

2
Introduction

+
Strong recovery
A strong recovery,
but not without risks

+
3 A sector which is
adapting to these risks **10**
6 What are the prospects
for 2015 ? **13**

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April 2015

The US automotive sector: a risky recovery ?

COFACE ECONOMIC PUBLICATIONS

By Coface Group Economists



The automotive industry in the United States, the "backbone of American industry" according to Barack Obama, was on the verge of bankruptcy at the time of the financial crisis, with a drop in sales of 35% between 2007 and 2009. It then underwent drastic restructuring of its companies, with factory closures, massive redundancies and significant federal support, with \$80 billion injected into the Big Three (Chrysler, Ford and General Motors).

Since then, the automotive industry has been aided by a highly incentivising "cash for clunkers" programme, by a level of household consumption which has recovered over the last few years thanks, amongst other things, to the drop in unemployment, as well as by tempting consumer finance arrangements. Employment in this sector has started to rise again, as has investment and expenditure on research & development (R&D). A virtuous circle seems to have been established. But we will see that this recovery is not without danger, which could even-

tually dent the virtue in this circle. Amongst these dangers are a median salary that is still below its pre-crisis level, consumer loans granted to risky borrowers (subprimes), the significant increase in payment defaults and the probable end of cheap loans. To this is added a strong trend amongst new generations of consumers, who increasingly often prefer to use alternative modes of transport, a trend that manufacturers are nevertheless gradually integrating within their product lines through large increase in their R&D expenditure.

STUDY

THE US AUTOMOTIVE SECTOR: A RISKY RECOVERY?

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« The automotive sector in the US, deeply impacted by the onset of the 2007 crisis, seems to be currently a part of a virtuous circle. As the car sales are on an upward trend, some risks could derail the sector economy, though »

INTRODUCTION

The automotive sector is often cited as an example to illustrate the resurgence of the US economy since the crisis. The latter particularly affected this industry, with sales collapsing by half. The automotive industry, which represented the omnipotence of the US economy, is therefore recovering from a very low position. Indeed, the large US automotive groups owe their salvation to the federal government. This was a painful process, with the large manufacturers undergoing radical slimming and some of them being sold to foreigners. Nevertheless, the US economy recovery, which is pulling the automotive

sector in its wake, is strong, as underlined by the dynamics in investment and recruitment, but also and particularly in sales. Conditions now seem favourable: the automotive groups have had their finances cleaned up and there is sustained household consumption. But this rude good health should not hide the weaknesses and underlying risks: the worldwide economic environment remains uncertain and certain excesses of the past now appear to be resurfacing, particularly in matters of automotive credit. 2015 is therefore a transitional year: will automotive sales, the momentum of which

partly results from credit conditions that are favourable to households, suffer from the expected tightening of the US Federal reserve's monetary policy? Are sociological and consumer-behaviour changes an inhibiting factor for this industry? What should this economy do to renew itself? To answer these questions, we will first explain this strong recovery and its causes. We will then analyse the risks associated with this recovery. Lastly, we will address the strategies established by the automotive manufacturers to deal with this new configuration.

1 STRONG RECOVERY

Phenomenal drop in sales during the crisis

Between 2007 and 2009 (see chart n° 1), sales of light vehicles (tourism and utility vehicles) dropped by 35%! This drop caused turmoil for North American manufacturers, because industrial facilities were oversized in relation to the size of the market. Indeed, production capacity utilisation rates went from 71% in 2007 to 43% in 2009, even though the phenomenon of factory closures was significant well before the crisis occurred. Accordingly, profits in the sector dropped sharply.

Huge federal support

In response to the magnitude of the drop, the federal authorities injected nearly \$80 billion, coming from the TARP⁽¹⁾ fund, into two large national manufacturers (General Motors Company and Chrysler, as well as their banking subsidiary). They supplemented this arrangement by a "cash for clunkers" programme. This programme aimed, between 1 July 2009 and 24 August 2009, to grant 3,500 or 4,500 dollars for the purchase or lease of a vehicle with lower fuel consumption, with an old vehicle being accepted in return.

The funds allocated by the U.S. Congress stood at nearly \$3 billion and concerned nearly 700,000 vehicles. The average price of the new vehicles sold stood at \$22,425 and vehicles with an average age of 14 years were scrapped. This federal aid represented an average of nearly 20% of the purchase price of the new car.

In total, the US automotive sector indirectly benefited from the payment of more than \$15 billion (0.1% of GDP). The Asian brands were the primary beneficiaries, because six out of the top ten brands concerned are Japanese or Korean.

Chart 2 illustrates the support of the second-hand market to that for new cars. Indeed, there is a causal link between the price of second-hand vehicles and sales of new cars, because increases in the first, also known as the residual value, allow buyers of new vehicles to sell their vehicles at a good price.

Strong increase in automotive sales, in parallel with that of household consumption

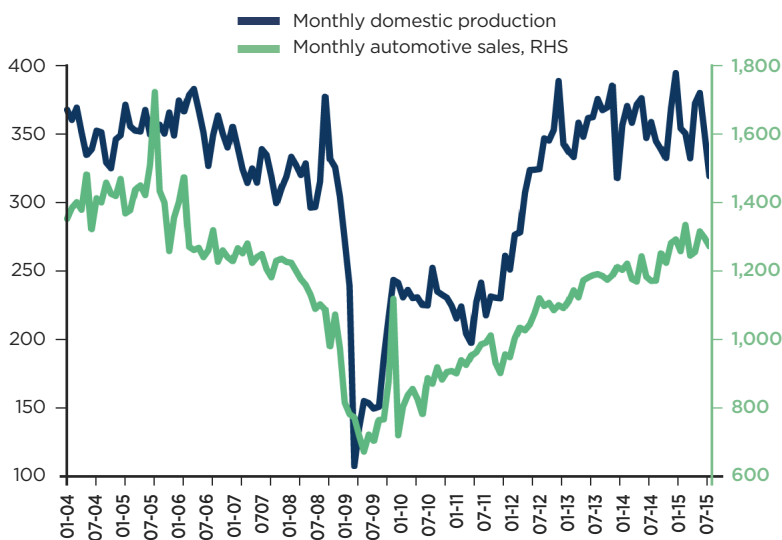
It is no surprise that the drop, then the return to pre-crisis levels, in automotive sales coincides with the dynamic in household consumption.

This consumption is also the historical driver of US growth because it represents 68% of GDP. The US economy, which has a large internal market (315 million inhabitants) has a relatively low degree of openness: exports represent 13.5% of GDP against 29% for the other members of the G7⁽²⁾. Changes to household consumption therefore play an essential role in the expectations of American companies.

Before the Lehman Brothers crisis, US households benefited from regular increases in their income and a relatively low rate of unemployment. They also benefited from favourable credit conditions which allowed them to easily get into debt to finance their purchases. Household debt represented 143% of available income in 2007, against 107% in 2000. And consumption grew rapidly between 2003 and 2007 (+3.2% on average each year). The 2008 financial crisis caused a significant

Chart n° 1

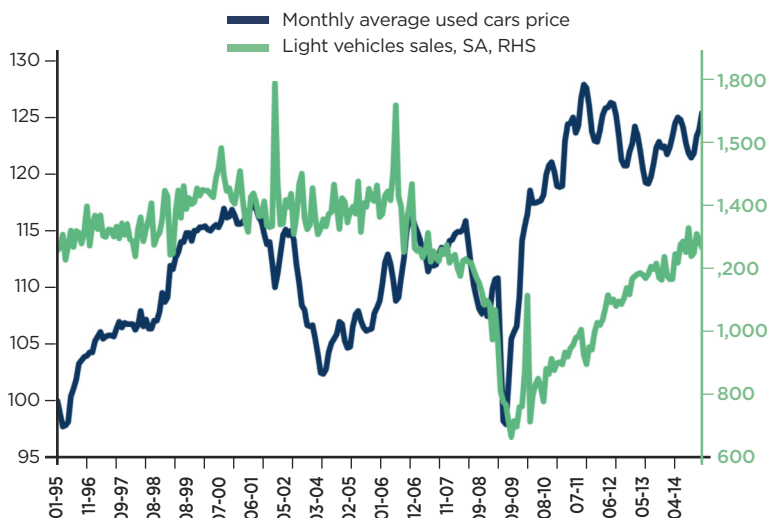
US automotive production and monthly sales since 2004.



Sources : BEA, Ward's

Chart n° 2

Monthly sales of light vehicles in the United States and second-hand price index, base 100 = January 1995.



Sources : BEA, Mannheim

(1) Troubled Asset Relief Program: series of measures taken in 2008 under the presidency of G.W Bush, to support the US economy, which was on the brink following the occurrence of the crisis.

(2) United States, Japan, Germany, France, United Kingdom, Italy and Canada.

contraction in consumer confidence and in consumption (see chart n° 3). But since 2012, US growth (estimated at +2.4% in 2014 and forecast by Coface at +3.6% in 2015) is again greater than its potential growth (2% according to the OECD) and the rate of unemployment is dropping (5.5% in February 2015, against 10% in 2009). This rate is close to the level of structural unemployment for the economy, which is assessed at 5.4%⁽³⁾ by the OECD.

The United States is therefore close to full employment and upward pressure is beginning to bear upon salaries and working time. Consequently, part-time work is tending to diminish and salary renegotiations by branches are increasing. For example, the US retail giant Wal-Mart has committed nearly \$1 billion to increase the salaries of its

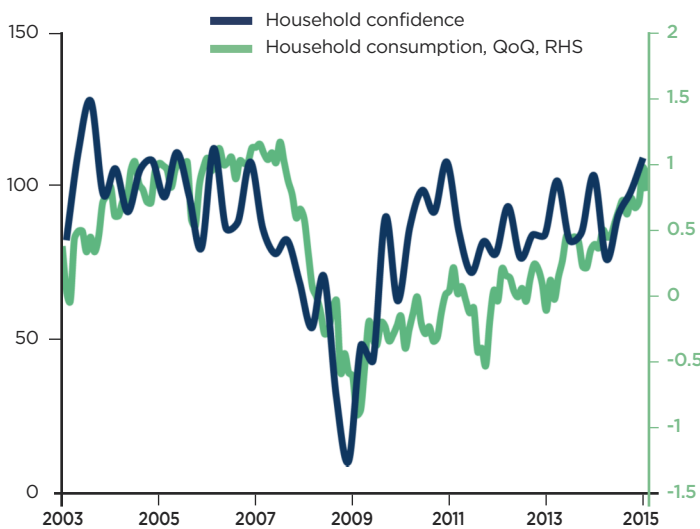
employees in 2015 (1.3 million in total). Likewise, IKEA has increased the minimum salary of its employees by 17%. The confidence of households is therefore going in the right direction and is leading them to consume (+2.2% on average since 2012).

Yet, according to the *Bureau of Labor Statistics*⁽⁴⁾ (BLS), US consumers devote a large share of their budget to expenses related to automobiles (16.6%). Their net expenditure in purchasing a car represented \$3,271 in 2013 (6.5% of annual expenditure). Indeed, the number of cars per inhabitant is higher in the United States (808 cars per 1,000 inhabitants in 2012⁽⁵⁾) than in other OECD countries (634 in Canada and 577 in Western Europe). Furthermore, according to J.D. Power and Associates, the renewal rate of a car in the United States is less than 7 years (6.5 years in 2014). Although consumers delayed their purchases of cars following the crisis, we have seen a catch-up since then. In 2007, US households bought 16 million vehicles. In 2009, sales dropped by 35% compared to 2007 (see chart n° 1 page 3).

In 2015, the automotive market appears to be returning to maturity, although the drop in the price of oil by 48% in 2014 nevertheless boosted sales from the second half of 2014, while beforehand they were tending to slow. Indeed, the annual growth rate of sales decreased by two percentage points between January and August 2014. Then in September, the oil price per barrel dropped under the symbolic level of \$100, helping to boost sales (+7.4% over one year in February 2015, when the price stood at \$60 per barrel). Coface estimates that the price per barrel will remain less than \$100 over the long term and predicts that it will stay around \$55 in 2015, which will contribute positively to the expectations of households.

Chart n° 3

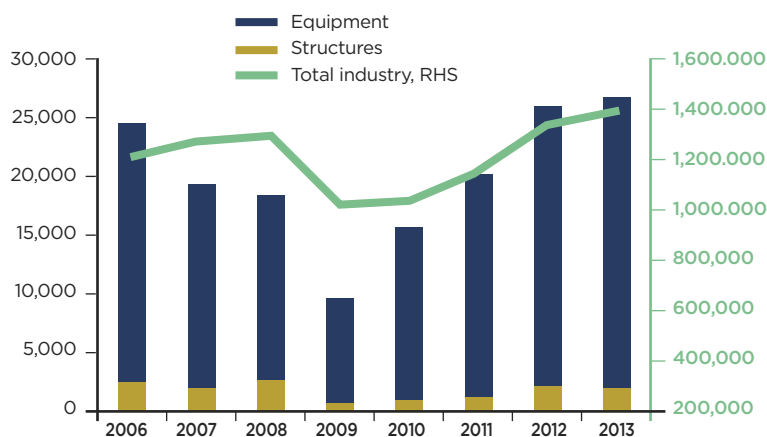
Confidence and annual growth in household consumption



Sources : Conference board, BEA

Chart n° 4

Changes to investment expenditure, millions of dollars



Source : US Census Bureau

Investment that is back on track

Since 2010, this recovery has been accompanied by an increase in investments in the sector⁽⁶⁾ (see chart n° 4), which returned to their pre-crisis level in 2011. The decision to invest expresses the confidence that industrialists will subsequently generate additional income. This dynamism was made possible by entrepreneurs getting their confidence back, but also, as we saw previously, consumers.

Analysis of changes to investment is particularly important in the US automotive sector because of its substantial effects on the rest of the economy. Indeed, each new job on an automotive assembly line creates eleven additional jobs in the rest of the economy through the supply chain⁽⁷⁾.

(3) The OECD publishes the structural unemployment rate (NAIRU) beyond which inflationary pressures appear.

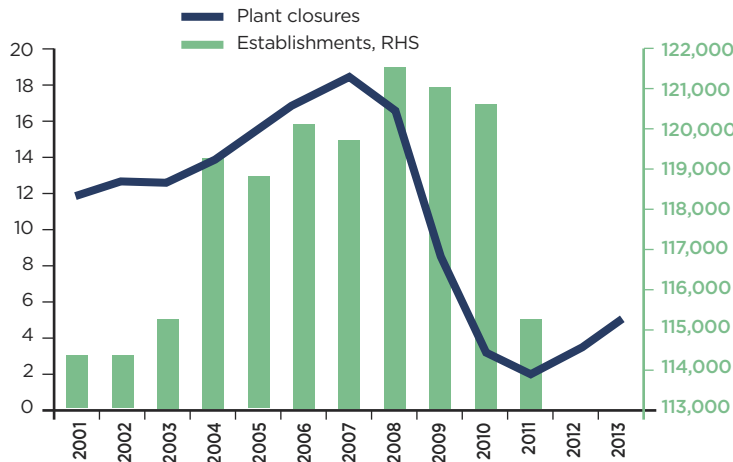
(4) "Consumer Expenditures in 2013", 2015, BLS report

(5) Office of Energy Efficiency & Renewable Energy

(6) Motor Vehicle Manufacturing (NAICS 3361); Body and Trailer Manufacturing (NAICS 3362); Parts Manufacturing (NAICS 3363); All Establishments (NAICS 3361-3363)

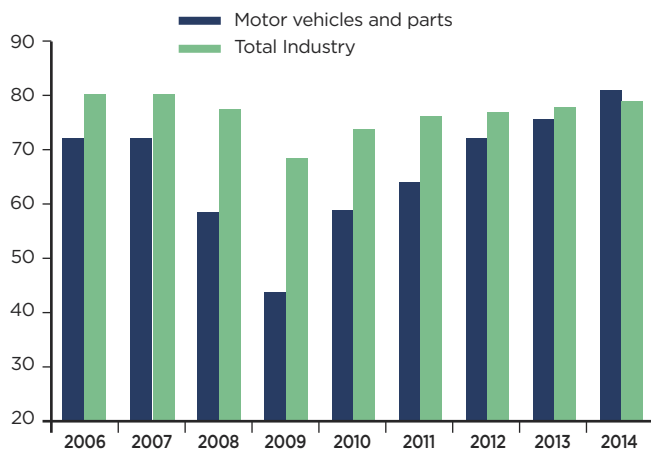
(7) Center for Automotive Research, "Accelerating the Growth of the U.S. Automotive Manufacturing Industry at Home, Rather than Abroad", 2014

Chart n° 5
Trend in the number of establishments and factory closures in the US automotive sector



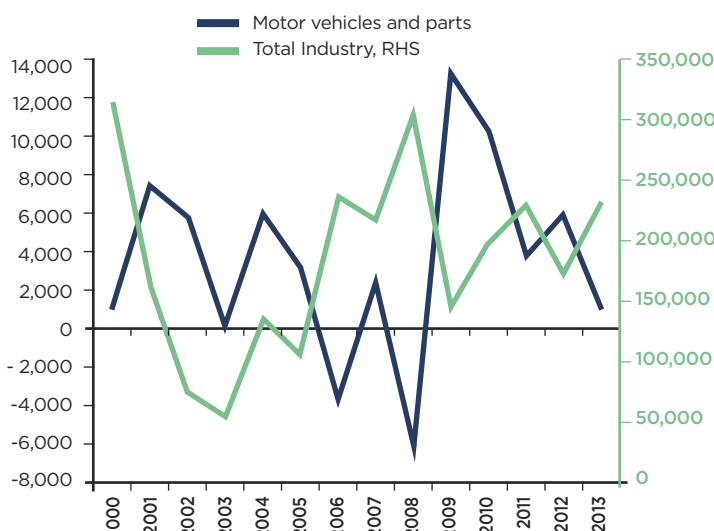
Sources : Center for Automotive Research, U.S. Bureau of Labor Statistics

Chart n° 6
Change to production capacity utilisation rates



Source : Federal Reserve System

Chart n° 7
Change to direct investment flows in the United States, in millions of dollars



Source : Federal Reserve System

This recovery was the fruit of a conjunction of factors. Firstly, the 112 factory closures between 2004 and 2010 undertaken mainly by US manufacturers (General Motors, Chrysler and Ford) to rationalise production consequently led to a drop in the productive capacity of the country (see chart n° 5). Therefore, the high rate of production capacity utilisation (81% in 2014, see chart n° 6), reflecting underinvestment during the crisis, required industrialists to invest in new production units and equipment. Then, car manufacturers took advantage of the moderation of funding costs allowed by the loose monetary policy of the US central bank, which has kept its key interest rate at 0.25% since December 2008. Also, public policies directly targeting the automotive sector have encouraged investment, such as the *Select USA Initiative*⁽⁸⁾ established in June 2011.

The return to favour of made in US ...

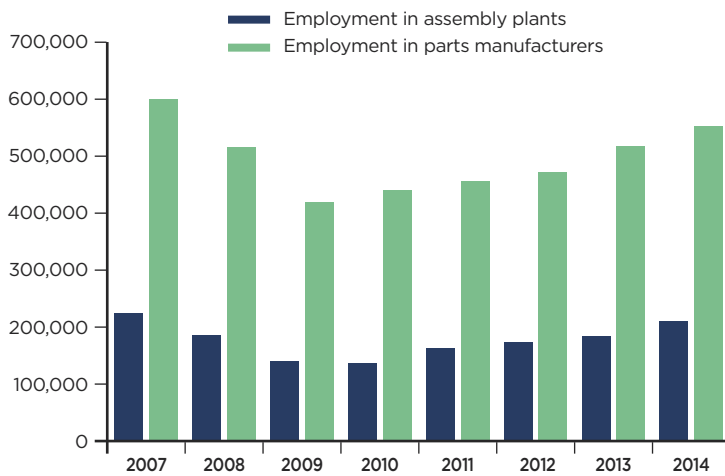
Concerning foreign direct investment in the United States (FDI), the country has not been left aside in recent years (see chart n° 7). After a gloomy period between 2007 and 2009, FDI flows restarted very vigorously in 2010 and 2011, before stabilising. In 2013, FDI in the automotive sector reached \$924 million, representing 0.4% of worldwide FDI.

In particular, these FDI reflect a changing trend in the organisation of automotive production. It is a process of onshoring production to the national territory, such as Ford moving part of its production (the *Fusion* and *Transit* models), which were initially located in Mexico and Turkey, for the benefit of the states of Michigan and Missouri. The adage "*build where you sell*" is now motivated by two factors. Firstly, the increasing automation of production methods is reducing the requirement for labour and consequently is tending to make the location of production insensitive to salary levels. Secondly, transport costs (energy and freight) and logistics costs have become greater, as well as the risks associated with an extended supply chain. In this way, automakers are tending to locate their production closest to final consumers.

(8) The SelectUSA initiative is a national initiative of the Obama government. This aims to encourage investment (attraction, retention and onshoring), both domestic and foreign, in the United States, supplementing the activities carried out at the State level. SelectUSA coordinates resources and functions between the US trade department, the federal departments and the agencies dealing with questions of investment.

Chart n° 8

Changes between 2007 and 2014 to employment in assembly plants and equipment manufacturers.



Source : BLS

... which is resulting in a jobs recovery

A corollary of this investment recovery is the creation of jobs. Indeed, the fallout from the 2008 crisis was particularly harmful for employment. The large US manufacturers and their equipment suppliers made massive redundancies, accompanying the closure of factories. Thus, according to the *Labor Bureau of Statistics*, employment in assembly plants and equipment manufacturers dropped respectively by 37% and 29% between 2007 and 2009. Nevertheless, the resumption in sales was followed by a return of hiring, because at the end of 2014, total employment in these two branches of the automotive sector increased by 51% and 31% respectively, compared to 2009 (see chart n° 8).

2

A STRONG RECOVERY, BUT NOT WITHOUT RISKS

Credit risk: increase in subprime automotive loans

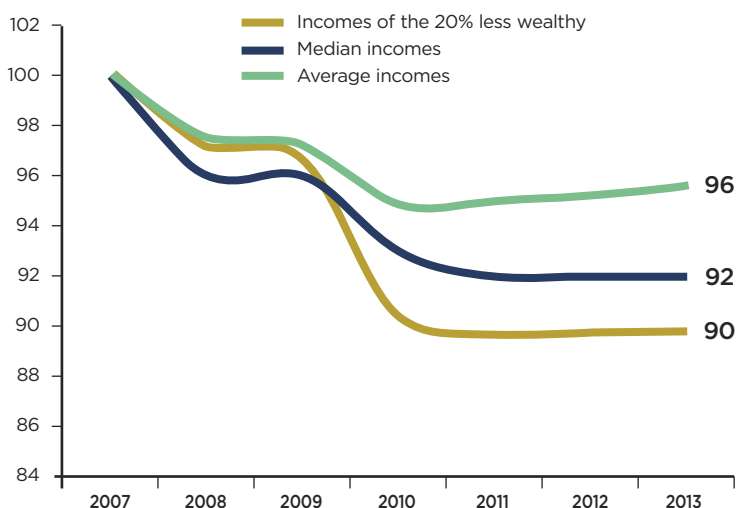
The resumption in household confidence caused fierce competition amongst automotive manufacturers. As a consequence of increased supply, the average price of cars increased less rapidly than salaries. Indeed, the average price of a vehicle was \$31,762 in 2013, against 28,966 in 2007, representing an increase of 10.7%. Over the same period, the average income of an American increased by 16.9%⁽⁹⁾. The increase seen in all salaries in 2015 (see *the previous part*) cannot hide the fact that in 2010, the return to growth did not benefit all consumers in the same way

(see chart n° 9). Although the average real income of Americans tended to grow from 2010, and in 2015, according to Coface, will probably exceed its 2007 level, the income of the least well-off remains below the pre-crisis level.

Yet, in the fourth quarter of 2014, the Federal Bank of New York showed that household debt had increased by 2.7% compared to the fourth quarter of the previous year, representing the greatest increase since 2010. This change is concomitant with a large increase in the stock of automotive loans since 2010 (+34, see chart n° 10), particularly aimed at borrowers who are considered risky. Thus, nearly 85% of new vehicles sales, in the third quarter of 2014, were financed using credit (*Experian*). This share stood at 74% in the third quarter of 2009. Interest rates are so low that lenders are seeking to increase their profitability by financing risky borrowers. According to the Fed, the average rate of an automotive loan over 24 months was 4% in 2015, against 7% in November 2008.

Chart n° 9

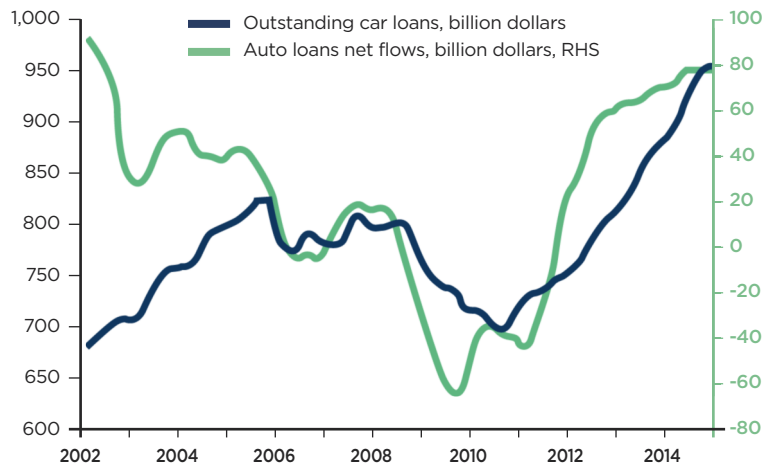
Changes to income in the United States (2007=100)



Source : Census Bureau

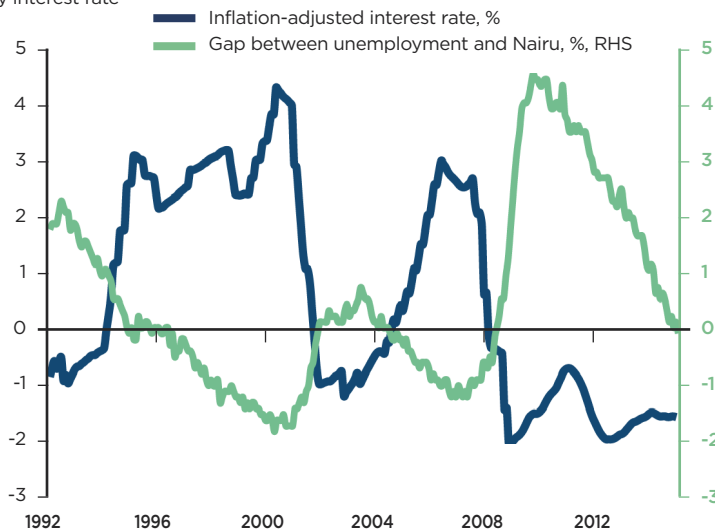
(9) Pre-tax income, Bureau of Economic Analysis, U.S. Department of Commerce

Chart n° 10
The volume of automotive loans has exploded since 2010 in the United States



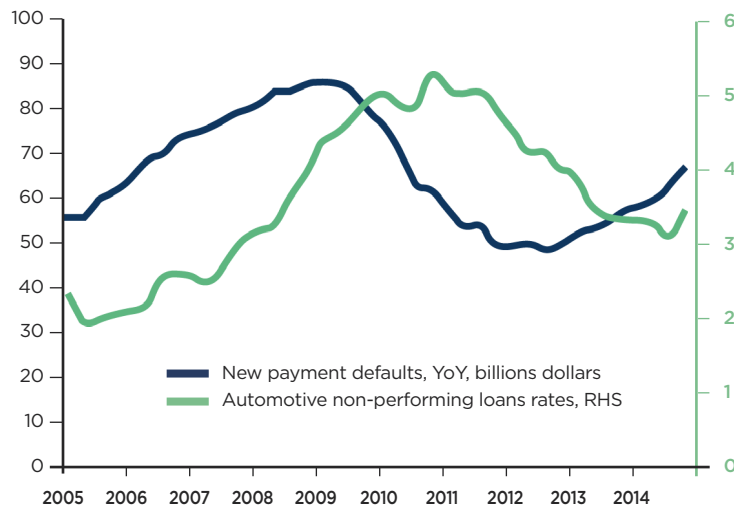
Source : FED

Chart n° 11
The return to full employment would lead to an increase in real American key interest rate



Sources : FED, BLS, Coface

Chart n° 12
Changes to non-performing loans



Source : FED

In 2013, two automotive lenders, *Drive Time Automotive Group* and *Credit Acceptance Corporation*, increased their loans respectively by 19% and 14%. Over the first 11 months of 2014, four loans (automotives, credit cards and consumer loans) out of ten were to risky borrowers (subprimes)⁽¹⁰⁾. The amount of these risky loans stood at \$189 billion, the highest level since 2007. Yet these borrowers, who are considered risky, must pay higher variable reimbursement rates, which make them even more sensitive to a reversal of the cycle.

The end of cheap credit

Besides, the employment figures have been going in the right direction since 2010. In February 2015, the level of unemployment, of 5.5%, corresponded to the long-term structural rate (see *chart n° 11*). Historically, such progress has been accompanied by rising interest rates, to avoid a rise in inflationary pressures. Although the current level of inflation in the United States, mainly related to weakness in the price of foodstuffs and energy, should not allow the Fed to increase its rates before the third quarter of 2015, this upward movement would reduce the income of the most risky borrowers and could quickly result in them having to return their vehicles.

The lenders justify the rise in subprime automotive loans by explaining that it is quicker to recover a vehicle than a house, in the case of property loans. Since the explosion of the subprimes crisis in 2008, it has required up to 1,000 days for a bank to be able to repossess a house in case its owner ceases repayment. In the case of a vehicle, the delay is only 60 days. Also, there is no speculative dimension in cars (with the exception of collectors' vehicles). Thus, car buyers know that cars depreciate over time. Therefore, vehicle repossessions due to payment cessation increased by 8% in 2014 compared to 2013, according to the consultancy Mannheim.

Significant increase in payment defaults

US households are already finding it difficult to service their debts. The statistics gathered by the New York Fed show that payment delays were up strongly over a year, representing \$67.5 billion at the end of 2014, against 57 in 2013. Defaults (delays greater than 90 days) represent 3.5% of outstanding debt. This percentage should significantly increase in 2015 to reach 5% (see *chart n° 12*). Also, the *Consumer Financial Protection Bureau*, established in 2011, shows that individual complaints related to loans are 66% related to the automotive sector. This result shows that buyers lack information when they borrow and are therefore relatively vulnerable.

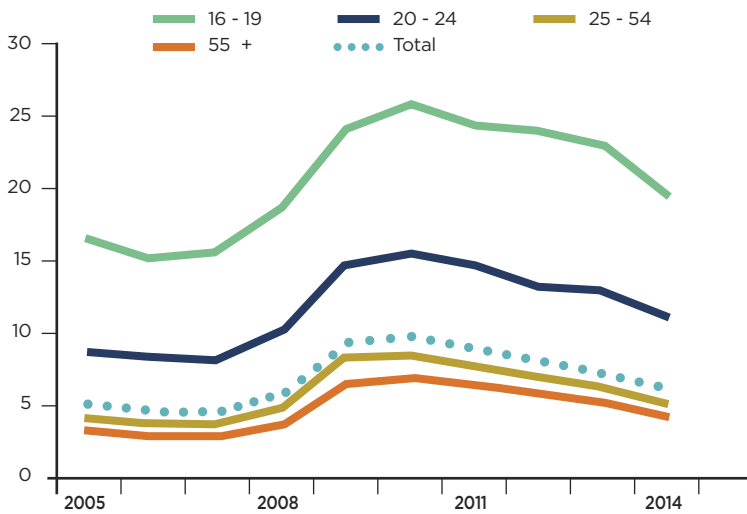
(10) Data compiled by the Wall Street Journal and Equifax

Disaffection for the automotive?

Although these observations mean that signs of short-term weakness are appearing, the automobile industry is gradually having to cope with various societal changes which are inviting companies to reconsider their business models. Amongst these changes, those coming from the new generation of Millennials (those born between 1983 and 2000) are particularly important because they rep-

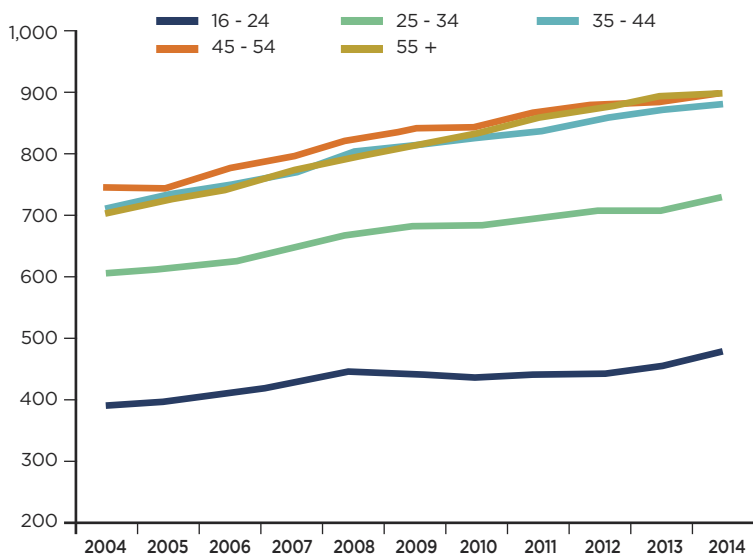
resent both a significant pool of future consumers and because their consumption habits, which are still very changeable due to their young age, will occupy an increasing place as the generations are renewed. It is therefore crucial for manufacturers to adapt their product ranges to their constraints (purchasing power) and preferences (online purchasing, preference for technology and sensitivity to environmental issues).

Chart n° 13
Unemployment rates per age



Source : U.S. Bureau of Labor Statistics

Chart n° 14
Median weekly income by age in dollars



Source : U.S. Bureau of Labor Statistics

Even though the United States remains the ultimate automotive country, the question of young adults becoming disaffected with cars, whether it results from a personal choice or from circumstances beyond their control, must be raised. Indeed, between 1995 and 2010, the country saw a 9% drop in the proportion of driving licence holders for the 20-29 year category⁽¹¹⁾ (going from 91% to 82%). At the same time, the daily average distance travelled by young Americans has also dropped since the beginning of the millennium. Between 2001 and 2009⁽¹²⁾, it went from about 61 to 47.5 km for those aged 16-20 (-22%) and from 73.4 km to 60.7 for those aged 21-35 (-17%).

Financial constraints and inter-generational inequalities: unemployment, student debt and salary moderation

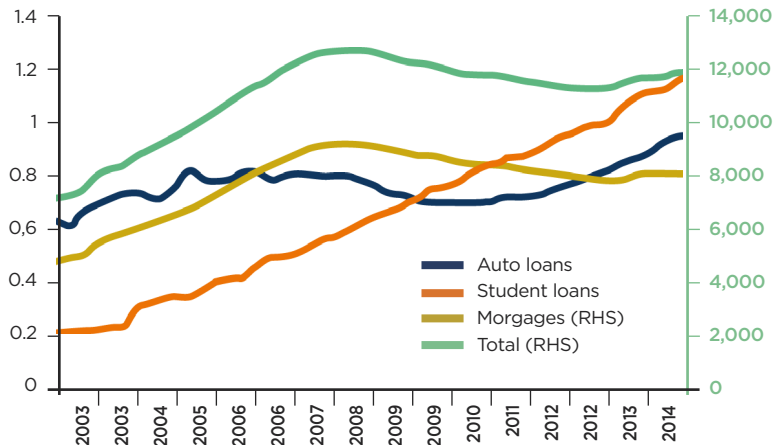
The demand for automobiles in the United States is having to cope with very marked inter-generational inequalities. The combination of unemployment, which is still very present amongst those aged 16-34, high student debt and income moderation highlights the financial difficulties of the new generations.

The US economic recovery has naturally been accompanied by an improvement in the job market, as shown by the rate of unemployment, which is near to its pre-crisis level (see chart n° 13). However, the younger generations, who were an adjustment variable during the crisis, are still suffering the consequences of it. While the unemployment rate of those aged 16-19 years was 15.7% in 2007 (8.2% for those aged 20-24), it still remained significantly higher in 2014 (19.5% for those aged 16-19 years and 11.2% for those aged 20-24).

Other than access to employment, the moderation of income amongst young people is restricting their access to automobiles. Young people, less experienced and joining a more complex job market, receive income that is significantly lower than that of older individuals (see chart n° 14). While the median weekly income of those aged 35-44 is \$881, that of those aged 25-34 is \$726 and for those aged 16-24 it is \$477.

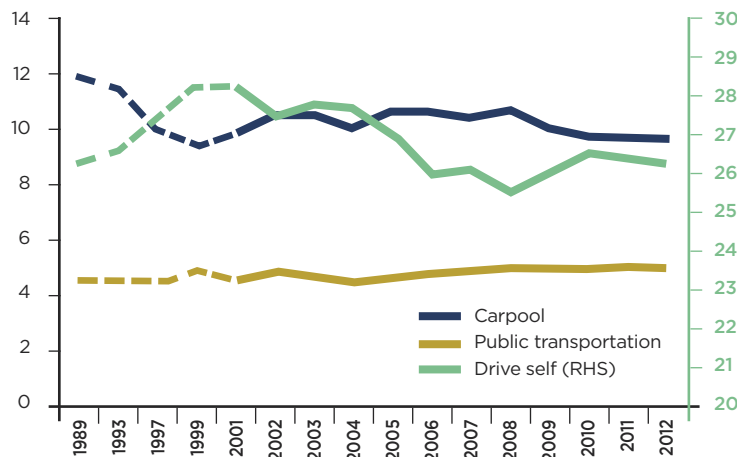
(11) Institute for Mobility Research (ifmo) A Research Establishment of the BMW Group 'Mobility Y' - The Emerging Travel Patterns of Generation Y
(12) Bureau of Transportation Statistics

Chart n° 15
Stock of debt in trillions of dollars



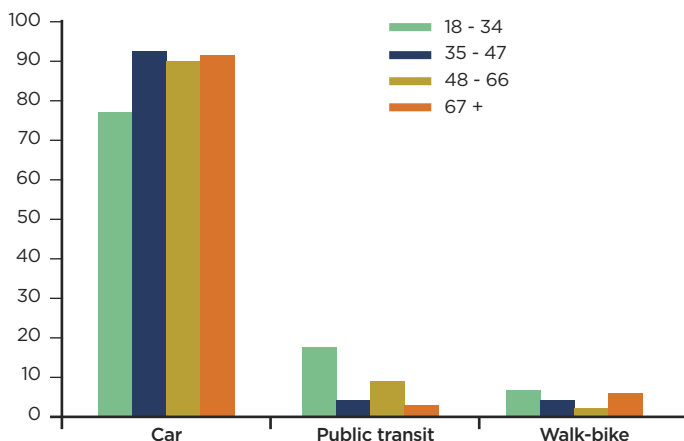
Sources : FRBNY, Consumer Credit Panel / Equifax

Chart n° 16
Modes of transport used for going to work, by percentage



Sources : U.S. Department of Housing and Urban Development, American Housing Survey, U.S. Department of Commerce, U.S. Census Bureau, American Community Survey

Chart n° 17
Modes of transport used for going to work, by age (2013)



Source : Urban Land Institute

In response to high levels of youth unemployment, young people are tending to pursue their studies to make it easier for them to enter the job market. The share of those aged 15-19 who are studying went from 73% to 81% between 2000 and 2012. In the case of those aged 20-29, it went from 20% to 27%. By delaying their arrival on the job market, individuals are postponing the time when they begin families, which defers the requirement to buy a larger vehicle to transport children.

Another corollary of this pursuit of studies is the increasing weight of student debt, which restrains consumption and demand for automotive loans and induces social changes in young workers (see chart n° 15)⁽¹³⁾. Indeed, the amount of student debt has become the main non-mortgage debt over the last few years, exceeding \$1,160 billion at the end of 2014⁽¹⁴⁾. This debt already appears too heavy because, since 2012, the share of student loans in arrears of more than 90 days exceeded 10% (11.3% in the 4th quarter of 2014).

Consequently, the financial constraints affecting young people are pushing them more towards the second-hand market or towards less expensive vehicles, or even to postpone their purchases of automotives.

Renewal of consumption behaviours: the use of alternative transport modes

If they manage to attract US consumers over the long term, the boom in alternative modes of transport could also be a threat to the sale of automotives in the United States. This is not yet the case: in spite of a drop of 2% between 2001 and 2012 (see chart n° 16), the preferred mode of going to work remains very largely the automotive (76% in 2012), leaving little place for car sharing (10%) and public transport (5%).

However, the transport habits of the new generations are changing more quickly (see chart n° 17). According to a survey by the *Urban Land Institute*, while about 90% of individuals aged over 35 use their cars to go to work, this rate is much lower for those aged 18-34 (77%), highlighting increased use of public transport. If the greater use of car-sharing and public transport continues with the renewal of the generations, automotive manufacturers will have to adapt to this over the long term. Furthermore, individuals' attachment to their automotives varies significantly between the generations. Indeed, according to the consultancy *Deloitte*⁽¹⁵⁾, only 64% of Millennials prefer their automotive as a mean of transport against 81% for the other generations.

(13) C.Mistretta-Belna, "The increase in student debt in the United States, a source of economic weakness?", Banque de France, 3rd quarter 2014 (N° 197)
 (14) Federal Reserve Bank of New York
 (15) Craig A. Griffi, et al., "The Changing Nature of Mobility," Deloitte Review 15, 28 July 2014

This process should continue during the years to come for several reasons. Firstly, university campuses (about 40% of Americans between 18 and 24 are enrolled in a university) favour and increasingly promote these means of transport, to reduce expenses and space devoted to garages, reduce road congestion and reduce their environmental footprints. To this end, universities are helping to shape new behaviours, which are likely to be retained, in the use of transport modes through various initiatives. For example, the establishment of free or subsidised public transport and the generalised construction of cycle tracks has contributed to the relative abandonment of cars on campuses. As evidence of this trend, 61% of universities offered financial incentives to use public transport in 2011⁽¹⁶⁾.

By the same reasoning, private car-sharing initiatives are spreading across US universities, such as Zipcar, which now offers its car-sharing service on more than 400 campuses. Founded in 2000 in the United States, this start-up⁽¹⁷⁾ has grown rapidly and is now established in six countries. The commercial success of the company (bought by the US rental group Avis in 2013) is evidence that this form of transport provides a solution that fits to the new environmental and economic constraints represented by automotive ownership. This development, made possible through the use of new technologies (automotive reservation over the Internet), should continue to attract more and more users. The large-scale tech-

nological revolutions (Internet, smartphones and Wi-Fi networks) that the Millennials have known have changed their preferences compared to previous generations: online comparison of products and sellers, preference for technology, etc. Now, this generation of consumers is causing hyper-competitiveness in the automotive market because it seems more demanding (easy comparison of technical characteristics) and they could therefore be less loyal to brands than previous generations were.

Even though increasing ecological awareness is probably not directly responsible for changes in transport behaviours, it supports and strengthens them alongside initiatives to raise awareness of environmental issues. At the same time, the direction of US regulation towards gradual reduction of polluting emissions will add to this process. Already, a survey by Zipcar shows that 35% (35-44 years) to 39% (18-34 years) of Americans say they are ready to use their automotives less to protect the environment. However, in practice, this motivation is only in fifth position concerning the choice of transport mode⁽¹⁸⁾, behind financial, practical and health reasons.

To summarise, young people, both constrained financially and aspiring to new modes of consumption, seem to be developing a certain propensity to reduce their use of automotives in favour of alternative modes of transport (public transport and car sharing).

3 A SECTOR WHICH IS ADAPTING TO THESE RISKS

Facing the difficulties affecting their industry, automotive manufacturers have begun to deliver solutions. The high price of oil over the last few years, and the policy of promoting "green" technologies⁽¹⁹⁾, have driven sales of electric and hybrid automotives in the United States.

Particle emissions: a danger, but also an opportunity

Chart 18 (page 11) highlights the spectacular increase in the sales of electric and hybrid vehicles in 2012, with the launch of vehicles such as the Tesla model S, and the Chevrolet Volt and Nissan Leaf gaining momentum. Neither should we forget the Toyota Prius, one of the pioneers in hybrid engines.

Policies to promote sales of "green cars" have assisted a promising sector, despite suffering from the inherent difficulties of the technologies used (high prices of components, autonomy still low compared to internal combustion engines, etc.). Thus, at the federal level, buyers of this type of vehicle can claim a tax credit of \$7,500 when they make their purchases. Furthermore, the energy ministry gives financial aid to manufacturers by offering them loans via the ATVM fund (*Advanced Technology Vehicles Manufacturing*), which promotes the development of technologies enabling the United States to limit its dependence on imported fuels.

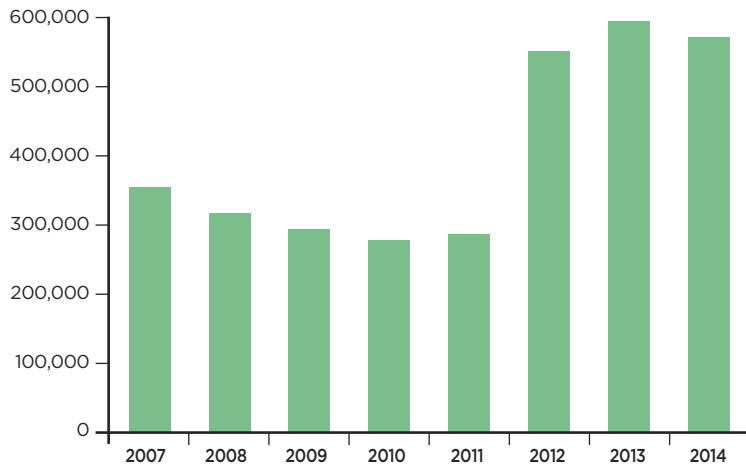
(16) Sustainable Endowments Institute, College Sustainability Report Card 2011

(17) Zipcar is a subsidiary of the Avis Budget group

(18) American Public Transportation Association, Millennials & Mobility: Understanding the Millennial Mindset, 2013

(19) By "green" vehicles, we mean hybrid electrical vehicles and those propelled completely by a source of electricity, whether it is on-board or not.

Chart n° 18
Changes to electric or hybrid vehicles sales in the United States



Source : EDTA

Table 1 summarises the loans granted from this fund. Thus Tesla Motors was able to take advantage of contributions from this fund to finance a factory producing, among others, the four-door saloon version of its model S. Lastly, the federal government grants a tax credit to companies

and shops, of 30% of the cost of a charging station. Concerning private individuals, this credit stands at \$1,000 if they install a station at their place of residence.

Table n° 1
Summary of the main loans granted by the ATVM

Programme	Number de projects	Amount granted
Ford Motor Company	13	\$5.9 billion
Nissan North America	2	\$1.5 billion
Tesla Motors	2	\$465 million

Source : Department of Energy

At the state level, the situation is just as interesting, but rather uneven. Most policies to promote these technologies are based on purchase subsidies or tax credits. There is also the free supply of electricity and aid to financing recharging terminals, due to the lower autonomy. The state of California is the leader in this matter (in particular because it is the largest of the states), requiring each manufacturer who wishes to continue to sell there to make 15% of its sales in the form of zero-emission vehicles by 2025.

Text box 1

Tesla Motors

Founded in 2003, Tesla Motors is an automotive manufacturer specialised in premium vehicles. Since it was founded, its development has been dazzling, making itself known for its models such as the Roadster and the Model S. These contribute to this manufacturer's strategy of influencing opinion leaders with vehicles at the cutting-edge of technol-

ogy (autonomy of more than 300 km), while having the attributes of luxury cars. The managers of Tesla thus hope to distribute their future models to the middle classes when they imitate the more wealthy classes. The company's profits have been constantly increasing since 2008, undergoing exceptional growth. The same applies to R&D

expenditure, indicating the company's strong desire to consolidate its technological lead over its competitors who are, partly, its customers. Tesla supplies the electric motor for Toyota's Rav4, one of the pioneers of hybrid technology.

Toyota

Toyota was the pioneer, in 1997, in the mass dissemination of hybrid technology, with its Prius model. Since then, a wide range of models with internal combustion engines now includes an electric

part. Thus, in the United States, Toyota is the leader in sales of hybrid vehicles, with a market share of 67% in 2014. This domination is mostly dependent on its Prius model and its numerous versions,

but also its Camry, one of the best sellers in its internal combustion engine version. To this must be added the CT200h from Lexus, the group's premium subsidiary.

We cannot do without the internal combustion engine

Nevertheless, manufacturers are betting more on improving internal combustion engines to reduce fuel consumption and thus reduce CO₂ emissions. Chart 19 is eloquent on this subject: the distance travelled per gallon of fuel (about 3.8 L), on average, by new vehicles, has continuously increased since 2007.

But this is also explained by the standards (issued by the States or at the federal level) that are increasingly restrictive concerning particle emissions. In order to be able to reduce the country's dependence on the import of oil products, vehicles must be able to travel greater distances per litre of fuel. This is obviously accompanied by a reduction in the carbon intensity of emissions, with reasons related to air quality and environmental protection being added to the above considerations.

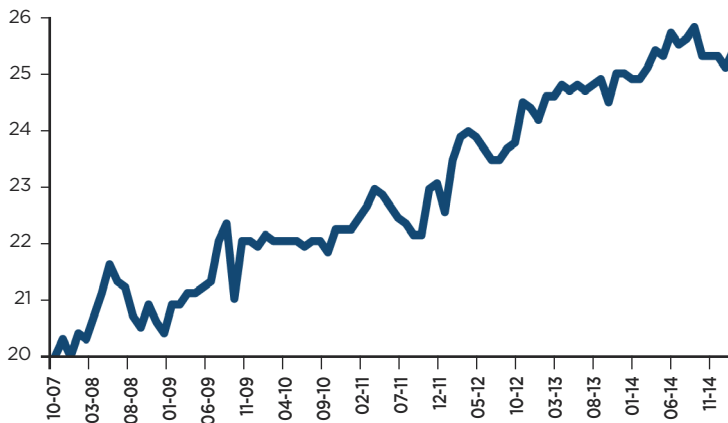
For this reason, the federal government (via its agencies EPA and NHTSA), following California's position on engines, decided in 2012 to reduce the carbon intensity of emissions by 48% by 2025 (model-year). In other words, the models coming out each year between 2012 and 2025 must emit fewer particles (see chart n° 20).

Inflation in new model launches in the years to come, driven by the R&D process

This will have a favourable effect on sales because consumers wishing to replace aged vehicles will have to consider the new models that will be offered by the manufacturers. Because of this, it will be necessary to adapt to a new landscape, partly dictated by new regulations put in place at the federal level. Yet, the launch of new models has a positive effect on sales. Thus, according to data compiled by Standard & Poor's, launches of new models (which must comply with the standards for air quality and environmental protection) are standing at levels which have not been seen since 2008 (see chart n° 21).

These launches of new models can only be possible if manufacturers invest in research and development (R&D) during the preceding years.

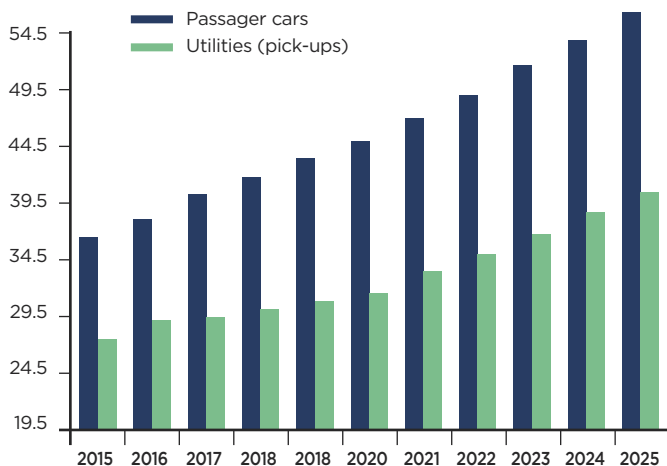
Chart n° 19
Miles increased per gallon of fuel.



Source : UMTRI

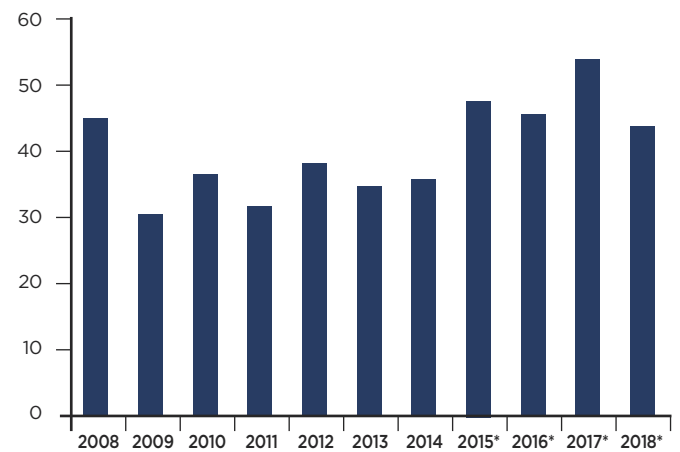
This trend towards fuel economy explains the desire of US consumers to have vehicles that use less fuel, to keep their bills down at service stations. Thus, the market share of small and medium-sized vehicles increased between 2011 and 2014 (36.8% against 34%), according to the NADA (National Automotive Dealers Association).

Chart n° 20
Forecast objectives in miles per gallon according to federal standards.



Source : ICCT

Chart n° 21
Projected launches of new models in the United States



Source : S&P

* Forecast

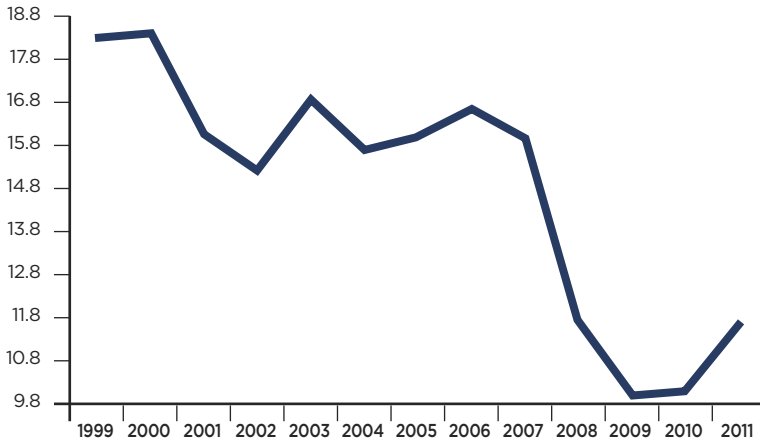
Chart 22 gives a snapshot of changes to R&D expenditure in the automotive industry in the United States. After a gap between 2008 and 2010, at the low point of the recession, R&D

expenditure recovered, reaching \$18 billion in 2013, according to figures from manufacturers. They concern the development of engines that emit fewer particles and less CO₂, whether they are of the internal combustion, electric or hybrid types. The other research topics are the development of the "connected car" and aid to driving. Also, in these areas, we are seeing a gradual transfer of the power relationship between equipment suppliers and manufacturers, switching towards the former.

At the worldwide level, the number one American manufacturer, GM Company, comes only third in R&D expenditure, behind its two other competitors: Volkswagen and Toyota. Thus, according to the 2014 annual survey by the consultancy Strategy& (formerly Booz & Co, now forming part of the PWC group), the amount spent by VW is much larger than that of GM (\$13.5 billion against 7.2). Toyota occupies second place, with \$9.1 billion, and Ford is in fifth place, with \$6.4 billion, behind Daimler.

Chart n° 22

Changes to R&D expenditure in the automotive industry in the United States, in billions of dollars.



Sources : NSF, CAR

Text box 2

Automotive sales forecast

We have conducted a forecast of the number of automotive sales for 2015. We have based this on ARMAX modeling, which is a dynamic regression of automotive sales, accepting and processing the autocorrelation of residuals. Our explanatory variables are the following: the survey of purchasing managers from ISM Chicago (ISM_CHI),

consumer credit (CC), the indicator from the national association of home builders (NAHB), savings rates (SAV) and unemployment rates (UNE). Here is the table of coefficients obtained.

The results obtained tell us that automotive sales in the United States will increase by 3.8% in 2015 compared to

2014. We explain this rate, which is lower than those of 2013 (+5.34%), 2012 (+6.9%) or 2011 (+13.7%), by the fact that automotive sales have caught up with their pre-crisis level, as well as the fact that the US economy, as a whole, has stabilised after the deep recession of 2008/2009.

	AR1	MA1	ISM_CHI	CC	NAHB	SAV	UNE
Coefficients	3.727	-19.182	3.779	1.970	3.573	-4.516	-3.263
p-values	0.0002	0.0000	0.0002	0.0488	0.0004	0.0000	0.0011

4 CONCLUSION

What are the prospects for 2015?

The sector has benefited from US growth since 2012 (+2.3% on average between 2012 and 2014) and from the concomitant household confidence. It seems to have returned to a mature level, which suggests a slowdown in the increase in sales (+7.6% in 2013 and +5.7% in 2014). In 2015, according to Coface, car sales should exceed 17 million vehicles (light vehicles and pickups), representing an increase of 3.8% compared to 2014. The volume

of sales made will then be comparable with those of the beginning of the 2000s (17.4 and 17.1 million vehicles sold in 2000 and 2001). The still-sustained growth in household consumption, the reduction of unemployment and the reduction in oil prices (providing that they do not spike upwards) are all factors that support the expansion of the automotive market in the short term.

RESERVATION

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