	20-40USD	Battery
Graphite	45kg	100-150USD	Battery
Aluminium	35-40kg	30-40USD	Battery, electric motor
Copper	35-40kg	130-170USD	Battery, electric motor
Combustion engine vehicles specific			
Palladium	2.8g	60-70USD	Exhaust catalyst
Platinum	1.1g	35-45USD	Exhaust catalyst
All vehicles			
Aluminium	150kg	200-250USD	Chassis, electronics, wiring
Copper	15kg	75-100USD	Electronics, wiring

Source: Recycling Journal, Macquarie, Exane, Julius Baer

Future mobility and metals use projections

World	2015	2020	2025	2030	2035
Evolutionary scenario					
Plug-in sales share (%)*	0.8	3.9	11.5	16.5	27.5
Battery size (kWh)	40	55	60	60	60
Battery capacity (Wh/kg)	120	170	230	290	340
Lithium carbonate use (kt)	12	55	150	200	310
... of total use today (%)	7.0	32.3	84.0	111.0	157.0
Cobalt use (kt)	6	27	75	100	155
... of total use today (%)	6.6	30.5	80.0	105.0	148.0
Revolutionary scenario					
Plug-in sales share (%)*	0.8	4.0	13.5	28.0	45.0
Battery size (kWh)	40	55	60	60	60
Battery capacity (Wh/kg)	120	170	240	300	350
Lithium carbonate use (kt)	12	63	190	380	540
... of total use today (%)	7.0	37.3	109.0	220.0	289.0
Cobalt use (kt)	6	32	95	190	270
... of total use today (%)	6.6	35.3	103.0	208.0	274.0
Palladium (mn oz)	6.8	7.6	7.3	5.9	4.3
... of total use today (%)	48.7	59.9	54.6	41.1	28.9

Source: Julius Baer (*Plug-in: plug-in hybrids and electric cars)

Lithium hype sanity check

The prospects for investors are more sobering. Lithium is an immature market, without transparent pricing, ruled by a handful of companies. Strong demand causes near-term supply constraints and lifts prices. But lithium is no scarce resource and given today's investments in mining, longer-term supplies will increase and prices should revert. The metal is predominantly mined above ground in the lithium triangle of the salt lakes in Chile, Bolivia and Argentina. These operations can be expanded comparably quickly for mining standards. The global reserves estimates provided for example by the US Geological Survey look tight at first sight. But reserves are a function of price and technology and tend to expand with investment. Many of today's projects develop hard rock resources, which have become economical thanks to increased prices. The leading producers alone guide for a doubling of output by 2020. Lithium is anything but easy to invest in. The metal trades in different compounds on long-term contracts and thus is not investible as a commodity. For the miners only Albemarle (not covered) is a sufficiently capitalised pure play, besides several junior miners. The remaining leading producers' business models (FMC, SQM, not covered) depend more on fertiliser demand and agricultural markets than mobility and battery demand. Entry barriers to lithium mining are generally low and today's hype bears a resemblance to the rare earth story some years ago. The fundamental growth outlook is more robust but the supply-side dynamics are equally challenging.

Cobalt is a by-product of copper and nickel mining. Glencore is the leading global producer and cobalt is a small but nevertheless earnings-relevant commodity. However, its operations in Congo are under public scrutiny for environmental, employment and governance issues. Overall, mining is cyclical and bears great business risks. Against this backdrop companies further down the value chain, engaged in refining the specific materials going into batteries or catalysts, offer a comparably less cyclical exposure to the metal content growth in cars.

Materials business positioning

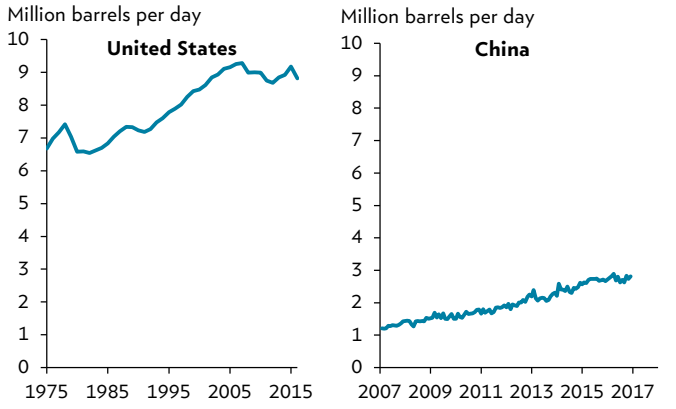
Company	Business	Structural exposure* (impact/implications)	Rating (Equity)
Albemarle	Lithium	●●●	n.c.
FMC	Lithium	●	n.c.
SQM	Lithium	●	n.c.
Glencore	Cobalt	●	Hold
Johnson Matthey	Catalysts	●●●	n.c.
Umicore	Catalysts	●●●	n.c.
SGL Carbon	Composites	●●	n.c.
Toray Industries	Composites	●●	Buy

Source: Julius Baer, (*Structural exposure: low impact /negative implications (●) to high impact / positive implications (●●●)). N.c. = not covered. Further information on ratings is provided in the respective equity and issuer coverage lists.

Energy: The when not if of peak oil

Autos burn fuels. Selling these fuels is almost an equally big business as selling autos, estimated at 1.5 trillion globally. In fact, automotive fuel use represents around 30 million barrels per day out of the more than 90 million barrels per-day market. US passenger vehicles alone consume roughly 9 million, mirroring their preference for roads over rail and big over small cars. The outlook for mobility has an important bearing on future oil demand. Global car fuel use is set to grow from today's levels and plateau around 35 million barrels per day after 2030 on the back of expanding car ownership in emerging markets. Increasing fuel efficiency pressures western world oil demand. Car fuel use has peaked in Europe, the United States and Japan between 2003 and 2005 and additional future headwinds likely come from more efficient driving. Online shopping means that home delivery partially replaces driving to shopping malls, which overall reduces fuel use. Self-driving cars will lead to smoother traffic and on-demand mobility limits the time-consuming search for parking in urban areas, which is primarily a traffic issue in Europe. Congestion alone already causes an estimated 2% fuel wastage according to Goldman Sachs.

Gasoline use United States and China



Source: Energy Information Administration, China Customs, Julius Baer

The revolutionary mobility scenario obviously bears highly negative implications. The shift towards electric mobility and self-driving taxis would translate into a much earlier peak in car fuel use around 2025. But the peak in total oil demand depends on further factors. Clean energy technologies have become competitive and should replace oil use for power generation namely in emerging markets. Although accounting for only roughly 6% of total use, the substitution nevertheless would slow overall oil demand growth. The shale boom unlocked cheap and abundant gas resources. Natural gas gains market share as a petrochemical feedstock, and could also become the alternative fuel for trucks and ships not least supported by regionally tightening air pollution limits. Gas boilers and heat pumps

oust heating oil use in Europe. Only air traffic remains shielded from structural headwinds and will need more oil going forward but the growth is from a low base, roughly 6% of total oil use today. Global oil demand looks likely to peak around 2030.

The consequences for the energy industry however are not clear-cut negative. The longer-term outlook bears threats on the oil side but brings opportunities on the natural gas side. Two opposing structural trends collide. Moreover, compared to auto makers the impact on the energy business is delayed as the auto stock and not auto sales determine fuel use. A company's positioning along the value chain determines its longer-term growth prospects. The following business areas should be distinguished:

- **Shale oil and gas**. North American shale irreversibly altered global energy markets. Ample resources and competitive costs due to persistent productivity gains suggest that North American shale will account for large parts of the incremental oil and gas supply growth and determine oil and gas price trends into the foreseeable future. Shale wells produce both oil and gas and thus exposure to this segment is a key producer strategy to maintain volume growth. Moreover, shale projects lead times are measured in weeks, not years, and capital expenses in millions, not billions. Shale projects bear lower balance sheet risks than conventional offshore projects in times of greater longer-term market uncertainty.
- **Petrochemicals**. Global growth and namely the wealth creation in emerging markets propel plastics use. Alternative feedstock to oil and gas such as biomass exist but should remain niche in future. There is no 'peak chemicals' into the foreseeable future.
- **Liquefied natural gas**. The natural gas market undergoes a sea change. Rising Australian, US and longer-term African supplies swamp the market and create demand for liquefied natural gas trade, the so-called LNG. Ever more countries become LNG importers. The large integrated oil companies have foothold in the LNG business, not least as the building the infrastructure requires lots of capital and experience with big projects.
- **Refining**. Refineries transform crude oil into fuels such as gasoline and diesel and thus are the most exposed segment along the energy value chain to peak oil. The implications are particularly negative and imminent in the western world while emerging economies should continue to experience road fuel demand growth over the coming decade. China and India have large and expanding capacities and western world refiners are thus unlikely to be able to offset weakening domestic demand with growing exports.

The big integrated oil companies' defensive business model and their ability to pay dividends have been put into question not only because of the oil price collapse but also because of the peak oil debate. The concerns are that dividend payments are unsustainable due to low oil prices and reduced cash flows and that share prices dismiss the reserve valuation risks due to peaking oil use. However, the diversification of the integrated business model often is underestimated. The oil majors all have significant stakes in petrochemical activity and liquefied natural gas trade, which mitigates the peak oil risks inherent to refining. Exemplary are Shells' LNG operations or Exxon's petrochemicals and shale gas exposure. Moreover, electric mobility's impact on the energy business is delayed. Into the foreseeable future the oil majors' business risks are rather determined by the eventual downturn in the business cycle and access to Middle Eastern oil and gas resources than the peak oil threat.

Road fuel threats versus natural gas opportunities.

Refiners meanwhile are trading stocks that fluctuate with gasoline and diesel margins. Nevertheless, the underlying structural threats to their business model should not be neglected. Their operations are mostly regional and especially the North America or Europe focused companies such as Valero or OMV should face headwinds from increasing fuel efficiency medium-term and electric vehicles longer-term. On the other hand, the shale-focused oil and gas producers are less exposed to the peak oil threats given in part their high gas exposure, but most importantly given their flexible and short-term capital allocation. The shale business remains the growth niche within the energy segment thanks to their competitive costs and flexible operations in today's environment with prices fluctuating around USD 50 per barrel.

Energy business positioning (selected companies)

Company	Business	Structural exposure* (impact/implications)	Rating (Equity)
BP	Integrated	●●	Hold
Chevron	Integrated	●●	Buy
China Petroleum	Integrated	●●	Buy
Exxon Mobil	Integrated	●●	Hold
OMV	Integrated	●●●	Buy
Shell	Integrated	●●	Hold
Total	Integrated	●●	Hold
Marathon Petroleum	Refining	●●●	Hold
Phillips 66	Refining	●●●	Hold
Valero	Refining	●●●	Hold

Source: Julius Baer, (*Structural exposure: low impact /negative implications (●) to high impact / positive implications (●●●)). Further information on ratings is provided in the respective equity and issuer coverage lists.

Utilities: A silver lining within the storm

Electric mobility needs juice and less road fuel use means increased electricity demand. The impact on the electricity market, however, tends to be vastly overestimated. Electric cars are almost 4 times more energy efficient than conventional cars with a combustion engine. Household electricity consumption increases by roughly 50% with the purchase of an electric car, based on the average driving and electricity usage patterns and assuming 100% home charging. But household consumption only accounts for roughly 30% of total electricity use. Electricity demand has been trending sideways and remains below the peaks reached ten years ago in both Europe and the United States largely due to industrial efficiency gains. Even within the revolutionary scenario mobility will account for less than 5% of today's electricity use by 2035 in both Europe and the United States according to our calculations. Thus, future electric mobility will hardly offset the negative impacts from continued structural efficiency gains.

Renewables and the ever cheaper solar panels and wind turbines will continue to have a far larger bearing on the electricity business than electric cars. That said, falling costs enabled by electric cars foster the use of batteries for electricity storage at home. Combined with roof-top solar, households will decrease their dependency on utilities. The ongoing decentralisation of the power grid yields competitive threats and market share losses for the utility business. Electric mobility can be seen as part of larger future electric ecosystem, which basically resembles the vision Tesla seems to be pursuing with their venturing into the solar business. Environmentally, electric cars are greener than combustion cars, even with today's coal-oriented power mix in Germany or the United States. The shift towards renewables and the likelihood of an emerging battery recycling business will only improve the electric car's sustainability track record. In brief, the future mobility is not much more than a silver lining for the utility business that will continue to struggle with the competitive threats unleashed by the shift to renewables.

Insurance & Telecom: Some collateral damage

Auto insurance is a big business estimated at USD 200 billion in annual premiums in the United States alone and up to USD 1 trillion globally. Drivers tend to spend equally much on insurance and taxes per year as on fuel itself. The near-term trends towards more technology are business supportive as crashes create higher property damage, which is compensated by higher premiums. The longer-term trends towards autonomous driving and declining auto ownership, however, bears significant change. First, self-driving cars are safer. Various sources expect a 40% reduction in accidents, an estimate that was recently confirmed by Tesla. The comparison of driving data before and after the introduction of autonomous driving features for the same model allows an accurate comparison. The statistics show a 40% decrease in crash rates. Second, the vision of self-driving taxis means that there are fewer autos to be insured. And third, the insurance mix shifts towards more competitive commercial fleet and product liability offerings as ride-hailing services grow. Although there are lots of uncertainties especially with regard to product liabilities of self-driving cars, the future suggests more potential losers than winners within insurance. That said, the outlook for increasing interest is what remains top-of-mind for insurance stocks today.

The consequences for the telecom business are opaque and difficult to foresee. Increased connectivity, autonomous driving and real-time mapping are data-intensive technologies and should multiply mobile data traffic. However, data usage has grown substantially as of late on the back of mobile usage, increased content sharing and video streaming. But the telecom industry so far struggled to translate this pick-up in data traffic into cash flows and earnings. Expensive up-front infrastructure investments and price-sensitive consumers make telecom a highly competitive business operating at slim margins. The companies will likely capitalise on the future mobility rather by delivering specialised content than by providing the infrastructure for increasing data traffic.

Future mobility and electricity use projections

European Union	**2015**	**2020**	**2025**	**2030**	**2035**
Average driving (km p.a.)	15000	15000	15000	15000	15000
Fuel use (kWh per 100km)	15.0	14.5	14.0	13.5	13.0
Evolutionary scenario					
Plug-in* market share (%)	0.1	0.8	3.2	7.6	12.0
Electricity demand (TWh)	0.3	2.4	9.8	23.6	39.1
... of total use today (%)	0.0	0.1	0.4	0.9	1.4
Revolutionary scenario					
Plug-in* market share (%)	0.1	0.8	3.3	9.3	18.8
Electricity demand (TWh)	0.3	2.9	12.4	40.0	75.4
... of total use today (%)	0.0	0.1	0.4	1.5	2.7

Source: Eurostat, Julius Baer (*Plug-in: plug-in hybrids and electric cars)

Insurance business positioning (selected companies)

Company	**Business**	**Structural exposure*** (impact/implications)	**Rating** (Equity)
Allianz	Insurance	●	Buy
Allstate	Insurance	●●●	Hold
Axa	Insurance	●	Buy
Direct Line	Insurance	●●●	Buy
Helvetia	Insurance	●	Buy
Progressive	Insurance	●●●	Buy
Travelers Cos	Insurance	●●	Buy
Zurich	Insurance	●	Hold

Source: Julius Baer, (*Structural exposure: low impact /negative implications (●) to high impact / positive implications (●●●)). Further information on ratings is provided in the respective equity and issuer coverage lists.

Investing today in tomorrow's mobility

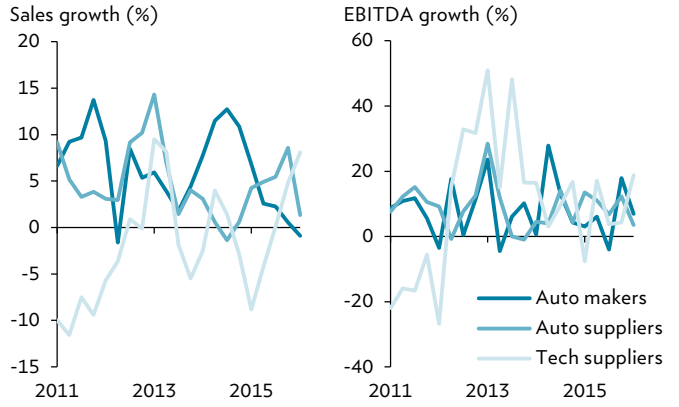
Financial markets are forward looking but the structural trends and future scenarios described in this report go beyond their investment horizon, which tends to be rather short-sighted. The auto business' valuations metrics indicate that share prices somewhat reflect the superior cash flow and growth outlook of the suppliers compared to the auto makers. However, superior growth and valuations bear set back risks and indeed the auto business' cyclical outlook calls for some near term caution.

Thematic investing is tactical investing.

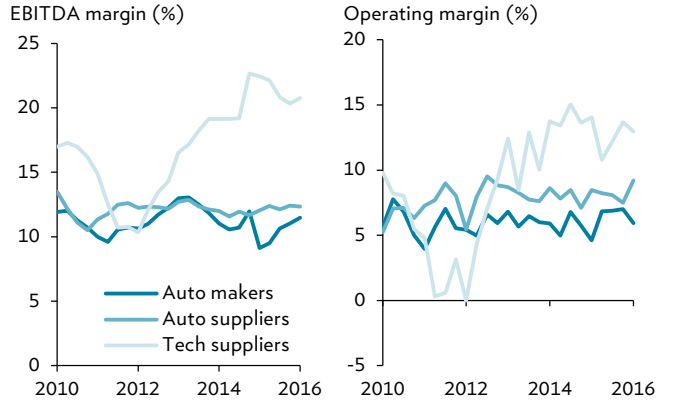
Global car sales are at record levels and the industry seems close to a cyclical top. The economic recovery, solid labour markets and cheap financing were factors fuelling car sales in North America and Europe as of late. Growth has been strongest in China where the rising middle class brings a deep pool of first-time buyers. That said, tax incentives as part of the latest governmental stimulus programme pulled forward consumption from 2017 to 2016. The auto business is set for temporary cyclical softness. The Trump government's proposals to introduce border taxes and to review fuel efficiency legislation bear additional, although contained, policy risks. Last but not least, the global economic cycle is well-advanced and a slowdown very likely to happen towards the end of the decade. These shorter-term cyclical threats should dominate the longer-term thematic opportunities in the near term. Thematic investing is tactical investing, and when growth concerns take over, structural themes will suffer. The focus on a company's competitive longer positioning and superior growth outlook needs to be complemented with shorter-term tactical view discounting the business cycle and the financial markets' sentiment cycle. With this in mind, we recommend the following companies today:

- **Daimler**, (Buy, Price/Target: EUR69.9/78), is a solid car company with a superior product offering, robust margins and attractive valuations.
- **Delphi Automotive**, (Buy. Price/Target: USD76.8/83), is among the leading auto suppliers with a diversified customer base and a superior earnings growth profile. Valuations are in line with historical averages.
- **Infineon Technologies**, (Buy, Price/Target: EUR17.3/EUR18), is a market leader in semiconductors with economies of scale that should drive earnings.
- **Toray Industries**, (Buy, Price/Target: JPY1009/1100), is leading supplier of carbon fibre composites with a yet undervalued secular growth profile.

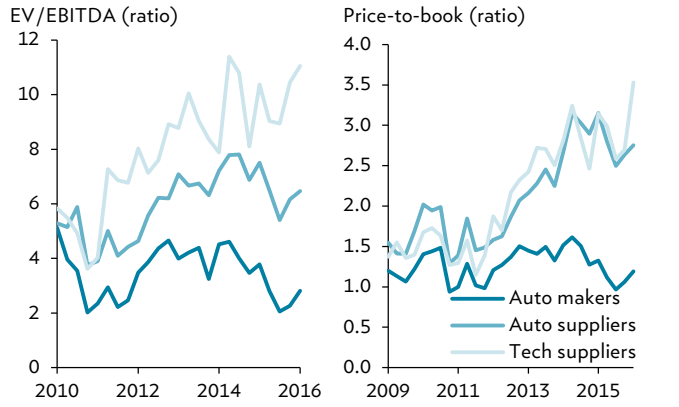
Auto business growth *



Auto business profitability *



Auto business valuation *



Sources: Bloomberg Finance L.P., Julius Baer (*Peer group auto makers: BMW, Daimler, Volkswagen, Fiat Chrysler, Ford, General Motors, Toyota, Nissan (n.c.). Peer group auto suppliers: Continental, Delphi Automotive, Denso (n.c.), Lear (n.c.), Autoliv, Magna (n.c.). Peer group tech suppliers: Mobileye, Infineon Technologies, Renesas Electronics (n.c.), STMicroelectronics, TE Connectivity (n.c.). N.c.: not covered.)

Thematic future mobility equity universe

Company	Exposure	Julius	Consensus	Price	Ccy	Market cap.	Performance (%)				ISIN
	Impact (implications)	Baer	(Buy/Hold/Sell)			(USDbn)	1m	3m	12m	5y	
Auto makers											
BMW	high (-)	Hold	Buy (15/14/6)	87.4	EUR	59.36	4	9	9	24	DE0005190003
BYD	high (++)	Hold	Buy (14/5/3)	45.5	HKD	18.46	7	0	13	83	CNE100000296
Daimler	high (-)	Buy	Buy (17/13/5)	70.0	EUR	78.55	2	12	5	52	DE0007100000
Dongfeng Motor Group	high (=)	Buy	Buy (15/12/0)	9.1	HKD	10.12	11	17	-3	-37	CNE100000312
Fiat Chrysler	high (--)	Reduce	Buy (12/8/9)	10.5	EUR	16.77	4	46	55	-	NL0010877643
Ford	high (--)	Hold	Hold (9/15/2)	12.7	USD	50.43	3	4	-4	0	US3453708600
Geely Automobiles	high (=)	Hold	Buy (24/9/4)	10.7	HKD	12.23	19	40	247	202	KYG3777B1032
GM	high (-)	Hold	Hold (10/15/1)	37.4	USD	56.07	5	6	24	42	US37045V1008
Great Wall Motors	high (=)	Hold	Buy (17/9/8)	9.4	HKD	14.96	21	32	59	80	CNE100000338
Guangzhou Automobiles	high (=)	Hold	Buy (21/7/3)	13.0	HKD	19.34	20	33	83	42	CNE100000Q35
Peugeot	high (--)	Hold	Buy (11/10/4)	18.5	EUR	16.78	6	33	27	76	FR0000121501
Renault	high (--)	Buy	Buy (14/9/2)	86.2	EUR	26.74	1	16	-1	114	FR0000131906
Tesla Motors	high (++)	Reduce	Hold (8/9/6)	250.0	USD	40.42	-1	38	33	634	US88160R1014
Toyota	high (-)	Hold	Hold (9/12/2)	6470	JPY	184.46	1	-3	6	95	JP3633400001
Volkswagen	high (-)	Reduce	Buy (15/10/7)	145.4	EUR	77.23	1	23	25	1	DE0007664039
Auto suppliers											
Autoliv	high (+)	Hold	Hold (4/16/8)	105.2	USD	9.28	-2	2	-4	55	US0528001094
BorgWarner	high (++)	n.c.	Hold (9/10/3)	43.0	USD	9.14	6	19	24	1	US0997241064
Continental	high (++)	Hold	Buy (14/14/5)	193.2	EUR	40.57	3	17	0	175	DE0005439004
Delphi Automotive	high (++)	Buy	Buy (18/4/2)	76.8	USD	20.69	4	20	11	137	JE00B783TY65
Denso	high (++)	n.c.	Hold (7/13/0)	5067.0	JPY	35.16	2	3	15	88	JP3551500006
Georg Fischer	medium (=)	Hold	Buy (4/3/1)	896.5	CHF	3.63	9	5	28	105	CH0001752309
Komax	high (+)	n.c.	Buy (3/1/0)	261.3	CHF	0.98	1	7	23	202	CH0010702154
Magna	high (-)	n.c.	Buy (11/9/2)	58.0	CAD	16.57	3	4	9	140	CA5592224011
Schaeffler AG	high (=)	n.c.	Buy (8/6/1)	15.3	EUR	10.70	0	27	3	-	DE000SHA0159
Valeo	high (++)	Hold	Buy (12/6/6)	59.8	EUR	15.02	5	15	36	331	FR0013176526
Tech suppliers											
Infineon Technologies	high (++)	Buy	Buy (19/14/3)	17.3	EUR	20.64	-1	13	49	125	DE0006231004
LG Chem	low (++)	n.c.	Buy (27/4/0)	287500	KRW	17.71	5	24	-8	-29	KR7051910008
Mobileye	high (++)	n.c.	Buy (18/7/0)	46.3	USD	10.16	8	28	35	-	NL0010831061
NXP Semiconductors	medium (++)	Hold	Hold (5/14/0)	103.2	USD	35.71	4	5	37	337	NL0009538784
Nvidia	medium (++)	Hold	Buy (16/12/4)	103	USD	60.54	-11	16	212	568	US67066G1040
Panasonic	low (++)	Hold	Hold (9/11/0)	1271.5	JPY	27.25	9	6	24	71	JP3866800000
Renesas Electronics	high (++)	n.c.	Hold (3/9/1)	1011.0	JPY	14.73	2	16	44	90	JP3164720009
Samsung SDI	low (++)	n.c.	Buy (22/13/1)	129000	KRW	7.74	9	41	28	-9	KR7006400006
STMicroelectronics	high (++)	Hold	Hold (9/10/4)	14.7	EUR	14.03	11	58	171	166	NL0000226223
TE Connectivity	high (+)	n.c.	Buy (6/4/1)	76.1	USD	27.05	2	13	28	108	CH0102993182
U-Blox	medium (++)	Hold	Hold (2/5/3)	200	CHF	1.35	13	9	1	326	CH0033361673
Materials											
Albemarle	high (++)	n.c.	Buy (12/8/0)	102.7	USD	11.56	10	21	78	56	US0126531013
FMC	low (++)	n.c.	Hold (8/12/1)	59.2	USD	7.92	-2	5	56	18	US3024913036
Johnson Matthey	high (++)	n.c.	Hold (8/10/1)	3089	GBp	7.34	-5	0	20	21	GB00BZ4BQC70
Orocobre	high (++)	n.c.	Buy (5/1/1)	3	AUD	0.49	-25	-31	30	79	AU000000ORE0
SGL Carbon	medium (+)	n.c.	Hold (2/5/4)	8.5	EUR	1.09	4	-3	-6	-73	DE0007235301
SQM	low (++)	n.c.	Hold (3/7/3)	32.0	USD	8.93	-6	13	79	-46	US8336351056
Toray Industries	medium (+)	Buy	Buy (11/5/0)	1009.5	JPY	14.39	3	10	8	76	JP3621000003
Umicore	high (++)	n.c.	Hold (7/9/7)	49.2	EUR	5.78	-9	-11	19	24	BE0003884047

Source: Bloomberg Finance L.P., Julius Baer (n.c.: not covered; Julius Baer offers no recommendation; **Note:** This list contains covered and non-covered (n.c.) titles by Julius Baer; The selection of non-covered titles does not imply any recommendation by Julius Baer; "Exposure to theme"=The thematic exposure rating ("Exposure to theme" or "NG Rating") follows the Next Generation investment selection process, which analyses a company's exposure to structural market growth in relation to a particular investment theme or topic; CCY=Currency. Price data as at 02/03/2017.

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APPENDIX

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The analysts hereby certify that views about the companies discussed in this report accurately reflect their personal view about the companies and securities. They further certify that no part of their compensation was, is, or will be directly or indirectly linked to the specific recommendations or views in this report.

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Equity research

Frequently used abbreviations

CAGR	Compound annual growth rate	EPS	Earnings per share	P/B	Price-to-book value
DCF	Discounted cash flow	EV	Enterprise value	P/E	Price-to-earnings ratio
EBIT	Earnings before interest and taxes	FCF	Free cash flow	PEG	P/E divided by year-on-year EPS growth
EBITDA	Earnings before interest, taxes, depreciation and amortisation	MV	Market value	ROE	Return on equity
Consensus rating	Consensus rating indicates the analysts' opinions on the security. It shows the number of analysts covering the security and the breakdown between Buy, Hold and Sell ratings.	Consensus target	The consensus target is the average price to which analysts expect the security to rise.	FY	Fiscal year

Equity rating allocation as of 02/03/2017

Buy	31.5%	Hold	65.6%	Reduce	2.9%

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Equity rating history as of 02/03/2017

Company	Rating	History
Allianz	Buy	Since 01/03/2016
Allstate Corporation	Hold (initiation of coverage)	Since 30/06/2016
Alphabet Inc.	Buy (initiation of coverage)	Since 18/10/2010
Autoliv	Hold (initiation of coverage)	Since 13/09/2016
Axa	Buy	Since 18/06/2007
BMW	Hold	Since 20/03/2015
BP	Hold	Since 23/10/2007
BYD-H	Hold	Since 31/08/2016
	Buy	Since 14/04/2016
	Hold	Since 24/11/2015
Chevron	Buy	Since 01/07/2016
	Hold	Since 05/02/2013
Continental AG	Hold	Since 14/04/2015
Daimler	Buy	Since 07/10/2016
	Hold	Since 22/10/2015

Delphi Automotive	Buy (initiation of coverage)	Since 13/09/2016
Direct Line Insurance	Buy (initiation of coverage)	Since 02/09/2016
Dongfeng Motor-H	Buy	Since 13/10/2015
Exxon Mobil	Hold	Since 01/07/2016
	Buy	Since 04/05/2015
Fiat Chrysler Automobiles	Reduce	Since 03/02/2016
Ford Motor Company	Hold (initiation of coverage)	Since 26/11/2014
Geely Automobile Holdings	Hold (initiation of coverage)	Since 18/11/2015
General Motors Company	Hold (initiation of coverage)	Since 26/11/2014
Georg Fischer	Hold	Since 25/11/2016
	Buy (initiation of coverage)	Since 14/03/2005
Glencore	Hold	Since 12/07/2016
	Reduce	Since 12/11/2015
Great Wall Motor-H	Hold	Since 01/08/2016
	Buy	Since 28/10/2015
Guangzhou Automobile	Hold (initiation of coverage)	Since 30/05/2016
Helvetia	Buy (initiation of coverage)	Since 26/09/2007
Honda Motor	Hold	Since 01/05/2015
Infineon	Buy (initiation of coverage)	Since 19/04/2011
Marathon Petroleum	Hold (initiation of coverage)	Since 21/06/2016
NVIDIA Corporation	Hold (initiation of coverage)	Since 04/03/2015
NXP Semiconductors	Hold	Since 20/10/2016
	Buy (initiation of coverage)	Since 15/12/2014
OMV	Hold (initiation of coverage)	Since 14/06/2016
Panasonic	Hold	Since 01/04/2016
	Buy (initiation of coverage)	Since 21/07/2015
PetroChina-H	Hold	Since 01/09/2016
	Buy (initiation of coverage)	Since 07/06/2007
Peugeot	Hold	Since 28/04/2016
	Buy	Since 05/08/2015
Phillips 66	Hold (initiation of coverage)	Since 07/12/2015
Progressive Corporation	Buy (initiation of coverage)	Since 27/04/2016
Renault	Buy (initiation of coverage)	Since 05/03/2015
Royal Dutch Shell	Buy (initiation of coverage)	Since 05/02/2013
SFS Group	Hold (initiation of coverage)	Since 11/05/2015
SKF	Hold (initiation of coverage)	Since 30/09/2015
STMicroelectronics	Hold (initiation of coverage)	Since 10/12/2014
Tesla Motors	Reduce	Since 17/11/2016
	Hold (initiation of coverage)	Since 18/11/2015
Toray Industries	Buy (initiation of coverage)	Since 22/01/2016
Total	Hold	Since 14/02/2013
Toyota Motor	Hold	Since 17/02/2016
Travelers Companies	Buy (initiation of coverage)	Since 04/07/2016
U-blox	Hold (initiation of coverage)	Since 04/12/2015
Valeo	Hold (initiation of coverage)	Since 01/09/2016
Valero Energy Corporation	Hold (initiation of coverage)	Since 13/10/2015
Volkswagen	Reduce	Since 06/10/2015
Zurich Insurance	Hold	Since 16/02/2011

Rating system for global equity research (stock rating)

Buy	Expected to outperform the regional industry group by at least 5% in the coming 9-12 months, unless otherwise stated.
Hold	Expected to perform in line (±5%) with the regional industry group in the coming 9-12 months, unless otherwise stated.
Reduce	Expected to underperform the regional industry group by at least 5% in the coming 9-12 months, unless otherwise stated.

Frequency of equity rating updates

An update on Buy-rated equities will be provided on a quarterly basis. An update for Hold and Reduce-rated equities will be provided semi-annually or on an ad-hoc basis.

Fixed income research

Issuer rating allocation as of 02/03/2017

Buy	53.4%	Hold	42.7%	Sell	3.9%

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Issuer rating history as of 02/03/2017

Issuer	Rating	History
BMW	Buy (initiation of coverage)	Since 22/10/2009

Daimler	Buy (initiation of coverage)	Since 07/07/2009
Volkswagen	Hold	Since 06/10/2015
Peugeot	Hold	Since 10/03/2015
Renault	Hold (initiation of coverage)	Since 28/09/2012
Tata Motors	Hold	Since 30/06/2016
	Buy (initiation of coverage)	Since 06/07/2015

Rating system for fixed income research

Buy	Within its risk category, the issuer is highly recommended due to its financial and business condition (strong balance sheet, income statement, cash flow and good position in the industry). Debt instruments of the issuer are regarded as an attractive investment from a risk/return perspective.
Hold	Maintain position based on stable credit fundamentals and/or average expected return characteristics within peer group.
Sell	The rating is changed to Sell, depending on a significant deterioration in the fundamental data of the issuer in relation to the industry peers. The investment is no longer justified from a risk/return perspective for the relevant category.

Frequency of issuer rating updates

An update on each issuer will be provided semi-annually, on a rating change or on an ad-hoc basis.

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